

Enablers and Barriers to Knowledge sharing in the UAE infrastructural projects

ممكنات ومعوقات مشاركة المعرفة في مشاريع البنية التحتية لدولة الإمارات العربية المتحدة

by

MOHAMED ALI AHMED ALDHANHANI

A thesis submitted in fulfilment

of the requirements for the degree of

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Abstract

The sharing of knowledge could be a catalyst for achieving organisational goals more quickly, or it could also be a means to a poor ending of a project. Recent researches have recognised the complications of knowledge sharing (KS) practices in projects due to their temporal nature and unaccountability of clients and beneficiaries in regard to projects. This thesis aims to examine how KS is successfully utilised to create successful projects in the infrastructure development sector. The research questions concentrate on addressing the integration of the KS process to improve project success within the infrastructure development sector of the United Arab Emirates (UAE).

The data was collected using questionnaire survey method to examine the integration of KS in infrastructural projects in the UAE.

The literature review is used to extract enablers and barriers of success in KS in UAE infrastructural projects. The extracted enablers are categorised into seven groups (organisational, motivation, processes, technologies, social networking, physical environment, and individual), whereas the barriers are categorised into three groups (individuals, organisational, and technological). The data was collected through a survey from 112 valid respondents. The respondents were drawn from specific organisations within the infrastructural sectors of the UAE. Several statistical methods were used for the data analysis, including descriptive statistics, reliability analysis, ANOVA analysis, correlation, and regression. The research outcomes indicate that three enablers influence the level of KS contributions to project success: the ability of social networks to simplify personal relationships and social interactions to facilitate the project KS process (E24); the characteristics of the physical environments such as the shape of the office spaces or relaxed and quiet environment (E30); and loyalty and hard work to increase project success via KS (E35). The research findings also show that four enablers are important for the benefits of timely KS in infrastructural projects: leadership commitment to support open and honest twoway communication in projects (E5), measurements of knowledge sharing before and after any project activities (E8), implementation of less formal resources such as social media to share embedded project knowledge (E11), and the ability to communicate between project stakeholders regarding the project through specific channels (E13). In addition, the results support that two enablers were assessed as important for the quality of the timeliness of KS in

infrastructural projects, the first of which is a clear policy or strategy for project knowledge sharing (E1), and the second refers to sufficient assets and resources to support project KS processes (E12). The results appear to show that respondents believed that two enablers are relevant to the effectiveness of KS between stakeholders at each stage of the projects lifecycle: sufficient reward systems to share knowledge (E4) and sufficient assets and resources to support project KS processes (E12). In the barriers clusters, the respondents agreed that a lack of trust for others regarding sharing project knowledge (B3) impacts KS contributions to project success. Only one barrier was deemed important for the effectiveness of KS between stakeholders at each stage of a project's lifecycle: lack of a motivation policy for knowledge sharing (B12). The ANOVA analysis findings offer a variety of interrelationships between the identified enablers and barriers based on respondents' work sectors. The study's conclusions support the vision that there is a need for more organisational commitment (E3), further leadership commitment arrangements to support open and honest two-way communication (E5), a wider range of communication channels organisational commitment to support the uses of KS in the project lifecycle (E13). In order to facilitate KS inside of the project, there is a need for sufficient funding, facilities, and technological resources (E28). Furthermore, it is very necessary to take further measures in order to facilitate communication between different stakeholders and to ensure the establishment of a culture of motivated KS in projects. Moreover, it is obligatory to address external or macroenvironmental factors (B15) in this regard to support the uses of KS in infrastructural projects in the UAE.

This research focuses primarily on KS inside the unique context of project management (PM) in the UAE region, so the results presented herein may not be fully applicable or generalisable to other countries due to existent cultural differences.

This research is considered to be one of the earliest studies which addresses the existing knowledge gaps by providing a roadmap to investigate KS practices and tools that can be successfully utilised in PM processes to promote underpinning knowledge within the UAE area. In addition, this study provides industry practitioners with better perceptions and an empirical framework of KS to utilise the lessons that have been learned from the mistakes of previous projects. This research can be further expanded in the future by applying social networking tools to analyse the interaction of knowledge flows among different stakeholders.

ملخص البحث

إن مشاركة المعرفة قد تشكل عاملا تحفيزيا لتحقيق الأهداف التنظيمية للمشروع بسرعة أكبر، أو ربما قد تكون أيضا وسيلة لفشل المشروع أو نهايته بشكل سيء. وقد اعترفت الأبحاث الحديثة بمدى تعقيدات ممارسات مشاركة المعرفة في المشاريع بسبب طبيعتها الزمنية المؤقتة وعدم توفر مبدأ المساءلة بين العملاء وكافة أصحاب المصلحة المستفيدين فيما يتعلق بتلك المشاريع. وعليه تهدف هذه الأطروحة إلى دراسة كيفية الاستخدام الأمثل لمشاركة المعرفة بنجاح لخلق مشاريع ناجحة في قطاع تطوير البنية التحتية. وتركز أسئلة البحث بشكل مباشر على معالجة آليات وطرق تكامل مشاركة المعرفة لغرض تحسين فرص نجاح المشاريع ضمن قطاع تطوير البنية التحتية في دولة الإمارات العربية المتحدة.

إن البيانات الخاصة بهذا البحث قد تم جمعها باستخدام طريقة الاستبيان الكمي وذلك لدر اسة و اختبار تكامل ودمج مشاركة المعرفة تحديدا في مشاريع البنية التحتية في دولة الإمار ات العربية المتحدة.هذا وقد تم استخدام متن البحث أو الإطار النظري لاستخلاص عو امل التمكين و العو ائق التي تحول دون نجاح مشاركة المعرفة في مشاريع البنية التحتية في الإمار ات العربية المتحدة. وبناء على ذلك تصنف العو امل التمكينية المستخرجة من خلال الإطار النظري لاست مجمو عات (التنظيمية أو المؤسسية ،و التحفيزية ،و المتعلقة بالعمليات،و التكنولوجية، و المتعلقة بالشبكات الاجتماعية ،و المتعلقة بالبيئة المادية ،و أخير ا الفردية)، في حين تصنف المعوقات إلى ثلاث مجموعات (الفردية و التنظيمية و التكنولوجية). تجدر الإشارة بأنه تم جمع البيانات من خلال استطلاع الرأي لعدد 112 مشارك فعال. هذا وقد تم اختيار هؤلاء المشاركين من منظمات حكومية محددة ضمن قطاعات البنية التحتية في دولة الإمار ات العربية المتحدة. كما أنه قد تم استخدام عدة طرق إحصائية لتحليل البيانات، بما في ذلك الالتحدية في دولة الإمار الفردية التحليمية مؤلاء المشاركين من منظمات حكومية محددة ضمن قطاعات البنية التحتية في دولة الإمار ات العربية المتحدة. كما أنه قد تم استخدام عدة طرق إحصائية لتحليل البيانات، بما في ذلك الإحصاء الوصفي، تحليل الموثوقية، تحليل أنوفا، التحليل الار تباطي، و تحليل الانحدار.

وتشير نتائج البحوث إلى أن ثلاثة عوامل تمكينية تؤثر على مستوى مساهمات مشاركة المعرفة في نجاح المشروع وهي: قدرة الشبكات الاجتماعية على تبسيط العلاقات الشخصية والتفاعلات الاجتماعية لتسهيل عملية مشاركة المعرفة للمشروع؛ وخصائص البيئات المادية مثل شكل المساحات المكتبية أو توافر الببيئة الهادئة ؛ والولاء والعمل الجاد لزيادة نجاح المشروع عن طريق مشاركة المعرفة .و أيضا تبين نتائج البحوث أن أربعة عوامل تمكينية مهمة لزيادة فائدة مشاركة المعرفة المتعلقة بالمشروع في الوقت المناسب في مشاريع البنية التحتية وهي: الالتزام القيادي بدعم الاتصالات المفتوحة والصادقة بين كافة أطراف المشروع ، وقياس أداء مشاريع البنية التحتية وهي: الالتزام القيادي بدعم الاتصالات المفتوحة رسمية مثل وسائل التواصل الاجتماعي لتبادل المعرفة المعرفة قبل وبعد أي فعالية في المشروع ، وتنفيذ موار د أقل رسمية مثل وسائل التواصل الاجتماعي لتبادل المعرفة المعمنة في المشروع، والقدرة على التواصل بين أصحاب المصلحة في المشروع بشأن المشروع من خلال قنوات محددة .وبالإضافة إلى ذلك، تدعم النتائج تقييم عاملين تمكينيين على أنهما مهمان بالنسبة لجودة مشاركة المعرفة في مشاريع البنية التحتية، أولهما هو وجود سياسة أو استراتيجية واضحة المشاركة المعرفة بين أسمروع من خلال قنوات محددة .وبالإضافة إلى ذلك، تدعم النتائج تقييم عاملين تمكينيين على أنهما مهمان بالنسبة لجودة مشاركة المعرفة في مشاريع البنية التحتية، أولهما هو وجود سياسة أو استراتيجية واضحة المشاركة المعرفة بين أسمراكة المعرفة في مشاريع البنية التحتية، أولهما هو وجود سياسة أو استراتيجية واضحة المشروع مشاركة المعرفة بين ألمعرا للتمكيني الثاني يشير إلى مدى توافر الأصول والموارد الكافية إلى دعم عمليات المشروع مشاركة المعرفة بين أساحاب المعاملة في كل مرحلة من مراحل دورة حياة المشاريع وهما: توافر نظم مكافآت بفاعلية متباركة المعرفة بين أصحاب المصلحة في كل مرحلة من مراحل دورة حياة المشاريع وهما: توافر نظم مكافآت بفاعلية مشاركة المعرفة، اين ألموارد والموارد الكافية لدعم عمليات المشروع. وأما فيما يتعلق بخصوص مرامرة موقات مشاركة المعرفة، اتفق المشاركون بالبحث عليات المشروع. وأما فيما يتعلق بخصوص مرافر منظم مكافآت بالمشروع يؤثر سلبيا على مساهمات مشاركة المعرفة في نجاح المشروع. وكذلك فقد اعتبر أن عدم وجود سياسة تحفيز لمشاركة المعارف تشكل أحد اهم العوائق السلبية لفعالية نظام مشاركة المعرفة بين أصحاب المصلحة في كل مرحلة من مراحل حياة المشروع.

بالإضافة إلى ذلك تقدم نتائج تحليل أنوفا مجموعة متنوعة من العلاقات المتبادلة بين العوامل التمكينية والحواجز المحددة بناء على قطاعات عمل المشاركين بالبحث. حيث تدعم استنتاجات الدراسة الرؤية بأن هناك حاجة لمزيد من الالتزام التنظيمي المؤسسي، والحاجة لمزيد من الالتزام القيادية لدعم مفتوحة ونزيهة الاتصالات بين كافة أطراف دورة حياة المشروع،وتوفير مجموعة واسعة من قنوات الاتصال من خلال الالتزام المؤسسي لدعم استخدامات مشاركة المعرفة في دورة حياة المشروع. وكذلك فإن هناك حاجة إلى توفير ما يكفي من التمويل والمرافق والموارد التكنولوجية بغية تسهيل عملية مشاركة المعرفة داخل المشروع، وعلاوة على ذلك، فإنه من التمويل والمرافق والموارد التكنولوجية بغية تسهيل تسهيل وتيسير عمليات الاتصال بين مختلف أصحاب المصلحة وضمان إنشاء ثقافة تحفيزية لمشاركة المعرفة في المشاريع. و علاوة على ذلك، فإنه من الضروري أيضا معالجة العوامل الخارجية ألميرية في

إن هذا البحث يركز في المقام الأول على مشاركة المعرفة ضمن السياق الفريد لإدارة المشاريع في دولة الإمارات العربية المتحدة، وبالتالي فإن النتائج المعروضة هنا قد لا تكون قابلة للتطبيق أو التعميم بالكامل إلى دول أو مناطق أخرى بسبب الاختلافات الثقافية القائمة.

يعتبر هذا البحث من أوائل الدراسات التي تعالج الثغرات المعرفية القائمة من خلال توفير خارطة طريق للتحقيق في ممارسات وأدوات مشاركة المعرفة التي يمكن استخدامها بنجاح في كافة العمليات المتعلقة بإدارة المشاريع لتعزيز المعرفة الأساسية داخل دولة الإمارات العربية المتحدة. وبالإضافة إلى ذلك، توفر هذه الدراسة للمختصين والممارسين بإدارة المشاريع تصور أفضل وإطار تطبيقي أفضل لمشاركة المعرفة للاستفادة من الدروس التي يتم تعلمها من أخطاء المشاريع السابقة. ويمكن تمديد هذا البحث في المستقبل من خلال تطبيق أدوات الشبكات الاجتماعية لدراسة وتحليل تفاعل التدفقات المعرفية بين مختلف أصحاب المصلحة في المشروع.

بسم الله الرحمن الرحيم

{قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا ٦ إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ }

سورة البقرة(32)

In the name of Allah, Most Gracious, Most Merciful They (angels) said: "Glory is to You, we have no knowledge except what you have taught us. Verily, it is You, the Knower, the Wise."

The Holy Quran surah Al Baqarah 32

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Table of Contents

1.	Chapter 1: Introduction
1.1	Overview1
1.2	Problem Statement
1.3	Significance of the Study
1.4	Aim of the Research
1.5	Research Objectives
1.6	Research Questions
1.7	Research hypotheses10
1.8	Research Methodology10
1.9	Research Assumptions 10
1.10	Research Limitations
1.11	Outline of structure
1.12	Chapter summary
2.	Chapter 2: Knowledge sharing theories15
2.1	Introduction15
2.2	The perception of Knowledge15
2.2.1	Knowledge concept
2.2.2	Difference between Data, Information, and Knowledge17
2.2.3	Knowledge as a tacit and explicit forms18
2.3	The perception of knowledge management
2.3.1	Knowledge management Concept 20
2.3.2	Knowledge management Processes
2.4	Knowledge sharing
2.4.1	Knowledge sharing concept
2.4.2	Knowledge sharing cycle
2.4.3	Related theories to Knowledge sharing
2.1	Chapter summary
3.	Chapter 3: Knowledge sharing in the Infrastructure Development Sector
3.1	Introduction
3.2	Characteristics of infrastructure development sector
3.3	Knowledge management at infrastructure development sector

3.4 industi	Conceptual model of KS theories in general organisational hierarchy at infrastructure level ry model
3.5	Chapter summary
4.	Chapter 4: Knowledge sharing through lifecycle of project management
4.1	Introduction
4.2	Knowledge sharing in project lifecycle
4.2.1	Integrating knowledge sharing to project cycle 49
4.2.2	Methods of Knowledge sharing in projects
4.2.3	Enablers of success Knowledge sharing in a project
4.3	Value of Knowledge sharing in project management
4.3.1	Definition of success in a project
4.3.2	The contribution of Knowledge sharing in the project success
4.4	How is Knowledge sharing through phases of the lifecycle of projects?
4.4.1	General project lifecycle, activities, stakeholders and knowledge
4.5	Development of new mapping of knowledge components at each stage of project lifecycle 79
4.6	Chapter Summary
5.	Chapter 5: Research framework
5.1	Introduction
5.2	Research problem
5.3 the UA	Development of conceptual model of knowledge sharing in UAE infrastructural projects in E infrastructure development sector
5.4	Development of Hypotheses
5.4.1	Enablers to knowledge sharing in the projects
5.4.2	Barriers to knowledge sharing in projects96
5.4.3	Personality traits as mediating variables97
5.5	Chapter Summary
6.	Chapter 6: Research Methodology100
6.1	Introduction
6.2	Research Philosophy
6.2.1	Research Paradigm 101
6.2.2	Research Approach
6.3	Research Design

Selection of Research Methods)7
Survey11	11
114	
Unit of Analysis	25
Pilot Study 12	26
Research sampling12	26
Collection of Data	27
Triangulation	28
Data Analysis	28
Ethical Considerations	30
Chapter Summary13	31
Chapter 7: Descriptive analysis	32
Introduction13	32
Descriptive Statistics for results and data analysis13	33
Reliability	34
Descriptive Analysis	38
Ranking Analysis) 3
Normality test)3
Chapter Summary	38
Chapter 8: Correlation and Regression analysis)9
Correlation)9
Regression Analysis	22
Modelling the impact of the KS enablers on the rate of knowledge sharing contribution to t success	27
Modelling the impact of the KS enablers on the benefits that might be gained from timely edge sharing in the infrastructural projects	34
Modelling the impact of the KS enablers on the quality of the timeliness of KS in ructural projects	42
Modelling the impact of the KS enablers on the effectiveness on knowledge sharing en stakeholders at each stage of the project lifecycle	49
Modelling the impact of the KS barriers on the rate of KS contribution to project success25	56
Modelling the impact of the KS barriers on the quality of the timeliness of KS in the ructural projects	63
	Selection of Research Methods 10 Survey 12 114 114 Unit of Analysis 12 Pilot Study 12 Research sampling 12 Collection of Data 12 Triangulation 12 Data Analysis 12 Ethical Considerations 12 Chapter Summary 13 Introduction 13 Descriptive Statistics for results and data analysis 13 Reliability 13 Descriptive Analysis 14 Descriptive Statistics for results and data analysis 15 Normality test 20 Chapter Summary 20 Correlation 20 Normality test 21 Modelling the impact of the KS enablers on the rate of knowledge sharing contribution to t success 22 Modelling the impact of the KS enablers on the quality of the timeliness of KS in ructural projects 24 Modelling the i

7.	Modelling the impact of the KS barriers on the effectiveness of KS between st 269	akeholders
8.3	Chapter Summary	276
9.	Chapter 9: Hypothesis Testing	277
9.1	Research Hypotheses for ANOVA	277
9.1.1	Hypothesis 1a	279
9.1.2	Hypothesis 1b	281
9.1.3	Hypothesis 1c	284
9.1.4	Hypothesis 1d	287
9.1.5	Hypothesis 1e	289
9.1.6	Hypothesis 1f	291
9.1.7	Hypothesis 1g	294
9.1.8	Hypothesis 2a	295
9.1.9	Hypothesis 2b	297
9.1.10	Hypothesis 2c	301
9.2	Hypotheses testing for regression and correlation analysis	302
9.2.1	Hypothesis 3	302
9.2.2	Hypothesis 4	303
9.2.3	Hypothesis 5	305
9.2.4	Hypothesis 6	305
9.2.5	Hypothesis 7	306
9.2.6	Hypothesis 8	307
9.2.7	Hypothesis 9	308
9.3	Chapter Summary	
10.	Chapter 10: Discussion	312
10.1	Introduction	
10.2	Research questions	313
10.3	Discussion of questionnaire survey	
10.3.1	The emerging enablers and barriers of KS (From descriptive analysis)	
10.3.2	ANOVA	321
10.3.3	Correlation and Regression	347
10.4	Summary of Chapter	358
11.	Chapter 11: Conclusion	359

11.1	Overview	359
11.2	Robustness of the Research Methodology	359
11.3	Research Objectives	360
11.4	Conclusion	361
11.5	Generalizability, Applicability, and Implications of Findings	364
11.6	Research Limitations	365
11.7	Research Contribution	366
11.8	Recommendations for further research	367
11.9	Chapter Summary	368
12.	References	369
13.	Appendices	384
Appen	dix 1 Knowledge components at each PM process group	384
Appen	dix 2 Letter of study Invitation	391
Appen	dix 3 Consent Form	392
Appen	dix 4 Questionnaire Survey	393
Appen	dix 5 Regressions results	406

List of Tables

TABLE	PAGE
Table 1-1: Research main hypotheses	
Table 2-1: Main literature findings for knowledge sharing theories.	
Table 3-1: Main literature findings for knowledge sharing theories.	
Table 4-1: Knowledge components at each project lifecycle phase	76
Table 4-2: PM process group and knowledge area mapping of PMBOK® guide	
Table 4-3: Main literature findings for knowledge sharing through lifecycle of PM.	
Table 5-1: The big five factors	
Table 6-1: Coding of personality traits sub questions	
Table 6-2: Coding of KS benefits	
Table 6-3: Coding of quality of KS	
Table 6-4: Coding of effectiveness of KS	
Table 6-5: Coding of the seven groups of enablers of the success of KS in infrastructural	projects 121
Table 6-6: Coding of the three groups of barriers of the success knowledge sharing in inf	rastructural
projects	
Table 6-7: Overview of research questions and unit of analysis	
Table 6-8: Overview of Research Hypotheses	
Table 7-1: Item-total statistics of reliability scale for survey question 2	
Table 7-2: Reliability (Cronbach alpha test) for the questionnaire questions	
Table 7-3: Extraversion Distribution (Q1a)	
Table 7-4: Extraversion Distribution (Q1b)	
Table 7-5: Extraversion Distribution (Q1c)	
Table 7-6: Extraversion Distribution (Q1d)	141
Table 7-7: Extraversion Distribution (Q1e)	141
Table 7-8: Agreeableness Distribution (Q2a)	
Table 7-9: Agreeableness Distribution (Q2b)	
Table 7-10: Agreeableness Distribution (Q2d)	143
Table 7-11:Agreeableness Distribution (Q2e)	144
Table 7-12: Conscientiousness Distribution (Q3a)	144
Table 7-13: Conscientiousness Distribution (Q3b)	145
Table 7-14: Conscientiousness Distribution (Q3c)	145
Table 7-15: Conscientiousness Distribution (Q3d)	146
Table 7-16: Conscientiousness Distribution (Q3e)	147
Table 7-17: Neuroticism Distribution (Q4a)	147
Table 7-18: Neuroticism Distribution (Q4b)	148
Table 7-19: Neuroticism Distribution (Q4c)	148
Table 7-20: Neuroticism Distribution (Q4d)	149
Table 7-21: Neuroticism Distribution (Q4e)	149
Table 7-22: Openness Distribution (Q5a)	
Table 7-23: Openness Distribution (Q5b)	150
Table 7-24:Openness Distribution(Q5c)	151
Table 7-25: Openness Distribution (Q5d)	151
Table 7-26: Openness Distribution (Q5e)	152

Table 7-27: Openness Distribution (Q5f)	152
Table 7-28: Work sector distribution (Q6)	153
Table 7-29: KS contribution distribution (Q7)	154
Table 7-30: KS culture distribution (Q8)	154
Table 7-31: KS benefits distribution (Q9a)	155
Table 7-32:KS benefits distribution (Q9b)	155
Table 7-33: KS benefits distribution (Q9c)	156
Table 7-34: KS benefits distribution (Q9d)	157
Table 7-35: KS benefits distribution (Q9e)	157
Table 7-36: KS quality distribution (Q10a)	158
Table 7-37: KS quality distribution (Q10b)	158
Table 7-38: KS quality distribution (Q10c)	159
Table 7-39: KS quality distribution (Q10d)	159
Table 7-40: KS quality distribution (Q10e)	160
Table 7-41: KS quality distribution (Q10e)	160
Table 7-42: KS effectiveness distribution (Q11a)	161
Table 7-43: KS effectiveness distribution (Q11b)	162
Table 7-44: KS effectiveness distribution (Q11c)	162
Table 7-45:KS effectiveness Distribution(Q11d)	163
Table 7-46: KS effectiveness distribution (Q11e)	163
Table 7-47: KS enablers distribution (E1)	164
Table 7-48: KS enablers distribution (E2).	165
Table 7-49: KS enablers distribution (E3)	165
Table 7-50: KS enablers distribution (E4).	166
Table 7-51: KS enablers distribution (E5)	166
Table 7-52: KS enablers distribution (E6)	167
Table 7-53: KS enablers distribution (E7).	167
Table 7-54: KS enablers distribution (E8)	168
Table 7-55: KS enablers distribution(E9)	168
Table 7-56: KS enablers distribution (E10)	169
Table 7-57: KS enablers distribution (E11)	169
Table 7-58: KS enablers distribution (E12)	170
Table 7-59: KS enablers distribution (E13)	170
Table 7-60: KS enablers distribution (E14)	171
Table 7-61: KS enablers distribution (E15)	171
Table 7-62: KS enablers distribution (E16)	172
Table 7-63: KS enablers distribution (E17)	172
Table 7-64: KS enablers distribution (E18)	173
Table 7-65: KS enablers distribution (E19)	173
Table 7-66: KS enablers distribution (E20)	174
Table 7-67: KS enablers distribution (E21)	175
Table 7-68: KS enablers distribution (E22)	175
Table 7-69: KS enablers distribution (E23)	176
Table 7-70: KS enablers distribution (E24)	176
Table 7-71: KS enablers distribution (E25)	177
Table 7-72: KS enablers distribution (E26)	177

Table 7-73: KS enablers distribution (E27)	178
Table 7-74: KS enablers distribution (E28)	179
Table 7-75: KS enablers distribution (E29)	179
Table 7-76: KS enablers distribution (E30)	180
Table 7-77: KS enablers distribution (E31)	180
Table 7-78: KS enablers distribution(E32)	181
Table 7-79: KS enablers distribution (E33)	181
Table 7-80: KS enablers distribution(E34)	182
Table 7-81: KS enablers distribution (E35)	182
Table 7-82: KS enablers distribution (E36)	183
Table 7-83: KS barriers distribution (B1)	183
Table 7-84: KS barriers distribution (B2)	184
Table 7-85: KS barriers distribution (B3)	184
Table 7-86: KS barriers distribution (B4)	185
Table 7-87: KS barriers distribution (B5)	185
Table 7-88: KS barriers distribution (B6)	186
Table 7-89: KS barriers distribution (B7)	186
Table 7-90: KS barriers distribution (B8)	187
Table 7-91: KS barriers distribution (B9)	187
Table 7-92: KS barriers distribution (B10)	188
Table 7-93: KS barriers distribution (B11)	189
Table 7-94: KS barriers distribution (B12)	189
Table 7-95: KS barriers distribution (B13)	190
Table 7-96: KS barriers distribution (B14)	190
Table 7-97: KS barriers distribution (B15)	191
Table 7-98: KS barriers distribution (B16)	191
Table 7-99: KS barriers distribution (B17)	192
Table 7-100: KS barriers distribution (B18)	192
Table 7-101:Ranking of each personality traits	193
Table 7-102: Ranking of personality traits as groups	193
Table 7-103: Ranking of KS benefits	195
Table 7-104: Ranking of KS benefits	195
Table 7-105: Ranking of KS quality	196
Table 7-106: Ranking of quality of timeliness of KS in infrastructural projects	196
Table 7-107: Ranking of KS effectiveness	197
Table 7-108: Ranking of the effectiveness of knowledge sharing	198
Table 7-109: Ranking of all KS enablers	198
Table 7-110: Ranking of KS enablers as groups	199
Table 7-111: Ranking of Key KS enablers	199
Table 7-112: Ranking of each KS barriers	201
Table 7-113: Ranking of KS barriers as groups	202
Table 7-114: Ranking of Key KS barriers	202
Table 7-115: Test of normality for five personality traits groups	204
Table 7-116: Test of normality for all variables of the three KS effectiveness groups	206
Table 8-1: Correlation between the KS enablers and personality traits	210

Table 8-2: Correlation between the KS enablers as independent variables and work sector (Q6) as
dependent variables
Table 8-3: Correlation between the KS enablers as independent variables and the KS contribution to
project success (Q7) as dependent variables
Table 8-4: Correlation between the KS enablers as independent variables and the current status of the
KS culture in the infrastructure sector (Q8) as dependent variables
Table 8-5: Correlation between the KS enablers as independent variables and Q9, Q10, and Q11 as
dependent variables
Table 8-6: Correlation between the KS barriers as independent variables and personality traits as
dependent variables
Table 8-7: Correlation between the KS barriers as independent variables and the KS contribution to
project success (Q7) as dependent variables
Table 8-8: Correlation between the KS barriers as independent variables and the status of the KS
culture in the infrastructure sector (Q8) as dependent variables
Table 8-9: Correlation between the KS barriers as independent variables and the benefits of KS in
infrastructural projects (Question 9) as dependent variables
Table 8-10: Correlation between the KS barriers as independent variables and the quality of the
timeliness of KS in infrastructural projects (Question 10) as dependent variables
Table 8-11: Correlation between the KS barriers as independent variables and the effectiveness of KS
between stakeholders at each stage of the project lifecycle (Ouestion 11) as dependent variables219
Table 8-12: Correlation between the dependent variables of the five personality traits with O6, O7, O9.
O_{10} and O_{11}
Table 8-13: Summary of the regression model results (for regression between the KS enablers and the
rate of knowledge sharing contribution to project success $[071]$
Table 8-14: Summary of the analysis of variation of the regression model results (for regression
between the KS enablers and the rate of knowledge sharing contribution to project success [07]) 228
Table 8-15: Results for estimated coefficients extracted from regression models (for regression
between the KS enablers and the rate of knowledge sharing contribution to project success [07]) 230
Table 8-16: Testing the Collinearity between variables (for regression between the KS enablers and
the rate of knowledge sharing contribution to project success [07])
Table 8-17: Residuals' Statistics (for regression between the KS enablers and the rate of knowledge
sharing contribution to project success [07])
Table 8, 18: Summary of the regression model regults (regression between the KS enablers and the
hanefits that might be goined from timely KS in infrastructural projects [O0])
Table 8 10. Summers of the analysis of variation of the regression model results (regression between
Table 8-19: Summary of the analysis of variation of the regression model results (regression between the KS and the heaviest that might be available to the second frequencies of the second se
the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])
Table 8 20: Results for estimated coefficients extracted from regression models (for regression
between the KS enablers and the benefits that might be gained from timely KS in infrastructural
projects [O0])
Table 8 21. Testing the collingerity between variables (for represeion between the KS anglers and the
have 0-21. Testing the confineative between variables (for regression between the KS enablers and the
Table 9.22. Desiduals? Statistics (for respective between the KS = 11 and 14 and 54 an
Table 6-22: Residuals Statistics (for regression between the KS enablers and the benefits that might
Tells 8.22. Summers of the mean relation of the mean relation of the second sec
1 able 8-23: Summary of the regression model results (regression between the KS enablers and the
quality of the quality of the timeliness of KS in infrastructural projects [Q10])243

Table 8-24: Summary of the analysis of variation of the regression model results (for regression	
between the KS enablers and the quality of the quality of the timeliness of KS in infrastructural	
projects [O10])	243
Table 8-25: Results for estimated coefficients extracted from regression models (for regression	
between the KS enablers and the quality of the quality of the timeliness of KS in infrastructural	
projects [O10])	24
Table 8-26: Testing the Collinearity between variables (for regression between the KS enablers and	
the quality of the quality of the timeliness of KS in infrastructural projects $[010]$	245
Table 8-27: Residuals' Statistics (for regression between the KS enablers and the quality of the qua	lity
of the timeliness of KS in infrastructural projects [O10])	ту)16
Table 8.28: Summary of the regression model results (for regression between the KS enablers and t	-40 ha
affectiveness of KS between stakeholders at each store of the project lifesyele [O11])	.11C
Table 8, 20. Summers of the analysis of surjection of the mersonian model results (for regression	230
Table 8-29: Summary of the analysis of variation of the regression model results (for regression	
between the KS enablers and the effectiveness of KS between stakeholders at each stage of the proj	ect
	250
Table 8-30: Results for estimated coefficients extracted from regression models (for regression	
between the KS enablers and the effectiveness of KS between stakeholders at each stage of the proj	ect
lifecycle [Q11])	252
Table 8-31: Testing the Collinearity between variables (for regression between the KS enablers and	Į
the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])	253
Table 8-32: Residuals' Statistics (for regression between the KS enablers and the effectiveness of K	S
between stakeholders at each stage of the project lifecycle [Q11])2	253
Table 8-33: Summary of the regression model results (for regression between the KS barriers and the	ne
rate of KS contribution to project success [Q7])2	257
Table 8-34: Summary of the analysis of variation of the regression model results (for regression	
between the KS barriers and the rate of KS contribution to project success [Q7])	258
Table 8-35: Results for estimated coefficients extracted from regression models (for regression	
between the KS barriers and the rate of KS contribution to project success [Q7])	259
Table 8-36: Testing the Collinearity between variables (for regression between the KS barriers and	the
rate of KS contribution to project success [07])	260
Table 8-37: Residuals' Statistics (for regression between the KS barriers and the rate of knowledge	
sharing contribution to project success (07))	260
Table 8-38: Summary of the regression model results (regression between the KS barriers and the	200
α and α β)64
Table 8-30: Summary of the analysis of variation of the regression model results (for regression	-04
hotwash the KS harriars and the quality of the timeliness of KS in the infrastructural projects [010]	0
between the KS barriers and the quarty of the timenness of KS in the infrastructural projects [Q10]))61
Table 9,40. Descrite for estimated as officients extracted from respection models (for respection	204
Table 8-40: Results for estimated coefficients extracted from regression models (for regression	
between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])
	266
Table 8-41: Testing the Collinearity between variables (for regression between the KS barriers and	the
quality of the timeliness of KS in the infrastructural projects [Q10])	266
Table 8-42: Residuals' Statistics (for regression between the KS barriers and the quality of the	
timeliness of KS in the infrastructural projects [Q10])	267
Table 8-43: Summary of the regression model results (for regression between the KS barriers and T	'he
effectiveness of knowledge sharing between stakeholders [Q11])	271

Table 8-44: Summary of the analysis of variation of the regression model results (for regression	
between the KS barriers and The effectiveness of knowledge sharing between stakeholders [Q11]) 271	
Table 8-45: Results for estimated coefficients extracted from regression models (for regression	
between the KS barriers and the effectiveness of knowledge sharing between stakeholders [Q11])	.272
Table 8-46: Testing the Collinearity between variables (for regression between the KS barriers an	d the
effectiveness of knowledge sharing between stakeholders [Q11])	273
Table 8-47: Residuals' Statistics (for regression between the KS barriers and the effectiveness of	
knowledge sharing between stakeholders [Q11])	274
Table 9-1: Research Hypotheses for ANOVA	278
Table 9-2: ANOVA test for organisational factors of KS.	280
Table 9-3: Post-hoc test – E3 Factor	281
Table 9-4: ANOVA test for motivation factors of KS.	282
Table 9-5: Post-hoc test – E5 Factor	284
Table 9-6: ANOVA test for process factors of KS	285
Table 9-7: Post-hoc test – E13 Factor	287
Table 9-8: ANOVA test for process factors of KS	289
Table 9-9: ANOVA test for social networking factors of KS.	291
Table 9-10: ANOVA test for physical environmental factors of KS.	292
Table 9-11: Post-hoc test – E28 Factor	293
Table 9-12: ANOVA test for individuals' factors of KS.	295
Table 9-13: ANOVA test for Individuals factors of KS barriers.	296
Table 9-14: ANOVA test for organisational factors of KS barriers	298
Table 9-15: Post-hoc test – B14 and B15 Factors	300
Table 9-16: ANOVA test for organisational factors of KS barriers	302
Table 10-1 : Summary of the average mean weighted of KS factors	317
Table 10-2 : Summary of the average mean weighted KS groups	320
Table 10-3 : Summary of the ANOVA results of the investigated hypotheses	321
Table 10-4 : Research question related to KS organisational enablers and hypotheses results	324
Table 10-5 : Research question related to KS motivational enablers and hypotheses results	326
Table 10-6 : Research question related to KS Processes enablers and Hypotheses results	330
Table10-7: Research question related to KS Technological enablers and Hypotheses results	332
Table 10-8 : Research question related to KS Social networking enablers and Hypotheses results.	335
Table 10-9 : Research question related to KS Physical environmental enablers and Hypotheses res	sults.
	338
Table 10-10 : Research question related to KS individual enablers and hypotheses results	340
Table 10-11: Research question related to KS individual barriers and hypotheses results	342
Table 10-12 : Research question related to KS organisational barriers and hypotheses results	344
Table 10-13 : Research question related to KS technological barriers and hypotheses results	346
Table10-14: Summary of the correlation results of the investigated hypotheses	347
Table10-15: Summary of the regression results of the investigated hypotheses	348
Table 13-1:Knowledge components at each PM process group	384
Table 13-2: Excluded variables for the regression analysis of KS enablers and the rate of KS	
contribution to PS (Q7)	406
Table 13-3: Excluded variables for the regression analysis of KS enablers and the benefits of KS ((Q9)
	408

Table 13-4: Excluded variables for the regression analysis of KS enablers and the quality of KS (Q10) Table 13-5: Excluded variables for the regression analysis of KS enablers and the effectiveness of KS Table 13-6: Excluded variables for the regression analysis of KS barriers and the rate of contribution Table 13-7: Excluded variables for the regression analysis of KS barriers and the quality of KS (Q10) Table 13-8: Excluded variables for the regression analysis of KS barriers and the effectiveness of KS Table 13-9: Correlations between independent variables (for regression between the KS enablers and Table 13-10: Correlations between independent variables (for regression between the KS enablers and the benefits that might be gained from timely knowledge sharing in the infrastructural projects (Q9)) Table 13-11: Correlations between independent variables (for regression between the KS enablers and the quality of timeliness of shared knowledge in the infrastructural projects (Q10))......418 Table 13-12: Correlations between independent variables (for regression between the KS enablers and Table 13-13:Correlations between independent variables (for regression between the KS barriers and Table 13-14:Correlations between independent variables (for regression between the KS barriers and the quality of timeliness of shared knowledge in the infrastructural projects (Q10))......422 Table 13-15:Correlations between independent variables (for regression between the KS barriers and

List of Figures

FIGURES

Figure 2-1: The learning process of knowledge (Adapted from: Newman 1997)......18 Figure 2-4: Knowledge SECI Model (Adapted from: Nonaka & Takeuchi 1995, p. 36)20 Figure 2-5: KM Framework (Adapted from: Gorelick & Tantawy-Monsu 2005)......22 Figure 2-6: KM Processes (Adapted from: Fernandez et al. 2004, p. 32)......23 Figure 2-7: KM emphasis parts (Adapted from: Wiig K. M. 1997)......24 Figure 2-8: KM lifecycle (Adapted from: Dalkir 2005)......25 Figure 2-11: A receiver-based model of KS (Source: Hunter & Lichtenstein 2008)......32 Figure 2-12: Relationship between TRA and KS behaviour (Adapted from: Silva & Agusti'i Cullell Figure 2-13: Ajzen model of planned behaviour adapted to the KS behaviour (Adapted from: Ajzen Figure 3-1: Proposed KS theories through organisational hierarchy at infrastructure level industry Figure 3-2: Proposed research model of KS in the infrastructure projects (Layout 2) (Adapted from: Figure 4-2: KS in project lifecycle (Source: Gudi & Becerra-Fernandez 2006)......51 Figure 4-3: The contribution of KS to a project success. (Source: BreitenöDer 2009)......59 Figure 5-1: Conceptual framework of this research, which links together enablers and barriers of KS Figure 6-1: Deductive and Inductive approaches (Adapted from: Gill & Johnson 2010)......105 Figure 6-3: Research methodology position (Adapted from: Sexton & Barrett, 2003; Saunders, et al., 2009; Bryman & Bell, 2007; Creswell, 2009).....110 Figure 7-6: Extraversion Frequency (Q1e).....141 Figure 7-7: Agreeableness Frequency (Q2a).....142

PAGES

Figure 7-12: Conscientiousness Frequency (Q3b)	145
Figure 7-13: Conscientiousness Frequency (Q3c)	145
Figure 7-14: Conscientiousness Frequency (Q3d)	146
Figure 7-15: Conscientiousness Frequency (Q3e)	147
Figure 7-16: Neuroticism Frequency (Q4a)	147
Figure 7-17: Neuroticism Frequency (Q4b)	148
Figure 7-18: Neuroticism Frequency (Q4c)	148
Figure 7-19: Neuroticism Frequency (Q4d)	149
Figure 7-20: Neuroticism Frequency (Q4e)	149
Figure 7-21: Openness Frequency (Q5a)	150
Figure 7-22: Openness Frequency (Q5b)	150
Figure 7-23:Openness Frequency (Q5c)	151
Figure 7-24: Openness Frequency (Q5d)	151
Figure 7-25: Openness Frequency (Q5e)	152
Figure 7-26: Openness Frequency (Q5f)	152
Figure 7-27: Work sector frequency (Q6)	153
Figure 7-28: KS contribution frequency (Q7)	154
Figure 7-29: KS culture Frequency (Q8)	154
Figure 7-30: KS benefits frequency (Q9a)	155
Figure 7-31: KS benefits frequency (Q9b)	155
Figure 7-32: KS benefits frequency (Q9c)	156
Figure 7-33: KS benefits frequency (Q9d)	157
Figure 7-34: KS benefits frequency (Q9e)	157
Figure 7-35: KS quality frequency (Q10a)	158
Figure 7-36: KS quality frequency (Q10b)	158
Figure 7-37: KS quality frequency (Q10c)	159
Figure 7-38: KS quality frequency (Q10d)	159
Figure 7-39: KS quality frequency (Q10e)	160
Figure 7-40: KS quality frequency (Q10f)	160
Figure 7-41: KS effectiveness frequency (Q11a)	161
Figure 7-42: KS effectiveness frequency (Q11b)	162
Figure 7-43: KS effectiveness frequency (Q11c)	162
Figure 7-44:KS effectiveness Frequency (Q11d)	
Figure 7-45: KS effectiveness frequency (Q11e)	
Figure 7-46: KS enablers frequency (E1)	164
Figure 7-47: KS enablers frequency (E2)	
Figure 7-48: KS enablers frequency (E3)	
Figure 7-49: KS enablers frequency (E4)	166
Figure 7-50: KS enablers frequency (E5)	166
Figure 7-51: KS enablers frequency (E6)	167
Figure 7-52: KS enablers frequency (E7)	167
Figure 7-53: KS enablers frequency (E8)	
Figure 7-54: KS enablers frequency (E9)	
Figure 7-55: KS enablers frequency (E10)	169
Figure 7-56: KS enablers frequency (E11)	169
Figure 7-57: KS enablers frequency (E12)	170

Figure 7-58: KS enablers frequency (E13)170
Figure 7-59: KS enablers frequency (E14)
Figure 7-60: KS enablers frequency (E15)
Figure 7-61: KS enablers frequency (E16)
Figure 7-62: KS enablers frequency (E17)
Figure 7-63: KS enablers frequency (E18)
Figure 7-64: KS enablers frequency (E19)
Figure 7-65: KS enablers frequency (E20)
Figure 7-66: KS enablers frequency (E21)
Figure 7-67: KS enablers frequency (E22)
Figure 7-68: KS enablers frequency (E23)
Figure 7-69: KS enablers frequency (E24)
Figure 7-70: KS enablers frequency (E25)
Figure 7-71: KS enablers frequency (E26)
Figure 7-72: KS enablers frequency (E27)
Figure 7-73: KS enablers frequency (E28)
Figure 7-74: KS enablers frequency (E29)
Figure 7-75: KS enablers frequency (E30)
Figure 7-76: KS enablers frequency (E31)
Figure 7-77: KS enablers frequency (E32)
Figure 7-78: KS enablers frequency (E33)
Figure 7-79: KS enablers frequency (E34)
Figure 7-80: KS enablers frequency (E35)
Figure 7-81: KS enablers frequency (E36)
Figure 7-82: KS barriers frequency (B1)
Figure 7-83: KS barriers frequency (B2)
Figure 7-84: KS barriers frequency (B3)
Figure 7-85: KS barriers frequency (B4)
Figure 7-86: KS barriers frequency (B5)
Figure 7-87: KS barriers frequency (B6)
Figure 7-88: KS barriers frequency (B7)
Figure 7-89: KS barriers frequency (B8)
Figure 7-90: KS barriers frequency (B9)
Figure 7-91: KS barriers frequency (B10)
Figure 7-92: KS barriers frequency (B11)
Figure 7-93: KS barriers frequency (B12)
Figure 7-94: KS barriers frequency (B13)
Figure 7-95: KS barriers frequency (B14)
Figure 7-96: KS barriers frequency (B15)
Figure 7-97: KS barriers frequency (B16)
Figure 7-98: KS barriers frequency (B17)
Figure 7-99: KS barriers frequency (B18)
Figure 7-100: Histograms for five personality traits groups
Figure 7-101:Histograms for effectiveness of KS groups
Figure 8-1: Conceptual model used to perform the regression tests for the KS enablers independent
variables

Figure 8-2: Conceptual model used to perform the regression tests for the KS barriers independent variables
Figure 8-3: Histogram of the frequency of the standardised residuals (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7])232 Figure 8-4: Normal P-P plot of regression standardised residual for the dependent variable (for
[Q7])
Figure 8-5: Histogram of the frequency of the standardised residuals (for regression between the KS
enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])240
Figure 8-6: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS enablers and the benefits that might be gained from timely KS in
infrastructural projects [Q9])
enablers and the quality of the timeliness of KS in infrastructural projects [Q10])247
Figure 8-8: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects
[Q10])
Figure 8-9: Histogram of the frequency of the standardised residuals (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])
Figure 8-10: Normal P-P plot of regression standardised residual for the dependent variable (for
regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])
Figure 8-11: Histogram of the frequency of the standardised (for regression between the KS barriers
and the rate of KS contribution towards the PS in the infrastructural projects [Q7])261
Figure 8-12: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS barriers and the rate of knowledge sharing contribution to project success
[Q7])
Figure 8-13: Histogram of the frequency of the standardised (for regression between the KS barriers
and the quality of the timeliness of KS in the infrastructural projects [Q10])
Figure 8-14: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural
projects [Q10])
Figure 8-15: Histogram of the frequency of the standardised (for regression between the KS barriers
and the effectiveness of KS between stakeholders [Q11])274
Figure 8-16: Normal P-P plot of regression standardised residual for the dependent variable (for
regression between the KS barriers and the effectiveness of knowledge sharing between stakeholders (O11))

List of Abbreviations

Knowledge management (KM)

Knowledge sharing (**KS**)

Project management (PM)

United Arab Emirates (UAE)

Analysis of Variance (ANOVA)

1. Chapter 1: Introduction

1.1 Overview

Knowledge sharing (KS) is a critical aspect of life and business that enables people to learn, grow, and, most importantly, help each other complete their required tasks (Leistner, 2010). This activity allows knowledge in the form of skills, information, or expertise to be exchanged between people, businesses, and communities. According to Grillitsch et al. (2007), KS is a very important step in the knowledge management (KM) process since it enables knowledge to be accessed by other people, thus validating its existence. There are many factors that affect KS because each individual or organisation offers specific knowledge to a certain degree (Styhre, 2011).

KS is a critical process, but it becomes even more significant during project management (PM). In the project lifecycle, numerous factors could lead to a project's success or failure, but a key factor is the KS (BreitenöDer, 2009). The sharing of knowledge could act as a catalyst for achieving organisational goals faster, or it could be a means to a poor ending of the project.

According to Howlett (2013), KS not only emphasises the need to share and reuse knowledge, but it also accentuates the need to learn vital lessons from the mistakes of previous projects; projects are not independent of one another and cannot succeed without input from both current and past knowledge. Utilising current and past knowledge primarily ensures that less time is spent on a particular problem and thus the project costs are scaled down.

Shanshan (2014) has concluded that KS plays a significant role in the quick completion of organisational projects and the development of new products. It also contributes to the reduction of costs associated with errors and delays during the production process. These

ideas verify that it is strongly necessary to share knowledge continuously during the lifecycle of a project.

According to reports, deficiencies in KS may cause yearly losses of \$31.5 billion to Fortune 500 companies (Quast, 2012). One of the major difficulties that face projects in the process of sharing knowledge and utilising past lessons is the temporary nature of projects (Carrillo, 2005). In addition, standardisation processes in PM play a vital role in facilitating KS in that they codify or standardise which lessons can be learned in certain projects. Moreover, Newell et al. (2002) argued that most project teams do not believe they may need to reuse such knowledge in future projects. Such knowledge mainly constitutes the lessons learnt from previous projects, which, when carried over to the future projects through sharing knowledge with other teams, would greatly contribute to facilitating projects' success.

The infrastructure sector has several important characteristics. These include high upfront costs, longevity, regulation intensiveness, and environmental impact; nevertheless, infrastructure sectors are very important for the economic development and prosperity of a country (Markard, 2011). However, numerous customers have complained about the lack of quality service and improperly completed projects by public workers. More specifically, recent reports have shown that about 70% of infrastructural projects in the UAE face postponements, which are caused by many reasons, including poor management practices.

Teerajetgul and Charoenngam (2006) highlighted the notion that different persons have different knowledge-based experiences and capacities, so therefore they develop different decision-making and problem-solving approaches. It is thus important to ensure that knowledge and experience are emphasised when choosing project managers for infrastructure development.

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This research highlights how these problems affect the utilisation of KS inside UAE infrastructural projects, and it offers recommendations for how organisations can better utilise the lessons that can be learnt from their projects. Therefore, this research aims to understand how KS is successfully utilised to create the success of projects in the infrastructure development sector. For this reason, this research discusses the various issues that are critical within PM and KS through how the two integrate at a project to ensure success in infrastructural projects in the UAE.

This goal is achieved through a questionnaire survey which provided necessary research data about the integration of KS between different projects stakeholders by representing the enablers and barriers for the process of KS in infrastructural projects in the UAE.

1.2 Problem Statement

Recent reports have indicated that many reasons, specifically including poor management practices, have caused about 70% of infrastructural projects in the UAE to face postponements (Maceda, 2016). Such statement supports that traditional methods of PM, which are still currently utilised in many areas, result in an increased ratio of project failure. Throughout the lifecycle of a project, numerous factors could lead to its success or failure, but a major factor is the sharing of knowledge (Gemunden, 2015). KS is a critical process, but it is more significant when it comes to PM. The proper sharing of knowledge could be a catalyst for achieving organisational goals faster, or it may be a means to a poor end of the project. Saade et al. (2015) highlighted that a project succeeds based on how well it utilises available information for solving problems and general challenges that might affect the outcome.

According to Winters (2014), there are many challenges that can hinder the successful implementation and completion of development projects, and one of the most common is accountability such that many projects have failed because of their unaccountability towards

stakeholders. The leaders of such projects gave the stakeholders little or no knowledge on how the projects were designed, which renders them vulnerable, and in many cases, susceptible to failure (Alashwal & Fong, 2015). Additionally, failure to involve the various stakeholders in a project can have important long-term negative impacts on the financial, social, and environmental outcomes of the community (Khasreen, et al., 2009). Such situations could engender hostility from the misunderstandings, since communities and other stakeholders may be suspicious of the objectives of projects.

Pemsel and Wiewiora (2013) indicated that another major challenge that projects face is that of knowledge reuse. According to these authors, this problem is largely due to the temporary nature of projects, and may also be caused by a PM's lack of vision regarding anticipated knowledge needs. The temporary nature of projects is characterised by a complete disbandment of the teams upon the project's completion, and if there any reviews to be done, Newell et al. (2006) argued that such reviews are often completed hastily, since most project teams do not believe they may need to reuse such knowledge in the future. These reports mainly constitute the lessons learnt from previous projects, which, when carried over to future projects through sharing knowledge with other teams, would greatly contribute to facilitating projects' success.

According to Howlett (2013), KS not only emphasises the need to share and reuse knowledge, but it also accentuates the need to learn vital lessons from the mistakes of previous projects. This process primarily ensures that less time is spent on a particular problem and thus the project costs are scaled down.

According to Mueller (2015), KS can greatly ease the process of accountability in a project. If every stakeholder is informed of the process and all activities concerning the project, its

4

design, and the challenges it faces, accountability can be enhanced and all stakeholders can be on the same page as far as the project implementation and other processes are concerned.

To illustrate more, KS can be improve the efficiency of project lifecycle through playing an important role in enhancing communication and responsibility between project stakeholders for the case of infrastructural projects that include many international subcontracts. In this case, KS contributes positively to enhance the project team adaption in dealing with the project risks and complexity especially at project handover stages between the different subcontracts.

Many researchers have investigated the challenges of infrastructural PM, and they have recommended the necessity of KS in the project lifecycle. This research addresses the gap in existing literature in terms of understanding the effective integration of KS in the PM standardisation process. The PhD research has attempted to investigate how KS is successfully utilised to create project success in the infrastructure development sector. In summary, the main problem is that many organisations suffer from KS deficiency due to the temporary nature of projects and a lack of communication in their PM lifecycle. This problem is addressed herein to examine the success of KS through the lifecycle of infrastructural projects. This problem is highlighted to examine the approach of integration in the KS process to assess its success in the PM of the infrastructure development sector.

The results of this research are achieved through investigating the success of the KS process integration by representing the enablers and barriers for the process of KS in the PM standardization process.

5

1.3 Significance of the Study

Recent literature has discussed the contributions of KS towards project success, but there remains a lack of a holistic framework for how KS can be implemented in an infrastructural project lifecycle. This research addresses the existing gap of how to understand the effective integration of KS in the PM standardisation process. This research investigates how KS is effectively utilised to create success in projects in the infrastructure development sector. This investigation can provide a roadmap to determine in which areas and how the KS process could be integrated into PM processes in the infrastructure development sector.

In a business scenario, project success refers to when there is the successful integration of an asset that functions as desired or provides quality goods and services as demanded by consumers, according to Gudi and Becerra-Fernandez (2006). Completion of projects during the desired time, within the desired budgets, and with the required quality means that the project has succeeded. Most importantly, in a project, the team members and contractors need to benefit to ensure all around success.

Moreover, KS facilitates the reuse of ideas and expertise (Kendra & Taplin, 2004) because once an effective process has been developed; the project team or any other person should be able to use the same process when a similar situation arises. In other words, KS offers project teams the ability to more easily address recurring needs using previous processes that have been proven to be effective. This reuse not only saves time and resources, but it also gives the project team members an opportunity to focus on other issues concerning the project. Shanshan (2014) concluded that KS plays a significant role in the fast completion of organisational projects and the development of new products. It also contributes to the reduction of costs associated with errors and delays during the production process. According to reports, deficiencies in KS have caused yearly losses of \$31.5 billion to Fortune 500 companies (Quast, 2012), which verifies that it is strongly necessary to continuously share knowledge during the lifecycle of a project.

Infrastructural projects tend to be high-cost investments; nevertheless, they are very important for the economic development and prosperity of a country (Markard, 2011). However, numerous customers have complained about the low-quality service and improperly completed projects by public workers. Teerajetgul and Charoenngam (2006) highlighted that different individuals have different knowledge-based experience and capacities, and thus they arrive at different decision-making and problem-solving approaches. Consequently, it is important to ensure that knowledge and experiences are emphasised when choosing a project manager for an infrastructure development. However, the practice of KM in the infrastructure sector has not been fully addressed in the literature.

In general, knowledge has been increasingly esteemed inside the UAE's public sector, so most organisations have attempted to integrate more KS into project development (government.ae, 2015). Although many project-based organisations have unique approaches to managing and sharing knowledge among individuals or project teams or across their boundaries, definite perceptions, strategies, and systems are highly demanded to increase the efficiency and effectiveness of project management knowledge (ecouncil, 2008). The UAE's infrastructure development sector has been described as among the best and quickest emerging in the Middle East (Harris E. , 2013). However, recent reports have shown that about 70% of infrastructural projects in the UAE face postponements due to many reasons, including poor management practices (Maceda, 2016), which introduces the feasibility of KS in pursuit of project success in the UAE's infrastructure development sector.

This study is considered to be one of the very earliest to offer valuable understandings of the KM inside PM in the UAE infrastructure development sector. The results of this work can

promote better understanding of effective KS mechanisms inside UAE public projects. For this reason, the expected results from this study hold both strategic and administrative significance in PM.

1.4 Aim of the Research

This research seeks to study the success of KS in infrastructure development projects in the UAE. The reason for this choice is the temporary nature of projects and the PM standards which act as obstacles to the integration of KS in the project lifecycle.

For this reason, this research discusses various issues that are critical within PM and KS through how the two are integrated at every stage of the project lifecycle to enact success. This study is undertaken by representing the enablers and barriers for the process of KS in infrastructural projects overall to examine the integration of the KS process in projects. Furthermore, it attempts to develop a framework for effective integration of KS in projects in the infrastructure development sector.

1.5 Research Objectives

The research objectives are as follows:

- Review the knowledge sharing integration in projects in the UAE's infrastructure development sector.
- Investigate the enablers and barriers associated with the success of KS in the projects in the UAE's infrastructure development sector.
- Investigate the association of enablers and barriers with the success of KS in projects in the UAE's infrastructure development sector.
- Evaluate the emerging KS enablers and barriers from different users' perspectives.

Completing these objectives can provide industry practitioners with a better empirical framework for assessing the success of KS that has recently implemented or integrated to utilise the lessons learned in UAE infrastructural projects with consideration for PM standards. This study contains an exploration of the tools, forms, activities, measurements, and characteristics of the current framework of KS in infrastructural projects in the selected industry of the UAE. This process led to the listing of significant enablers and barriers for the success of KS in projects using the statistical analysis.

1.6 Research Questions

To achieve the research aims described above, the main research questions is presented as follows:

RQ: How successful is knowledge sharing between stakeholders in the projects in the

UAE's infrastructure development sector?

To develop a strong answer to this key question, research sub-questions were established to split the main research aim into more manageable goals, and these sub-questions are the following:

- 1. Which KS enablers are the most influential to the success of KS in the UAE's infrastructural projects from the perspective of the respondents?
- 2. Which KS barriers are the most influential to the success of KS in the UAE's infrastructural projects from the perspective of the respondents?
- 3. Is there a difference between the respondents' opinions regarding the identified KS enablers?
- 4. Is there a difference between the respondents' opinions regarding the identified KS barriers?
- 5. What is the influence of the KS enablers' variables on the success of KS in the UAE's infrastructural projects?
- 6. What is the influence of the KS barriers variables on the success of KS in the UAE's infrastructural projects?
1.7 Research hypotheses

The drive of this study is to contribute to the recognition of KS enablers and barriers and then to prove and assess their influence on successful KS in projects. In addition, this study aims to improve the level of stakeholder consciousness and avoid any barriers related to the sharing of project knowledge in future projects. These goals are accomplished through dividing the research hypothesis into nine main hypotheses:

Table 1-1: Research main hypotheses

Restatement of Research Hypotheses

H1: KS enablers associated to the success of KS in projects "based on the respondents work sector".
H2: KS barriers relate to the success of KS in projects "based on the respondents work sector".
H3: The KS enablers are associated with the rate of KS contributions to project success.
H4: The KS enablers are associated with the benefits that might be gained from timely KS in infrastructural projects.
H5: The KS enablers are associated with the quality of the timeliness of KS in infrastructural projects.

H6: The knowledge sharing enablers are associated with the effectiveness of KS between stakeholders.

H7: The KS barriers are associated with the rate of KS contributions to project success.

H8: The KS barriers are associated with the quality of the timeliness of KS in infrastructural projects.

H9: The KS barriers are associated with the effectiveness of KS between stakeholders.

1.8 Research Methodology

The research was conducted by using a questionnaire survey method to examine the

integration of KS in UAE infrastructural projects and collect data for each research objective.

The success of KS implementation in PM was considered to be the unit of analysis and was

determined using statistical analysis and literature review.

1.9 Research Assumptions

1. The study was carried out over the PMI cycle to cover the five phases before it is actually

handed to the operation stage.

2. This questionnaire was distributed to the experts in infrastructural projects in the UAE's infrastructural development sector, which involves six participating organisations: the Ministry of Infrastructural Development, Dubai Municipality, Abu Dhabi Sewerage Company, Federal Authority of Electricity and Water in Dubai, Abu Dhabi Airports Company, and Etisalat Company in the UAE. All participants in the research survey are assumed to be aware of basic KM concepts based on the UAE's knowledge-based economy targets.

1.10 Research Limitations

This research aims to understand how KS is utilised in UAE infrastructural projects in the infrastructure development sector and which practices to be learned are standardised in their projects. Therefore, the main three limitations of the research can be anticipated based on the existing literature and selected research methodology:

- 1. The primary focus of this research is the UAE's infrastructure development sector, which limits the ability to generalise findings to other regions; cultural differences and the unique leadership style of the UAE government contribute to the lack of generalisability.
- 2. One of the key aspects that it is not fully elucidated in this research is a study of the live integration of KS at each stage of the project lifecycle to create success due to time restrictions. The selected method has not allowed us to investigate how the change across time impacts each project stage as some projects last for more than five years. This limitation introduces an opportunity for future research in this field by implementing a longer time frame and using other analytical tools like social networking.
- 3. Another research limitation is the difficulties in the validation process where the KS questionnaire was given to academic experts in project management and knowledge

management to validate the questionnaire. But, such necessity was very hard and time consuming to come across and assurance.

1.11 Outline of structure

This paper has 11 main chapters. The first chapter, which is the introduction, provides an overview of this research problem statement, significance, aims, objectives, questions, methodology, and limitations.

Chapter 2 presents relevant KS theories. This chapter reviews the existing KS theories and presents an adaptation of a model of KS for projects specific to the infrastructure sector. It starts by introducing the concepts of knowledge, KM, and KS. Then, it discusses existing literature on KS theories, mechanisms, enablers, and barriers as well as their value to PM. It ends by highlighting how KS is managed in projects in the infrastructure sector's.

Chapter 3 explains KS in the infrastructure development sector. This chapter introduces the adapted model of KS for infrastructure sector projects. It offers an overview of KS in the UAE and the infrastructure development sector.

Chapter 4 describes KS through the PM lifecycle. It represents the literature review of the theoretical extent of KS in the PM context. The chapter also discusses the existing literature on KS within the lifecycle of projects and the comprehensive areas of KM and PM. The main aim of this chapter is to highlight how KS operates in PM. Consequently, gaps are recognised through this chapter to clarify the research objectives and questions.

Chapter 5 is the research framework. It begins by highlighting the research problem and concludes with the development of a research model for KS in PM in the lifecycle of projects by shedding light on the main research constructs.

Chapter 6 describes research methodology. It defines the proposed research philosophy, design, plan, data collection, and analysis and it also highlights the pilot study and ethical considerations. This chapter includes the method for the development of the questionnaire plan for the survey.

Chapter 7 offers information on descriptive analysis. It defines the data collection and the descriptive analysis of the survey answers, for which Microsoft Excel and SPSS software were used. This descriptive analysis includes different analyses such as reliability, descriptive analysis, ranking test, and normality tests to define the significance of each variable in the perspective of the respondents.

Chapter 8 explains correlation and regression analysis. It defines the correlation and regression between independent and dependent variables of the survey, which also used Microsoft Excel and SPSS software.

Chapter 9 is the results and data analysis. It represents the results and data analysis for research constructs. It explains the analysis of the variance for the responses via a one-way ANOVA to define whether there is there a difference between the respondents' opinions regarding KS enablers and barriers in order to examine the research hypotheses. Also, the chapter defines the analysis of hypotheses related to correlation and regression analysis to explain the association between dependent and independent variables.

Chapter 10 is the discussion. It explains the research outcomes and conclusions of the questionnaire analysis.

Chapter 11 is the overall conclusion. It presents a summary of research findings, contributions, and recommendations for future studies.

1.12 Chapter summary

This chapter has introduced the research mapping in terms of research background, problem, significance, aims, and objectives. It has also highlighted the research methodology, limitations, and outline of the research structure. The upcoming section reviews the existing literature about KS theories.

2. Chapter 2: Knowledge sharing theories

2.1 Introduction

Knowledge is simply people's understanding of concepts, practices, things, procedures, and processes. Within an organisation, KS refers to the exchange of skills, expertise, and information with colleagues and between employees and their employers. In traditional organisations and economy, the success of an organisation has much relied on their physical assets, such as land and capital. Today, due to the shift from the traditional economy to the modern economy, the current economy is service based. This shift has increased the importance of skills in organisations. In this regard, KS is one key factor for achieving higher performance of an organisation. The success of a KS process depends on a number of factors. These factors are important because they enable the effectiveness of the KS process.

The aim of this chapter is to review the existing KS theories and adapt a model of KS for projects in the infrastructure sector. Therefore, this section starts by introducing the concepts of knowledge, KM, and KS. The final focus of this chapter represents different types of theories that are used in KS.

2.2 The perception of Knowledge

2.2.1 Knowledge concept

Knowledge, as a term, is argued to be an intangible resource for an organisation in competitive circumstances (Nonaka, 1994). Furthermore, knowledge is generated from the information movement and closely connected to human acts and beliefs. It is represented as a main factor which determines organisational success in the long term (Nonaka & Takeuchi, 1995).

Knowledge-based theory states that organisational knowledge is considered to be a valued resource of competences, innovation opportunities, and product development. This theory

connects the role of KS practices to an organisation's performance (Grant & Baden-Fuller, 1995). As a result, knowledge is reflected as a managerial tool which enhances organisational capability and decision-making inside organisations (Grant R., 1996). In this regard, Shariq (1997) reported, "As knowledge increasingly becomes the key strategic resource of the future our need to develop comprehensive understanding of knowledge processes for the creation, transfer and deployment of this unique asset are becoming critical."

Similarly, knowledge has been defined as a unique and intangible organisational asset that is considered, along with human capital and technology, to aid in organisational competence (Mårtensson, 2000). Organisational competence is measured by a corporation's capability to achieve its own goals and tasks and sustain itself in the industry; competence is defined for individuals in the form of knowledge, skills, or capabilities, and for organisations, in such client-specific databases, technology, processes, practices, and culture (Mårtensson, 2000).

Knowledge is highly connected to and shaped by a person's personality and career, particularly because it illustrates the mixture of outlined skill, beliefs, related information, and professional visions to integrate new information. To clarify, according to Davenport and Prusak (1998) knowledge is defined as "a fluid mix of framed experiences, values, contextual information, and expert insight that proves a framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of the knower. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices and norms."

McAdam and Leonard (1999) highlighted the impact of learning activities in incorporating knowledge assets within an organisation to sustain the competitive advantages of its products and services.

In reality, knowledge exists in different forms such as facts, outlooks, ideas, concerns, views, values, details, processes, guidelines, implications, orders, cases, strategies, relationships, business matters, threats, and dangers (Coulson-Thomas, 1997).

The literature review has defined the knowledge concept as it is increasingly considered to be a significance competitive resource for organisations and closely related to human experiences and skills (Nonaka, 1994; Nonaka & Takeuchi, 1995; Grant, 1996; Shariq, 1997; Coulson-Thomas, 1997;Davenport & Prusak, 1998;McAdam & Leonard, 1999;Mårtensson, 2000).

2.2.2 Difference between Data, Information, and Knowledge

The literature review advises the presence of diverse researchers' perspectives on the difference between data, information, and knowledge terms. For this reason, it is essential for this research to differentiate these terms to remove misperceptions among them and to provide better understanding of knowledge theories overall.

Alavi and Leidner (2001) have suggested that data represents raw material for information, while information consists of data with sense and sympathy, and knowledge involves information of individual's personal beliefs, skills, and know-how. In other words, the knowledge concept can be described as information combined with human input and experience.

In addition, Newman (1997) stated that organisational learning enhances and increases knowledge opportunities in competitive environments. He proposed a model of organisational learning that demonstrates a hierarchy of data, information, and knowledge. To explain, knowledge inside an organisation is usually accumulated from the learning process that includes the transformation of raw data to information forms and then into the knowledge

patterns, which is implemented to support existing organisation technologies to add market value, as shown in Figure 2-1.



Figure 2-1: The learning process of knowledge (Adapted from: Newman 1997)

In addition, Frické (2009) has critiqued another knowledge hierarchy model to distinguish data, information, and knowledge by placing wisdom on the top of the knowledge hierarchy. Accordingly, wisdom is seen as a transformation of knowledge by adding values and vision, as shown in Figure 2-2 below.



Figure 2-2: Hierarchy of knowledge (Adapted from: Frické 2009)

2.2.3 Knowledge as a tacit and explicit forms

Polanyi divided knowledge into tacit (implicit) and explicit forms in the 1950s (Gao, 2003). Appropriate awareness of an organisation's top management is required for a conversion of activities amongst tacit and explicit knowledge forms, in addition to the high involvement of individual employees; this, in turn, needs the facilitation of a supportive organisational culture (Gao, 2003). Explicit knowledge typically exists in the formula of structured data, information, words, documents, and computational data. On the other hand, tacit knowledge is characterised as internal knowledge inside people's minds, including non-documented and informal information types. Furthermore, tacit knowledge is presented as ideas or experiences of certain processes or practices with regard to organisational projects, as illustrated in Figure 2-3 below (Al-Khouri, 2014).



Figure 2-3: Layers of knowledge (Adapted from: Al-Khouri 2014)

Dalkir (2011) has claimed that tacit knowledge presents an organisational competitive advantage since it has distinctive features and is difficult to express, transfer, or duplicate. Furthermore, both tacit and explicit forms of knowledge are thought to be complementary for any industry. As noted by Massingham, "Tacit and codified knowledge are two sides to the same coin, in the sense that you need one to use the other" (Massingham, 2014).

Nonaka and Takeuchi (1995) discussed the creation of knowledge in a spiral model where the creation of knowledge involves different activators as illustrated in Figure 2-4 below. To clarify, socialisation activities are involved to convert tacit knowledge to other tacit knowledge via communication or sharing knowledge, such as through training. On the other hand, externalisation, for instance, transforms tacit to explicit knowledge via sharing lessons learned, and internalisation involves producing extra tacit knowledge from explicit knowledge. Lastly, combination processes involve relating one type of explicit knowledge

with another, and this process is often done via activities like best practices. Such processes of knowledge conversion among tacit and explicit knowledge result in KM (Nonaka & Takeuchi, 1995).



Figure 2-4: Knowledge SECI Model (Adapted from: Nonaka & Takeuchi 1995, p. 36)

This research adopts the view that externalisation activities exist where lessons learned from past projects are shared among project stakeholders as knowledge transforms from tacit to explicit.

2.3 The perception of knowledge management

2.3.1 Knowledge management Concept

KM has been suggested to represent a new management field that effectively reacts to knowledge-based economies. Subsequently, with the growing importance of the KM discipline in different business industries, the KM society was reported to focus on education and research with increasing attention on innovation triggers (Nonaka & Takeuchi, 1995).

In addition, the KM society was introduced in the 21st century to support knowledge implementation by various consultants and organisations in knowledge-based industries. It was introduced mainly to control organisational knowledge assets and support decision-making during different downsizing and technological improvement situations to deliver competitive advantages (Shariq, 1997).

The history of KM clarifies that it is related to learning, innovation, and core competencies, along with technology development and within organisational processes. The history of KM highlights the conversion of tacit knowledge from individuals to an explicit form of knowledge in order to exploit knowledge as valuable assets, and this is believed to sustain organisations' competitive advantages (Mårtensson, 2000).

The notion of KM involves knowledge through human capital and other resources, such as information technology, used to improve managerial performance. Accordingly, the process of KM has been described by Massingham (2014) as "identifying the firm's competitive position in terms of what it knows (strategy), protecting this position (retention), growing this position (creativity) and benchmarking (measurement)."

Moreover, KM aims to identify and exploit organisational assets to preserve organisational success. Accordingly, KM places emphasis on some practices and activities, such as governance functions, which observe and accelerate knowledge-related events; staff functions, which establish and update the knowledge frame; and operational functions that create, renew, and organise knowledge resources. These are combined with realising the value of knowledge-related functions by transforming and exhausting knowledge resources (Wiig K. M., 1997).

Whereas Davenport and Prusak (1998) expressed KM as "managing the corporation's knowledge through a systematically and organisationally specified process for acquiring, organising, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organisational performance and create value".

Furthermore, KM has been defined as "a discipline that promotes an integrated approach to identifying, managing and sharing all of an organisation's knowledge assets including unarticulated expertise and experience resident in individual workers" (Kim, 1999).

In addition, Alavi and Leidner (2001) explained KM to be systematic, and they identified a procedure involving obtaining, organising, and interacting with knowledge to the reach of organisational workforces to increase organisational efficiency and productivity.

Also, KM is believed to enhance innovation prospects and learning, as well as decisionmaking and, consequently, overall performance via following KM processes through knowledge-based systems and applications (King, 2009).

Subsequently, the KM field was established to solve the persisting issue of transformation between implicit and explicit types of knowledge, as well as KM's role in the enhancement of organisational competence through performance and decision quality (Al-Khouri, 2014).

In other models, KM is suggested to incorporate people, processes, technology, organisational cultures, and others to enhance performance and sustainability as shown in Figure 2-5 below (Gorelick & Tantawy-Monsu, 2005)



Figure 2-5: KM Framework (Adapted from: Gorelick & Tantawy-Monsu 2005)

In this study, KM is used as a systematic view with identified project procedures to involve sharing knowledge among different project stakeholders in each project lifecycle to increase project success.

2.3.2 Knowledge management Processes

The literature review confirms the presence of diverse researchers' viewpoints on the KM process, which involves mostly identifying, creating, sharing, and applying knowledge. Usually, identifying knowledge is interchangeable with creation or capturing, while some authors have used distribution or transferring knowledge and KS interchangeably. The KM processes have been described in various studies (Nonaka & Takeuchi, 1995; Wiig, 1997; Fernandez, et al., 2004; Dalkir, 2005; King, 2009).

Fernandez et al. (2004) established a KM process model where processes of socialisation, externalisation, internalisation, and combination in the SECI model of Nonaka and Takeuchi (1995), as illustrated previously in Figure 2-4, are involved to convert between tacit and explicit knowledge, as presented in Figure 2-6. In this model, knowledge is discovered by converting from tacit to tacit knowledge via socialization sub-processes or from explicit to explicit knowledge through combination. Also, knowledge is captured by conversion between tacit and explicit knowledge, via internalisation or externalisation. Then, knowledge is shared via either socialisation or exchange processes to be applied inside organisations by implementing directions and routines.



Figure 2-6: KM Processes (Adapted from: Fernandez et al. 2004, p. 32)

In addition, Wiig (1997) introduced a model in which KM places emphasis on some practices and activities such as governance functions, which observe and accelerate knowledge-related events; staff functions to establish and update the knowledge frame; and operational functions that create, renew, and organise knowledge resources. These are combined with realising the value of knowledge-related functions by transforming and exhausting knowledge resources, as represented in Figure 2-7.



Figure 2-7: KM emphasis parts (Adapted from: Wiig K. M. 1997)

According to Dalkir (2005), an active KM process contains different phases including knowledge identification, creation, acquiring, sharing, dissemination, acquisition, and application, as illustrated in Figure 2-8.



Figure 2-8: KM lifecycle (Adapted from: Dalkir 2005)

Similarly, as illustrated in Figure 2-9, the KM process includes five different stages: creation, refinement, storage, sharing, and utilisation of knowledge inside an organisation (King, 2009). The creation stage has been purported to involve different activities that create or capture both explicit and implicit knowledge from documents and individuals. These include lessons learned, research, learning, and job rotation. The refinement stage emphasises current and necessary knowledge related to organisational competency to obtain esteemed knowledge. The storage stage adds knowledge inside the memory of an organisation with an identical and categorised layout, in addition to updating it regularly. The KS process includes different knowledge paths and activities. To illustrate this notion, paths can be from the memory of an organisation towards individual counterparts, or even between employees at different managerial levels. These paths include different tools such as the intranet, knowledge audits, retention process, after-act analyses, and sharing bulletins. Finally, the utilisation stage targets the application of this knowledge to all businesses that are related to the core organisational competency, such as problem resolving or research. In this study, KM is used to map the KS

between different project stakeholders through the lifecycle of projects as in the King Model in the following figure.



Figure 2-9: Knowledge lifecycle (Adapted from: King 2009)

2.4 Knowledge sharing

2.4.1 Knowledge sharing concept

The concept of KS is an important and critical process which permits individuals organizations to pick up and exchange skills, information and experience from each other's and most importantly cooperate with each other's to improve their job performance (Leistner, 2010). According to Grillitsch et al. (2007), KS is one of the most significant phases in the KM lifecycle because it is what enables knowledge to be right to use by other people, consequently confirming its presence.

In fact, KS is a more complex and systematic activity than information transformation. Cummings (2004, p. 352) defined KS as "the provision or receipt of task information, knowhow, and feedback regarding a product or procedure". Similarly, KS has been defined by Wang and Noe (2010) as the "provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures".

As a fundamental stage of the KM process cycle, KS contributes to the activity of utilising tacit and implicit knowledge to provide organisational competency. It has been reported that the KS culture is created initially from individuals (Nonaka, 1994).

Knowledge is represented in the human memory, and thus individuals must be highly encouraged and facilitated rather than forced to share knowledge (Hartini, et al., 2006). Moreover, knowledge is shared at different levels as it can be transferred at the individual, group, or organisational levels (Alavi & Leidner, 2001).

In addition, KS is associated with strategic organisational management, and therefore, at present, various organisations invest enormously to facilitate KS and learning skills to flexibly and successfully respond to internal and environmental process changes (McAdam & Leonard, 1999).

Furthermore, KS supports public organisations in order to improve their operational effectiveness in terms of budget, quality, and client satisfaction. The results of KS implementation indicate increased performance capabilities as it increases the level of individual learning, capability, and experience (Cong & Pandya, 2004).

There are many factors that affect KS because each individuals or organisations offer information to a certain degree. The giver, recipient, and the environment also play critical

roles in affecting how information is shared, according to Styhre (2011). In terms of knowledge, it could be tacit or explicit, depending on the source and environment. As Silva and Agustí (2008) explained, explicit KS is more formalised and organised, and might be more complex compared to tacit KS.

It has also been suggested that a KS system must be adapted to organisational characteristics to ensure the systematic approach of KS (Boh, 2007). With this in mind, researchers have concluded that KS practices within projects that are often influenced by organisational culture can predict organisational learning (Wiewiora, et al., 2014).

It is discussed that personal and community interactions are associated with sharing tacit knowledge in either personal communication or informational exchanging, while sharing explicit knowledge elements is associated with written contributions and organisational communication (Kitimbo & Dalkir, 2013).

Currently, there are different strategies and tools associated with the implementation of KS in public organisations. To illustrate this idea, KS can be implemented and evaluated through different variables such as written contributions, personal interactions, community interactions, and organisational communication to exchange employees' tacit knowledge (Yi, 2009).

Different KS models exist in the public sector. One such model is the T-shaped manager, which is an example of an existing practical model of KS in the public sector that involves the transference of best practices, peer advice, shared know-how, and the cross-fertilization of ideas, in addition to assurance of well-organised implementation. It was reported to contribute positively to organisational performance in terms of efficiency, decisions, revenue, and strategic management (Edwards, 2008).

In this study, KS is related to tacit knowledge since lessons learned from projects are considered to be shared to increase future projects' success. Also, the definition of KS by Cummings (2004, p. 352) as the provision or receipt of project information, know-how, and feedback regarding a certain project activity has been adopted for this study.

2.4.2 Knowledge sharing cycle

The process of KS is part of a broader practice that is integrated into other activities and forms a critical network. In addition, KS cannot stand on its own since it must be supported by activities, process, and people around a project who aid to implement it, according to Newell et al. (2002). Before and after knowledge has been shared, it has to be handled in a specific manner, which forms the network of KS.

With reference to Figure 2-9 in the previous section, the representation of the KS cycle and how knowledge is managed illustrates that it one of the most critical activities. This is because if knowledge is not shared, it becomes meaningless and unusable, and thus wasted.

Knowledge creation and acquisition are some of the ways to gain access to information and knowledge, which is the first step towards sharing. BreitenöDer (2009) justified this by explaining that people cannot share knowledge they do not have. After acquiring knowledge, the safer storage and refinement of this knowledge into useful information guarantees that it can be shared. If information is successfully gained and not properly stored, it is not available to share (Niedergassel, 2011). Moreover, if not refined, it might be incoherent and irrelevant at the time of sharing.

The transfer process is what involves sharing where knowledge in the form of information moves to another person or party. With proper and careful utilisation, this knowledge can be useful to an organisation. This transfer process is referred to as a cycle because another party for processing, storage, and sharing acquires the process to start again once the information is transferred.

The process of sharing and disseminating information itself could be in the form of pushed information on a routine basis or stationary in certain areas for people to access whenever they want, according to Levine (2010). Access to information could be in the form of users trying to browse information, thus making sharing easier even if the person offering it is not immediately available. According to Tokuda (2014), the internet is one of the best ways to store information for individuals to have unlimited access whenever they need.

Niedergassel (2011) also offered a different perspective of how the knowledge cycle affects different activities, thus leading to a continuous cycle like the circular representation below in Figure 2-10. The processes of embedding and diffusing information are related to personifying information to increase its usefulness in order to understand it. The person who shares the knowledge must be familiar and experienced with the knowledge they offer. Codification allows a person to assign information to a certain category to allow it to be used or stored with reference. With the bulk of information people receive every day, it is not possible to store and access it later if there has not been proper codification. The production and innovation stages of KS require people and tools that are critical for making certain that accurate information is stored in the correct places.



Figure 2-10: Innovation and KS cycle (Source: Niedergassel 2011)

Tan (2013) divided the knowledge cycle into two areas that have been categorised as the innovation cycle and the sharing cycle, as seen in Figure 2-10. The innovation cycle is important because it generates, reproduces, and embeds knowledge into the cycle, thus refining it for better use. Furthermore, the sharing cycle involves gathering knowledge after it has been acquired and disseminating it for use. The organisation of information and its storage allow it to be better used in the future, as explained by Widen-Wulff (2007). Carrillo (2005) added that organising information in a specified manner, such as a given taxonomy, makes it easier to retrieve.

On other hand, Hunter and Lichtenstein (2008) have suggested another area of KS to study the impact of the receiver upon sharer behaviour in KS process, as presented in Figure 2-11. There are two main assumptions which were made in this model: first is the assumption that the receiver of knowledge can realise and apply it once it has been received with no extra communication from the knowledge sender. The second assumption dictates that through receiving the same knowledge implications by the sender and receiver, the flow of explicit knowledge do not involve any fundamental loss. There are six different stages of KS according to this model: value awareness of knowledge towards recipients, delivering knowledge to recipients' attention, transferring knowledge to recipients via suitable channels, acquiring knowledge from recipient, applying of useful knowledge, and feedback from knowledge recipient to knowledge sender regarding knowledge demand as well as behaviour. In this research, the KS cycle is used as the Niedergassel Model above to show how the knowledge cycle affects different project activities considering the personification of the project information to increase its usefulness in order for project stakeholders to understand it.



Figure 2-11: A receiver-based model of KS (Source: Hunter & Lichtenstein 2008)

2.4.3 Related theories to Knowledge sharing

This study emphasises the main different types of theories that are used in KS to understand the mechanisms of KS: theory of reasoned action (TRA), theory of planned behaviour (TPB), and social exchange theory (SET). Although these theories have been developed to study the behaviour of subjects, they are important for understanding how behaviour may contribute to KS or otherwise.

Theory of reasoned action (TRA)

According to Lipiński and Świrski (2012), the theory of reasoned action explains the intention of the behaviour of a particular person. Therefore, as different scholars have used it widely to define the intent of certain conduct on a multidisciplinary extent (Niedergassel, 2011), the theory could also be applied for trying to determine intentions in KS.

The perception of how well other people approve of one's intention on a social scale is influenced by positive attitudes and social norms that govern the particular behaviour (Widen-Wulff, 2007). Therefore, effective KS requires more dynamicity and flexibility to change from both individuals' behavioural and organisational structures (Pardo, et al., 2006). When a

person deems an act of sharing information to be productive and useful, they tend to derive approval and meaning from peers and other social attitudes from people. According to Webster (2009), the attitude of the person who shares the knowledge, as well as that of the recipient, influences intentions. In addition, the social norms are the manners through which people as individuals think and act and how they expect others to think and act towards what they have done (Leistner, 2010).

Various studies have been conducted to determine if KS behaviours are related to TRA, such as one conducted by Bock and Kim (2002). The researchers explored if there are any variations in KS when it comes to the theory, which they did by examining areas such as the associations and contributions expected from an individual and the rewards expected by the individual in order to determine an individual's attitude within a business environment. In this research, the results specify that there is a positive connection between KS and attitude as well as subjective norms. The subjective norms and attitudes from an individual in KS positively affect KS behaviour. In the same context, formal extrinsic reward patterns inside organisations are suggested to pose a hurdle to KS behaviour inside organisations. This is due to the claim of Bock and Kim (2002) that an individual intends to share knowledge only when organisational support of KS can be identified or when involvement and collaboration from their workfellows is at stake.

Other researchers such as Silva and Agustí (2008) have also investigated the role of the theory when it comes to KS in business citizenship behaviour. The scholars used the model to predict KS behaviour in different individuals, and thus determined the dimensions of KS behaviour under the theory of reasoned action, as presented in Figure 2-12.



Figure 2-12: Relationship between TRA and KS behaviour (Adapted from: Silva & Agusti'i Cullell 2008)

In this study, this theory is considered to review the different enablers and barriers of KS in the projects by considering the intention of stakeholders to share project knowledge.

Theory of planned behaviour (TPB)

The theory of planned behaviour is an extension of the TRA developed by Ajzen in 1980, but in this case, TPB has the added variable of perceived behavioural control (Ajzen, 1991). In the first theory, the critical aspect is individual willingness, ability, and effort of performing certain behaviour (Webster, 2009). However, in the TPB, more stress is on the perceived behavioural control. The perceived behavioural control is a supplementary dimension that focuses on the fact that despite the willingness and ability of an individual to perform certain actions, an extra factor also exists which results from an individual's beliefs of whether the skills and ability are sufficient in the given opportunity, according to Styhre (2011).

Also, the TPB, developed by Ajzen in 1980, is also called the theory of reasoned action and explains and predicts human behaviour, specifically from corresponding attitudes about implementing this behaviour. To illustrate, this model suggests that individual intention is driven and measured by one's approach or attitude towards that behaviour, personal norms, and perceived social control (Ajzen, 1991).

Moreover, the individual would also likely look at self-efficacy, which is judgement and a measure of the confidence to perform the given behaviour. Therefore, the TPB affects KS in the same way as the TRA, but in a much deeper perspective since the individuals has to consider ability, judgement, and outcomes after completing the intended action.

The TPB was selected by some writers to discover the main barriers for KS implementation within the public sector. This was achieved via discussing the human behaviour of KS behaviour through individual or group intentions of KS. With this idea in mind, Tzortzaki (2014) applied a human-centred approach to evaluate KS behaviour.

The application of the TPB towards KS can be viewed in terms of individual KS behaviour with interactions to organisational or social control, as illustrated in Figure 2-13. This figure shows that perceived KS behaviour is driven by individual intention. Moreover, individual intention is determined by three main beliefs – behavioural, normative, and social control beliefs. Furthermore, it has been noted that observed behavioural control may lead directly to shape the specific KS behaviour (Ajzen, 1991).



Figure 2-13: Ajzen model of planned behaviour adapted to the KS behaviour (Adapted from: Ajzen 1991)

In this study, this theory is considered to review the different enablers and barriers of KS in the projects by considering the intention of stakeholders as it is influenced by the organisational motivation and social control to share project knowledge.

Social exchange theory (SET)

The other theory related to KS is the social exchange theory (SET), which was introduced in 1958 by Homans and explains exchanges between two parties and how likely they are to benefit the two individuals making the exchange. According to Bernus and Fox (2005), SET explains the behaviour of an individual in trying to achieve rewards from a given social exchange. In order for the theory to be complete, there must be an individual who has the perception of creating a need which could be fulfilled by another.

According to Cropanzano and Mitchell (2005), the concepts of SET are dependent on the social value orientation of a person and the individual's propensity to share. Furthermore, this theory highlights exchange guidelines and models, resources, and emerging relationships within organisations.

According to Webster (2009), the theory sees KS as an explanation of how individuals seek to maximise benefits and reduce costs when they exchange information with others. The maximisation of benefits comes in the form of rewards that were categorised by Widen-Wulff (2007) as money, self-esteem, social approval, and compliances.

Moreover, the SET was selected by many writers to explore current practices of KS and its impact upon managerial performance. The social context is highlighted to explore the KS practices by studying both individual and organisational motivation elements towards effective KS in the social network or relationship behaviours. To explain, individuals seem to be motivated to share or exchange knowledge in the social network, especially when

supported by leadership and information technologies, as well as powerful relationships based on trust and effective communication in the organisational culture (Skok, et al., 2013).

In this study, this theory is considered to review the different enablers and barriers of KS in the projects by considering how project stakeholders are motivated by the organisational social networking's factors to share project knowledge.

2.1 Chapter summary

This chapter has established a review of the existing literature of KS theories including the concepts of knowledge, KM, and KS. Table 2-1 presents the chapter's main literature findings. The next chapter reviews the literature of KS in PM to understand how KS is effectively utilised to create project success in every phase of the project lifecycle.

Literature Reviewed	Issues Learned	Expanding LR adding	Questions
The literature review has defined the knowledge concept to be a mixture of framed experiences, values, contextual information, and expert insight that is increasingly considered as a significant competitive resource for organisations and closely related to human experience and skills (Mårtensson, 2000; McAdam & Leonard, 1999; Davenport & Prusak, 1998; Shariq, 1997; Coulson-Thomas, 1997; Grant, 1996; Nonaka & Takeuchi, 1995; Nonaka, 1994)	Knowledge Concept	To better understand knowledge term.	What does knowledge exactly mean?
Data represents raw material for information, while information consists of data with sense and sympathy and knowledge involves information with individuals' personal believes, skills, and know-how. In other words, knowledge can be described as a combination of information with human input and experience (Frické ,2009;Alavi & Leidner ,2001;Newman ,1997)	Difference between data, information, and knowledge.	To fully capture the deference between data, information, and knowledge.	How to distinguish between data, information and knowledge?
Explicit knowledge exists usually in the form of structured data, information, words, documents, and computational data. On the other hand, tacit is characterised as internal knowledge inside people's minds, with non-documented and informal information types. Furthermore, it is presented as ideas or experiences of certain processes or practices with regard to organisational projects (Massingham, 2014;Al-	Knowledge as a tacit and explicit forms.	To practically capture the deference tacit and explicit knowledge.	How to distinguish between tacit and explicit knowledge?

Table 2-1: Main literature findings for knowledge sharing theories.

Khouri, 2014;Gao, 2003; Dalkir ,2011;Nonaka & Takeuchi, 1995)			
(Massingham,2014;Al-Khouri, 2014;King, 2009; Dalkir, 2005; Gorelick & Tantawy-Monsu, 2005 ; Fernandez, et al., 2004; Alavi and Leidner ,2001; Mårtensson, 2000; Kim, 1999; Davenport & Prusak ,1998; Shariq,1997;Wiig,1997;Nonaka &Takeuchi, 1995)	Knowledge management (concept and process).	Knowledge management concept. Different frameworks of knowledge management process.	What does knowledge management exactly mean? What is the lifecycle of KM?
(Tokuda ,2014; Wiewiora, et al., 2014;Kitimbo & Dalkir, 2013; Tan ,2013;Niedergssel, 2011;Leistner, 2010; Levine ,2010; BreitenöDer ,2009;Yi, 2009; Edwards, 2008; Silva & Agustí ,2008; Hunter & Lichtenstein ,2008; Grillitsch, et al.,2007; Boh, 2007; Widen-Wulff ,2007;Hartini, et al., 2006; Carrillo ,2005;Cong & Pandya, 2004; Cummings ,2004; Newell, et al,2002; Leidner, 2001; McAdam & Leonard, 1999; Nonaka, 1994)	Knowledge sharing (concept, process, and theories)	Knowledge sharing concept. Different frameworks of knowledge management process. Theories related to knowledge sharing (TRA, TPB, & SET).	What does KS exactly mean? What is the lifecycle of KS? What is the lifecycle of KS?

3. Chapter 3: Knowledge sharing in the Infrastructure Development Sector

3.1 Introduction

The aim of this chapter is to review the existing KS theories of the infrastructure development sector with the view of adapting a model of KS for projects in the infrastructure sector. Therefore, this section starts by representing the characteristics of the infrastructure development sector. Then, the focus of this chapter is KM and the project lifecycle in the infrastructure development sector. The last focus of this chapter is the construction of a conceptual model of KS at the level of the infrastructure projects industry by representing the characteristics of infrastructure development sector.

3.2 Characteristics of infrastructure development sector

The basic definition of infrastructure states that it is the basic physical system of a business or a nation; water, electric system, water, sewage, transportation, and communication are examples of infrastructure. Infrastructural projects tend to be high-cost investments; nevertheless, they are very important for the economic development and prosperity of a country (Markard, 2011). Infrastructure is also a sector of its own, in which infrastructure projects such as water fall under the water supply sector, electricity under the energy sector, sewage infrastructure is under the waste management sector, and so on. The infrastructure sector has several important characteristics. These include high upfront costs, longevity, intensive regulations, and environmental impacts.

According to Markard (2011), the infrastructure sector is capital intense; it requires high upfront costs. However, it requires low ongoing operational costs. The main reason why infrastructure sector tends to require intensity in capital is because such projects are often regionally widespread and very large.

Moreover, the infrastructure sector has longevity as these projects are associated with durability. The physical life of these projects can run for dozens of years; for example, nuclear power and electricity supply plants, which have a useful life of approximately 30 years. Others, such as power lines and sewers, have an even longer use life.

Another characteristic of the infrastructure sector is the regulations that are required therein such as service quality norms, price regulation, and environmental regulations, among others. One of the reasons why this sector is subject to many regulations is because infrastructure projects are of fundamental societal importance (Markard, 2011).

The infrastructure sector has an impact on the environment (Ortiz, et al., 2009); it has externalities, both positive and negative. Some of the negative impacts of this sector include depletion of fossil fuels and air pollution, particularly in projects related to electricity and gas supply.

3.3 Knowledge management at infrastructure development sector

There are some knowledge components in infrastructure development that are important to the sector. Knowledge can be described as information that has been previously used and which becomes part of the knowledge-based experiences of an individual. Different individuals have different knowledge-based experiences and capacities, and thus they arrive at different decision-making and problem-solving approaches. It is thus important to ensure that knowledge and experience are emphasised when choosing a project manager for an infrastructure development. However, the practice of KM in the infrastructure sector has not been fully addressed in the existing literature compared to other sectors like education sector.

The research of Teerajetgul and Charoennangam (2006) covered the concerns of practicing KM in infrastructure development by investigating the relationship between the process of

knowledge creation and knowledge factors that involve externalisation, combination, socialisation, and internalisation. A framework was adopted to put these relationships to test. Findings from the study indicated that three factors (information technology, incentive, and individual capacity) have an impact on overall knowledge in infrastructure development. From the research, it can be argued that KM in infrastructure projects cannot be undertaken without human interaction and information technology.

Tserng and Li (2004) also presented a more in-depth framework of KM used in infrastructure projects. The authors identified three KM spheres of infrastructure development, and these are experience management, content management, and process management. Moreover, they identified six management stages: occurrence of the problem, sharing of knowledge, creating knowledge, recording knowledge, storing knowledge, and reusing knowledge. Overall, the position of KM in infrastructure management is generalised by identifying the four most integral stages of KM, which are as follows: project information and gathering of knowledge, knowledge acquisition, creation of a database for best practice knowledge, and knowledge-based decision support for implementing other projects.

3.4 Conceptual model of KS theories in general organisational hierarchy at infrastructure level industry model

As stated before, the aim of this chapter is to review the existing KS theories and adapt a model of KS for infrastructure sector projects. So, the last focus of this chapter is to construct conceptual model of KS at the infrastructure industry project level to illustrate what knowledge components, activities, and stakeholders exist for each project lifecycle phase specifically at the infrastructure industry level as shown in Figures 3-1 and 3-2 below.

Given that the characteristics of the infrastructure development sector vary from other industries, it is better to generalise the proposed model so that it is more valid for different industries. This model is proposed based on general organisational hierarchy at the infrastructure industry level to include any knowledge components, activities, and stakeholders that exist for different infrastructural project lifecycle phases.

As this research seeks to understand how KS is effectively utilised to create project success in the infrastructure development sector, the knowledge flow between the stakeholders is represented to discuss the various issues that are critical within PM and KS through how the two are integrated at every stage of the project lifecycle to create success, which helps this research achieve the two main research objectives. The various critical issues may include the dynamicity of KS in the project lifecycle, integration of KS in the project lifecycle, type of KS in the project lifecycle, defectiveness of KS in the project lifecycle, mapping KS activities in the project lifecycle with a concentration on stakeholders, and networks of KS stage by stage in the project lifecycle.

Therefore, the following Figure 3-1 illustrates the conceptual model of the KS approach for the infrastructure sector's projects to implement the knowledge lifecycle in the body of the

project lifecycle whereby KS is supported by related activities, knowledge, process, and people in infrastructure sector projects.

In order to define the knowledge flow among different stakeholders in the PM process, this research refers to the PMBOK® guide model (PMI, 2013). Accordingly, there are 10 different knowledge components which appear in almost every project and are related to the management of the following areas: integration, scope, time, cost, quality, human resources, communications, risk, procurement, and stakeholders. Furthermore, PM process groups were introduced and distinguished separately from the PMBOK® guide model (PMI, 2013) and were categorised as initiating, planning, executing, monitoring and controlling, and closing process groups, which have been shown to interact with the network of connected PM processes. Accordingly, each of these processes includes sets of project activities that are considered in the study.

Also, it can be demonstrated from this model how the KS process consists of six phases such as identifying and realization knowledge value, creation, sharing, applying, capturing, and reuse as well as feed baking and measurements as represented in previous literature models (Nonaka & Takeuchi, 1995; Niedergassel, 2011).

The output of this conceptual model directly addresses the knowledge flow between different project stakeholders at each stage and integration of KS in PM. This model concerns project activities at each stage to answer the research questions that were mentioned earlier in this paper in regard to KS among different stakeholders in the infrastructure projects.



Figure 3-1: Proposed KS theories through organisational hierarchy at infrastructure level industry model (Layout 1)



Figure 3-2: Proposed research model of KS in the infrastructure projects (Layout 2) (Adapted from: *PMI*, *2013*).

3.5 Chapter summary

This chapter has introduced an adapted model of KS for projects in the infrastructure sector. It has offered an overview of KS in the UAE and the infrastructure development sector. The next Table 3-1 represents its main literature findings. The next chapter reviews the literature of KS in PM to understand how KS is effectively utilised to create project success at every phase of the project lifecycle.
Table 3-1: Main literature findings for knowledge sharing theories.

Literature Reviewed	Issues Learned	Expanding LR adding	Questions
(Harris & McCaffer, 2013;Markard, 2011;Yuan & Shen, 2011; Hoyer, et al., 2010;Khasreen, et al., 2009;Ortiz, et al., 2009; Song, et al., 2009; Zu, 2009;Teerajetgul and Charoennangam ,2006; Tserng and Li ,2004;)	Infrastructure development sector (features, KM & PM) Conceptual model of KS theory.	Characteristics of infrastructure development sector (high upfront costs, longevity, regulation intensive, and environmental impacts). Knowledge management at infrastructure development sector. Project lifecycle of the infrastructure development sector.	What are the characteristics of the infrastructure development sector? What is the status of KM in the infrastructure development sector? What is specifically the lifecycle of infrastructure development sector projects?

4. Chapter 4: Knowledge sharing through lifecycle of project management

4.1 Introduction

Newell et al. (2002) expressed the belief that the failure of many projects is, to a great extent, related to when project leaders or project managers fail to apply PM effectively in their projects, and as such, many organisations lose a great deal of knowledge. This type of knowledge, in many cases, could ease problem-solving difficulties in the projects by facilitating faster detection of these issues and, therefore, determining measures to address them in time (Wenger, et al., 2002). The experiences and lessons that are learnt from previous projects are fundamental to solving any recurrent issues in the project, and in order to ensure that the project is implemented effectively, the project team has to be in the position to avoid as many mistakes as possible (Lueg, 2001).

The success of any project is faced by a wide array of constraints, and as Burger and Owens (2006) have explained, modern-day projects are complex in nature, mainly because of constraints of time and resources. Furthermore, modern projects are very costly at every stage of development, which is why KS is fundamental. This is also why Liebowitz (2001) attempted to link KS practices with PM practices, and in order to establish this connection, Tan et al. (2006) recommend an integration of KS, such that a component of KM in included in PM.

The key stages in the project lifecycle, as specified in this study, include defining the project goal, planning the project through designing a well-thought-out plan, executing the project plan, closing the project, and, finally, evaluating the project. In order to understand the stages that require KS and the necessity of it in every stage, it is fundamental to bear in mind the PM practices at every stage of the project lifecycle.

Furthermore, KS is identified in the context of exchanging knowledge, which is separated into objective knowledge (i.e. project performance, agenda, teams, systems) and essential knowledge to complete a project (i.e. project object, design qualifications, technologies) at either the individual or organisational level (Lee, 2001).

These pieces of knowledge that are assembled together over time as an organisation involves itself in an array of projects are key to the success of future projects. This is why Wenger et al. (2002) acknowledged that the risk of knowledge loss, especially after the closure of a project, is a serious problem faced by modern-day organisations and an aspect that has significantly contributed to the failure of projects.

When it comes to KS in PM in the infrastructure development sector, certain areas take precedence, especially in terms of the application of the process to project lifecycle. Certain theories have been identified as important to KS since they describe the process and how it could be improved. When these theories of KS are applied to the PM cycle, there could be possible benefits and value added to the whole project.

This section discusses existing literature on KS within infrastructure sector projects and the comprehensive areas of public sector KM and PM. The main aim of this chapter is to identify and discuss some of the academic studies that are related to this research purpose. Consequently, research gaps in these studies are recognised to clarify the objectives and questions of the present study.

As stated previously, this research aims to understand how KS is effectively utilised to create project success in the infrastructure development sector. This section discusses the various issues that are critical within PM and KS through how the two integrate at every stage of the project lifecycle.

These goals are accomplished by representing the components of KS in the PM lifecycle. Firstly, this chapter describes the project lifecycle. Then, it sheds light on how KS is accomplished in PM and its value to the PM. It also focuses on what knowledge is involved in the project lifecycle to show the process of KS beside the stakeholders to represent the knowledge flow at each stage of the project lifecycle. At the end, this chapter develops a new mapping of knowledge components at each stage of the project lifecycle of the fifth PMBOK® guide.

4.2 Knowledge sharing in project lifecycle

4.2.1 Integrating knowledge sharing to project cycle

As mentioned in previous sub-topics, the KS cycle is greatly important to the project lifecycle. These two cycles could be integrated, thus resulting in certain KS processes to be presented at every stage of the project lifecycle. Scully (2013) proposed a model, as presented in Figure 4-1, which could be used to show how the two processes relate.



Figure 4-1: relationship between KS and PM (Source: Scully 2013)

The KS process is part of all project activities on a daily basis until the project is completed (Carrillo, 2005). Accordingly, in a project, the initiation or project definition phase involves

gathering proper information to allow the project to start, whereas the planning stage also involves assembling information together.

Therefore, Scully (2013) has classified this initiation phase as the phase where information is created in the KS cycle. The first and second phase of a project enhances the creation of knowledge since no further details of a project have been constructed yet. The initial stages of a project are suitable for establishing a knowledge-sharing centre to begin collecting information right from the start. The second phase of the project, which is the implementation or execution phase, involves many KS activities because it is the stage where the most relevant project activities are concentrated. The implementation phase contains the acquisition, refinement, storage, and transfer processes, all of which contribute to sharing. The final phase, which is the closure and evaluation portions, includes knowledge utilisation and measuring of the effectiveness of the knowledge process with regard to the organisational performance.

In addition, Gudi and Becerra-Fernandez (2006) proposed another model, as shown in Figure 4-2, that could be used to explain the role that KS and KM plays in project success.

As Gudi and Becerra-Fernandez (2006) have argued KS, is fundamental for project success, not just in the public sector, but also in the private sector. In other words, by integrating KM strategies, organisations stand a strong chance of developing successful projects in an environment where project success faces an array of challenges. This model recommends that there are generally many factors that affect important factors such as project risk, especially in complex project organisations, and in most cases, they constitute external factors like economic and political impacts.

According to this model, factors such as the extent of innovation and the complexity of the project are just some of the internal factors that could significantly affect project risk (Kerzner H., 2009). It is important to also note that the technologies and the KM mechanisms put in place play an important role in influencing project team adaptation. Project team adaptation, according to Ismail et al. (2009), is a very important factor as far as project success is concerned.



Figure 4-2: KS in project lifecycle (Source: Gudi & Becerra-Fernandez 2006).

Guidelines for integrating Knowledge sharing into a project

The effective execution of such KS systems requires management initiatives to establish a suitable culture that highlights the context of KS and learning throughout the entire project lifecycle (Ahmed, et al., 2014).

According to Levine (2010), a project needs to adopt and implement certain guidelines in order to ensure that there is successful integration of the KS process into a project. The first step according to Levine (2010) is to define KS and KM so that every person understands them within the project. Members of the project team must understand what is happening for

them to be capable of sharing or receiving knowledge. A lack of understanding leads to confusion and poor project outcomes.

The second step is to ensure that the KS process is included in the work breakdown structure, which results in the integration of processes into the daily operations. Making it easier to access or provide knowledge throughout other activities boosts efficiency rather than segments it. The next step is to ensure that there is an established contact point for KS for each project. A successful project employs the use of a routine guideline by having a specific contact used for the exchange of knowledge where every person can access it. Random exchange of knowledge is not helpful because it gets lost along the way.

Levine (2010) also advised that there is the need for using a responsibility accountability matrix (RAM), which is used to define the responsibilities, accountability, and roles of each individual relating to the KS process. The next step is to ensure constant communication as a reminder of the importance of KS to all stakeholders. Every stakeholder has a critical contribution of knowledge to share that helps to ensure success.

A further step is to provide KS and training orientation to all stakeholders. By involving all stakeholders directly, they can realise the usefulness of KS faster and be more directly involved. Poor communication and lack of sharing information and strategies might lead to locking out important knowledge from others as well. Therefore, a successful project considers gathering knowledge from all perspectives to allow room for the selection of the best information to build the best strategy. Furthermore, there is a real need to build project planning and forecasting supported by knowledge by increasing education and training among projects (AlNasseri & Aulin, 2015).

As mentioned by Tokuda et al. (2014) and Schmitz (2013), this research further adds the step that encourages KS through creating a system for recognising and rewarding those who contribute to KS in the best way. Tracking the importance, use, and effectiveness of the KS process is also important. The project manager should apply the usage metrics to ensure that there are the correct measures of effectiveness. Lastly, there should be an aspect of continuous improvement in which the process is updated and evaluated to ensure that it delivers better results each time.

In conclusion, guidelines for integrating KS into a project lifecycle can be listed as follows:

- 1. Establish a suitable culture to highlight the context of KS and learning within the project (Ahmed, et al., 2014).
- Define KS and KM for every person to understand them within the project (Levin, 2010).
- 3. Ensure that the KS process is included in the work breakdown structure (Levin, 2010).
- 4. Use a responsibility accountability matrix, which defines the responsibilities, accountability, and roles of each individual relating to the KS process (Levin, 2010).
- 5. Provide KS and training orientation to all stakeholders (AlNasseri & Aulin, 2015).
- 6. Create a system for recognition and rewards that encourage KS (Tokuda, T., et al., 2014).
- 7. Track the importance, use, and effectiveness of the KS process (Schmitz, 2013).

4.2.2 Methods of Knowledge sharing in projects

For projects, the sharing and accessing of knowledge is done through certain methods or resources, which are enablers of KS. Without these tools and media, it would not be possible to transmit such an immense amount of knowledge. Different projects and organisations have reported sharing information through numerous platforms for making that information available (Wenger, et al., 2002).

Newell et al. (2002) explained that some of the latest and fastest ways of sharing knowledge are based on the internet, including email, websites, blogs, and social media. These platforms allow people to access information on both formal and informal levels. The internet is a useful resource since requests for information are less costly and do not have to directly involve the person sharing the information. According to research conducted by Niedergassel (2011), effectiveness of KS through the internet was reported by many organisations to be around 49% in accessing the proper information.

Carrillo (2005) also reported that in many projects, the highest level of efficiency and relevance of information to contribute to effectiveness was found in intranet search engines. The information collected and stored for use within a project is thus more critical than any other source of information sharing. Another source of knowledge considered important for a project is peer-reviewed processes. According to Kendra and Taplin (2004), information collected during past projects and reviewed by critics represent a very important source that shows the strategies used for successes and failures.

Post-implementation reviews, internal audits, customer relationship management, and enterprise resource planning systems are also important sources of KS. Styhre (2011) explained that relationships with customers during the project implementation phase are a critical aspect of PM that not only builds confidence in the customer of the project, but also

opens a source of useful knowledge. The customer provides key information about what they want and need, thus building knowledge on customer behaviour. Contractors or project managers are thus aware of what the stakeholders really want.

In conclusion, methods of KS in projects can be listed as follows:

- 1. Internet-based methods, which include mail, websites, blogs, and social media (Newell, et al., 2002);
- 2. Intranet (Carrillo, 2005);
- 3. Peer-reviewed processes (Kendra & Taplin, 2004);
- 4. Post-implementation reviews; Internal audits; Customer relationship management; and Enterprise resource planning systems (Styhre, 2011).

4.2.3 Enablers of success Knowledge sharing in a project

Today, KS is considered a part of KM, which is a process that entails the cycle of information within a given environment. The notion of KM also includes acquiring information, sharing it, and implementing it to aid in projects. According to Grillitsch et al. (2007), KS in projects is critical and has certain steps that are followed to ensure its success. The researcher points out that the process starts with knowledge creation, knowledge storage, knowledge transfer, and finally knowledge application. Within the context of PM, these processes help to increase efficiency of work amongst employees.

BreitenöDer (2009) outlined the notion that within a project, it is impossible for all employees to have the same level of knowledge and information. This means that in order to achieve success, there is need for some employees to share their extra knowledge to ensure that every member is aware of what a project entails and how it can be done.

Behaviour of KS needs to be considered from the board of directors of an organisation in order to establish a collaborative project culture to enhance tacit KS. There are many existing practices to encourage the KS inside organisations, such as introducing incentives and supportive leadership styles (Wiewiora, et al., 2014).

In a study conducted by Grillitsch et al. (2007) on the successful sharing of project knowledge, the researchers outlined numerous critical points for the success of a project through KS. According to Grillitsch et al. (2007), some of the factors required for a successful project through KS include strategic relevance, communication, concept, continuous development, IT, and coordination, among others. Similarly, Kotlarsky & Oshri (2005) have suggested the development of social mechanisms of KS as collective knowledge besides transitive memory. In addition, technical tools of communication are also effective, such as emails and groupware or discussion applications between dispersed team members for global distributed projects.

In addition, KM systems are embedded in PM to build a motivating culture of effective KS through different practices. To illustrate this idea, KM practices in PM comprise managing coordination of content and documentation, sharing best practices, and lessons learnt (Yeong & Lim, 2010).

From the explanation of the ideas of experts, these factors must be present in order for successful KS and a successful project. Strategic relevance involves having a proper plan of action on how to share information through specific channels. These channels must avoid duplication, wastage of resources, and delays that might lead to time constraints. This is where the role of communication and employee relations enters. Employees need to be able to communicate well and objectively regarding the project in question in order to acquire specific pieces of necessary information. According to Lipiński and Świrski (2012), utilising

the TRA and TPB, the attitudes of the person sharing information and the recipient are important.

Ajayi (2013) has argued that there is need for understanding how effectively they could be integrated into the daily operations of a project. The goals and objectives of the project should be aligned to match the KS process so that it could be able to influence the outcomes positively. This means that there should be extensive understanding of the assets and needs of knowledge within the project itself.

According to Jayasinghe and Kapurubandara(2013), in order for the KS process to be integrated into a project successfully, certain conditions must be ideal. For instance, every member of the project team should understand and relate to the subject matter of the project so that they could make relevant contributions. Most critically, Saad et al. (2014) added that significance, relevance, and influence within the project all aid in creating consistent and proper supervision.

According to Kendra and Taplin (2004), in order for any KS process to work, certain preconditions must be met. The commitment to the project by managers to ensure that they and subordinates adhere to KS is critical, so top management needs to steer the project members towards understanding that the project requires every individual's input. Another prerequisite before utilising KS within a project is a structured process and procedure to guide the implementation, according to Tan (2013). The researcher explained that a procedure or process is critical because it helps to reduce wastage of resources, such as time.

According to BreitenöDer (2009), recording and documenting specific lessons learnt and best practices during the project and from past projects can ensure sufficient KS, as explained by Wenger et al. (2002). Technology support, clear roles and responsibilities, and evaluation of

the project process with access to KS are also very critical factors to consider. However, the overall outcome of the success of utilising KS depends on the willingness of the person sharing information, the amount of useful information, and the commitment of the team to the project.

The KS systems of project-based organisations rely on employees, organisational social networks, and other technological elements (Wiewiora, et al., 2014). Often, project teams must have high-quality knowledge, skill sets, and experiences and require social sharing of project knowledge to accomplish their project tasks (Mat, et al., 2012). Moreover, KS contributes positively to projects by transferring tacit knowledge or know-how between team members through effective communication. In this manner, sharing knowledge between project team members enhances performance and increases innovation opportunities (Hong, et al., 2008). Sharing tacit knowledge among project team members can be predicted by the degree of flexibility of the project team, as well as the effectiveness of communication (Mueller J., 2015).

In general, there are different applications and practices of KM inside different industries in the context of PM, such as knowledge risk management, like IT projects that usually have a risk management strategy (Love, 2004). Providing a KS culture in an organisation to enhance knowledge of risks among individuals via different knowledge activities improves the overall management of the project and associated risks in a complex environment (Massingham, 2010).

In a project, KS leads to success (Shareff, 2014), and Styhre (2011) emphasised that it needs to be applied correctly for positive outcomes to be realised. The contributions of KS occur through offering new knowledge to ensure that all processes are improved from previous projects. BreitenöDer (2009) proposed a model that shows how different factors could contribute to proper KS, which could result into a project success. The model in Figure 4-3 below represents a possible way that KS could contribute to a project success.



Figure 4-3: The contribution of KS to a project success. (Source: BreitenöDer 2009)

Individuals' motivation factors are personal intentions as explained by the theories of KS. The expected outcome by an individual, personal expectation and social viewing of the act of KS all contribute to why and how a person is motivated in this process. Individual team members' motivation is a deciding factor in how knowledge is shared in projects. In this way, project managers who have created a highly functional project team that work collectively and are willing to work together to see success re considered collectively motivated. However, individualism and a lack of teamwork lead to a lack of KS amongst project members, which could lead to failure of the project (Saad, et al., 2014).

The intention to share knowledge by an individual could be motivated by materialistic, philanthropic, selfish, social, or compliance reasons. Whatever the reason, intentions differently contribute to how much and how well the project members share knowledge. According to Schmitz (2013), social exchange theory guides the motivations of a person, especially those who are materialistic because they hope to receive something in return. However, some team members are driven by hard work and the desire to see the project

succeed, and thus they may contribute more knowledge because they do not have materialistic expectations. However, Shareff (2014) elaborated that as much as some project members are loyal and hardworking, it does not mean that their work should not be rewarded. Recognition and rewarding of such team members renders them role models and increases motivation to have positive intentions when sharing the knowledge they have gathered.

The other aspect is the organisational motivation factors, which include how the organisation treats the knowledge and the project team members. The team members should expect a degree of recognition and remuneration for their work. Moreover, the knowledge should be properly processed and stored, if not required immediately. Kerzner (2009) explained that many times, the knowledge learnt during the early stages of a project is useful during the maturity stages, since it is used to makes changes and improvements with time. Knowledge used to make projects succeed does not have to be learnt from past projects altogether, but could be learnt systematically from daily operations.

The KS behaviour comprises two areas: one is tacit and the other is explicit. Explicit behaviour of KS is formalised and designed to meet specific needs. For example, internal systems within a project designed to enhance communication, information sharing, and customer relations all contribute to KS from a specific perspective with an ideal objective of offering a solution to a pre-determined problem (Maalej & Thurimella, 2013). On the other hand, Carrillo (2005) explained that tacit knowledge is informal and shared through less formal resources such as social media and friendly chats.

According to Kasvi et al. (2003), in order to manage knowledge in projects, a codification or a personalisation strategy should be developed. A codification strategy usually corresponds to codifying knowledge and storing it in accessible databases, whereas a personalisation strategy corresponds to when knowledge is connected to personnel who create it and transfer it to others via face-to-face interaction like meetings.

On other hand, KS barriers that vary from one project to another are signified through a codification process, information technology, lack of employee participation, time shortages, and asset limitations (Hong, et al., 2008).

In conclusion, critical points for the success KS through projects can be listed as follows:

- Successful implementation of KS process and mechanisms in the PM (Grillitsch, et al., 2007; Ajayi, 2013).
- 2) Strategic relevance, which involves having a proper plan of action on how to share information through specific channels (Lipiński & Świrski, 2012;Saad, et al., 2014).
- Supportive leadership styles and a culture of motivation through recognition and rewards in the PM (Wenger, et al., 2002; BreitenöDer, 2009;Yeong & Lim, 2010;Wiewiora et al., 2014).
- Development of social mechanisms of KS as collective knowledge besides transitive memory or social media (Carrillo, 2005; Kotlarsky & Oshri, 2005; Maalej & Thurimella, 2013).
- 5) Development of IT tools of communication between dispersed team members (Grillitsch, et al., 2007).
- Individual team members' motivation and positive intention (BreitenöDer, 2009; Jayasinghe & Kapurubandara, 2013;Saad, et al., 2014).

4.3 Value of Knowledge sharing in project management

4.3.1 Definition of success in a project

According to Kerzner (2009), in order for a project cycle to be considered full and successful, certain factors need to be taken into account, such as the outcomes. BreitenöDer (2009) supported this idea by explaining that without understanding the limits, outcomes, and success of a project, it is impossible to determine if it performs the function that was intended. Lueg (2001) mentioned the profitability, ease of operation, and time constraints of a project as the key factors to consider when it comes to success of the project. Widen-Wulff (2007) added that the assets, team satisfaction, and budget constraints are also critical factors to consider.

Shareholder value is an important factor because it determines how the stakeholders benefit from a project. Through satisfying stakeholders, a project successfully completes its tasks. Most stakeholders invest in projects because they expect positive outcomes such as profitability. This is why profits and losses are used to measure how successful a project has become, according to Schmitz (2013). Widen-Wulff (2007) explained that some projects are designed to create performance improvement, which could be a huge opportunity to develop the performance of critical areas of business, investments, and systems. Therefore, such a measure would consider how the components, systems, or people have improved after the project completion to determine its success.

In a business scenario, project success means that there has been successful integration of an asset that functions as desired or provides quality goods and services as demanded by consumers, according to Gudi and Becerra-Fernandez (2006). Completion of projects during the desired time, within the desired budgets, and with the required quality means that the project has succeeded. Most importantly, in a project, the team members and contractors need to benefit as well to complete all around success. The purpose of understanding the definition

of project success at this stage is to shed light on which areas and how the KS process could be integrated.

Furthermore, project success is, at its most basic, the acceptance of the results by the approved stakeholders. Given the short-term nature of projects, their performance must be tracked by scope, time, cost, quality, resources, and risk constraints as agreed by the stakeholders. In this research, success in understood to mean the completion of projects during the desired time, budgets, and quality means that the project stakeholders have completed all of their project responsibilities and accountabilities.

4.3.2 The contribution of Knowledge sharing in the project success

According to Howlett (2013), projects are not independent of one another and cannot succeed without input from current and past knowledge. This means that it is necessary to share continuously knowledge during the lifecycle of a project. One of the areas in which a project could benefit from information is old projects. Maalej and Thurimella (2013) have emphasised that mistakes and lessons learnt could be avoided by sharing that information in the current project. Figure 4-4 below shows an example of a model of how KS could affect a new project.



Figure 4-4: Impact of KS upon new projects (Adapted from: Maalej & Thurimella 2013)

An effective KS strategy in a company is fundamental to the success of PM in that organisation. According to Kendra and Taplin (2004), there are many benefits of PM, and this is because all projects benefit from the sharing of ideas, reusing ideas, and collaborating information as some of the most effective ways of learning and acquiring knowledge that is necessary for dealing with project risks.

One of the most important benefits of KS is that it facilitates better and faster decisionmaking. According to Kerzner (2009), by delivering information that is relevant and at the time of need through an effective structure, subscription, search, syndication, and support, the project team is in a strong position of not only avoiding risks, but also mitigating them and determining the most effective strategies to facilitate project success.

According to Ismail et al. (2009), collaboration through the KM environment gives the organisation the basis of making strong and informed decisions. This is because such collaboration allows for the power of diverse opinions, large numbers, and varied experiences, which are valuable, especially at a time when important decisions are made about the project. Kerzner (2009) noted the belief that when knowledge is reused in repositories, the decisions made are most likely based on actual experiences, practical lessons learnt, and large samples. In other words, such decisions are made based on reliable information and, therefore, problem diagnosis and prognosis are more effective. This is a key factor in project success.

According to Ismail et al. (2009), another important use of KS in PM is that it makes it easy to find relevant information and resources. Information is very important for success of any project and its convenient availability even more so. There are many issues that arise during the project lifecycle, most of which must be solved to avoid delays or extra costs, and in most cases, to avoid project failure. These issues might include, among others, solving problems, the need to respond to a client, the need to assess markets, the need to analyse trends, and the need to understand competition. These factors are important for strategy formulation, since in order to develop a relevant and effective strategy, the project team has to have information about all variables.

The process of KS helps the project team to avoid redundant effort. In other words, KS helps the project team members to avoid making the same mistakes or learning the same information over again, which are processes that waste a lot of time and resources (Kendra & Taplin, 2004). When information is shared, there is no duplication of effort, hence time and resources are saved and the morale of the team members is boosted, which makes great strides in streamlining work. According to Gudi and Becerra-Fernandez (2006), the difference between success and failure in a project may depend on whether or not the team members spend time 'reinventing the wheel' instead of focussing on inventing something new.

Proper KS facilitates the reusing of ideas and expertise (Kendra & Taplin, 2004). This is because, once an effective process has been developed, then the project team or any other person should be able to use the same process when a similar requirement arises. In other words, KS gives the project team the ability to easily manage recurring needs using prior processes that have been proven to be effective. This not only saves time and resources, it also gives the project team members an opportunity to focus on other issues concerning the project.

Every project succeeds based on how well it utilises the information available in solving its project-related problems and general challenges the might affect the bottom line. According to Burger and Owens (2006), there are many challenges that face the successful implementation and completion of projects, and one of the most commonly encountered problems is accountability, such that many failed projects have been accused of not being accountable to

clients and beneficiaries. The fact that in such situations, teams gave the beneficiaries little or no knowledge on how the projects were designed makes the projects vulnerable and, in many cases, susceptible to failure (Von Zedtwitz, 2003). Additionally, such situations could engineer hostility from the misunderstandings, since the communities and other stakeholders might become suspicious of the intentions of that particular project.

Tan et al. (2006) noted that KS is effective at easing the process of accountability. With every stakeholder informed of the process and all the activities concerning the project, its design, and the challenges it faces, accountability can be enhanced and all the stakeholders can be on the same page as far as the project implementation and other processes are concerned.

Carrillo (2005) highlighted that another major challenge that projects face is the challenge of knowledge reuse, and according to this author, this is largely due to the temporary nature of projects. The temporary nature of projects is characterised by a complete disbandment of the project team as soon as the project is over, and if there any reviews to be written, Newell et al. (2002) argued that such reviews are done hastily, since most project teams do not believe they would need to reuse such knowledge in future projects. This mainly constitutes the lessons learnt from previous projects, which, when carried over to future projects by sharing knowledge with other project teams, can greatly impact project success. Thus, standardization processes in PM play a vital role in facilitating KS to codify or standardise which lessons can be learned from projects. Furthermore, KS not only emphasises the need to share and reuse knowledge, but also the need to pick up any lessons learnt from the mistakes of previous projects. This primarily ensures that less time is spent on a particular problem in a newer project, and thus the project costs are scaled down.

In conclusion, value of KS in PM can be listed as follows:

- 1. Improve collaboration and project learning (Kendra & Taplin, 2004).
- 2. Facilitate better and faster decision-making (Kerzner H., 2009).
- Facilitate finding relevant information and resources in project lifecycle (Ismail, et al., 2009;Kendra & Taplin, 2004).
- 4. Avoid redundant effort (Kendra & Taplin, 2004; Gudi & Becerra-Fernandez, 2006).
- Enhance the process of accountability and stakeholders' engagement in PM (Von Zedtwitz, 2003; Burger & Owens, 2006; Tan, et al., 2006).
- Reduce the project costs and time and hence increase project success (Newell, et al., 2002; Carrillo, 2005).

4.4 How is Knowledge sharing through phases of the lifecycle of projects?

4.4.1 General project lifecycle, activities, stakeholders and knowledge

Project lifecycle and activities

The project lifecycle is important to understand because it offers insight into how the KS process could be integrated at each stage. In addition, it is necessary to understand the project environment and put in practice any related project experiences and perceptions to shape the project effectively (Smith & Winter, 2010). Different researchers have crafted different models to represent these cycles.

According to Tan (2013), the standard model needs to have critical phases such as the starting and ending phase, as well as the implementation. However, Howlett (2013) insisted that all projects must have all phases instated correctly for them to be functional and efficient. Such phases involve the definition of the project goal, planning, execution, closing, and evaluation. According to Cabanis-Brewin and Dinsmore (2011), PM has different phases, as shown in Figure 4-5, which represents an example of a project lifecycle.



Figure 4-5: Project lifecycle (Adapted from: Cabanis-Brewin & Dinsmore 2011)

According to the PMI (2013), the project lifecycle consists of a sequence of phases from initiation to closure within certain timeframes and defined outcomes. Consequently, the organisation management and control style of the projects, besides implemented technology, affect the characteristics of a project lifecycle.

Furthermore, PM process groups were introduced and distinguished separately from project phases by the PMBOK® guide (PMI, 2013). These were categorised as initiating, planning, executing, monitoring and controlling, and closing process groups, as shown in Figure 4-6, to interact with the network of connected PM process. Due to the iterative character of PM, each process group can be replicated in each project phase.



Figure 4-6: PM process group (Adapted from: PMI 2013).

Project Initiation stage

Each of the project phases are significant because the next stage of a project cannot occur before its predecessor. The first phase, the project definition, is also known as the project initiation phase.

In this stage, a project team needs to identify the objectives, problems, and opportunities that present themselves (Newell, et al., 2002). This stage also allows the project stakeholders to conduct feasibility studies, tests, and research to identify if the suggested idea is relevant, workable, safe, and useful. According to Kendra and Taplin (2004), a feasibility study aids the identification of if the project could be conducted as well as the justification for conducting the project. Upon approval of the solution recommended to the identified problem through the project, this phase also allows for some of the most important positions to be filled, which include the appointment of a manager and key project team members. Once the manager has assembled the critical people, they seek permission to move on to the next stage of a project.

Tan et al. (2006) studies the important activities at the first stage of the project lifecycle, and notes that the most important activities include relationship, inclusion, collaboration, prioritisation, and general KS. By undertaking these activities, the project team puts itself in a

beneficial position to diagnose and analyse any possible glitches that may arise at that stage of the project lifecycle, or even at another later stage (Wiig K., 2000).

Project planning stage

The next phase is the planning phase, which involves the further development of a strategy and solution for the whole project. This phase ensures that all details are covered to avoid not achieving the objectives.

Planning activities are complex and time consuming, and as such, they need care (Niedergassel, 2011). In a study conducted by Widen-Wulff (2007), they identified some of the areas to be covered in a plan including timeframes, tasks, activities in each task, people responsible for each task, dependencies, materials, costs, labour, budget estimates, and scope management, among many more minute details that, if poorly managed, could lead to the failure of the whole project. Moreover, each step needs to be verified and justified.

In the definition of the goal stage, the managers have to ensure that they correctly identify all variables, since this stage dictates the type of plan and the type of execution that would be adopted to facilitate successful project implementation. According to Wiig (2000), this stage constitutes social and collaborative processes, which accompany individual cognitive behaviour. In all of these processes, knowledge is created, amplified, shared, enlarged, and most importantly, justified in the organisational settings (Wenger, et al., 2002). This is a stage where managers would mostly be involved in defining the plan, as well as partially planning the execution. Newell et al. (2002) pointed out that KS at this stage could facilitate not only the identification of possible flaws in the plan but also assess the probability of success if the current plan is executed. The planning stage and the goal defining stage, according to Newell et al. (2002), are done concurrently in some projects.

The project planning phase stage therefore requires much technology knowledge, which, according to Tan et al. (2006), equips the project team with the means to address the current project-related problems in an innovative way. In order to implement KS at this stage of the project lifecycle, Liebowitz (2001) recommended that the project team engage in intense consultations from other team members from different projects in terms of the technological and technical challenges they have faced in the past and the mechanisms they employed in dealing with such challenges. This option puts the project team in a position in which they can anticipate a problem and, therefore, can take proactive measures to ensure that such problems do not affect the project's chances of success (Lueg, 2001).

Newell et al. (2002) summarised the activities at this stage of the project cycle as participatory processes, strategic planning, collaborations and alliances, and partnerships. These are all elements of KS and together can amount to an effective strategy as far as planning for the project is concerned. The acquired or created knowledge is refined to ensure that all ideas have been contextualised to the specific needs of the project to ensure that the goal of the project is put into consideration in every project activity that is carried out.

Project Execution stage

The execution phase, also known as the implementation phase, is one of the most important phases where the plan is put into motion. During this phase, the project continuously faces challenges since many problems arise during this phase.

For this reason, it is critical to maintain communication, monitoring, and control during this period. Project reports and updates, among other important areas, need to be completed on time and correctly (Howlett, 2013).

The execution phase of the project is reliant on an array of factors, including how well the first two stages of the project have been carried out. This is because the execution of the project is largely the product of how well the goals were set and how well the plan was enacted. According to Newell et al. (2002), this is the stage where the project team members collaborate with other stakeholders of the project under the management of the project leader to initiate the project as they analyse the situation in real time.

Burger and Owens (2006) explained that there is a need to manage different processes during this stage of PM, and these management processes are aimed at facilitating the management of time, quality, risks, other project-related issues, and any other changes that might be necessary for the project. Performing procurement and acceptance management also constitutes some of the most important project activities at this stage. In order to ensure that these project activities have been carried out in an effective manner, knowledge is key, especially in terms of how the project (Wenger, et al., 2002).

The management of risks through the analysis of risk portfolios in the project requires knowledge and expertise, and it is closely associated with the ability of the project team to identify the issues that the project faces, not only at this stage, but also at any other later stage of the project. The risk portfolio and risk matrix in the project are aspects of the project on which the team must put emphasis, according to Liebowitz (2001), since they could determine the difference between success and failure of the project.

Project monitoring & control stage

The next phase is the project monitoring and control phase. After identifying the work required, estimating the costs, and making a schedule, the PM team needs to design a risk

management plan, quality assurance plan, control measures, and targets (Carrillo, 2005). These features are not part of the essential planning, but they may be equally important as the project progresses. Clients, customers, and stakeholders want to be assured of the quality of the work.

Project closure stage

Lastly, the closing phase involves final deliverables and handing the project over to the direct stakeholders. The evaluation is when the project is checked and rated for its success or failure to deliver what is required at each phase of project lifecycle.

Project stakeholders

The PM cannot succeed without input, knowledge, and sharing from its stakeholders. The different groups of people need to work together to ensure that they have established a unique system of retrieving, collecting, and utilising the existing knowledge, which, upon successful creation, can be passed on to the next project.

According to PMI (2013), project stakeholders are those individuals, groups, or even organisations that have an effect on the project's process or results or can be affected in reality or potentiality by the project process or results at different levels. Often, project stakeholders may be involved in the project internally within the organisation or externally as partners or service providers in the project lifecycle.

To specify further, the PM stakeholders are all members with an interest in the project. These include project investors, customers which involve communities (users and the host), the regulatory authorities, cost consultant, suppliers, contractors, civil engineer, technicians, project managers, and project team members (PMI, 2013; APM, 2012).

All of these stakeholders have expectations and contributions in terms of KS according to Maalej and Thurimella (2013). The project owners aid in providing information that could be useful in areas of budgeting and resource allocation. Moreover, an explanation of what they expect guides the project manager and the project team members to determine a strategic way to fulfil these needs and have a proper understanding of where to get the necessary knowledge.

Project team members have the most to contribute throughout the project, particularly the managers. This is because the managers are tasked with the responsibility of creating an environment in which other employees can effectively co-exist and work, and most importantly, the manager should be able to supervise them. The project team members have to fulfil the daily tasks by ensuring that they each do their part to further the project (Carrillo, 2005). Besides, the managers are responsible and accountable for the project success through defining accurate and realisable project borders (PMI, 2013).

The project initiation stage includes project investors, customers which involve communities (users and the host), cost consultant, safety manager, and the regulatory authorities (Song, et al., 2009).

The project planning stage includes all stakeholders such as project investors, cost consultants, customers and communities (users and the host), the regulatory authorities, safety manager, suppliers, contractors, civil engineers, technicians, project managers, and project team members (PMI, 2013; Harris & McCaffer, 2013;Song, et al., 2009).

The project monitoring and control stage includes the regulatory authorities, contractors, customers, cost consultant, project managers and project team members (PMI, 2013).

Mapping knowledge components at each stage of the project lifecycle

As mentioned previously, Kerzner (2009) has explained that many times, knowledge learnt during the early stages of a project is useful during the maturity stages since it is used to makes changes and improvements with time. Knowledge used to make projects succeed does not have to be acquired from past projects altogether, but it could rather be learnt systematically from daily operations.

Newell et al. (2002) defined knowledge as a compound phenomenon that consists of product knowledge, project knowledge, and process knowledge. Project knowledge consists of functional and attributable requirements, the knowledge about resources and constraints, the budget, timing, work products, quality targets, milestones, increments, deliverables, and performance parameters. The product knowledge, on the other hand, constitutes knowledge about different product features and how they are related to other products, protocols, and standards. Process knowledge constitutes knowledge about workflows, business processes, responsibilities, interfaces between processes, and supporting technologies.

In order to define knowledge components in PM, this research refers to the PM body of knowledge (PMBOK®) guide model (PMI, 2013) and the framework of knowledge components at each project lifecycle phase as was introduced by Beiryaei and Vaghefi (2010). Beiryaei and Vaghefi (2010) have attempted to investigate how to implement the knowledge lifecycle into the body of the project lifecycle by using KM system via a literature review. As a result, project knowledge areas were mapped in the project lifecycle, by as illustrated in Table 4-1 below. Based on this table, 12 knowledge components are characterised as involved in projects and related to projects, processes, products, or technology. This table represents the allocation of the KM process to each project lifecycle phase. In addition, the knowledge lifecycle is represented in connected chains embedded in the project lifecycle.

On other hand, the main critique which is to be raised for this study is that the represented knowledge components are very general and need to be more specific to better understand how to implement the knowledge lifecycle in the body of PM. This is addressed by developing more specific knowledge components in the next research subsection.

Table 4-1: Knowledge components at e	each project lifecycle phase
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Project	PLC				
knowledge	define project goal	plan project	execute project plan	close project	evaluate project
Project Knowledge		Data and Information about resources, functional and attributes requirements, work products, budget, timing, milestones, deliverables, increments, quality targets and performance parameters	Data and Information about resources, functional and attributes requirements, work products, budget, timing, milestones, deliverables, increments, quality targets and performance parameters,	Data and Information about Budget, timing, Deliverables,	Data and Information about resources, functional and attributes requirements, work products, budget, timing, milestones, deliverables, increments, quality targets and performance parameters
Product Knowledge	Data and Information about Quality goal, Requirement	Data and Information about Resource	Data and Information about product features, Data and Information about how a product relates to other products, standards, Data and Information about development, Data and Information about changes.		
Process Knowledge	Data and Information about business processes, workflows, Business Value	Data and Information about responsibilities			
Technology Knowledge	Data and Information about requirement	Data and Information about resource	Data and Information about type of technology, Data and Information about techniques used in development, Data and Information about technology support for new changes.		
Knowledge life Cycle step	Creation	Acquisition ,Re	finement ,storage ,Transfer, sl	haring Uti	lization, Organization

⁽Source: Beiryaei & Vaghefi 2010).

According to PMI (2013), there are 10 different knowledge components which appear in almost every project and are related to the management of the following areas: integration, scope, time, cost, quality, human resource, communications, risk, procurement, and stakeholders.

The integration knowledge area covers all phases in the project lifecycle, while the communication area assists the distribution of information to all stakeholders correctly at a suitable time. Also, the stakeholders area assists the management of relationships between all stakeholders involved in the project. On other hand, the human resources area supports

project managers to handle individuals' needs. The scope area is vital for assisting project managers to recognise what stakeholders anticipate from project output delivery, whereas the time area assists in identifying and estimating project activities, reliance, capitals, and periods. Cost area maps the entire costs of all of the project's needs. Often, the procuring knowledge area includes know-how and is made by a professional seller. The quality area identifies the required procedures to fulfil the project scope and match stakeholders' requirements for products, services, and results. The risk area assists in managing project risks through identifying, analysing, and controlling related threats or hazards.

The PMI (2013) has attempted to distinguish between project data, information, and knowledge as follows. The project data are always collected and evaluated throughout the active perspective of the project execution stage. After that, the project data are gathered and converted into information through the monitoring and controlling phase. The project information is often transferred orally or kept and disseminated as reports in different layouts among stakeholders. Subsequently, project information is then accumulated in project documents or intended to be used to produce decisions or judgements about concerns, activities, or insights.

Accordingly, projects contain different knowledge bases such as knowledge about configuration management, past information and lessons learnt, financial, issues besides defect management, process measurement databases, and project files from previous projects databases (PMI, 2013). In view of these different bases, the 10 areas of knowledge can be integrated into five process groups in the PM to result in knowledge flow over 47 processes within the project lifecycle, as illustrated below in Table 4-2.

This table successfully represents the specific 10 project knowledge areas in the project lifecycle. However, this table is limited in that it represents only the project activities at each

knowledge area instead of representing or mapping which knowledge components exist at each knowledge area that may be obstacles to the flow of knowledge between different project stakeholders. Therefore, this study further develops this table in the next section to provide a better understanding of how to implement the knowledge lifecycle in the body of PM.

	Project Management Process Groups				
Knowledge Areas	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Table 4-2: PM proc	cess group and	knowledge area	mapping of PME	3OK® guide
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(Source: PMI 2013).

4.5 Development of new mapping of knowledge components at each stage of project lifecycle

In Table 4-2, it can be clearly seen that the project knowledge areas are mapped only by representing the activities of each PM process group instead of representing what knowledge is involved at each project phase. On other hand, Beiryaei and Vaghefi (2010) concluded their study with the recommendation to use their results to map knowledge management and knowledge lifecycle to the PMBOK® guide phases.

Consequently, it is worthwhile to develop Table 3, which represents PM process groups and knowledge area mapping of the PMBOK® guide, by including knowledge components at each knowledge area of the project lifecycle in accordance with what is illustrated in Table 4-2. In fact, defining knowledge components at each knowledge area of the project lifecycle can be seen as the best solution for this research to overcome the existing problem of KS deficiency in PM. This can be justified through defining the flow of knowledge among different project stakeholders via the classification of knowledge from project to project, products and processes to show where the knowledge component is, and to find out how knowledge can be shared and to which stakeholders. For this reason, research Appendix 1 presents the development of a new mapping of **312** knowledge components in the general project lifecycle.

This Appendix 1 contributes to answering the research questions via the identification of which knowledge components are represented as input for every individual project activity at each stage of a project's lifecycle. This in particular can contribute to find out how knowledge can be shared and to which stakeholders inside the projects.

4.6 Chapter Summary

This chapter has expressed how KS is effectively utilised at every stage of the project lifecycle to bolster success in the infrastructure development sector with consideration for the relevant concerns. Firstly, it has attempted to introduce methods and enablers of KS in PM, how KS is done in PM, and its value to PM from the existing literature. The chapter has also discussed barriers and enablers of KS, the social networking of KS, an overview of KS in the UAE, and the infrastructure development sector. After that, it has focused on what knowledge components are involved in the project lifecycle to represent the knowledge flow at each stage of the project lifecycle. This was completed with a new mapping of knowledge components at each stage of project lifecycle of the fifth PMBOK® guide. Table 3-3 below offers the main literature findings regarding knowledge sharing through the lifecycle of PM. The next chapter explains the research framework through a discussion of the research problem and development of the research model.

Literature Reviewed	Issues Learned	Expanding LR adding	Questions
(Scully, 2013)	Integrating KS into project cycle.	To demonstrate the integration of the KS process as a part of all project activities by representing the dynamic knowledge flow.	How can KS processes be presented at every stage of the project lifecycle? What are the dynamics of knowledge flow between stakeholders?
(Gudi & Becerra- Fernandez, 2006,Carrillo, 2005)	The role that KS and KM play in project success.	To identify the contributions of KS in project success.	How do the KM mechanisms play a role in influencing project success in terms of project team adoption?
(AlNasseri & Aulin, 2015; Ahmed, et al., 2014; Tokuda, T., et al., 2014; Schmitz, 2013;Levin, 2010)	Guidelines for integrating KS into a project	To end up with a list of guidelines for integrating KS into a project lifecycle.	How can KS be integrated into a project lifecycle?
(Styhre, 2011; Carrillo,	Methods of KS in	To highlight the list of	What are the certain

Table 4-3: Main literature findings for knowledge sharing through lifecycle of PM.

2005; Kendra & Taplin, 2004 & Newell, et al., 2002).	projects.	KS methods in projects	methods or resources that are enablers of KS in PM?
(BreitenöDer, 2009; Jayasinghe & Kapurubandara, 2013; Saad, et al., 2014 ; Grillitsch, et al., 2007; Ajayi, 2013; Lipiński & Świrski, 2012;Saad, et al., 2014; Wenger, et al., 2002 ; BreitenöDer, 2009; Wiewiora, et al., 2014; Maalej & Thurimella, 2013; Yeong & Lim, 2010; Grillitsch, et al., 2007; Carrillo, 2005; Kotlarsky & Oshri, 2005;).	Enablers of success KS in a project	To conclude with critical points for the success of KS through projects by identifying the interaction and relationship among project stakeholders.	What are the critical points for the success of KS through projects?
Schmitz ,2013; BreitenöDer ,2009;Kerzner ,2009; Widen-Wulff,2007; Gudi & Becerra- Fernandez ,2006;Lueg ,2001)	Definition of success in a project.	In order for a project cycle to be considered successful, certain factors need to be taken into account, such as the outcomes.	How successful is the project that has been defined?
(Kerzner, 2009; Ismail, et al., 2009; Gudi &Becerra-Fernandez, 2006; Burger & Owens, 2006;Tan, et al., 2006; 2002;Carrillo, 2005; Kendra & Taplin, 2004 ; Von Zedtwitz, 2003 & Newell, et al., 2002)	The contribution of KS in project success	Values of KS in PM can be listed as follows: Improve collaboration and project learning (Kendra & Taplin, 2004); facilitate better and faster decision- making (Kerzner, 2009); facilitate finding relevant information and resources in project lifecycle (Ismail, et al., 2009;Kendra & Taplin, 2004); avoid redundant effort (Kendra & Taplin, 2004; Gudi & Becerra- Fernandez, 2006); enhance the process of accountability and stakeholders' engagement in PM (Von Zedtwitz, 2003 ; Burger & Owens, 2006;Tan., 2006); reduce the project costs and time and hence increase project success (Newell, et al., 2002;Carrillo, 2005)	How does KS contribute to the project success?
(PMI, 2013;Tan,2013;	General project	To identify more about	What are the main
Maalej & Thurimella	lifecycle, activities, and	project lifecycle and	activities and
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,2013;Howlett,2013;	stakeholders.	activities.	stakeholders at each
Harris & McCaffer,			stages of the lifecycle
2013;Cabanis-Brewin		To identify more about	of projects?
&Dinsmore ,2011;		project stakeholders.	
Niedergassel, 2011;			
Smith & Winter, 2010;			
Song, et al., 2009;			
Widen-Wulff,2007;Tan,			
et al ,2006; Burger &			
Owens,2006;Carrillo,			
2005; Kendra & Taplin			
,2004;Newell, et al.,			
2002; Wenger, et al.,			
2002; Liebowitz ,2001;			
Lueg, 2001;Wiig, 2000)			
(PMI, 2013;	Knowledge area at	To define knowledge	How to map
Beiryaei & Vaghefi	each stage of project	components at PM	knowledge components
,2010; Kerzner ,2009;	lifecycle.	(general mapping	at each stage of project
Newell, et al ,2002)		knowledge components	lifecycle?
		at each stage of a	
		project).	How to map the
		To investigate how to	interaction between
		implement the	knowledge and
		knowledge lifecycle in	stakeholders at the
		the body of project	lifecycle of projects?
		lifecycle by using KM	
		system.	

5. Chapter 5: Research framework

5.1 Introduction

The aim of this chapter is to adapt a model of KS to infrastructural projects in the UAE. Therefore, this section begins with a restatement of the main research problem. Then, the focus of this chapter is on constructing a conceptual model of KS in projects in the infrastructure development sector in the UAE by representing the main constructs of this research. This process attempts to link the barriers and enablers of KS with the success of KS in these infrastructural projects.

5.2 Research problem

The traditional methods of PM, which are still used currently, result in an increased ratio of failure among projects. Recent reports have shown that about 70% of infrastructural projects in the UAE face postponements, which are caused by many reasons including the poor management practices (Maceda, 2016). Throughout the lifecycle of a project, numerous factors could lead to its success or failure, but a primary factor is the sharing of knowledge (Gemunden, 2015). KS is a critical process, but it is more significant when it comes to PM. The proper sharing of knowledge could be a catalyst for achieving organisational goals faster, or it may be a means to a poor end of the project. Saade et al. (2015) highlighted that a project succeeds based on how well it utilises available information for solving problems and general challenges that might affect the outcome.

According to (Winters, 2014), there are many challenges that can hinder the successful implementation and completion of development projects, and one of the most common is accountability such that many projects have failed because of their unaccountability towards consumers. The leaders of such projects gave the beneficiaries little or no knowledge on how the projects were designed, which renders them vulnerable, and in many cases, susceptible to

failure (Alashwal & Fong, 2015). Additionally, failure to involve the various stakeholders in a project can have important long-term negative impacts on the financial, social, and environmental outcomes of the community (Khasreen, et al., 2009). Such situations could engender hostility from the misunderstandings, since communities and other stakeholders may be suspicious of the objectives of projects.

Pemsel and Wiewiora (2013) indicated that another major challenge that projects face is that of knowledge reuse. According to this author, this problem is largely due to the temporary nature of projects, and may also be caused by a PM's lack of vision regarding anticipated knowledge needs. The temporary nature of projects is characterised by a complete disbandment of the teams upon the project's completion, and if there any reviews to be done, Newell et al. (2006) argued that such reviews are often completed hastily, since most project teams do not believe they may need to reuse such knowledge in the future. These reports mainly constitute the lessons learnt from previous projects, which, when carried over to future projects through sharing knowledge with other teams, would greatly contribute to facilitating projects' success.

According to Howlett (2013), KS not only emphasises the need to share and reuse knowledge, but it also accentuates the need to learn vital lessons from the mistakes of previous projects. This process primarily ensures that less time is spent on a particular problem and thus the project costs are scaled down.

According to Mueller (2015), KS can greatly ease the process of accountability in a project. If every stakeholder is informed of the process and all activities concerning the project, its design, and the challenges it faces, accountability can be enhanced and all stakeholders can be on the same page as far as the project implementation and other processes are concerned. In other words, a primary problem from which many organisations in the UAE suffer is KS shortage due to the temporary nature of projects and a lack of communication in their PM lifecycles. This research problem can be considered through several different points of view, such as the dynamicity of KS in UAE infrastructural projects, the integration of KS in UAE infrastructural projects, and the type of KS in UAE infrastructural projects. In addition, it can be identified via the defectiveness of KS in UAE infrastructural projects, mapping KS activities in UAE infrastructural projects with a concentration on stakeholders and networks of KS stage by stage in UAE infrastructural projects.

Many researchers have investigated the challenges of infrastructural PM, and they have recommended the necessity of KS in the project lifecycle. This research addresses the gap in existing literature in terms of understanding the effective integration of KS in the PM standardization process. This research has attempted to investigate how KS is successfully utilised to create project success in the infrastructure development sector.

5.3 Development of conceptual model of knowledge sharing in UAE infrastructural projects in the UAE infrastructure development sector

This section represents the theoretical development model of KS in projects of the infrastructure development sector within the UAE as based on the results of previous studies. For this reason, a conceptual model of KS in the infrastructure sector's projects can be built based on previous KS models that were explained in previous subsections (Fernandez, et al., 2004; Tsergn & Lin, 2004; Gorelick & Tantawy-Monsu, 2005; Teerajetgul & Charoenngam, 2006; Hunter & Lichtenstein, 2008; King, 2009; PMI, 2013).

Based on the prior literature review, there are several critical points for aiding the success of KS through projects: successful implementation of KS processes and mechanisms in the PM (Grillitsch, et al., 2007; Ajayi, 2013). Additionally, strategic relevance involves having a

proper plan of action on how to share information through specific channels (Lipiński & Świrski, 2012;Saad, et al., 2014). In addition, it is important to have supportive leadership styles and a motivational culture through recognition and rewards in the PM (Wenger, et al., 2002; BreitenöDer, 2009;Yeong & Lim, 2010;Wiewiora, et al., 2014). Moreover, there should be proper development of social mechanisms of KS as collective knowledge besides transitive memory or social media (Carrillo, 2005; Kotlarsky & Oshri, 2005; Maalej & Thurimella, 2013). Development of IT communication tools among dispersed team members should be present (Grillitsch, et al., 2007), and lastly, individual team members' motivation and positive intentions are essential to success (BreitenöDer, 2009; Jayasinghe & Kapurubandara, 2013;Saad, et al., 2014).

In fact, the research conceptual model is built based on the conceptual model of KS theories in general organisational hierarchy at the infrastructure industry level model, which are represented in both Figures 3-1 and 3-2 in Chapter 3.

Figure 5-1 below clarifies this research's conceptual framework. The first stage of this conceptual framework passes through both the enablers and barriers of the success of KS in the projects, in which there are 36 enablers variables from 7 main clusters: organisational, motivation, processes, technological, social networking, physical environment, and individual. Meanwhile, there are 18 KS barriers variables spread over 3 main clusters: organisational, technological, and individual. The second step is benchmarking, which utilises types of modelling like ANOVA, regression, correlation, reliability, and ranking. For the second stage involving testing, the dependent variables of the successful KS in the project using the regression are used. In the third phase, the mediating variables for this framework's relationships are needed, and they are the personality traits divided into five groups: extraversion, agreeableness, conscientiousness, neuroticism, and openness. These mediating

variables test whether these ideas further contribute to the connections. Then, the fourth step is to apply the output indicators for the successful implementation of the KS process inside the UAE in publicly listed organisations, including the rate of KS contribution, benefits of KS, quality of KS, and effectiveness of KS.

This research conceptual model is proposed with the aim to overcome the introduced research problems. In this model, a successful KS process is considered to offer the possible solutions that counteract the effects of the temporary nature of projects and the shortage of stakeholders' accountability. This enhances the integration of KS in PM with recommendations that organisations can better share knowledge and utilise lessons to be learned in their projects. The conceptual model was created through representing the enablers and barriers to KS in projects and their impacts on the success of KS in projects considering personality traits as mediating variables.



of KS success indicators in the projects

5.4 Development of Hypotheses

5.4.1 Enablers to knowledge sharing in the projects

Currently, KS in the context of an organisation means that employees participate in the innovation and application of expertise and knowledge in order to help the organisation to gain a competitive advantage (Shanshan, 2014, p. 7). The advantages of KS are numerous. For example, it plays a noteworthy role in the fast completion of organisational projects and development of new products. It also contributes to the reduction of costs associated with

errors and delays during the production process. According to reports, the deficiencies in KS have caused yearly losses of \$31.5 billion to Fortune 500 companies (Quast, 2012). However, productive KS cannot be possible without appropriate motivation, culture, and trust (Shanshan, 2014, p. 8), which means that the factors that influence the success of KS include an organisation's culture, an organisation's structure and role, the physical environment, and the organisation's process; KS can also be encouraged by the individual culture, technologies, and environment (Shanshan, 2014, p. 9).

In order to better understand KS inside organisations, key factors must be recognised, particularly enablers and barriers which influence KS activities within the organisation. This paper highlights the most recent frameworks of KS barriers and enablers from the period of 2011 until 2015 (Li & Zhou, 2011; Sung & Joo, 2011; Najibullah, et al., 2012; Paulienė, 2012; Moskaliuk, et al., 2013; Rudawska, 2013; Sharma & Singh, 2014; Shanshan, 2014; AlfazziAljuhani, 2014;Tzortzaki, 2014; Hidayanto, et al., 2015), as well as some older models as what are discussed in the following sections. Accordingly, enablers of KS are explained from both individual organisational perspectives including: organisational culture, KS motivation in the organisational business context, processes, technologies, social networking of KS processes, the physical environment, and individuals.

Therefore, the hypothesis is posited as follows:

H3: The knowledge sharing enablers are associated with the rate of knowledge sharing contribution to project success.

H4: The knowledge sharing enablers are associated with the benefits that might be gained from timely knowledge sharing in infrastructural projects.

H5: The knowledge sharing enablers are associated with the quality of the timeliness of KS in infrastructural projects.

H6: The knowledge sharing enablers are associated with the effectiveness of knowledge sharing between stakeholders.

5.4.1.1 Organisational enablers to knowledge sharing

Organisations have progressively focused on the development of KS culture. The culture of an organisation entails the norms, values, and expectations that shape the interactions of people within that organisation. Organisational culture plays a great role in the KS process because all practices and operations that are carried out within a given organisation reflect the culture, values, and ethics of that organisation (Najibullah, et al., 2012, p. 13). The KS culture is influenced by the organisational management through regulations and rules that are enforced. Based on previous research, it can be said that the culture implemented within an organisation determines social interactions and how employees judge the importance of KS (Najibullah, et al., 2012, p. 14).

In addition, there are different motivational methods that are currently implemented to support the culture of knowledge associated with KS. For instance, a culture of trust amongst employees must be built to enhance an organisation's culture and motivate KS among employees to enrich the level of the organisation's outputs within its service sector (Tzortzaki, 2014).

The abovementioned factors combined with strong organisational goals and long-term objectives can provide an accurate model of KS for a given organisation (Abzari, et al., 2014). This means that KS processes should be planned, implemented, and managed like any other project or initiatives. In addition, continuous feedback and measurements are involved in KS processes. Moreover, organisations should allocate a given amount of resources from their budget to the KS process. Therefore, the hypothesis is posited as follows:

H1a: There is no statistically significant difference between the respondents' perceptions of the idea, "Organisational factors of KS enablers related to the success of KS in projects".

5.4.1.2 Motivation enablers to knowledge sharing

Organisations should also develop a culture of KS and enhance it through motivation (Zhang & Vogel, 2013). In order to promote a KS culture within an organisation, employees need to be motivated. Therefore, without strong motivation behind KS initiatives, people are less motivated to share knowledge (Sung & Joo, 2011, p. 10). Motivating employees to engage in KS involves the process of rewarding those who demonstrate outstanding ability to bring innovation and enhance the application of knowledge within the organisation.

For a KS initiative to achieve its objectives, it is vital that the KS culture is linked to the organisation's business goals. This link facilitates the transfer of knowledge amongst employees or from employers to their employees (Sung & Joo, 2011, p. 16). Researchers have indicated that a consensus of KS should be created through open communication between an organisation's management and its employees (Paulienė, 2012, p. 33).

Furthermore, an organisation's structural factors, such as lateral coordination, can facilitate KS as it is associated with a high level of trust, fewer public games, and more employee motivation through incentives (Willem & Buelens , 2007). Therefore, the hypothesis is posited as follows:

H1b: There is no statistically significant difference between the respondents' perceptions of the idea, "Motivation factors of KS enablers related to the success of KS in projects".

5.4.1.3 Processes enablers to knowledge sharing

Organisations should combine and recognise the position of each individual in the process of KS. For instance, the position of individual (people) in the process is centred on the concept of "betweenness". The concept of betweenness consists of the abilities that individuals possess to transfer knowledge based on their individual networks in the organisation. This facility offered by people to transfer knowledge can be useful in large or multinational

organisations for sharing knowledge and helping less informed people access vital information (Zhang & Vogel, 2013).

The role of the organisation in this model is to oversee and to coordinate the entire process, which consists of providing the required support in terms material, finances, and other facilities. The role of technology, on the other hand, is to boost the speed and accuracy of the process and the quality of the shared knowledge (Zhang & Vogel, 2013). Therefore, the hypothesis is posited as follows:

H1c: There is no statistically significant difference between the respondents' perceptions of the idea, "process factors of KS enablers related to the success of KS in projects"

5.4.1.4 Technologies enablers to knowledge sharing

The role of technologies and processes in the KS process can be viewed in many ways. First of all, technologies enhance the innovation and facilitate the communication, hence enabling the organisation to implement effective KS (Alfazzi Aljuhani, 2014, p. 34). The KS uses technologies to train people within the organisation or to send instructions to various departments of the organisation. In Addition, for the KS to be effectively implemented within the organisation, it needs to be applicable and occurring in all of the day-to-day processes of the organisation. Therefore, the hypothesis is posited as follows:

H1d: There is no statistically significant difference between the respondents' perceptions of the idea, "Technological factors of KS enablers related to the success of KS in projects".

5.4.1.5 Social Networking enablers to knowledge sharing

The social networking of KS can be viewed from numerous perspectives, such as the social media perspective and the organisational perspective, in terms of creating specific networks among employees. The role of social networks is enormous in the KS process because knowledge can be shared between people through this avenue. In general, social network

simply refers to a network of personal relationships and social interactions (Moskaliuk, et al., 2013, p. 52). In the current digital age, a social network is a type of application or website that is dedicated to enabling communication between people by sharing messages and digital content (Li & Zhou, 2011, p. 7).

With a rise in the number of social networking platforms and number of users across the previous few years, social networking has come to be one of the most important aspects of current daily life. This trend can be viewed from the perspective of users and the increasing popularity of social networking platforms. Given the nature of social networking platforms and how information is shared on those social media, there is no doubt that, when used to transfer knowledge, social networks can be the most accurate and appropriate tool (Moskaliuk, et al., 2013, p. 56). For example, in the context of multinational corporations, social networks can bring their employees much closer. It is important to mention that some organisations or companies operate in several countries and employ thousands of workers (Li & Zhou, 2011, p. 9). Moreover, given the costs involved in employee empowerment and training programs, the use of social networking for KS can save the organisation from the burdens associated with costly programs.

With a social network of its choice, an organisation can create an application that is specifically dedicated to communication among all departments and branches of the organisation. This can be completed through many channels such as a WhatsApp group, Facebook page or group, or professional websites such as LinkedIn or YouTube. Given the abilities of social interactions to enhance KS, it is necessary to note that in the history of humanity, no previous invention has managed to bring together as many people as social networks do today (Moskaliuk, et al., 2013, p. 61). Various studies have demonstrated the extent to which the combination of social networks and KS is important, and they have stated

that at the organisational level, social networking can be defined as having some specific groups of employees who possess the same characteristics and interests (Li & Zhou, 2011, p. 13). This presence enhances the interactions between them and increases the level of developing a KS model suitable for them. People who have much in common can also rapidly share knowledge and have sufficient ability to disseminate information. In this case, the organisation should provide them with necessary facilities and arrangements in terms of technical assistance, leadership, finances, and coordination in order to ensure compliance with the organisational business goals and objectives (Li & Zhou, 2011, p. 15).

Consequently, whether through online social networking platforms or in the organisation's social groups, the networking aspect KS is a consideration for how information is shared between people and the way it is perceived. Researchers have revealed that when creating a network in the organisation, managers should consider early adopters of technologies among their employees (Li & Zhou, 2011, p. 16). It has been argued that these early adopters have the ability to transfer their knowledge to other employees within the organisation. In this regard, it is necessary to identify those early technology adopters so that they may introduce the intended skills to others in the organisation. The early adopters are often the most influential people in the organisation and possess advanced knowledge compared to their colleagues (Moskaliuk, et al., 2013, p. 67). Therefore, through the existing individual networks of these influential people in the organisation, managers can rapidly spread knowledge and skills with little struggle. Therefore, the hypothesis is posited as follows: H1e: There is no statistically significant difference between the respondents' perceptions of the idea, **"Social networking factors of KS enablers related to the success of KS in projects".**

94

5.4.1.6 The physical environment enablers to knowledge sharing

The components of the physical environment of the organisation are some of the important enablers of KS. For instance, some characteristics of the physical environment include the shape of the offices, the layout of the spaces, how relaxed the environment is, and if it is a quiet environment. For this reason, depending on the nature of the organisation and its structure, the physical environment may greatly affect the KS process (Alfazzi Aljuhani, 2014, p. 41). Therefore, the hypothesis is posited as follows:

H1f: There is no statistically significant difference between the respondents' perceptions of the idea, "Physical environment factors of KS enablers related to the success of KS in projects".

5.4.1.7 Individuals enablers to knowledge sharing

From an individual's perspective, KS can be influenced by different factors. Such factors include the individual's skill set, personality, and interpersonal skills. Based on reports, individuals' behaviours have a significant impact on their KS behaviours (Hidayanto, et al., 2015, p. 29). Individuals' behaviours consist of individual creativity, innovation, and their ability to interact with others within the organisation, which facilitates KS among employees or between employees and managers (Hidayanto, et al., 2015, p. 33).

Furthermore, individuals' attitudes influence their KS attitudes as it is stimulated by a degree of personal encouragement involved. This intention can be derived from emotional encouragement from an organisation or incentives to associate with other employees (Bock & Kim, 2002). In the same context, it has been declared that knowledge inside an organisation should be exploited through human behaviour to increase the organisation's competitive advantages (Hartini, et al., 2006). Therefore, the hypothesis is posited as follows:

H1g: There is no statistically significant difference between the respondents' perceptions of the idea,

"Individual factors of KS enablers related to the success of KS in the projects".

5.4.2 Barriers to knowledge sharing in projects

Within an organisation, the effectiveness of KS can be hindered by many factors, such as individual, technological, or organisational factors. Organisations comprise a combination of the above factors; therefore, if any of them work improperly or are impaired, KS behaviour is automatically affected (Rudawska, 2013, p. 66). Therefore, three hypotheses are posited as follows:

H7: The knowledge sharing barriers are associated with the rate of knowledge sharing contribution to project success.

H8: The knowledge sharing barriers are associated with the quality of the timeliness of KS in infrastructural projects.

H9: The knowledge sharing barriers are associated with the effectiveness of knowledge sharing between stakeholders.

5.4.2.1 Technological barriers to knowledge sharing

Since organisations rely on technology in all aspects of their operations, they also need technology to implement some of their initiatives, including KS. A lack of technical and IT facilities within an organisation can hinder the effectiveness of its operations. Additionally, technology plays a vital role in communication and training employees, among many other important processes (Sharma & Singh, 2014, p. 44). Therefore, when an organisation lacks access to technology, it can significantly slow down KS. Therefore, the hypothesis is posited as follows:

H2a: There is no statistically significant difference between the respondents' perceptions of the idea,

"Technological factors of KS barriers related to the success of KS in projects".

5.4.2.2 Individual barriers to knowledge sharing

Being part of an organisation, people are important in helping the organisation to achieve its objectives and goals. In an organisation, people conduct operations using knowledge received through many ways (Sharma & Singh, 2014, p. 47). For this reason, an individual's fear of

sharing knowledge or lack of time to interact with other employees can hinder the effectiveness of KS. In addition, low realisation or awareness of the importance of sharing knowledge with others is another individual barrier to KS. Some other individual barriers to KS within the organisation include differences in social status or education level, gender differences, lack of trust in others, age differences, and the use of a strong hierarchy or position occupied by people to intimidate others. The hypothesis is thus posited as follows:

H2b: There is no statistically significant difference between the respondents' perceptions of the idea,

"Individual factors of KS barriers related to the success of KS in projects".

5.4.2.3 The organisational barriers to knowledge sharing

In order to critically assess various organisational barriers to KS, it is important to understand that most organisations seek to align their programs with their organisation goals (Sharma & Singh, 2014, p. 52). Consequently, a lack of leadership and an environment that is unsuitable for the KS can affect the effectiveness of knowledge. Other organisational barriers of KS are the organisational structure, the external or macro-environmental factors, a lack of motivation policy for KS within an organisation, the corporate culture, and the physical work environment. Therefore, the hypothesis is posited as follows:

H2c: There is no statistically significant difference between the respondents' perceptions of the idea, "Organisational factors of KS barriers related to the success of KS in projects".

5.4.3 Personality traits as mediating variables

Personality was defined by the American Psychological Association (APA) as, "individual differences in characteristic patterns of thinking, feeling, and behaving" (APA, 2017). A personality trait has also been explained as a structured and active set of typical behaviours that an individual possesses, and personality traints specifically influence a person's thoughts, inspirations, and behaviours (Ryckman, 2004). Moreover, the big five theory of personality

traits was introduced firstly in 1932 by McDougall. Later on, the five traits of extroversion, neuroticism, agreeableness, conscientiousness, and openness to experiences were established and explained by Cattell and Kline in 1977, Eyskenck in 1985, and John and Srivastava in 1999, as shown in the summary of the big five factors in Table 5-2.

Big Five Dimensions	Facet (and correlated trait adjective)	
Extraversion vs introversion	Gregariousness (sociable)	
	Assertiveness (forceful)	
	Activity (energetic)	
	Excitement-seeking (adventurous)	
	Positive emotions (enthusiastic)	
	Warmth (outgoing)	
Agreeableness vs antagonism	Trust (forgiving)	
	Straightforwardness (not demanding)	
	Altruism (warm)	
	Compliance (not stubborn)	
	Modesty (not show-off)	
	Tender-mindedness (sympathetic)	
Conscientiousness vs lack of direction	Competence (efficient)	
	Order (organised)	
	Dutifulness (not careless)	
	Achievement striving (thorough)	
	Self-discipline (not lazy)	
	Deliberation (not impulsive)	
Neuroticism vs emotional stability	Anxiety (tense)	
	Angry hostility (irritable)	
	Depression (not contented)	
	Self-consciousness (shy)	
	Impulsiveness (moody)	
	Vulnerability (not self-confident)	
Openness vs closeness to experience	Ideas (curious)	
	Fantasy (imaginative)	
	Aesthetics (artistic)	
	Actions (wide interests)	
	Feelings (excitable)	
	Values (unconventional)	

Table 5-1: The big five factors

Source : (John & Srivastava, 1999)

Consensus has been reached regarding the precursors to KS. There has recently been increasing attention in the literature on studying the associations between the big five personality traits and KS behaviour. For example, the recent study by Agyemang, Dzandu, and Boateng (2016) has revelead the important impact of all personlity traits, excluding the conscientiousness trait, on the KS attitudes and behaviour sof instructors. Additionally, the

study by Lotfi, Muktar, Ologbo, and Chiemeke (2016) has offered significant perceptions keen on the role of three important personality traits, openness, extroversion, and conscientiousnessin development, in KS behaviors in the framework of academics. In addition, Matzler and Müller (2011) observed that openness is the most influential personality trait in forecasting KS behaviour of the five personality traits. On other hand, the practical research of Matzler, Renzl, Müller, Herting, and Mooradian (2008) indicated the relationship between agreeableness, conscientiousness, and openness as personality traits and an individual's KS tendencies inside teams in the context of the engineering industry. Moreover, Gupta (2008) has confirmed that agreeableness and conscientiousness as traits have a significant relationship with an individual's KS activities.

It has been that validated individuals' personality characteristics have different yet significant influences upon individuals' behaviours of KS. Accordingly, this research's conceptual model involves personality traits (agreeableness, openness, neuroticism, extraversion, and conscientiousness) as mediating variables to investigate the research constructs in a regression analysis. This offers a practical contribution to the investigation of the influence of individual characteristics on KS behaviour between project stakeholders in the UAE's infrastructural projects.

5.5 Chapter Summary

This chapter expresses the research framework by introducing the existing research problem and concludes with the development of the research model. The developed conceptual research model attempts to link the enablers and barriers with the success of KS in projects. The next chapter is the research methodology, which explains the proposed research philosophy, design, plan, data collection, and analysis as well as the underlining pilot study and ethical considerations.

6. Chapter 6: Research Methodology

6.1 Introduction

As stated in section 1, this research aims to empirically investigate how KS is effectively utilised to create success in projects in the infrastructure development sector. In fact, this sector is complex and is extremely based on projects, including many stakeholders (OECD, 2016).

After the completion of the literature review and identification of current knowledge gaps, it is essential to determine and explain the appropriate research procedures to answer the research questions and result in consistent findings. The research objectives are attained through the research design. In addition, the proposal for data collection and data analysis are given through process suggestions for each particular method that is selected.

This research addresses the problem of implementing effective KS to create project success in the infrastructural development sector. This problem is highlighted to examine the approach of integrating the KS process in the PM of the infrastructure development sector.

Research strategies have three categorizations, namely, qualitative, quantitative, and mixed method. For this reason, Creswell (2009) has recommended that determining a research problem is the most critical element that influences the selection of the research approach. In addition, various factors affect the choice of research paradigms including organisational, physical, and geographical borders. A quantitative method research has been selected for this paper since it increases the validity of the results by adding more credibility, acceptance, and understanding of the research results. For this research, the quantitative method contributes to a sufficiently understanding of how the KS process is utilised in infrastructural projects in the UAE.

This section explains the research approach and justifies the choice of research methods, which is the implementation of a quantitative research method that incorporates a questionnaire survey.

Research methodology is further discussed through the initial introduction of the research philosophy in this section. In addition, this chapter explains and justifies the choice of the research approach, design, data collection, analysis methods, and ethical considerations. Subsequently, the selection of questionnaire survey as a study method and sampling is justified.

In summary, to achieve the research objectives and answer the research questions specified in Section 1, this chapter begins directly with a review of existing KS in project lifecycle theories and allied concepts. Then, a quantitative method are implemented to identify and investigate the utilisation of KS in the infrastuctural projects from different public-sector specialists and project-based organisation practices. Diverse data resources may enhance the understanding of the research problem and provide better solutions.

6.2 Research Philosophy

6.2.1 Research Paradigm

Research is established on definite views and assumptions to recognise and interpret the relevant social practicality. The research philosophy determines the selection of design and methodology. In research, a basic design, which is called as research paradigm, is often implemented to clarify processes and theoretic areas.

Research paradigm is recognised by the Merriam Webster Online Dictionary (2016) as "a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated broadly: a philosophical or theoretical framework of any kind." According to

Creswell (2009), a research paradigm is identified by a compulsory procedure of philosophy, collaboration, identification, and inspection to test variables. Therefore, the research paradigm determines how researchers reach their findings through how specifically research knowledge in the world is considered and what kind of questions and methodologies are included.

A paradigm is considered through five key elements: ontology, epistemology, methodology, rhetorical considerations, and axiology (Creswell J., 2009). Accordingly, ontology considers the nature of the knowledge in the study to understand the research topic in reality and how it works (knowledge type), which epistemology considers what is identified and studied (knowledge range). In addition, rhetorical considerations correspond to discussion and the application of certain study terms, and axiology highlights the research significance from a philosophy point of view. Finally, methodology determines what techniques and tools are implemented for the study examination (tools). This research philosophy explains both ontological and epistemological considerations to adopt the research objectives.

Ontological considerations

Ontology considers the nature of knowledge in the study to understand the topic in reality and how it works (knowledge nature). The ontology paradigm can be represented in this research by investigation of the conception of KS in projects.

Objectivism and constructivism are represented as main features of ontological considerations in research (Bryman & Bell, 2007). Objectivism is defined as a philosophy which includes reference to practicality to investigate the facts, and it also concerns the characteristics involved and the approach through which knowledge is gained. Thus, objectivism is implemented to highlight this research situation as it emphasises results to measure practicality and investigate the facts. Constructivism emphasises the insights and subsequent proceedings and experiences of social events. Also, its concentration is on individuals' knowledge and experiences in regard to the investigated topic (Saunders, et al., 2009). However, this research has not implemented constructivism as this ontological situation would utilised more beneficially to identify social concerns facing the individual in the implementation of KS processes in the project lifecycle to create project success in the infrastructure development sector.

Consequently, this research study examines the actual conditions of social events through recognising the stakeholders' viewpoints and experiences that are included in the implementation of KS mechanisms in the infrastructure sector's PM.

This research's social phenomena are built from the actions and interface of KS in the project lifecycle among stakeholders who have diverse viewpoints. Therefore, this research's social object is represented through mainly the viewpoints and actions of stakeholders.

Epistemological considerations

Epistemology considers what knowledge is identified, accepted, and studied and how (knowledge scope and creditability). The epistemology paradigm can be represented in this research by explaining and evaluating the approach of KS in the framework of PM.

Also, positivist and interpretivist perspectives are presented as main divisions of epistemology positions of research (Saunders, et al., 2009). Positivism claims that knowledge is built on logic, experiences, and positive rationalisation so it tends to explain recognizable facts (Creswell J., 2009). Besides, it suggests reality is objective, and it highlights existent connections involving reality and perceptions about it (Saunders, et al., 2009). So, the positivist position do not fit into this research purpose based on the nature of research objectives given that it is an exploratory project.

Interpretivism is a position for epistemology which advises the understanding of phenomena via participation and interpretation. It attempts to perceive the world and recognise individual actions through studying human behaviour, so it tends to help the understanding of participants' actions and intelligence (Bryman & Bell, 2007).

For this reason, interpretivism for epistemological considerations is selected to emphasise the real need of finding, investigating, and understanding how KS is utilised in PM in the infrastructure sector.

Justification for the selected paradigm

Ontological and epistemological considerations are acknowledged as key sides of social research (Bryman & Bell, 2007; Saunders, et al., 2009). Therefore, the ontological and epistemological considerations underlay this research approach.

An objective position emphasises the social construction of reality and recognises the significance of objective participants in the construction of meaning. It has the advantage of high levels of interaction among researchers and participants, which permits storytelling from participants. This aids the researcher's ability to interpret more human actions and the explanations of practicality out of participants' stories (Bryman & Bell, 2007; Saunders, et al., 2009).

On other hand, interpretivism is a position for epistemology which allows for the understanding of phenomena via participation and interpretation. It attempts to perceive the world and recognise individual actions through studying human manners, so it tends more to benefit research into participants' actions and senses (Bryman & Bell, 2007; Saunders, et al., 2009).

Therefore, the research position has been chosen due to the significance of the background information and context recognition (projects) for the research phenomenon (utilisation of KS in the project in the infrastructure sector). Also, it is important to understand and interpret the sensibilities of involved participants (stakeholders).

6.2.2 Research Approach

Research can adopt either an inductive or deductive approach (Creswell J., 2009). Deductive research approach is usually linked to the positivism paradigm as it is used to verify certain assumptions and is built from general knowledge to attain a particular state. The deductive approach typically begins with theory and aims to end with an empirical validation of assumptions after conducting necessary observations and testing hypotheses. It depends on tools like the survey and experiment chosen (Gill & Johnson, 2010).

The inductive approach helps researchers to deliver particular perceptions and generalisations using actual cases, and it is associated with the interpretivist paradigm. Also, inductive reasoning does not require the definition of a prearranged theory for data collection. The inductive approach typically begins with observations of specific details and aims to end with the generation of a certain theory with respect to the existing problems after extending patterns and tentative observations. The results depend on tools, like interviews (Gill & Johnson, 2010). Figure 6-1 below illustrates the differences between deductive and inductive approaches.



Figure 6-1: Deductive and Inductive approaches (Adapted from: Gill & Johnson 2010)

This research includes both inductive and deductive approaches as Saunders et al. (Saunders, et al., 2009) has claimed that include both inductive and deductive approaches contribute to enhanced rationality and accuracy in the results. Firstly, the deductive approach is implemented to deduce theory of KS in PM from existing literature and test the ideas. After that, the inductive approach is implemented to construct certain conclusions (critical factors of success the KS process implementation in UAE infrastructural projects).

The research process is illustrated in Figure 6-2, and the process attempts to fulfil the research objectives by collecting, analysing, interpreting data, along with the literature review. The research model of KS utilisation inside projects interacts with the entire general organisational activities to study relevant practices of project teams at all levels. Ultimately, the framework of final utilisation of KS implementation inside the project lifecycle makes recommendations based on the main research outcomes. Accordingly, research can be subdivided into four main stages, as shown in Figure 6-2. The first stage was created according to what is illustrated in Figure 5-1, which represents the conceptual model of KS in the infrastructual project based on a wide scope from the literature review. Based on this model, a pilot study was designed and conducted to test and review the selected methodologies. For the second stage, the survey method was selected to collect necessary data to examine the impact of KS enablers and barriers on project success through sampling and characteristic results of the entire population.

For this reason, the major elements of KS in the project lifecycle model were identified empirically. The literature review is carried out to deeply examine the identified aspects and attain better understandings and perceptions of the subject matter. The survey method identifies the relationships among different elements like stakeholders and knowledge components in projects as well as establishes relationship models. Also, it enhances sampling and characteristic results of the sample population (Saunders, et al., 2009).



Figure 6-2 : Research process

6.3 Research Design

The research design acts as a structure since it links together all elements and defines rational steps to investigate the research questions (Bergh & Ketchen, 2007). In order to conclude the research results, the research design should consider investigating the research questions and defining what data and analyses are necessary.

6.3.1 Selection of Research Methods

Creswell (2008) characterised the research methodology as qualitative, quantitative, or a mix of those two methodologies. Creswell (2008) also identified qualitative research methodology as follows: "an inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting." Furthermore, qualitative methods target the development of understanding and meaning of reality, so it often follows subjective and inductive approaches. For this method, data collection needs more time and resources as it is constructed mainly on words, but it involves a strong response rate. Also, data collection includes different methods which require academic expertise such as interviews, observation, focus groups, and document analysis (Bryman & Bell, 2007; Saunders, et al., 2009).

On the other hand, quantitative research methodology was described by Creswell (2008) as "an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures, in order to determine whether the predictive generalizations of the theory hold true." In addition, quantitative methods aim to explain processes in reality, so it often follows objective and deductive approaches. Unlike qualitative methods, quantitative methods usually contain open-ended rather than closed-ended questions. For this method, data collection is more standardised and requires less time and fewer resources as it is constructed mainly on numbers but involves a lower response frequency than qualitative methods. Also, data collection includes different methods which require specific measurements, tools, and expertise such as interviews, surveys, observations, and statistical document analysis (Bryman & Bell, 2007; Saunders, et al., 2009). Mixed data collection methods refer to the mixture of qualitative and quantitative methods together to collect data in a study (Creswell J., 2009).

Furthermore, it has been suggested that research methods be selected to match theoretical aspects with the descriptive research purpose and corresponding questions (Stuart, et al., 2002; Handfield & Melnyk, 1998; Voss, et al., 2002). Extensive information gained from industry experts is required in order to answer the research questions of how (e.g. implementation of KS in projects) and what happens (e.g. the utilization of KS in project in project and issues of KS implementation).

Quantitative methods have been selected for this research since they increase the validity of results. The reason for this is that quantitative methods include controlling to confirm validity according to its ability to generalise outcomes to a broader population sample (Saunders, et al., 2009). This method thus should add more credibility, acceptance, and understanding of the research results. For this research, the quantitative method contributes to the ability to sufficiently generalise how the KS process is utilised in the UAE's infrastructural projects at selected organisations.

After selecting the research approach, research methods are selected to gain better insights through existing practices and to allow more knowledge interaction with industry experts. According to the literature review, the critical factors of successful KS implementation and the impacts upon project competence have been identified. This research requires both qualitative and quantitative methods to recognise the main relevant factors of success with respect to the research objectives and questions.

Furthermore, research methods were selected to match the theory aspects with a descriptive research purpose and corresponding questions (Stuart, et al., 2002; Handfield & Melnyk, 1998; Voss, et al., 2002). Extensive information gained from industry experts is required in order to answer the research questions of how (e.g. success & interaction of knowledge flow and sharing between stakeholders at the project lifecycle) and what (e.g. enablers and barriers to KS in projects).

To illustrate this idea, the research study is executed by first conducting a literature review to understand key theoretical aspects that are relevant to the integration of KS at the project level. Quantitative research methods are presented including survey to collect data.

109

The research questions are descriptive in nature as they aim to provide appropriate recommendations and strategies of KS implementations to industry specialists. As discussed earlier, this research directly investigates the utilisation of KS in the lifecycle of projects within the UAE infrastructure sector. As mentioned previously, the interpretive and objective approach was selected as it concentrates on interpretation and searches for meaning and experience (Hesse-Biber & Leavy, 2010). Also, this research adopts a quantitative research strategy to obtain a better understanding of KS implementation in the public sector. In fact, such practices require detailed examination of real-life public sector projects. The methodological position is illustrated in Figure 6-3, which attempts to represent the position of the research methodology according to the research philosophy.





For this research context, to investigate and identify the utilisation of KS in the project lifecycle within the UAE infrastructure sector, different statistical tools were used to analyse the collected data. This allows the ability to determine the specific and complexity of the activity of KS implementation in the UAE's infrastructure sector by investigating the success of the integration of the KS process in standard PM processes via the different statistical analysis tools.

6.3.2 Survey

The survey method has a descriptive feature in which collected data from a specific and large sample of people can verify a hypothesis regarding a larger sample size. Surveys focus on generality and are often used when there is no direct observation of the phenomenon. However, it is not a suitable method for a complete empirical investigation of problems as it is built on participants' claims. Surveys represent an objectivism epistemological position (Bryman & Bell, 2007)

The survey method is purported to be a useful method that supports studies of recognising relationships among different elements and establishing relationship models. Also, it enhances research procedures through sampling and characteristic results of all population (Saunders, et al., 2009).

Approximately 300 questionnaire-based surveys were distributed to the selection organisations to collect the necessary data. However, the questionnaire-based survey was developed further after receiving feedback from academics prior to the data collection stage. For the context of this research, questionnaires were concerned with four segments: personal traits (PT), effectiveness of KS inside UAE infrastructural projects (EFF), enablers of the success of KS in projects (E), and barriers of the success of KS in the projects (B), as shown in **Appendix 4**.

The survey method has a descriptive feature in which collected data from a specific and large sample of people can verify a hypothesis regarding a larger sample size. Surveys focus on generality and are often used when there is no direct observation of the phenomenon. However, it is not a suitable method for a complete empirical investigation of problems as it is built on participants' claims. Surveys represent an objectivism epistemological position (Yin, 2003; Bryman & Bell, 2007; Saunders et al., 2009; Creswell, 2009).

This provides a better understanding of current KS approaches in UAE's infrastructural projects and activities to reflect on the real-life context of the UAE's infrastructure sector. In particular, this method can especially help to gather data about project stakeholders' actions, behaviours, and communication.

Planning and Designing

Knowledge sharing can be defined primarily as the dissemination or transfer of knowledge between persons or groups in a company (Bock, et al., 2009). The sharing of knowledge is a voluntary process, not a persuasive one; that is, the person or group with relevant information must transmit it willingly, while the recipient needs to actively want the knowledge. Knowledge sharing can play a fundamental role in facilitating the completion of projects. The survey aims to assess the success of KS and its impact on project success.

Referring back to this research's conceptual model, which has been discussed in Chapter 5, this research seeks understanding of how KS is successfully utilised to create project success in the infrastructure development sector. Subsequently, it attempts to achieve the two main research objectives by representing the knowledge flow between stakeholders and investigating the most critical issues within PM and KS through how the two are integrated to create project success. This was attempted initially by considering several potential problems of the dynamicity of KS in UAE infrastructural projects, integration of KS in UAE

112

infrastructural projects, type of KS in UAE infrastructural projects, defectiveness of KS in UAE infrastructural projects, and mapping KS activities in UAE infrastructural projects with a concentration on stakeholders.

Moreover, the conceptual model of the KS approach in the infrastructure sector's projects was built based on previous KS models that were represented in previous subsections (Fernandez, et al., 2004; Tsergn & Lin, 2004; Gorelick & Tantawy-Monsu, 2005; Teerajetgul & Charoenngam, 2006; Hunter & Lichtenstein, 2008; King, 2009; PMI, 2013). The past and current models implement the knowledge lifecycle into the body of the project lifecycle such that KS is supported by related activities, knowledge, processes, and people in the infrastructure sector's projects. In this model, effective KS processes together with defining the knowledge components of the PM are possible solutions to counter the effects of the temporary nature of projects and the lack of stakeholders' accountability. This solution must be proved and investigated well to enhance the integration of KS in PM with recommendations that organisations can better share knowledge and utilise lessons that can be learned from their projects. Therefore, the objective of the questionnaire was to address the following two research objectives concerning effective KS processes in the project lifecycle: to examine how to integrate the KS process in the infrastructure projects lifecycle.

Based on the established research model, which was built mainly on the literature review, the questionnaire design was intended to investigate the hypotheses and focus on identifying the effective KS processes of the PM in the UAE's infrastructural projects. Therefore, the questionnaire examined the current situation of KS to assess the quality and success of KS between stakeholders in infrastructural projects and to assess how KS contributes to the fast completion of organisational projects. Moreover, it was also considered to be effective to evaluate the impact of the listed enablers and barriers of successful KS that are cited from the

113

literature review and the personality traits to statistically evaluate the effects of personality traits on the KS behaviours of respondents in the infrastructural sector.

Questionnaire overview

Accordingly, the research questionnaire is attached in Appendix 4 – Questionnaire, which includes 20 subdivisions that cover 99 variables overall. In fact, in order for this survey to come to relevant conclusions, it was divided into four general sections: personal traits (PT), effectiveness of KS in UAE infrastructural projects (EFF), enablers of the success of KS in the projects (E), and barriers of the success of KS in the projects (B). These four main sections were further divided into nine main parts, as listed below:

- 1. Personality traits, which are represented in the first five survey questions.
- 2. Work sector, which is represented in the survey question 6.
- The KS contribution to project success, which is represented in survey question 7.
- 4. The current status of the KS culture in the infrastructure sector, which is represented in survey question 8.
- 5. The benefits of KS in infrastructural projects, which is represented in survey question 9.
- The quality of the timeliness of KS in infrastructural projects, which is represented in survey question 10.
- The effectiveness of KS between stakeholders at each stage of the project lifecycle, which is represented in survey question 11.

- The enablers of the success of KS in projects, which are represented in survey questions 12 to 17.
- 9. The barriers of the success of KS in projects, which are represented in survey questions 18 to 20.

The first group consists of the first five questions and attempts to reflect the personality traits of the participants in the projects to asses any information that is further provided in the survey. Questions 6 to 11 give some information and set up a basic background of the employee and how much the knowledge effectiveness in the projects can be trusted or assessed. The third group is represented by questions 12 to 17, which show the enablers of KS in infrastructural projects. The final group is composed of questions 18 to 10, which reveal the barriers of KS in infrastructural projects.

Furthermore, the first five questions reveal if the employee has ever felt useful in any project. The personality traits were divided into five parts based on previous papers (John & Srivastava, 1999): *extraversion, agreeableness, conscientiousness, neuroticism, and openness.* By learning this characteristic of all respondents, their loyalty to the organisation, love for the organisation, and motivation for the organisation to succeed can be concluded. More involvement translates to more loyalty (Way, 2004). On the other hand, these questions help gauge the employee's trust and satisfaction in the management in the sense that they involve their employees in various decision-making areas. Based on the argument brought forth by Bartol and Srivastava (2002) and also on the comprehension of the questionnaire, a lower percentage shows that the respondents are unsatisfied with the small decision-making power they are given.

115

The first section of the questionnaire is about the five personality traits of the participants in the projects. This personality trait section covers the first five sections in the questionnaire in which the respondents were requested to answer the following question: "Please rate your agreement with the following statements. 'I see myself as someone who…'"

A Likert scale was used to measure the respondent's agreement and ratings of different statements related to the five following personality traits on how they see themselves. The five-point Likert scale used the following distinctions: 1 to indicate 'disagree', 2 to indicate 'disagree a little', 3 to indicate a neutral stance, 4 to indicate 'agree a little', and 5 to indicate 'agree strongly'. Under these five main questions, there were 26 sub-questions, which are shown in Table 6-1 below.

SN	Personality traits:	Code
	"Please rate your agreement with the following statements. 'I see myself as someone	
	who'"	
1	Is talkative	Q1a
2	Is full of energy	Q1b
3	Generates a lot of enthusiasm	Q1c
4	Has an assertive personality	Q1d
5	Is outgoing, sociable	Q1e
6	Is helpful and unselfish with others	Q2a
7	Has a forgiving nature	Q2b
8	Is generally trusting	Q2c
9	Is considerate and kind to almost	Q2d
10	Likes to cooperate with others	Q2e
11	Does a thorough job	Q3a
12	Is a reliable worker	Q3b
13	Perseveres until the task is finished	Q3c
14	Does things efficiently	Q3d
15	Makes plans and follows through with them	
16	Is depressed, blue	Q4a
17	Can be tense	Q4b
18	Worries a lot	Q4c
19	Can be moody	Q4d
20	Gets nervous easily	Q4e
21	Is original, comes up with new ideas	Q5a
22	Is curious about many different things	Q5b
23	Is ingenious, a deep thinker	Q5c
24	Has an active imagination	Q5d
25	Likes to reflect, play with ideas	Q5e
26	Is sophisticated in art, music, or literature	Q5f

 Table 6-1: Coding of personality traits sub questions

The sixth question is useful for understanding respondents' specialties, areas of expertise, and how they earn their living. For instance, an individual in the engineering sector is more likely

to be an engineer or a subordinate who has knowledge and some expertise in design. This

question attempted to cover all sectors; for instance, the insurance industry, which is a critical sector in today's economy. The respondents were requested to specify to which industry their organisation belongs. The variables were coded to Q6 for which the respondents were requested to answer the following question: "What industry does your organisation belong to?" by selecting their work sector from the multiple choices. Based on the answers, the respondents were subdivided into three main groups: "construction, machinery, and homes"; "governmental", which includes governmental sectors aside from the utilities, energy, and extraction sector; and "others", which includes respondents involved in different work sectors such as airlines and aerospace (including defence), finance and financial services, healthcare and pharmaceuticals, telecommunications, technology, internet and electronics, manufacturing, non-profit sectors, and the 1.8% of the respondents who were not currently employed. No respondents indicated employment in the advertising and marketing, agriculture, automotive, business support and logistics, education, entertainment and leisure, food and beverages, insurance, retail and consumer durables, real estate, or transportation and delivery sectors.

Question 7 asked the respondents' opinions on the importance of KS in projects, both personally and for the company as a whole. To get responses, this type of question should use a statement or question such as, "how would you rate the knowledge sharing contribution to project success?" because it is a direct way to ask. Proper survey questions should be designed in such a way that they help gather necessary information and are easy and interesting to answer (Saunders, et al., 2009). The responses can determine whether a respondent prefers KS. Low ratings insinuate that a respondent does not think KS is that important compared to higher ratings which show the belief that it is crucial. In this question,

117
the rating was offered on a scale from one to five to show the KS contribution to project success. Adding the option to dictate any other advantage the respondent may feel is relevant is also important to help gather more information on the benefits of KS. The respondents were requested to rate the KS contribution to project success. The question was **"How would you rate the knowledge sharing contribution to project success"** was coded to Question 7. The Likert scale was used to measure the respondents' rating of the contribution of KS to project success. A six-point Likert scale was used on which the answers were ranked in the following arrangement: 1 to indicate 0%, 2 to indicating 2.5%, 3 to indicate 5%, 4 to indicate 7.5%, 5 to indicate 10%, and 6 to indicate more than 10%.

Question 8 shows the degree of KS in the company and to what depth it is implemented. Very low scores imply very low implementation and very high scores mean high application. The respondents were requested to rate the culture of KS in the projects of their organisations. The question was phrased as "**Please rate the culture of knowledge sharing in the projects of your organisation**" and is coded to Q8. The Likert scale was used to measure the culture of KS in the projects. The five-point Likert scale on which it was ranked was offered with the following arrangement: 1 to indicate very low, 2 to indicate low, 3 to indicate medium, 4 to indicate moderately high, and 5 to indicate very high.

Question 9 shows benefits that might be gained from timely KS in infrastructural projects and to what depth such projects are enhanced by KS. Very low scores mean very low benefits and very high scores mean high application. To illustrate this idea, the benefits that might be gained from timely KS in the infrastructural projects are listed as follows: *stakeholder satisfaction, add value to the project, contribute to project success, reduce project disputes,*

118

and reduce cost overheads. The respondents were requested to rate the benefit that might be gained from timely KS in infrastructural projects under the general question: **'Please rate the benefits that might be gained from timely knowledge sharing in infrastructural projects'**. These variables are coded according to Table 6-2. A Likert scale was used to measure the benefits that might be gained from timely knowledge sharing in infrastructural projects. The five-point Likert scale on which it these answers were ranked had the following arrangement: 1 to indicate very low, 2 to indicating low, 3 to indicate medium, 4 to indicate moderately high, and 5 to indicate very high.

 Table 6-2: Coding of KS benefits

SN	Benefits of knowledge sharing:	Code
	"Please rate the benefits that might be gained from timely knowledge sharing in	
	the infrastructural projects"	
1	Stakeholder Satisfaction	Q9a
2	Adding value to the project	Q9b
3	Contribution to project success	Q9c
4	Reducing project disputes	Q9d
5	Reducing cost overheads	Q9e

In addition, the question 10 is more direct: "Personally, how would you rate the quality of the timeliness of KS in projects?" Statements of quality are suitable for this survey. The categories used for rating are enough for drawing conclusions. The qualities of timeliness of KS in the infrastructural projects are listed as follows: *availability of information, reliability of information and accessible of information.* The respondents were requested to rate the quality of the timeliness of KS in infrastructural projects and representational and accessible of KS in infrastructural projects under the general question: 'Personally, how would you rate the quality of the timeliness of KS in the infrastructural projects'. These variables are coded according to Table 6-3. A Likert scale was used to measure the quality of the timeliness of KS in infrastructural projects. The five-point Likert scale on which the answers were ranked took the following

arrangement: 1 to indicate very low, 2 to indicate low, 3 to indicate medium, 4 to indicate moderately high, and 5 to indicate very high.

Table 6-3: Coding of quality of KS

SN	<u>Quality of timeliness of shared knowledge</u> : "Personally, how would you rate the quality of the timeliness of KS in infrastructural projects"	Code
1	Availability of information	Q10a
2	Reliability of information	Q10b
3	Response time of communication	Q10c
4	Relevance to project tasks	Q10d
5	Representational of information	Q10e
6	Accessible of information	Q10f

Also, the eleventh question aimed to gather information about the degree of effectiveness of KS among stakeholders in every phase of a company's projects. The ratings given need to be averaged before a conclusion on the effectiveness can be made. On average, high ratings can imply that KS in the company is very effective between stakeholders, whereas low ratings show a low effectiveness and need for improvement in the KS systems; moderate ratings show average effectiveness. The options for the effectiveness of KS between stakeholders at each stage of the project lifecycle were as follows: *Knowledge sharing is done on time, knowledge sharing is associated with depth of content, availability of shared knowledge on time, usability of shared knowledge, and knowledge sharing is associated with personal ownership.* The respondents were requested to rate the effectiveness of KS between stakeholders at each stage of the project lifecycle under the general question:

'Please rate the effectiveness of knowledge sharing between stakeholders'.

These variables are coded according to Table 6-4. A Likert scale was used to measure the effectiveness of KS between stakeholders in infrastructural projects. The five-point Likert scale on which it was ranked had the following arrangement: 1 to indicate not effective, 2 to indicate somewhat effective, 3 to indicate effective, 4 to indicate moderately very effective, and 5 to indicate extremely effective.
 Table 6-4: Coding of effectiveness of KS

SN	Effectiveness of knowledge sharing: "Please rate the effectiveness of knowledge sharing between stakeholders"	Code
1	Knowledge sharing is done on time	Q11a
2	Knowledge sharing is associated with depth of content	Q11b
3	Availability of shared knowledge on time	Q11c
4	Usability of shared knowledge	Q11d
5	Knowledge sharing is associated with personal ownership	Q11e

Survey questions 12 to 17 offer some factors that help support and facilitate KS in projects with the intention to determine the impact they have on knowledge sharing levels; the ratings give the literal levels of impact. The option of "any other" helps to maximise data collection.

These also needed to be a rating to enable correct conclusions. The seven groups of enablers

of successful KS that are cited from the literature review are listed as groups below, and the

respondents were requested to rate the influence of the enablers on the success of

KS in projects under the general question: 'Please rate the influence of the

following enablers on the success of knowledge sharing in the projects'. These

variables are coded according to Table 6-5. A Likert scale was used to measure the

influence of the following enablers on the success of KS in infrastructural projects.

The five-point Likert scale on which it was ranked offered the following arrangement: 1 to

indicate no impact, 2 to indicate low impact, 3 to indicate moderate impact, 4 to indicate

moderately high impact, and 5 to indicate very high impact.

Table 6-5: Coding of the seven groups of enablers of the success of KS in infrastructural projects

Organisational factors of KS enablers:

E1. Clear policy or strategy for project knowledge sharing.

E2. Awareness of the important role that knowledge sharing has in increasing project success. E3. Organisational commitment to project knowledge sharing.

Motivation factors of KS enablers:

E4. Sufficient reward systems to share knowledge.

E5. Leadership commitment to support open, honest two-way communication in the projects. **Process factors of KS enablers:**

E6. Clear procedure of knowledge sharing between project stakeholders.

E7. Sufficient training program of both formal and informal knowledge sharing content.

E8. Measurements of knowledge sharing before and after any project activities.

E9. Accountability to the evaluation result and feedbacks of project knowledge sharing.

E10. Linking the content of knowledge sharing with the project job description.

E11. Implementation of less formal resources such as social media to share embedded project knowledge.

E12. Sufficient assets and resources to support project knowledge sharing processes.

E13. The ability to communicate between project stakeholders regarding the project through specific channels.

E14. Effective composition of the project knowledge sharing practices in documentation and sharing best practices.

Technological factors of KS enablers:

E15. Implementation of sufficient technological resources in all of the day-to-day project processes of sharing knowledge.

E16. Implementation of sufficient technological resources for documentation specifically for lessons learnt and best practices.

E17. Implementation of sufficient technological resources to clarify roles and responsibilities of project stakeholders.

E18. Implementation of sufficient technological resources to enhance communication between dispersed project stakeholders.

E19. Awareness of the importance of technological and IT resources to share knowledge in UAE infrastructural projects.

E20. Implementation of sufficient technological resources for knowledge sharing feedback and measurements.

E21. Sufficient training program and instructions of on how to use of IT tools and equipment for knowledge sharing content.

Social networking factors of KS enablers:

E22. Implementation of technical tools of communication, such as emails and groupware or discussion applications to share knowledge between dispersed team members.

E23. Implementation of the social media to share project knowledge through projects.

E24. Ability of social network to simplify the personal relationships and social interactions and facilitate the project knowledge sharing process.

E25. Consideration that social networking platforms are one of the most accurate and appropriate tools to share knowledge aspects of projects daily operations.

E26. Designation of the influential people in the organisation, managers to rapidly spread the project knowledge and skills on the social networking platforms.

E27. Involvement of continuous feedback and measurements in the use of social networking of knowledge sharing process.

Physical environmental factors of KS enablers:

E28. Sufficient funding, facilities, and technological resources to facilitate project knowledge sharing.

E29. Sufficient tools and instruments to maximise the potential of others to share project knowledge.

E30. The characteristics of physical environment as the shape of the offices, spaces; relaxed environments and quiet environment.

Individuals factors of KS enablers:

E31. Self-motivation and value to share knowledge with other project stakeholders.
E32. Individual awareness of the social importance of sharing knowledge in achieving the project goals.
E33. Individual accountability between project stakeholders to share information in UAE infrastructural projects.
E34. Teamwork and teambuilding in UAE infrastructural projects via knowledge sharing.

E34. Teamwork and teambuilding in UAE infrastructural projects via knowledge sharing. E35. Loyalty and hardworking to increase project success via knowledge sharing. E36. Desire to be rewarded to share project information.

Finally, the last questions, numbers 18 to 20, state some barriers and were included with the

intention to determine the impact of these barriers on KS in projects. Again, the ratings give a

literal degree of the perceived impact. Any other restriction stated needed to be rated too.

Those with high impact levels call for measures to be established to try to eradicate them and

improve knowledge sharing. In the study by Dyer and Nobeoka (2000), it was said that

ascertaining, fostering, and redeploying sources of knowledge is crucial for company success.

Any barriers therefore need to be addressed to allow KS and therefore ensure company

success. The barriers of the success of KS in the projects are listed in Table 6-6.

The respondents were requested to rate the influence of the following barriers on the

success of KS in the projects under the general question: 'Please rate the influence

of the following barriers on the success of knowledge sharing in the projects'.

These variables are coded according to Table 6-6. A Likert scale was used to measure

the influence of the following barriers on the success of KS in infrastructural projects.

The five-point Likert scales on which it was ranked had the following arrangement: 1 to

indicate no impact, 2 to indicate low impact, 3 to indicate moderate impact, 4 to

indicate moderately high impact, and 5 to indicate very high impact.

Table 6-6: Coding of the three groups of barriers of the success knowledge sharing in infrastructural projects

Individuals factors of KS barriers:

B1. Threat of losing some of individual's power towards sharing project knowledge.

B2. Lack of internal motivation to share project information.

B4. Lack of time to interact and share knowledge with other stakeholders.

B3. Lack of trust towards others' sharing of project knowledge.

B5. Lack of awareness of the importance of sharing knowledge with other project stakeholders. B6. Difficulty with communicating and sharing knowledge with other stakeholders.

Organisational factors of KS barriers:

B7. Lack of organisational encouragement of knowledge sharing.

B8. Lack of organisational trust towards sharing project knowledge.

B9. Lack of a suitable physical work environment for knowledge sharing.

B10. Lack of resources for knowledge sharing.

B11. The use of strong hierarchy and position occupied by people to intimidate others from sharing knowledge.

B12. The influence of organisational structures changes on motivation to share knowledge.

B13. Lack of motivation policy of knowledge sharing.

B14. Lack of a suitable corporate culture of knowledge sharing.

B15. The external or macro-environmental factors such as global crises towards sharing project knowledge process.

Technological factors of KS barriers:

B16. Lack of technical and IT resources and other necessary project assets for knowledge sharing. B17. Lack of project access to technology for knowledge sharing.

D17. Lack of project access to technology for knowledge sharing.

B18. Lack of provided training on how to use necessary IT tools and equipment to share knowledge.

Sampling and Data Collection

This questionnaire was given to the experts of infrastructural projects in the UAE's

infrastructural development sector, which involves six different participating organisations

such as the Ministry of Infrastructural Development, Dubai Municipality, Abu Dhabi

Sewerage Company, Federal Authority of Electricity and Water in Dubai, Abu Dhabi Airports

Company, and the Etisalat Company in UAE.

The selection of the UAE's infrastructural development sector was due to their excellent

performance as mentioned before to maximise data validity and credibility. The organisations'

experts were selected to participate in the questionnaire through straightforward contact with

them in order to guarantee quick response.

The questionnaire was administered to 300 project experts including those who were recognised for performance and advised by their top managers to be selected as they had been directly involved in infrastructural projects for relatively long time. Because of these recommendations, they were selected to reflect their real industrial experience of project management.

The questionnaire copies were distributed as both hard and soft copies which were posted on the Survey Monkey website. Hard copies of the questionnaire were submitted directly to 150 project delegates of the Ministry of Infrastructural Development, Dubai Municipality, and Abu Dhabi Sewerage Company by arranging multiple visits directly to their offices. The other 150 delegates were invited to participate in the questionnaire through official emails including a link to the online survey posted on the Survey Monkey website. Two reminders were sent to these delegates by post and phone every two weeks after the invitation to make sure that delegates completed the questionnaire.

After two months of questionnaire administration, 140 questionnaires were finally received. However, 19 delivered questionnaires were excluded as they were incomplete, and another nine questionnaires were excluded as they were irrelevant, which left a total of 112 questionnaires considered. Therefore, the total complete response rate 37.33%. Afterward, questionnaire output data were saved and coded in the software 'Statistical Package for the Social Sciences' (SPSS) 23 to facilitate both descriptive and inferential statistical analyses.

6.4 Unit of Analysis

The unit of analysis can be identified by determining whether an individual, organisational, or procedural unit is analysed (Creswell, 2009; Yin, 2011). For this research data analysis, the quantitative research method facilitates the analysis unit of the questionnaire survey units as presented below in Table 6-7.

Table 6-7: Overview of research questions and unit of analysis

Research questions	unit of analysis
---------------------------	------------------

1. To examine how to integrate the KS	The success of KS implementation in PM
process in the infrastructure project	using survey questionnaire tool.
lifecycle.	

6.5 Pilot Study

A pilot study was carried out with one applicant at each of the selected companies in order to recognise related methodology limitations and improve the selected research methodology. The pilot study primarily aimed to test the survey questions, time and places, reliability, validity, and other methodology processes (Glesne, 2011). A pilot study is usually selected from different elements such as: geography, proximity, accessibility, and convenience (Yin R. , 2011). The pilot study was analysed prior to the main study with the support of educational research specialists at the British University in Dubai in coordination with the selected organisation. In addition, the questions of the survey were pilot tested and validated via sending it to and asking for feedback from experts with KS backgrounds and implementation in UAE projects to increase the understanding and certainty of participants toward the study subject prior to the actual data collection.

6.6 Research sampling

All participants in the research survey are assumed to be aware of basic KM concepts based on the UAE knowledge-based economy targets (uaeinteract, economy, 2016). Furthermore, approximately 300 questionnaire surveys were distributed to six different organisations.

The research focuses on covering KS practices in infrastructural projects and relevant recent publications in the UAE after 2008. This is due to the fact that the KM perspective was introduced officially in 2008 by the governmental leadership when the UAE Vision 2021 was announced (uaeinteract, economy, 2016). In fact, the vision aims to convert the UAE economy into a competitive knowledge-based economy by supporting innovation and the

establishment of attractive and value-adding contexts in, for example, the public sector (uaevision2021, 2016).

The research considers the federal government by studying the six different participating organisations such as the Ministry of Infrastructural Development, Dubai Municipality, Abu Dhabi Sewerage Company, Federal Authority of Electricity and Water in Dubai, Abu Dhabi Airports Company, and the Etisalat Company in the UAE. These organisations were chosen because the research sample data is intended to enrich this study's results due to their excellent performance in the infrastructure sector (Harris E. , 2013).

6.7 Collection of Data

Surveys are one of the most popular data resources for research. Furthermore, permission to conduct individual questionnaire surveys was gathered from all participants with open-ended questions to maximise interaction with each research participant and build full explanations of their responses. Questionnaire surveys of people in the selected company were selected for the expertise level of people in the project management sector. These participants were selected from amongst experts in the project knowledge field in each organisation. These people tended to be managers of project or knowledge-related units, in addition to the specialists who work with them.

A questionnaire-based survey was carried out at the selected organisations. The survey questions are related directly to the research objectives as shown in Appendix 4 and were based on the initiated research model of KS in UAE infrastructural projects. Such questions attempt to fill existing knowledge gaps in the literature as discussed earlier. Furthermore, follow-up questions were asked for the purpose of data validity and reliability assurance.

Questionnaires need 10 working days to be arranged and carried out for each selected organisation. In addition, Approximately 300 questionnaire-based surveys were distributed to the selection organisations to collect the necessary data.

6.8 Triangulation

Meanwhile, data triangulation is considered to enhance the validity of research data at each individual organisation by collecting data from different resources (Yin R., 2011). In addition, Gray (2004) argued that including multiple methods in the research supports data triangulation beside it adds more strength to every included method.

Data triangulation was attempted for this research through employing a combination of different data resources, as there were six organisations that participated in the survey.

6.9 Data Analysis

Data collection and analysis of this study occurred at the same time as it was intended for the study (Baxter & Jack, 2008). Data was analysed after the surveys were completed. This included data classification and development of different tables and figures to present output data adequately. Furthermore, content analysis and data display were carried out with the aid of computer software programs such as SPSS and Microsoft Excel.

Also, data which were collected quantitatively via the survey were analysed through descriptive and inferential statistics. The SPSS was implemented to illustrate the quantitative data analysis to facilitate interpretation of data using output texts, records, transcripts, and notes (Kvale & Brinkmann, 2014). Microsoft Excel was used for the development of different tables and figures to adequately present output data.

Overall, the entire research data collection stage took about four months as a minimum period, since conducting the survey at the selected company needed about 20 working days as

discussed above. Consequently, weekly data reports were written and saved for later review

and to regularly tie together collected data.

At this point, the research hypothesis are revisited again and shown in Table 6-8.

Table 6-8: Overview of Research Hypotheses

	Restatement of Research Hypotheses					
1a –	Organisatio	onal factors of KS enablers related to the success of KS in projects "Work sector"				
1a	H1a: β1a	There is no statistically significant difference between the respondents' perceptions of the idea,				
	= 0.	"Organisational factors of KS enablers related to the success of KS in projects".				
	HA1a: β1a	There is a statistically significant difference between the respondents' perceptions of the idea,				
	$\neq 0.$	"Organisational factors of KS enablers related to the success of KS in projects".				
1b -	Motivationa	l factors of KS enablers related to the success of KS in projects "Work sector"				
1b	H1b: β1b	There is no statistically significant difference between the respondents' perceptions of the idea,				
	= 0.	"Motivation factors of KS enablers related to the success of KS in projects".				
	HA1b:	There is a statistically significant difference between the respondents' perceptions of the idea,				
	$\beta 1b \neq 0.$	"Motivation factors of KS enablers related to the success of KS in projects".				
1c –	Process facto	ors of KS enablers related to the success of KS in projects "Work sector"				
1c	H1c: β1c	There is no statistically significant difference between the respondents' perceptions of the idea, "Process				
	= 0.	factors of KS enablers related to the success of KS in projects".				
	HA1c: β1c	There is a statistically significant difference between the respondents' perceptions of the idea, "Process				
	$\neq 0.$	factors of KS enablers related to the success of KS in projects".				
1d -	Technologi	ical factors of KS enablers related to the success of KS in projects "Work sector"				
1d	H1d: β1d	There is no statistically significant difference between the respondents' perceptions of the idea,				
	= 0.	"Technological factors of KS enablers related to the success of KS in projects".				
	HA1d:	There is a statistically significant difference between the respondents' perceptions of the idea,				
_	$\beta \text{Id} \neq 0.$	"Technological factors of KS enablers related to the success of KS in projects".				
1e –	Social netw	orking factors of KS enablers related to the success of KS in projects "Work sector"				
1e	H1e: β1e	There is no statistically significant difference between the respondents' perceptions of the idea, "Social				
	= 0.	networking factors of KS enablers related to the success of KS in projects".				
	HA1e: β1e	There is a statistically significant difference between the respondents' perceptions of the idea, "Social				
	$\neq 0.$	networking factors of KS enablers related to the success of KS in projects".				
1f –	Physical en	vironmental factors of KS enablers related to the success of KS in projects "Work sector"				
1f	H1f: β 1f =	There is no statistically significant difference between the respondents' perceptions of the idea,				
	0.	"Physical environment factors of KS enablers related to the success of KS in projects".				
	HA1f: β1f	There is a statistically significant difference between the respondents' perceptions of the idea, " Physical				
4	≠0.	environment factors of KS enablers related to the success of KS in projects".				
1g –	Individuals	factors of KS enablers related to the success of KS in projects "Work sector"				
Ig	H1g: β1g	There is no statistically significant difference between the respondents' perceptions of the idea,				
	= 0.	There is a statistically significant difference between the success of KS in projects .				
	HAIg: $0.1a \neq 0$	"Individuals factors of KS enablers related to the success of KS in projects"				
20	pig + 0. Individual fo	nutriduals factors of NO enablers related to the success of NO in projects.				
$\frac{2a}{2a}$		There is no statistically significant difference between the respondents' percentions of the idea				
Za	-0	"Individual factors of KS barriers related to the success of KS in projects"				
	= 0. HA2a: 82a	There is a statistically significant difference between the respondents' perceptions of the idea				
	11A2a. p2a ≠0	"Individual factors of KS barriers related to the success of KS in projects"				
2h_	+ 0. Organisation	nal factors of KS harriers related to the success of KS in projects "Work sector"				
20 2h	H2b: B2b	There is no statistically significant difference between the respondents' percentions of the idea				
20	= 0	"Organisational factors of KS barriers related to the success of KS in projects".				
	HA2b	There is a statistically significant difference between the respondents' perceptions of the idea				
	$\beta_{2b} \neq 0$	"Organisational factors of KS barriers related to the success of KS in projects".				
2c –	Technologics	al factors of KS barriers related to the success of KS in projects "Work sector"				
2c	H2c: B2c	There is no statistically significant difference between the respondents' perceptions of the idea				
	= 0.	"Technological factors of KS barriers related to the success of KS in projects".				
	HA2c: β2c	There is a statistically significant difference between the respondents' perceptions of the idea,				

	<i>≠</i> 0.	"Technological factors of KS barriers related to the success of KS in projects".					
H3: The knowledge sharing enablers are associated with the rate of knowledge sharing contribution to							
	project success.						
3	H3: β3 =	There is a significant association between the KS enablers and "the rate of knowledge sharing					
	0.	contribution to project success."					
	HA3: β3 ≠	There is no association between the KS enablers and "the rate of knowledge sharing contribution					
	0.	to project success."					
H4:	The knowle	dge sharing enablers are associated with the benefits that might be gained from timely					
kno	wledge sha	ring in infrastructural projects.					
4	H4: β4 =	There is a significant association between the KS enablers and "the benefits that might be gained					
	Ó.	from timely KS in the infrastructural projects."					
	HA4: β4 ≠	There is no association between the KS enablers and "the benefits that might be gained from					
	0.	timely knowledge sharing in the infrastructural projects."					
H5:	The knowle	doe sharing enablers are associated with guality of the timeliness of KS in infrastructural					
pro	ects.						
5	H5: $\beta 5 =$	There is a significant association between the KS enablers and "the quality of the timeliness of KS					
	0.	in the infrastructural projects."					
	HA5: β5 ≠	There is no association between the KS enablers and "the quality of the timeliness of KS in the					
	0.	infrastructural projects."					
H6:	The knowle	doe sharing enablers are associated with the effectiveness of knowledge sharing between					
stal	eholders.						
6	H6: $\beta 6 =$	There is a significant association between the KS enablers and "the effectiveness of KS between					
-	0.	stakeholders."					
	HA6: β6 ≠	There is no association between the KS enablers and "the effectiveness of KS between					
	0.	stakeholders."					
H7:	The knowle	dge sharing barriers are associated with the rate of knowledge sharing contribution to					
pro	ect success	с. Б.					
7	H7: β7 =	There is a significant association between the KS barriers and "the rate of knowledge sharing					
	0.	contribution to project success."					
	HA7: β7 ≠	There is no association between the KS barriers and "the rate of knowledge sharing contribution					
	0.	to project success."					
H8:	The knowle	dge sharing barriers are associated with guality of the timeliness of KS in infrastructural					
pro	ects.						
8	H8: β8 =	There is a significant association between the KS barriers and "the timeliness of KS in the					
	0.	infrastructural projects."					
	HA8: β8 ≠	There is no association between the KS barriers and "the timeliness of KS in the infrastructural					
	0.	projects."					
H9:	The knowle	dge sharing barriers are associated with The effectiveness of knowledge sharing between					
stak	ceholders.						
9	H9: β9 =	There is a significant association between the KS barriers and "the effectiveness of KS between					
	Ó.	stakeholders at every phase of the projects "					
	HA9: β9 ≠	There is no association between the KS barriers and "the effectiveness of KS between					
	0.	stakeholders at every phase of the projects."					
	HA9: þ9 ≠ 0.	stakeholders at every phase of the projects."					
	0.	stakeholders at every phase of the projects.					

6.10 Ethical Considerations

Prior to conducting the study, the British University of Dubai Research Ethics Board was consulted about ethical consideration regarding this research in order to increase the reliabity and validity of collected data.

Letters of invitation are represented as a statement or declaration of approval of participation in this study (Glesne, 2011). These letters are important for research ethics as it is mandatory to represent study privacy for all participants and to obtain the participants' consent prior to starting the research (Hesse-Biber & Leavy, 2010).

Furthermore, letters of study invitation were dispatched to selected participants after receiving permission from related company directors to request permission for conducting the study in the selected firm at this stage, as shown in Appendix 2. Details of participants in this study might be attached to these letters based on suggestions or contact with the directors.

A consent form is in Appendix 3 and was attached to the letters of study invitation. These forms needed to be completed and emailed back to the researcher by the participants prior to the data collesction.

Each invitation letter to conduct the survey contained the research objectives. Furthermore, contact details for the researcher were presented to allow respondent to pose any inquiry and enable future communication. Also, such invitation letters clarified and guaranteed the privacy and freedom of participants at all stages of the study.

For the survey formatting, overall ethical issues were considered when structuring the hard copy and online questionnaires like informed consent, data privacy and secrecy of contributors' personalities, and examiners which may affect the answers of repondents (Saunders et al., 2012).

6.11 Chapter Summary

Based on the proposed research conceptual model, this chapter has explained the research methodology and the proposed research philosophy, design, plan, data collection and sampling, data analysis, underlining pilot study, and ethical considerations. Data collection, analysis, and discussion are spot on for the next research chapters.

7. Chapter 7: Descriptive analysis

7.1 Introduction

This section highlights the outcomes of questionnaire survey which was operated from February to March of 2017 together with data analysis and results. The main aim of the research was to examine how KS is successfully utilised to create project success in the UAE's infrastructure development sector. This questionnaire has different parts, as shown later, and it was targeted to discover the current situation of KS in the UAE's infrastructural sector according to the literature review findings. Therefore, the goal was established to assess the quality and effectiveness of KS between stakeholders in infrastructural projects and to assess how KS contributes to achieve the fast completion of organisational projects. In addition, this questionnaire was created to evaluate the impact of enablers and barriers of success of KS and personality traits to statistically evaluate the effect of personality traits as mediating variables on the KS behaviour of respondents in the infrastructural sector.

7.2 Descriptive Statistics for results and data analysis

This subsection explains the descriptive statistical analysis with the aid of the SPSS software program, which began with data preparation to clean data and remove any invalid data, or outliers. This descriptive statistical analysis includes different five measurement aspects: reliability, descriptive analysis, ranking analysis, normality test, correlation, and regression analysis.

Reliability measures the consistency and reliability of the scale, not the data, through obtaining an alpha coefficient; an alpha score of .70 or greater is generally considered to be acceptable for the gathered data. Descriptive analysis is used to prepare and clean data through frequency and normality tests through the following measurements: central tendency, to consider the mean, median, and mode; variability measures of standard deviation, kurtosis, and skewness; and the minimum and maximum data. A ranking analysis was performed on the personality traits, knowledge effectiveness, and enablers and barriers groups to statistically represent the attributes that show their levels of impact on KS in the projects. Furthermore, a normality test was applied to test the normality of the dependent variable, which must be considered in the next stages like correlation, regression, and analysis of variance. A correlation test is used to represent how and to what extent two variables are associated. Regression analysis is used to predict one variable from existing information of one or more variables and to find significant relationships (residual square). Since multiple regressions are applied to estimate the result of a dependent quantity via two or more independent quantities, a linear multiple regression analysis was performed for this survey to determine which enablers of KS contribute to project success. Factor analysis is implemented

to clean data by disposing of any repeated data which were gathered in a questionnaire. However, it was not applied for this study because both the KS enablers and barriers were categorised and minimised from theoretical resources.

7.2.1 Reliability

A reliability test was conducted to test the consistency and reliability of the scale for each individual survey question, which cover the four sections: personal traits, effectiveness of KS inside UAE infrastructural projects, enablers of the success of KS in the projects, and barriers to the success of KS in the projects.

However, a reliability test could not be applied individually to survey questions 6, 7, and 8, which inquired about each of the KS contributions to project success, work sector, and the current status of the KS culture in the infrastructure sector. These could not be tested because there are no existing scales for these variables since they all corresponded with only one statement. However, there were included in the scale reliability test for the total questions. Cronbach's alpha informs about the consistency and reliability of the scale, not the data. A

score of .70 or greater is generally considered to be acceptable, as demonstrated below:

.90 or > = high reliability

.80-.89 = good reliability

.70-79 = acceptable reliability

.65-.69 = marginal reliability

The scale which was used to measure the reliability of the specific sample of **survey question** 1, which consists of five items, indicates an acceptable level of internal consistency ($\alpha = 0.703$).

The scale which was used to measure the reliability of the specific sample of **survey question 2**, which consists of five items does not initially indicate an acceptable level of internal consistency ($\alpha = 0.586$). However, in Table 7-1, which represents item-total statistics, Q2c (which refers to "is generally trusting") can be removed to improve the reliability scale to match the Cronbach's alpha of $\alpha = 0.617$, which can be considered as a marginally acceptable level of internal consistency for this scale.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q2a	17.65	3.652	.247	.597
Q2b	17.66	3.019	.541	.402
Q2c	17.93	4.013	.190	.617
Q2d	17.53	3.729	.489	.468
Q2e	17.41	4.190	.341	.540

Table 7-1: Item-total statistics of reliability scale for survey question 2

The scale which was used to measure the reliability of the specific sample of **survey question 3** that consists of five items indicates a good level of internal consistency ($\alpha = 0.809$).

The scale which was used to measure the reliability of the specific sample of **survey question** 4 that consists of five items indicates a good level of internal consistency ($\alpha = 0.830$).

The scale which was used to measure the reliability of the specific sample of **survey question**

5 that consists of five items indicates an accepted level of internal consistency ($\alpha = 0.786$).

The scale which was used to measure the reliability of the specific sample of survey question

9 that consists of five items indicates a good level of internal consistency ($\alpha = 0.830$).

The scale which was used to measure the reliability of the specific sample of survey question

10 that consists of six items indicates a high level of internal consistency ($\alpha = 0.918$).

The scale which was used to measure the reliability of the specific sample of survey question

11 that consists of five items indicates an acceptable level of internal consistency ($\alpha = 0.851$).

The scale which was used to measure the reliability of the specific sample of **survey questions 12 to 17** that consist of 36 items indicates a high level of internal consistency ($\alpha = 0.970$).

The scale which was used to measure the reliability of the specific sample of **survey questions from 18 to 20** that consists of 18 items indicates a high level of internal consistency ($\alpha = 0.941$).

According to the following Table 7-2 and Figure 7-1, it can be seen that the highest reliability test outcomes arose from the **enablers group**, which represents survey questions 12 to 17 and contains 36 items. For this group, $\alpha = 0.970$, which offers an indication that the KS enablers were strongly adopted.

The second highest reliability test outcome refers to the **barriers group**, which represents survey questions 18 to 20 and contains 18 items. For the barriers, $\alpha = 0.941$, which indicates that the KS barriers were strongly adopted.

The third highest reliability corresponds to survey question 10, which represents the **timeliness of KS** and contains six items. In this case, $\alpha = 0.918$, which strongly signals that the quality of the timeliness of KS in infrastructural projects was strongly adopted.

The fourth reliability refers to survey question 10, which represents the timeliness of KS and contains six items. In this case, $\alpha = 0.851$, which offers a very good sign that the quality of the timeliness of KS in infrastructural projects was strongly adopted.

The fifth reliability refers to survey questions 4 and 9, which asked about **neuroticism as a personality trait** and **benefits that might be gained from timely knowledge sharing in infrastructural projects**, where $\alpha = 0.830$ and each one contains five items. This result

suggests that both neuroticism as a personality trait and benefits that might be gained from timely KS in infrastructural projects were appropriately adopted.

The sixth highest reliability was found for survey question 3, which represents the **conscientiousness personality trait**. This question contained five items and received a score of $\alpha = 0.809$, which offers a good sign that conscientiousness as a personality trait was appropriately adopted.

The seventh reliability was found for survey question 5, which asked about the **openness personality trait** and contained six items. For this question, $\alpha = 0.786$, which might be due to the extensive variation in the answers about personality traits based on different personalities in the projects. This information offers a very good sign that the openness personality trait was acceptably adopted.

The eighth reliability refers to survey questions 1, which represents the **extraversion personality trait** and contained five items. For this question, $\alpha = 0.703$, which might be due to extensive variation in the answers about personality traits based on different personalities in the projects. This information offers a sign that the extraversion personality trait was acceptably adopted.

The last reliability refers to survey questions 2, which represents the conscientiousness **personality trait** and contained four items. For this question, $\alpha = 0.617$, which might be due to extensive variation in the answers about personality traits based on different personalities in the projects. Overall, this reliability result is still accepted and is a sign that the conscientiousness personality trait was marginally acceptably adopted.

 Table 7-2: Reliability (Cronbach alpha test) for the questionnaire questions

SN	Question Name	Survey	No. of	Cronbach	Ranking of
		Question	Valid items	Alpha	Reliability

		Number			
1	Extraversion personality trait	1	5	.703	8th
2	Agreeableness personality trait	2	4	.617	9th
3	Conscientiousness personality trait	3	5	.809	6th
4	Neuroticism personality trait	4	5	.830	5th
5	Openness personality trait	5	6	.786	7th
6	Benefits that might be gained from	9	5	.830	5th
	timely knowledge sharing in				
	infrastructural projects				
7	The quality of the timeliness of KS	10	6	.918	3rd
	in infrastructural projects				
8	The effectiveness of knowledge	11	5	.851	4th
	sharing between stakeholders				
9	The enablers of the success of	Questions	36	.970	1st
	knowledge sharing in the projects	from 12 to			
		17.			
10	The barriers to the success of	Questions	18	.941	2nd
	knowledge sharing in projects	from 18 to			
		20.			
11	TOTAL	All	99	.934	
		questions			



Figure 7-1: Reliability (Cronbach alpha test) for the survey questions

7.2.2 Descriptive Analysis

Descriptive analysis was done to briefly review the collected data individually for each individual survey questions covering the four sections. Descriptive analysis is used to prepare and clean data, and it represents frequency through the measurement of central tendency to

consider the mean, median, and mode, in addition to variability measures of standard deviation, kurtosis, skewness, and the minimum and maximum data.

Descriptive analysis for Personality traits Extraversion

Extraversion (Q1a)

The "agree a little" answer was the most popular selection of the respondents at 27.7%; however, many other participants also selected "neutral", "agree strongly", and "disagree a little", while few participants selected "disagree". This is indicated in Table 7-3 and Figure 7-2 below which show these five variables were analysed with 112 valid cases or respondents for each with no data missing.



Extraversion (Q1b)

The "agree strongly" answer was the most popular among the respondents, of which 48.2% selected it; however, many other participants also selected "agree a little" with 33%, few others selected "neutral" and "disagree a little" answer, and the smallest number of participants selected "disagree". These results are indicated in Table 7-4 and Figure 7-3 below, which show these five variables were analysed with 112 valid cases or respondents for each with no data missing.



Extraversion Distribution (Q1c)

The most popular answer was "**agree a little**", which was selected by 41.1% of respondents; however, 34.8% of participants also selected "**agree strongly**", few others selected "**neutral**" and "**disagree a little**", and no one selected "**disagree**". These results are indicated in Table 7-5 and Figure 7-4 below, which show these five variables were analysed with 112 valid cases or respondents for each with no data missing.



Extraversion Distribution (Q1d)

"Agree a little" and "agree strongly" were equally the most popular answers and were selected by 37.5% of respondents; however, many others selected "neutral" and few others selected "disagree a little", but none selected "disagree" answers. These results are indicated in Table 7-6 and Figure 7-5 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Extraversion Distribution (Q1e)

"Agree strongly" was the most selected answer at 41.1% of respondents; however, 37.5% selected "agree a little", a few others selected "neutral" and "disagree a little", and no participants selected "disagree". These results are indicated in Table 7-7 and Figure 7-6 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

			Valid	Q1e
	Frequency	Percent	Percent	50-
Valid Disagree a little	9	8.0	8.0	40- Č 30-
Neutral	15	13.4	13.4	Len bez
Agree a little	42	37.5	37.5	
Agree strongly	46	41.1	41.1	10-
Total	112	100.0	100.0	Disagree a little Neutral Agree a little Agree strongly Q1e
Table 7-7: Extraversion Distribution (Q1e)			n (Q1e)	Figure 7-6: Extraversion Frequency (Q1e)

Agreeableness

Agreeableness (Q2a)

"Agree strongly" was the most-selected answer with 55.4% of respondents; however, 36.6% of respondents selected "agree a little", and few others selected "neutral", "disagree a little", and "disagree" answer equally. These results are indicated in Table 7-8 and Figure 7-7 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

			Valid	Q2a
	Frequency	Percent	Percent	
Valid Disagree	3	2.7	2.7	60-
Disagree a little	3	2.7	2.7	01g 40-
Neutral	3	2.7	2.7	
Agree a little	41	36.6	36.6	20-
Agree strongly	62	55.4	55.4	
Total	112	100.0	100.0	Disagree Disagree a little Neutral Agree a little Agree strongly Q2a
Table 7-8: Agreeableness Distribution (Q2a)				Figure 7-7: Agreeableness Frequency (Q2a)

Agreeableness (Q2b)

"Agree strongly" was the most popular answer and 54.5% of respondents selected it; however, many others selected "agree a little" at 34.8%. Few others selected "neutral" and "disagree a little", and the lowest number of participants selected "disagree". These results are indicated in Table 7-9 and Figure 7-8 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Agreeableness (Q2d)

Most of the respondents, 58%, selected "**agree strongly**"; however, 35.7% selected "**agree a little**", some others have selected "**neutral**", and none of the participants selected "**disagree a little**" nor "**disagree**". These results are indicated in Table 7-10 and Figure 7-9 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

				Q2d
	Frequency	Percent	Valid Percent	60-
Valid Neutral	7	6.3	6.3	40-
Agree a little	40	35.7	35.7	E C
Agree strongly	65	58.0	58.0	20-
Total	112	100.0	100.0	
				. Neutral Agree's title Agree's toongly Q2d
Table 7-10: Agree	ableness Dis	stributior	n (Q2d)	Figure 7-9: Agreeableness Frequency (Q2d)

Agreeableness (Q2e)

Most of the respondents have selected "**agree strongly**" at about 67%1 however, many others selected "**agree a little**" at 29.5%, at least a few others selected "**neutral**" answer, and no one selected "**disagree**" nor "**disagree a little**". These results are indicated in Table 7-11 and Figure 7-10 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

				Valid	80-		Q2e		
		Frequency	Percent	Percent					
Valid Neutra	al	4	3.6	3.6	60-				
Agree	a little	33	29.5	29.5	ency				
Agree	strongly	75	67.0	67.0	nbər H				
Total		112	100.0	100.0	20-	Neutral	Agree a little	Agree strongly	
							Q2e		
Table 7-1	1:Agreea	bleness Dis	tribution	(Q2e)	Figu	re 7-10: Agre	eeableness Fr	equency (Q2	e)

Conscientiousness

Conscientiousness (Q3a)

"Agree a little" was the most commonly selected answer with 47.3% of respondents; however, 41.1% selected "agree strongly", at least few others selected "neutral" and "disagree a little", and none of the participants selected "disagree". These results are indicated in Table 7-12 and Figure 7-11 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

				Valid	Q3a
		Frequency	Percent	Percent	
Valid Dis litt	sagree a le	4	3.6	3.6	50- 40- 2
Ne	eutral	9	8.0	8.0	19 99 30- 4
Ag	ree a little	53	47.3	47.3	20-
Ag str	jree ongly	46	41.1	41.1	10-
То	tal	112	100.0	100.0	Disagree a little Neutral Agree a little Agree strongly Q3a
Table 7-	12: Conscie	ntiousness I	Distributio	on (Q3a)	Figure 7-11: Conscientiousness Frequency (Q3a)

Conscientiousness (Q3b)

Most of the respondents have selected "agree strongly" with 58.9%; however, many others selected "agree a little" with 34.8% of respondents. Others selected "neutral" answers, and none of the participants selected and "disagree a little" nor "disagree". These results are

indicated in Table 7-13 and Figure 7-12 below, which show these five variables were analysed with 112 valid cases or respondents for each with no data missing.

				Valid	
		Frequency	Percent	Percent	60-
ľ	√alid Neutral	7	6.3	6.3	
	Agree a little	39	34.8	34.8	
	Agree strongly	66	58.9	58.9	20-
	Total	112	100.0	100.0	
_					Q3b
٦	able 7-13: Con	scientiousne	ess Distri	bution	Figure 7-12: Conscientiousness Frequency (Q3b)
(Q3b)				

Conscientiousness (Q3c)

Most of the respondents selected "**agree strongly**" at 62.5%; however, many others, 32.1%, selected "**agree a little**", few others selected "**neutral**" and "**disagree a little**", and no one selected "**disagree**". These results are indicated in Table 7-14 and Figure 7-13 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Conscientiousness (Q3d)

Most of the respondents selected "agree strongly" at about 51.8%; however, 39.3% selected "agree a little", others selected "neutral" and "disagree a little" answers, and no one selected "disagree". These results are indicated in Table 7-15 and Figure 7-14 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Conscientiousness (Q3e)

"Agree strongly" was selected the most often by 39.3% of respondents; however, 38.4% of the others selected "agree a little" answer, some others selected "neutral" and "disagree a little", and the lowest number of respondents selected "disagree". These results are indicated in Table 7-16 and Figure 7-15 below, which show these five variables were analysed with 112 valid cases or respondents for each with no data missing.



Neuroticism

Neuroticism (Q4a)

"Disagree" was selected by 30.4% of respondents; however, many others (25.9%) selected "disagree a little", others selected "neutral" and "agree a little", and only a few others selected "agree strongly" answers. These results are indicated in Table 7-17 and Figure 7-16 below which, show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Neuroticism (Q4b)

"Agree a little" was the most popular answer at 43.8%; however, 25% selected "neutral", others selected "disagree a little", and a few others selected "agree strongly" and "disagree".

These results are indicated in Table 7-18 and Figure 7-17 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Neuroticism (Q4c)

"Agree a little" was selected by 26.8% of respondents, which is the most popular answer. However, others selected "neutral", "disagree", and "disagree a little" and only a few others selected "agree strongly" answers. These results are indicated in Table 7-19 and Figure 7-18 below which, show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Neuroticism (Q4d)

"Agree a little" was the most popular answer with 35.7%; however, 25% of respondents selected "Neutral", and others selected "disagree" and "disagree a little", and the lowest

number of respondents selected "**agree strongly**". These results are indicated in Table 7-20 and Figure 7-19 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Neuroticism (Q4e)

"Neutral" was selected most often with 26.8% of respondents; however, 24.1% selected "disagree a little", others selected "disagree" and "agree a little", and the least selected answer was "agree strongly". These results are indicated in Table 7-21 and Figure 7-20 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

			Valid	1	ſ					Q4e			
	Frequency	Percent	Percent	1	30-								
Valid Disagree	19	17.0	17.0	1									
Disagree a little	27	24.1	24.1		20-								
Neutral	30	26.8	26.8		dneuc								
Agree a little	22	19.6	19.6		е <u>н</u> 10-								
Agree strongly	14	12.5	12.5										
Total	112	100.0	100.0	1	Ļ								
							Disagree	Dis	sagree a little	Q4e	Agree a little	Agree strongly	
Table 7-21: Neuroticism Distribution (Q4e)					Figu	re ′	7-20: N	Neu	iroticisr	n Freq	uency (Ç	2 4e)	

Openness

Openness (Q5a)

Most of the respondents selected "**Agree a little**" at 52.7%; however, many others selected "**agree strongly**" and "**neutral**", and some others selected "**disagree**" and "**disagree a little**". These results are indicated in Table 7-22 and Figure 7-21 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Openness (Q5b)

"Agree strongly" was selected most by 42% of respondents; however, 38.4% selected "agree a little", a few others selected "neutral", and the least popular selections were "disagree" and "disagree a little" answers. These results are indicated in Table 7-23 and Figure 7-22 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	Q5b
Valid Disagree	1	.9	.9	40-
Disagree a little	3	2.7	2.7	à 30-
Neutral	18	16.1	16.1	Jan Barana and Andrea a
Agree a little	43	38.4	38.4	20-
Agree strongly	47	42.0	42.0	
Total	112	100.0	100.0	ussagree ussagree ainttie Noutral Agree ainttie Agree πrongsy Q5b
Table 7-23: Op	enness Dis	tributior	n (Q5b)	Figure 7-22: Openness Frequency (Q5b)



Of the respondents, 48.6% selected "**agree a little**"; however, others selected "**neutral**" and "**agree strongly**", and the least-selected answers were "**disagree**" and "**disagree a little**". These results are indicated in Table 7-24 and Figure 7-23 below, which show these five variables were analysed with 112 valid cases or respondents for each and only 1 datum missing.



Openness (Q5d)

"Agree a little" was selected most often by 42.9% of respondents; however, many others selected "agree strongly" with 37.5%, some others selected "neutral", a few selected "disagree a little", and no one selected "disagree". These results are indicated in Table 7-25 and Figure 7-24 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequency	Percent	Valid Percent		Q5d			
	Valid Disagree a little	1	.9	.9		40-			
	Neutral	21	18.8	18.8		30-			
	Agree a little	48	42.9	42.9		20-			
	Agree strongly	42	37.5	37.5		10-			
	Total	112	100.0	100.0					
					Disagree a little Neutral	Agree a little Q5d	Agree strongly		
•	Table 7-25: Op	enness Dis	tribution	n (Q5d)	gure 7-24: Openness Fre	equency (C	(25d)		

Openness (Q5e)

Most of the respondents selected "**agree a little**" answer, which equated to 54.5%; however, 32.1% selected "**agree strongly**", few others selected "**neutral**", even fewer selected "**disagree**", and no respondent selected "**disagree a little**". These results are indicated in Table 7-26 and Figure 7-25 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Openness (Q5f)

"Neutral" was selected with the highest frequency, which is 35.7% of respondents; however, many others (25.9%) selected "agree a little", others selected "agree strongly" and "disagree a little", and the least-selected answer was "Disagree". These results are indicated in Table 7-27 and Figure 7-26 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Descriptive analysis for Work sector

It can be seen that 49.1% of the respondents were from the "construction,

machinery, and homes" work sector, many other respondents (39.3%) were involved in the "**governmental**" sector, and the "**others**" work sector was indicated by 11.6% of respondents. These results indicate that the majority of respondents from each work sector are involved in infrastructural projects.

This can be seen in Table 7-28 and Figure 7-27 below, which shows these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Descriptive analysis for the knowledge sharing contribution to project success

Of all respondents, 38.4% rated the KS contribution to projects at "10%"; however, 29.5% selected the "7.5%" answer, and a further 29.5% selected "more than 10%". On average, in (these respondents rate the contribution manually and it was found to be 41% on average for this selection);and. Few respondents selected "5%", and the least-selected answers were "0%" and"2.5%". These results are indicated in Table 7-29 and Figure 7-28 below which shows these six variables were analysed with 112 valid cases or respondents for each and no data missing.
			Dereent	Valid		Q7	
		Frequency	Percent	Percent			
	Valid 0	1	.9	.9		40-	
	2.5%	1	.9	.9			
	5%	8	7.1	7.1		A 30-	
	7.5%	33	29.5	29.5		20-	
	10%	43	38.4	38.4			
	More than 10%	26	23.2	23.2		10- 0 2.5% 5% 7.5% 10% More than 10%	
	Total	112	100.0	100.0		Q7	
Table 7-29: KS contribution distribution				istributio	1	Figure 7-28: KS contribution frequency (Q7)
((Q7)						

Descriptive analysis for the current status of knowledge sharing culture in the infrastructure sector

In terms of rating the KS culture in projects, 36.6% of respondents selected "moderately

high"; however, many others (34.8%) selected "medium", some others selected "very

high", and the lowest number of respondents selected "very low" and "low". These results

are indicated in Table 7-30 and Figure 7-29 below, which show these six variables were

analysed with 112 valid cases or respondents for each and no data missing.

				Q8
	Frequency	Percent	Valid Percent	50-
Valid Very low	6	5.4	5.4	40-
Low	9	8.0	8.0	
Medium	39	34.8	34.8	
Moderately high	41	36.6	36.6	20-
Very high	17	15.2	15.2	
Total	112	100.0	100.0	10-
				¯ ∨ery`low Low Medium Moderately high ∨ery`high Q8
Table 7-30: KS cult	ure distribu	tion (Q8)	Figure 7-29: KS culture Frequency (Q8)

Descriptive analysis for the benefits of knowledge sharing in the infrastructural projects

KS benefits (Stakeholder Satisfaction Q9a)

Most of the respondents (53.6%) rated KS benefits to projects in terms of stakeholder

satisfaction as "moderately high"; however, many others (29.5%) selected "very high", a

few others selected **"medium"**, and no respondents selected **"low"** nor **"very low"**. These results are indicated in Table 7-31 and Figure 7-30 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS benefits (Adding value to the project Q9b)

The most frequently selected answer when respondents were asked to rate KS benefits to projects in terms of adding value to the project was "**moderately high**", which was selected by 48.2% of respondents; however, 35.7% selected "**very high**", a few others selected "**medium**", and no respondents selected "**low**" nor "**very low**". These results are indicated in Table 7-32 and Figure 7-31 below which shows these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS benefits (Contribution to project success Q9c)

Of all of the respondents, 45.5% rated KS benefits to projects in terms of contribution to project success as "very high", the most commonly selected; however, many others (40.2%) selected "moderately high", some others selected "medium", a few others selected "low", and no respondents selected "very low". These results are indicated in Table 7-33 and Figure 7-32 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS benefits (Reducing project dispute Q9d)

Among all of the respondents, 41.1% rated KS benefits to projects in terms of reducing project disputes as **"moderately high"**; however, 38.4% selected **"very high"**, which is some others selected **"medium"**, few others selected **"low"**, and no respondents selected **"very low"**. These results are indicated in Table 7-34 and Figure 7-33 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

			Valid	Q9d
	Frequency	Percent	Percent	50-
Valid Low	3	2.7	2.7	40-
Medium	20	17.9	17.9	6 30-
Moderately bigb	46	41.1	41.1	
Very high	43	38.4	38.4	10-
Total	112	100.0	100.0	Low Medium Moderately high Very high
Table 7-34: KS benefits distribution (Q9d) Particular				Figure 7-33: KS benefits frequency (Q9d)

KS benefits (Reducing cost overheads Q9e)

Among all of the respondents, 31.3% rated KS benefits to projects in terms of reducing cost overheads as "moderately high"; however, many others selected "medium" (30.4%), some others selected "very high", a few others selected "low", and the least chosen selection was "very low". These results are indicated in Table 7-35 and Figure 7-34 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Descriptive analysis for the quality of the timeliness of KS in infrastructural projects KS quality (Availability of information Q10a)

Among all of the respondents, 41.1% rated the timeliness of KS in projects in terms of availability of information as "moderately high"; however, many others have selected

"medium" (31.1%), some others selected **"very high"**, and the least chosen answers were **"very low"** and **"low"**. These results are indicated in Table 7-36 and Figure 7-35 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS quality (Reliability of information Q10b)

Among all of the respondents, 45.5% rated the timeliness of KS in projects in terms of reliability of information as "moderately high"; however, many others selected "medium" (32.1%), some others selected "very high", a few others selected "low", and no other respondents selected the "very low" answer. These results are indicated in Table 7-37 and Figure 7-36 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS quality (Response Time of communication Q10c)

Among all of the respondents, 38.4% rated the timeliness of KS in projects in terms of response time of communication as "moderately high"; however, 29.5% of respondents selected "medium", some others selected "very high", and the least frequently selected

answers **were "very low"** and **"low"**. These results are indicated in Table 7-38 and Figure 7-37 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS quality (Relevance to project tasks Q10d)

Among all of the respondents, 43.8% rated the timeliness of KS in projects in terms of relevance to project tasks as "moderately high"; however, many others selected "medium" (28.6%), some others have selected "very high", and the least common answers were "very low" and "low". These results are indicated in Table 7-39 and Figure 7-38 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS quality (Representational of information Q10e)

Among all of the respondents, 46.4% rated the timeliness of KS in projects in terms of representability of information as "moderately high"; however, 30.4% selected

"medium" answer, some others selected **"very high"**, and the least common answers were **"very low"** and **"low"**. These results are indicated in Table 7-40 and Figure 7-39 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS quality (Accessible of information Q10f)

Among all of the respondents, 35.7% rated the timeliness of KS in projects in terms of accessibility of information as "moderately high"; however, many others selected "medium" (32.1%), some others selected "very high", and the least chosen answers were "very low" and "low". These results are indicated in Table 7-41 and Figure 7-40 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Descriptive analysis for the effectiveness of knowledge sharing between stakeholders

KS effectiveness (KS is done on timeQ11a)

Among all of the respondents, 37.5% rated the effectiveness of KS in project lifecycle in

terms of how effective KS is done on time as "moderately very effective"; however,

28.6% selected "effective", some others selected "extremely effective", and "not

effective" and "somewhat effective" were selected least often. These results are indicated in

Table 7-42 and Figure 7-41 below, which show these five variables were analysed with 112

valid cases or respondents for each and no data missing.

		Frequenc y	Percen t	Valid Percen t		Q11a
Vali d	Not effective	2	1.8	1.8		40- 6 yr-
	Somewhat Effective	6	5.4	5.4		
	Effective	32	28.6	28.6		
	Moderatel y Very effective	42	37.5	37.5		10- Not effective Somewhal Effective Effective Moderately Very Extremely effective
	Extremely effective	30	26.8	26.8		Q11a
	Total	112	100.0	100.0		
Table 7-42: KS effectiveness distribution				bution	Figure 7-41: KS effectiveness frequency	
(Q11a)					(Q11a)	

KS effectiveness (KS is associated with depth content Q11b)

Among all of the respondents, 42.9% rated the effectiveness of KS in the project lifecycle in terms of the effectiveness of KS, in terms of its association with depth of content, as **"moderately very effective"**; however, many others selected **"effective"** (32.1%), some others selected **"extremely effective"**, and the least selected answers were **"not effective"** and **"somewhat effective"**. These results are indicated in Table 7-43 and Figure 7-42 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS effectiveness (Availability of shared knowledge on timeQ11c)

Among all of the respondents, 35.7% rated the effectiveness of KS in the project lifecycle in terms of the effectiveness of the availability of shared knowledge on time as "effective"; however, many others selected "moderately very effective" (32.1%), some others selected "extremely effective", the lowest number of respondents selected "not effective" and "somewhat effective". These results are indicated in Table 7-44 and Figure 7-43 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS effectiveness (Usability of shared knowledgeQ11d)

Among all of the respondents, 34.8% rated the effectiveness of KS in the project lifecycle in

terms of the usability of shared knowledge as "moderately very effective"; however,

33% selected **"effective"**, some others selected **"extremely effective"**, and **"not effective"** and **"somewhat effective"** were selected least often. These results are indicated in Table 7-45 and Figure 7-44 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



KS effectiveness (KS is associated with personally ownership Q11e)

Among all of the respondents, 37.5% rated the effectiveness of KS in the project lifecycle in terms of KS's association with personally ownership as **"effective"**; however, many others selected **"moderately very effective"** (26.8%); some others selected **"extremely effective"**, and **"not effective"** and **"somewhat effective"** were selected least. These results are indicated in Table 7-46 and Figure 7-45 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	011e
Valid Not effective	7	6.3	6.3	40-
Somewhat Effective	13	11.6	11.6	₹ 30-
Effective	42	37.5	37.5	
Moderately Very effective	30	26.8	26.8	- 20-
Extremely effective	20	17.9	17.9	
Total	112	100.0	100.0	u Not effective Somewhalt Effective Effective Moderately Very Extremely effective effective Q11e
Table 7-46: KS effectiveness distribution			tion	Figure 7-45: KS effectiveness frequency (Q11e)
(Q11e)				

Descriptive analysis for the enablers of the success of KS in the projects

Organisational factors of KS enablers:

Among all of the respondents, 42% rated the influence of this enabler (E1) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (30.4%), some others selected "moderate impact", and the least chosen answers were "no impact" and "low impact". These results are indicated in Table 7-47 and Figure 7-46 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	E1
Valid No impact	1	.9	.9	
Low impact	3	2.7	2.7	40*
Moderate impact	27	24.1	24.1	Au 30-
Moderately high impact	47	42.0	42.0	ت 20-
Very High impact	34	30.4	30.4	10-
Total	112	100.0	100.0	o No impact Low impact Moderate impact Moderately high ∨ery High impact
				E1
Table 7-47: KS enablers distribution (E1)				Figure 7-46: KS enablers frequency (E1)

Among all of the respondents, 44.6% rated the influence of this enabler (E2) on the success of KS in infrastructural projects as "moderately high impact"; however, 35.7% selected "very high impact", others selected "moderate impact", and the least cited answers were "no impact" and "low impact". These results are indicated in Table 7-48 and Figure 7-47 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 43.8% rated the influence of this enabler (E3) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (31.3%), some others selected "moderate impact", and the least selected answers were "no impact" and "low impact". These results are indicated in Table 7-49 and Figure 7-48 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	E3
Valid No impact	1	.9	.9	40-
Low impact	3	2.7	2.7	ع
Moderate impact	24	21.4	21.4	
Moderately high impact	49	43.8	43.8	10-
Very High impact	35	31.3	31.3	No moact Low inpact Moderate impact Moderate Which Vary High impact
Total	112	100.0	100.0	E3
Table 7-49: KS enablers distribution (E3)			n (E3)	Figure 7-48: KS enablers frequency (E3)

Motivation factors of KS enablers:

Among all of the respondents, 43.8% rated the influence of this enabler (E4) on the success of KS in infrastructural projects as "moderately high impact"; however, 31.3% selected "very high impact", some others selected "moderate impact", and the least frequently selected answers were "no impact" and "low impact". These results are indicated

in Table 7-50 and Figure 7-49 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 39.3% rated the influence of this enabler (E5) on the success of KS in infrastructural projects as "moderately high impact"; however, 30.4% selected "very high impact", some others selected "moderate impact", fewer respondents selected "low impact", and respondents selected "no impact". These results are indicated in Table 7-51 and Figure 7-50 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Process factors of KS enablers:

Among all of the respondents, 44.6% rated the influence of this enabler (E6) on the success of KS in infrastructural projects as "moderately high impact" which is about; however, many others selected "very high impact" (28.6%), some others selected

"moderate impact", and the least frequently chosen were **"no impact"** and **"low impact"**. These results are indicated in Table 7-52 and Figure 7-51 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 43.8% rated the influence of this enabler (E7) on the success of KS in infrastructural projects as "moderately high impact"; however, 25.9% selected "very high impact", some others selected "moderate impact", fewer others selected "low impact", and none selected "no impact". These results are indicated in Table 7-53 and Figure 7-52 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this enabler (E8) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (29.5%), others selected "moderate impact", and

"low impact" and **"no impact"** were selected least. These results are indicated in Table 7-54 and Figure 7-53 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 37.5% rated the influence of this enabler (E9) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (30.4%), some others selected "moderate impact", fewer others selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-55 and Figure 7-54 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 49.1% rated the influence of this enabler (E7) on the success of KS in infrastructural projects as "moderately high impact"; however, 27.7% selected "very high impact", others have selected "moderate impact", fewer others

selected **"low impact"**, and no respondents selected **"no impact"** answers. These results are indicated in Table 7-56 and Figure 7-55 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 40.2% rated the influence of this enabler (E6) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (30.4%), some others have selected "very high impact", fewer others selected "no impact" and "low impact". These results are indicated in Table 7-57 and Figure 7-56 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this enabler (E12) on the success of KS in infrastructural projects as "moderately high impact"; however, 29.5% selected "very high impact", some others selected "moderate impact", and "no impact"

and **"low impact"** were answered least often. These results are indicated in Table 7-58 and Figure 7-57 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	E12
Valid No impact	1	.9	.9	40-
Low impact	6	5.4	5.4	
Moderate impact	25	22.3	22.3	
Moderately high impact	47	42.0	42.0	20-
Very High impact	33	29.5	29.5	
Total	112	100.0	100.0	0 No impact Low impact Moderate impact Moderately high ∨ery High impact Impact E12
Table 7-58: KS enablers distribution (E12)			n (E12)	Figure 7-57: KS enablers frequency (E12)

Among all of the respondents, 42% rated the influence of this enabler (E13) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (33%), some others selected "moderate impact", and fewer others selected "low impact", and no respondents selected "no impact" answers. These results are indicated in Table 7-59 and Figure 7-58 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 47.3% rated the influence of this enabler (E14) on the success of KS in infrastructural projects as "moderately high impact"; however, 27.7% selected "very high impact", some others selected "moderate impact", fewer

respondents selected **"low impact"**, and no respondents selected **"no impact"**. These results are indicated in Table 7-60 and Figure 7-59 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Technological factors of KS enablers:

Among all of the respondents, 50.9% rated the influence of this enabler (E15) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (28.6%), others selected "moderate impact", fewer others selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-61 and Figure 7-60 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 47.3% rated the influence of this enabler (E16) on the success of KS in infrastructural projects as **"moderately high impact"**; however, many

others selected **"very high impact"** (30.4%), some others selected **"moderate impact"** (19.6%), and the fewest respondents selected **"no impact"** and **"low impact"**. These results are indicated in Table 7-62 and Figure 7-61 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this enabler (E17) on the success of KS in infrastructural projects as "moderately high impact"; however, 33% selected "very high impact", others selected "moderate impact" (23.2%), and the fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-63 and Figure 7-62 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 51.8% rated the influence of this enabler (E18) on the

success of KS in infrastructural projects as "moderately high impact"; however, 33.9%

selected **"very high impact"**, 33.9% also selected **"moderate impact"**, fewer others selected **"low impact"**, and no respondents selected **"no impact"** answers. These results are indicated in Table 7-64 and Figure 7-63 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 43.8% rated the influence of this enabler (E19) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (38.4%), others selected "moderate impact" (16.1%), fewer others selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-65 and Figure 7-64 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequency	Percent	Valid Percent	E19]			
	Valid Low impact	requeries	i crociii	1 Croone					
	valiu Low impact	2	1.8	1.8	40-				
	Moderate impact	18	16.1	16.1	ê 30-				
n	Moderately high impact	49	43.8	43.8					
	Very High impact	43	38.4	38.4	10-				
	Total	112	100.0	100.0					
					0 Low impact Moderate impact Moderately high impact ∨ery High impact E19				
				··· (E10)	$\mathbf{F}_{\mathbf{r}} = \mathbf{T} \left(\mathbf{A} \mathbf{K} \mathbf{G} - 1 1 - \mathbf{G} \right) $				
I able 7-65: KS enablers distribution (E19)				n (E19)	Figure 7-64: KS enablers frequency (E19)				

Among all of the respondents, 41.1% rated the influence of this enabler (E20) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (32.1%), others selected "moderate impact", fewer others selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-66 and Figure 7-65 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 39.3% rated the influence of this enabler (E21) on the success of KS in infrastructural projects as "moderately high impact"; however, many others have selected "very high impact" (31.3%), others selected "moderate impact", and the fewest percentage of respondents selected "no impact" and "low impact". These results are indicated in Table 7-67 and Figure 7-66 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	E21	
Valid No impact	1	.9	.9	40-	
Low impact	4	3.6	3.6	ē 30-	
Moderate impact	28	25.0	25.0	ар 20-	
Moderately high impact	44	39.3	39.3	10-	
Very High impact	35	31.3	31.3	0 No impact Low impact Moderate impact Moderately high Very High impact	
Total	112	100.0	100.0	E21	

Table 7-67: KS enablers distribution (E21)	Figure 7-66: KS enablers frequency (E21)
--------------------------------------------	------------------------------------------

Social networking factors of KS enablers:

Among all of the respondents, 42.9% rated the influence of this enabler (E22) on the success of KS in infrastructural projects as "very high impact"; however, 29.5% selected "moderately high impact", 22.3% selected "moderate impact", and the least frequently chosen answers were "no impact" and "low impact". These results are indicated in Table 7-68 and Figure 7-67 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 33.9% rated the influence of this enabler (E23) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (33%), 26.8% selected "very high impact", and fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-69 and 7-68 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequenc	Percen	Valid Percen		40-			E23			
		у	l	l								
Valı d	No impact	1	.9	.9		30-						
~	Low impact	6	5.4	5.4		Acuanda 20-						
	Moderate impact	37	33.0	33.0		Fre						
	Moderatel y high impact	38	33.9	33.9		10-						
	Very High impact	30	26.8	26.8		-	No impact	Low impact	Moderate impact	Moderately high impact	Very High impact	
	Total	112	100.0	100.0								
Table 7-69: KS enablers distribution (E23)			Figur	e 7-68: I	KS enal	olers fre	equency	(E23)				

Among all of the respondents, 39.3% rated the influence of this enabler (E24) on the success of KS in infrastructural projects as "moderately high impact"; however, 30.4% selected "very high impact", some others selected "moderate impact", and the least popular answers were "no impact" and "low impact". These results are indicated in Table 7-70 and Figure 7-69 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this enabler (E25) on the success of KS in infrastructural projects as **"moderately high impact**"; however, many others selected **"moderate impact"** (33%), some others selected **"very high impact"** (17.9%), and the least popular answers were **"no impact"** and **"low impact"**. These results

are indicated in Table 7-71 and Figure 7-70 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 36.6% rated the influence of this enabler (E26) on the success of KS in infrastructural projects as "moderately high impact"; however, 33.9% selected "moderate impact", 22.3% selected "very high impact", and fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-72 and Figure 7-71 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 37.5% rated the influence of this enabler (E27) on the

success of KS in infrastructural projects as "moderately high impact"; however, many

others selected **"moderate impact"** (31.3%), some others selected **"very high impact"** (24.1%), and the least frequently selected answers were **"no impact"** and **"low impact"**. These results are indicated in Table 7-73 and Figure 7-72 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Physical environment factors of KS enablers:

Among all of the respondents, 33.9% rated the influence of this enabler (E28) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (30.4%), some others selected "very high impact" (28.6%), fewer respondents selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-74 and Figure 7-73 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Table 7-74: KS enablers distributionFigure 7-73: KS enablers frequency (E28)(E28)

Among all of the respondents, 36.6% rated the influence of this enabler (E29) on the success of KS in infrastructural projects as "moderately high impact"; however, 31.3% selected "moderate impact", 29.5% selected "very high impact", few others selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-75 and Figure 7-74 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequenc y	Percen t	Valid Percen t		E29
Vali d	Low impact	3	2.7	2.7		
	Moderate impact	35	31.3	31.3		20- 20-
	Moderatel y high impact	41	36.6	36.6		
	Very High impact	33	29.5	29.5		‴ Low impect Moderate impact Moderately`high impact ∨ery Hsgh impact E29
	Total	112	100.0	100.0		
Table 7-75: KS enablers distribution					Figure 7-74: KS enablers frequency (E29)	
(E29)						

Among all of the respondents, 38.4% rated the influence of this enabler (E30) on the success of KS in infrastructural projects as "moderately high impact" which is about; however, many others have selected "moderate impact" (29.5%), some others selected "very high impact" (25.9%), and few popular answers were "low impact" and "no impact". These results are indicated in Table 7-76 and Figure 7-75 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Individuals factors of KS enablers:

Among all of the respondents, 41.1% rated the influence of this enabler (E31) on the success of KS in infrastructural projects as "moderately high impact"; however, 32.1% selected "very high impact", 23.2% selected "moderate impact", few respondents selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-77 and Figure 7-76 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this enabler (E32) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (30.4%), some others selected "moderate impact" (24.1%), few respondents selected "low impact", and none selected "no impact". These

results are indicated in Table 7-78 and Figure 7-77 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	50-	E32
Valid Low impact	4	3.6	3.6	40-	
Moderate impact	27	24.1	24.1	-05 gen	
Moderately high impact	47	42.0	42.0	ррания 20-	
Very High impact	34	30.4	30.4	10-	
Total	112	100.0	100.0		
					Low impact Moderate impact Moderately nign impact Very Hign impact E32
Table 7-78: KS enablers distribution(E32)					re 7-77: KS enablers frequency (E32)

Among all of the respondents, 47.3% rated the influence of this enabler (E33) on the success of KS in infrastructural projects as "moderately high impact"; however, 28.6% selected "very high impact", some others selected "moderate impact", few others selected "low impact", and none selected "no impact" answers. These results are indicated in Table 7-79 and Figure 7-78 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42.9% rated the influence of this enabler (E34) on the success of KS in infrastructural projects as "very high impact"; however, 40.2% selected "moderately high impact", some others selected "moderate impact", fewer others selected "low impact", and no respondents selected "no impact". These results are

indicated in Table 7-80 and Figure 7-79 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 39.3% rated the influence of this enabler (E35) on the success of KS in infrastructural projects as "very high impact"; however, many others selected "moderately high impact" (38.4%), some others selected "moderate impact" (22.3%), and no respondents selected "no impact" nor "low impact". These results are indicated in Table 7-81 and Figure 7-80 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 41.1% rated the influence of this enabler (E36) on the success of KS in infrastructural projects as "moderately high impact"; however, 29.5% selected "very high impact", some others selected "moderate impact", few people selected "low impact", and no respondents selected "no impact". These results are indicated in Table 7-82 and Figure 7-81 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequency	Percent	Valid Percent	E36
Valid Low impac	t	7	6.3	6.3	40-
Moderate impact		26	23.2	23.2	
Moderately high impac	/ ct	46	41.1	41.1	
Very High impact		33	29.5	29.5	
Total		112	100.0	100.0	Low impact Moderate impact Moderately high impact Very High impact E36
Table 7-82: KS enablers distribution (E36)				(E36)	Figure 7-81: KS enablers frequency (E36)

Descriptive analysis for the barriers of the success of KS in the projects Individuals factors of KS barriers:

Among all of the respondents, 34.8% rated the influence of this barrier (B1) on the success of KS in infrastructural projects as "moderate impact" which is about; however, 29.5% selected "moderately high impact", 26.8% selected "very high impact", and the least frequently selected answers were "no impact" and "low impact". These results are indicated in Table 7-83 and Figure 7-82 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequency	Percent	Valid Percent	B1
	Valid No impact	2	1.8	1.8	
	Low impact	8	7.1	7.1	30-
	Moderate impact	39	34.8	34.8	20- ⊥.
	Moderately high impact	33	29.5	29.5	
	Very High impact	30	26.8	26.8	
	Total	112	100.0	100.0	No impact Low impact Moderate impact Moderate impact Moderate impact
					В1
-	Table 7-83: KS barriers distribution (B1)				Figure 7-82: KS barriers frequency (B1)

Among all of the respondents, 43.8% rated the influence of this barrier (B2) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (33%), some others selected "very high impact", and the fewest respondents selected "no impact" and "low impact". These results are indicated

in Table 7-84 and Figure 7-83 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this barrier (B3) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (25.9 %, some others selected "very high impact" (25%), and fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-85 and Figure 7-84 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 45.5% rated the influence of this barrier (B4) on the success of KS in infrastructural projects as "moderately high impact"; however, "very high impact" and "moderate impact" each were selected by 24.1% of respondents, and few respondents selected "no impact" and "low impact". These results are indicated in

Table 7-86 and Figure 7-85 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (29.5%), some others selected "moderate impact", fewer others selected "no impact", and no respondents selected "low impact". These results are indicated in Table 7-87 and Figure 7-86 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 42% rated the influence of this barrier (B6) on the success of KS in infrastructural projects as "moderately high impact"; however, 26.8% selected "very high impact", some others selected "moderate impact", and the least frequently

selected answers were **"no impact"** and **"low impact"**. These results are indicated in Table 7-88 and Figure 7-87 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Organisational factors of KS barriers:

Among all of the respondents, 40.2% rated the influence of this barrier (B7) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (27.7%), some others have selected "very high impact", and the fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-89 and Figure 7-88 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 45.5% rated the influence of this barrier (B8) on the

success of KS in infrastructural projects as "moderately high impact"; however, "very

high impact" and "**moderate impact**" were each selected by 24.1% of respondents, and fewer others selected "**no impact**" and "**low impact**". These results are indicated in Table 7-90 and Figure 7-89 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	B8 60-	[
Valid No impact	4	3.6	3.6	50-	
Low impact	3	2.7	2.7	40- 5	
Moderate impact	27	24.1	24.1	5 30- -	
Moderately high impact	51	45.5	45.5	10-	
Very High impact	27	24.1	24.1	o No impact Low impact Moderate impact Moderately high Very High impact	1
Total	112	100.0	100.0	B8	
Table 7-90: KS barriers distribution (B8)				Figure 7-89: KS barriers frequency (B8)	

Among all of the respondents, 45.5% rated the influence of this barrier (B9) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (26.8%), some others selected "very high impact", and fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-91 and Figure 7-90 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 39.3% rated the influence of this barrier (B10) on the

success of KS in infrastructural projects as "moderately high impact"; however, many

others selected **"moderate impact"** (29.5%), some others have selected **"very high impact"**, and the fewest respondents selected **"no impact"** and **"low impact"**. These results are indicated in Table 7-92 and Figure 7-91 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 38.4% rated the influence of this barrier (B11) on the success of KS in infrastructural projects as "moderately high impact"; however, 31.3% selected "very high impact", some others selected "moderate impact", and the least popular answers were "no impact" and "low impact". These results are indicated in Table 7-93 and Figure 7-92 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

		Frequency	Percent	Valid Percent	B11	
Valid	No impact	3	2.7	2.7	40-	
	Low impact	7	6.3	6.3	≥ ₃₀₋	
	Moderate impact	24	21.4	21.4		
	Moderately high impact	43	38.4	38.4	10-	
	Very High impact	35	31.3	31.3	0 No impact Low impact Moderate impact Moderately High Very High impact	
	Total	112	100.0	100.0	imped 5 5 5 5	

Table 7-93: KS barriers distribution (B11)	Figure 7-92: KS barriers frequency (B11)
--------------------------------------------	------------------------------------------

Among all of the respondents, 43.8% rated the influence of this barrier (B12) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (28.6%), some others selected "moderate impact", and the least few popular selections were "no impact" and "low impact". These results are indicated in Table 7-94 and Figure 7-93 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



success of KS in infrastructural projects as "moderately high impact"; however, 25.9% selected "very high impact", some others selected "moderate impact", and the least frequently selected answers were "no impact" and "low impact". These results are indicated in Table 7-95 and Figure 7-94 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.
			Valid	B13
	Frequency	Percent	Percent	50-
Valid No impact	2	1.8	1.8	
Low impact	5	4.5	4.5	40-
Moderate impact	27	24.1	24.1	
Moderately high impact	49	43.8	43.8	20-
Very High impact	29	25.9	25.9	10-
Total	112	100.0	100.0	
				0 No impact Low impact Moderate impact Moderately high ∨ery High impact impact
				B13
Table 7-95: KS barriers distribution (B13)				Figure 7-94: KS barriers frequency (B13)

Among all of the respondents, 50.9% rated the influence of this barrier (B14) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "very high impact" (23.2%), some others selected "moderate impact", and the least popular selections were "no impact" and "low impact". These results are indicated in Table 7-96 and Figure 7-95 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 41.1% rated the influence of this barrier (B15) on the success of KS in infrastructural projects as "moderately high impact"; however, 27.7% selected "moderate impact", some others selected "very high impact", and the least frequently chosen answers were "no impact" and "low impact". These results are indicated

in Table 7-97 and Figure 7-96 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Technological barriers of KS barriers:

Among all of the respondents, 45.5% rated the influence of this barrier (B16) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (29.5%), some others selected "very high impact", and the fewest respondents selected "no impact" and "low impact". These results are indicated in Table 7-98 and Figure 7-97 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 36.6% rated the influence of this barrier (B17) on the success of KS in infrastructural projects as "moderately high impact"; however, many others selected "moderate impact" (31.3%), some others selected "very high impact", and the least frequently selected answers were "no impact" and "low impact". These results are indicated in Table 7-99 and Figure 7-98 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.



Among all of the respondents, 38.4% rated the influence of this barrier (B18) on the success of KS in infrastructural projects as "moderately high impact"; however, "very high impact" and "moderate impact" were each selected by 26.8% of respondents, and the least popular answers were "no impact" and "low impact". These results are indicated in Table 7-100 and Figure 7-99 below, which show these five variables were analysed with 112 valid cases or respondents for each and no data missing.

	Frequency	Percent	Valid Percent	B18
Valid No impact	2	1.8	1.8	40-
Low impact	7	6.3	6.3	
Moderate impact	30	26.8	26.8	Access to the second seco
Moderately high impact	43	38.4	38.4	20-
Very High impact	30	26.8	26.8	
Total	112	100.0	100.0	Noimpact Low impact Moderate impact Moderately high ∨ery High impact impact B18
Table 7-100: KS barriers distribution				Figure 7-99: KS barriers frequency (B18)
(B18)				

7.2.3 Ranking Analysis

Ranking analysis is performed on the personality traits, knowledge effectiveness, enablers and barriers groups to statistically representing the attributes showing levels of impact of them on the KS in the infrastructural projects in the UAE.

Ranking of Personality Traits

A ranking test was performed for each of the five groups of personality traits in infrastructural project knowledge to highlight the level of significance of these attributes in understanding the personalities and behaviours of project stakeholders in infrastructural projects. Table 7-101 below shows the highest level of significance of the personality traits of stakeholders at each stage of the project lifecycle.

Table 7-101:Ranking of each personality traits						
	Rankir	ng Mean	Std. Deviation			
Q2e	1	6	.553			
Q3c	2	4.56	.626			
Q3b	3	4.53	.615			
Q2d	4	4.52	.615			
Q3d	5	4.42	.680			
Q2a	6	4.39	.884			
Q2b	7	4.38	.830			
Q3a	8	4.26	.756			
Q1b	9	4.23	.910			
Q5b	10	4.18	.862			
Q5d	11	4.17	.758			
Q5e	12	4.17	.709			
Q1e	13	4.12	.928			
Q1d	14	4.05	.919			
Q1c	15	4.04	.884			
Q3e	16	4.04	1.030			
Q5a	17	3.94	.809			
Q5c	18	3.84	.837			
Q1a	19	3.35	1.243			
Q5f	20	3.33	1.102			
Q4b	21	3.28	1.092			
Q4d	22	3.19	1.205			
Q4c	23	2.87	1.319			
Q4e	24	2.87	1.270			
Q4a	25	2.41	1.227			
Table 7-102	: Rank	ing of pers	onality traits as g	groups		
		Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Ranking		3	1	2	5	4
· ·						
Mean		3.958	9 4.4089	4.3607	2,9214	3,9378

Median	4.0000	4.4000	4.4000	3.0000	4.0000
Mode	4.20	4.80	5.00	3.00	3.83
Std. Deviation	.66638	.45905	.57003	.94473	.59461

All ranking results from Table 7-101 were higher than 2.92, but only the rankings of **Q2e**, **Q3c**, **Q3b**, **Q2d**, **and Q3d** were greater than or equal to 2.41, as shown above.

The ranking statistics in Table 7-102 show that the individuals in the personality trait group for agreeableness has the most significant impact on the behaviour of stakeholders in infrastructural projects, and the conscientiousness group has the second-highest impact (mean > 4.35).

Both extraversion and openness are shown to have a mid-level impact on determining the personal traits of project stakeholders (mean < 3.96). On other hand, the least significant impact on the personal behaviour of stakeholders in infrastructural projects is from the **neuroticism** group (mean < 2.93).

In the same context, the most significant elements of those who embody agreeableness as a personality trait are listed as follows: like to cooperate with others (Q2e) and are considerate and kind to almost everyone (Q2d). Also, the most significant elements of conscientiousness are the ability to communicate between project stakeholders regarding the project through specific channels, perseverance until tasks are finished (Q3c), reliability as a worker (Q3b), and then efficient completion of tasks (Q3d). This result supports the research output because it determines the most significant personality traits to predict personality behaviours of project stakeholders concerning sharing knowledge at every phase of the lifecycle of infrastructural projects. This finding is subjected to comparison with the literature review findings.

Ranking of knowledge sharing benefits

A ranking test was performed for each of the five groups of benefits of shared knowledge in the infrastructural project knowledge to highlight the level of impact of these benefit attributes on infrastructural projects. The following Table 7-103 shows the highest level of the benefits of KS between stakeholders at each stage of the project lifecycle.

Table 7-103: Ranking of KS benefits						
	Ranking	Mean	Std. Deviation			
Q9c	1	4.29	.755			
Q9b	2	4.20	.695			
Q9d	3	4.15	.808			
Q9a	4	4.12	.673			
Q9e	5	3.71	1.026			

Overall, all ranking results were more than 3.71, but only the ranking of **Q9c**, **Q9b**, **Q9a**, **and Q9d** was greater than or equal to 4.15, which introduces the possibility to consider them as shown above.

Table 7-103 shows that the highest levels of benefits of shared knowledge in the infrastructural projects come from contribution to project success (**Q9c**), adding value to the project (**Q9b**), reducing project disputes (**Q9d**), and stakeholder satisfaction (**Q9a**).

The below Table 7-104 shows the three highest levels of benefits of shared knowledge in the infrastructural projects:

Var. code	Questionnaire question	Mean
Q9c	Contribution to project success	4.29
Q9b	Adding value to the project	4.20
Q9d	Reducing project dispute	4.15

Table 7-104: Ranking of KS benefits

This result supports the research output by determining the benefits that might be gained from timely KS in infrastructural projects. This finding is subjected to comparison with the literature review findings.

Ranking of quality of timeliness of KS

A ranking test was performed for each of the six groups of the timeliness of KS to highlight the impact of the attributes in each of the quality measures of timeliness of KS in infrastructural projects. The following Table 7-105 shows the highest level of the effectiveness measures of KS between stakeholders at each stage of the project lifecycle.

Table 7-105: Ranking of KS quality						
	Ranking	Mean	Std. Deviation			
Q10d	1	3.87	.840			
Q10a	2	3.85	.851			
Q10c	3	3.80	.919			
Q10b	4	3.79	.784			
Q10e	5	3.74	.878			
Q10f	6	3.71	.983			

Table 7-106 below shows that the highest three levels of quality measures of timeliness of KS in infrastructural projects are as follows.

All ranking results were above 3.71, but only the rankings of **Q10d**, **Q10a**, **and Q10c** were greater than 3.80, as shown above.

The ranking statistics in Table 7-106 indicate that the highest levels of the quality measures of timeliness of KS in infrastructural projects are relevance to project tasks (Q10d), availability of information (Q10a), and response time of communication (Q10c).

Table 7-106: Ranking	of quality of t	timeliness of KS	in infrastructural	projects
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Var. code	Questionnaire question	Mean
Q10d	Relevance to project tasks	3.88
Q10a	Availability of information	3.85
Q10c	Response Time of communication	3.80

This result supports the research output in that it explains how to measure the effectiveness of KS between stakeholders at every phase of the lifecycle of infrastructural projects. This finding is subjected to comparison with the literature review findings.

Ranking of effectiveness of knowledge sharing

A ranking test was implemented for each of the levels of effectiveness of KS between stakeholders at each stage of the project lifecycle to highlight the effectiveness of the attribute measures in each of the variables of the success KS in infrastructural projects. The following Table 7-107 shows the highest level of the effectiveness measures of KS between stakeholders at each stage of the project lifecycle.

Table 7-107: Ranking of KS effectiveness						
	Ranking	Mean	Std. Deviation			
Q11a	1	3.82	.951			
Q11d	2	3.64	.994			
Q11c	3	3.64	.994			
Q11b	4	3.60	.885			
Q11e	5	3.38	1.101			

The below Table 7-108 shows that the two highest levels of the effectiveness measures of KS between stakeholders at each stage of the project lifecycle are as follows:

All ranking results were greater than 3.67, but only the rankings of **Q11a**, **Q11c**, **and Q11d** were greater than 3.38, as shown above.

The ranking statistics in Table 7-108 demonstrate that the most effective measures of KS between stakeholders at each stage of the project lifecycle were when KS is done on time (**Q11a**), the availability of shared knowledge is on time (**Q11c**), and there is usability of shared knowledge (**Q11d**).

Var. code	Questionnaire question	Mean
Q11a	Knowledge sharing is done on time	3.82
Q11c	Availability of shared knowledge on time	3.64
Q11d	Usability of shared knowledge	3.64

Table 7-108: Ranking of the effectiveness of knowledge sharing

This result supports the research output by expressing how to measure the effectiveness of KS between stakeholders at every phase of the lifecycle of infrastructural projects. This finding is subjected to comparison with the literature review findings.

Ranking of the success knowledge sharing enablers

A ranking test was conducted for each of the seven groups of KS success enablers to highlight the level of impact of the attributes in each of the enablers' variables on the success of KS in infrastructural projects. The following Table 7-109 shows the level of impact of KS enablers' variables on the success of KS in infrastructural projects.

Table 7-109: Ranking of all KS enablers					
	Ranking	Mean	Std. Deviation		
E34	1	4.22	.813		
E19	2	4.19	.766		
E35	3	4.17	.770		
E18	4	4.17	.734		
E2	5	4.12	.836		
E22	6	4.09	.954		
E13	7	4.06	.797		
E15	8	4.06	.739		
E17	9	4.05	.826		
E16	10	4.04	.810		
E20	11	4.03	.822		
E3	12	4.02	.849		
E31	13	4.02	.838		
E32	14	3.99	.833		
E33	15	3.99	.833		
E10	16	3.98	.838		
E1	17	3.98	.859		
E14	18	3.97	.832		
E21	19	3.96	.890		
E6	20	3.96	.884		
E5	21	3.96	.864		
E36	22	3.94	.883		
E12	23	3.94	.903		
E24	24	3.93	.917		
E29	25	3.93	.846		
E9	26	3.92	.902		
E8	27	3.90	.958		
E4	28	3.89	.981		
E7	29	3.88	.892		
E28	30	3.84	.926		

E30 E23 E27 E26 E11 E25 Table 7-1	10: Rankin	31 32 33 34 35 36 : Ranking of KS enablers		3.83 3.80 3.77 3.72 3.71 3.70 as groups		.909 .928 .939 .932 .936 .868	
	Organisational _enablers	Motivation_en ablers	Processes_en ablers	Technology_e nablers	Social_networking_ enablers	Physical_environment _enablers	Individual_en ablers
Ranki ng	3	4	5	1	7	6	2
Mean	4.0387	3.9241	3.9236	4.0727	3.8348	3.8661	4.0551
Median	4.0000	4.0000	4.0000	4.0000	3.8333	4.0000	4.0000
Mode	4.00	4.00	4.00	4.00	3.50	4.00	5.00
Std. Deviation	.77077	.82803	.66282	.63916	.72786	.73448	.67055

All ranking results were greater than 3.70, but only the rankings of **E34**, **E19**, **E18**, **E35**, **E2**, **E22**, **E13**, **E15**, **E17**, **E16**, **E20**, **E3**, and **E31** were greater than or equal to 4, as shown above.

The ranking statistics in Table 7-110 demonstrate that the enablers groups with the most significant impact on the success of KS in infrastructural projects are **the technological enablers** groups, then **individual enablers** group, and then **the organisational enablers** group (mean > 4).

On other hand, the least impactful enablers groups on the success of KS in infrastructural

projects are the social networking enablers, physical environment enablers, process

enablers and motivation enablers groups. These groups can be considered to have an

insignificant level of impact on the success of KS in infrastructural projects compared to

other groups (mean < 4).

Table 7-111 below shows that the 10 KS enablers with the highest level of impact on the success KS in infrastructural projects are as follows:

Var. code	Questionnaire question	Mean
E34	Teamwork & teambuilding in UAE infrastructural projects via KS.	4.22
E19	Awareness of the importance of technologies and IT resources to share knowledge in UAE infrastructural projects.	4.19

 Table 7-111: Ranking of Key KS enablers

E18	Implementation of sufficient technologies resources to enhance communication between dispersed project stakeholders.	4.17
E35	Loyalty and hard work to increase project success via KS.	4.17
E2	Awareness of the important role of KS has in increasing the project success.	4.12
E22	Implementation of technical tools of communication, such as emails and groupware, or discussion applications to share knowledge between dispersed team members.	4.09
E13	The ability to communicate between project stakeholders regarding the project through specific channels.	4.06
E15	Implementation of sufficient technologies resources in all of the day-to-day project processes of KS.	4.06
E17	Implementation of sufficient technologies resources to clarify roles and responsibilities of project stakeholders.	4.05
E16	Implementation of sufficient technologies resources for documentation specific for lessons learnt and best practices.	4.04
E20	Implementation of sufficient technologies resources for KS feedback and measurements.	4.03
E3	Organisational commitment to project KS.	4.02
E31	Self-motivation and value to share knowledge with other project stakeholders.	4.02

In the same context, **the most significant organisational enablers were found to be as follows:** Awareness of the important role KS has in increasing project success (**E2**) and organisational commitment to KS in projects (**E3**). **The most significant process enablers are as follows:** Communication between project stakeholders regarding the project through specific channels (**E13**). **The most significant technological enablers can be listed as follows:** Awareness of the importance of technologies and IT resources to share knowledge in UAE infrastructural projects (**E19**), implementation of sufficient technological resources to enhance communication between dispersed project stakeholders (**E18**), implementation of sufficient technological resources in all of the day-to-day project processes of sharing knowledge (**E15**), implementation of sufficient technological resources to clarify roles and responsibilities of project stakeholders (**E17**), implementation of sufficient technological resources for documentation specifically for lessons learnt and best practices (**E16**), and implementation of sufficient technological resources for KS feedback and measurements (E20). The most significant social networking enabler is listed as follows: Implementation of technical tools of communication, such as emails and groupware or discussion applications to share knowledge between dispersed team members (E22). Finally, the most significant individual enablers were found to be teamwork and teambuilding in infrastructural projects in the UAE via KS (E34), loyalty and hard work to increase project success via KS (E35), and self-motivation to share knowledge with other project stakeholders (E31).

This result supports the research output because it offers insight into the most important enablers of successful KS between stakeholders at every phase of the lifecycle of infrastructural projects. This finding is subjected to comparison with the literature review findings.

Ranking of the success knowledge sharing barriers

A ranking test was completed for each of the three groups of barriers to successful KS to highlight the impact of the attributes in each of the barriers on successful KS in infrastructural projects. The following Table 7-112 shows the highest level of impact of the KS barrier variables on the success of KS in infrastructural projects.

Table 7-112: Ranking of each KS barriers					
	Ranking	Mean	Std. Deviation		
B12	1	3.96	.874		
B11	2	3.89	1.008		
B14	3	3.89	.863		
B13	4	3.88	.912		
B6	5	3.87	.944		
B4	6	3.86	.899		
B8	7	3.84	.945		
B18	8	3.82	.961		
B3	9	3.81	.973		
B2	10	3.81	.811		
B16	11	3.79	.843		
B5	12	3.78	1.046		
B17	13	3.78	.946		
B7	14	3.74	.993		

2	0	1

B9 B10 B1 B15 Valid N (lis	15 16 17 18 :twise)	3.73 3.73 3.72 3.67		949 949 997 934		
Table 7-1	Table 7-113: Ranking of KS barriers as groups					
	Individual_barrie	s Organisation	al_barriers	<u>Fechnological</u>	barriers	
Ranking	2	1		3		
Mean	3.808	0	3.8145		3.7946	
Median	3.833	3	3.8889		4.0000	
Mode	4.3	3	3.89		4.00	
Std. Deviation	.7152	7	.69579		.79064	

All ranking results were higher than 3.67, but only the rankings of B12, B11, B14, B13, and B6 were greater than or equal to 3.87, as shown above. The ranking statistics in Table 7-113 show the organisational barriers group has the most significant impact on the success of KS in infrastructural projects, whereas the individual barriers group has the second highest impact on the success of KS in infrastructural projects. On other hand, the technological barriers group seems to have an insignificant impact on the success of KS in infrastructural projects compared to other groups (mean < 3.8).

The below Table 7-114 shows the five KS barriers with the highest level of impact on the success of KS in infrastructural projects. In the same context, the most significant organisational barriers are listed as the influence of organisational structure changes on motivation to share knowledge (B12), the use of a strong hierarchy or position occupied by people to intimidate others from KS (B11), the lack of a suitable corporate culture of KS (B14), and finally a lack of a motivational policy of KS (B13). On the other hand, the most significant individual barrier is the difficulty to communicate and share knowledge with other stakeholders (B6).

I able	Table 7-114: Ranking of Key KS barriers					
Var.	Questionnaire question	Mean				
code						
B12	The influence of organisational structures changes upon motivation to share	3.96				
	knowledge.					

7 4 4 4 5 ... C 17

B11	The use of strong hierarchy and position occupied by people to intimidate others from knowledge sharing.	3.89
B14	Lack of a suitable corporate culture of knowledge sharing.	3.89
B13	Lack of motivation policy of knowledge sharing.	3.88
B6	Difficulty to communicate and share knowledge with other stakeholders.	3.87

This result supports the research output because it explains the most important barriers of successful KS between stakeholders at every phase of the lifecycle of infrastructural projects. This finding is subjected to comparison with the literature review findings.

7.2.4 Normality test

The research question must be understood before selecting which statistical tests to apply. Different researchers recommend that it is necessary to address population distribution, sample size, and the type of measurement aspects in order to understand the research questions.

Statistical tests are categorised into two main categories: parametric and non-parametric statistical tests. Parametric tests are applied to data that have normal particular distribution, which assumes a continuous scale of measurement and involves interval and ratio data. Additionally, several statistical techniques are applied only for nearly normally distributed variables, and such techniques include T-tests, F-tests, and regression analyses.

Meanwhile, non-parametric tests rely on ranks or marks more than definite data, so this type is more applicable for a nominal or ordinal scale of measurements. Furthermore, nonparametric tests are ideal for smaller sample sizes.

Normality can be assessed through either visual inspection of P-P and Q-Q plots or statistical criteria such as skew and kurtosis values, which are likely to be close to zero in a normal distribution. According to the central limit theorem, an increase in sample size results in increasing confidence that the sampling distribution is normal.

Skew is used to test the distribution symmetry; positive skew values indicate several low scores, whereas negative skew values indicate several high scores. On the other hand, positive kurtosis values show a sharp and weighty tailed distribution, whereas negative kurtosis values show a level and lightly tailed distribution. It is recommended that the data is not normally distributed if kurtosis and skewness values are not between -2 and +2.

Furthermore, there are different tests for distribution normality, such as Shapiro-Wilk (for a sample size < 2000), Kolmogorov-Smirnov (for a sample size >2000), Anderson-Darling, and Lilliefors. Since these tests do not have similar results at all times, the Shapiro-Wilk and Kolmogorov-Smirnov tests were applied for this research.

Normality test for Personality traits group

The outcomes of the normality test are shown in Table 7-115 together with the histograms for the five personality traits groups are presented below in Figure 7-100.

Table 7-115: Test of normality for five personality traits groups						
		Tests of No	rmality			
	Kolmo	ogorov-Smirn	OV ^a	Sh	napiro-Wilk	
	Statistic	df	Sig.	Statistic	df	Sig.
Extraversion	.097	112	.012	.962	112	.003
Agreeableness	.171	112	.000	.917	112	.000
Conscientiousness	.146	112	.000	.898	112	.000
Neuroticism	.122	112	.000	.972	112	.017
Openness	.091	112	.023	.972	112	.018
a. Lilliefors Significance Correction						



It can be detected from the above histograms and the test of normality that the data are not normally distributed.

For the test of normality, a significance value higher than 0.05 indicates the data is normally distributed. Consequently, if the significance value is less than 0.05, this means that the data are not normally distributed, as shown in Table 6.124.

For this case, the continuous scale (rank order) is implemented as a scale of measurement. In addition, the sample size was small (n = 112), so a non-parametric test, which is more appropriate for smaller sample sizes, was used for this case. Subsequently, non-parametric techniques were implemented for the data analysis of this personality group.

Normality test for the group of effectiveness of knowledge sharing in UAE infrastructural projects

As mentioned before, the group of effectiveness of KS in UAE infrastructural projects (EFF) which includes work sector (Question 6), the KS contribution to project success (Question 7), the current status of the KS culture in the infrastructure sector (Question 8), the benefits of KS in infrastructural projects (Question 9), the quality of the timeliness of KS in infrastructural projects (Question 10), and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Question 11).

The outcomes of the normality test are shown in Table 7-116 together with the histograms for the knowledge effectiveness group are presented below in Figure 7-101.







It can be detected from the above histograms and the test of normality that the data are not normally distributed.

For the test of normality, if the significance value is more than 0.05, then the data are normally distributed. Conversely, as the significance value is less than 0.05, this value means that the data are not normally distributed, as shown in Table 6.125.

For this case, continuous scale (rank order) was implemented as scale of measurement. In addition, the sample size was small (n = 112), so a non-parametric test, which is more appropriate for small sample sizes, was used for this case. Subsequently, non-parametric techniques are implemented for the data analysis of this KS effectiveness group.

7.3 Chapter Summary

The personality traits, different KS effectiveness factors, and KS enablers and barriers of this research have been presented. These ideas have been described and applied in this research with the contribution of knowledge management experts. Reliability tests were applied initially to clean data and identify what data should be considered. The statistical data were evaluated based on contributions in the literature review, and the scaled survey was crafted with respect to the respondents' working sectors and personality traits. The data obtained have been applied in this chapter in order to further develop this study's next stages, such as data

ranking and factor analysis, in the following chapters. Ranking analysis has been performed based on the weighted mean and standard deviation of each variable of the personality traits, knowledge effectiveness, enablers group, and barriers groups to statistically represent the attributes and show the levels of their impact on KS in projects. These significant factors must be considered in future studies. As shown in the tables earlier in this chapter, the rating and ranking of the questionnaire variables show some similarities and differences amongst the respondents. These ideas are subjected to more detailed discussion the upcoming sections. Furthermore, the Shapiro-Wilk test, Kolmogorov-Smirnov test, and visual inspections were applied to test the normality of the dependent variables, which must be considered in the next stages including correlation, regression, and analysis of variance, as presented in the following chapters.

8. Chapter 8: Correlation and Regression analysis

8.1 Correlation

This subsection attempts to measure the association between two continuous variables of interest and how they both change over time via the correlation test. Correlations are usually between -1, which stands for a high level of negative correlation, and +1, which represents a high level of positive correlation. A correlation is considered to be significant at coefficients of 1% (which is indicated by** in the correlation tables) and 5% (which is indicated by* in the correlation tables).

Correlation tests use Pearson's r coefficient with a parametric test for interval and ratio data when the relationship is typically linear. It additionally uses the Spearman and Kendall's tau-b coefficients with nonparametric tests for ordinal data when the Spearman coefficient matches for linear relationships and Kendall's tau-b matches for either increasing or decreasing relationships. Both Pearson's coefficient and non-parametric Spearman's coefficient were implemented in this study. According to the normality tests in the previous sub-section, most variables are not normally distributed, so Spearman's coefficient is investigated for these variables.

This section explains the correlations between the variables in the following group pairings: the KS enablers group (independent variables) and the personality traits group (dependent variables), the KS barriers group (independent variables) and the personality traits group (dependent variables), the KS enablers group (independent variables) and the KS effectiveness group (dependent variables), and the KS barriers group (independent variables) and the KS effectiveness group (dependent variables). Furthermore, this section explains the correlation between the variables of the KS effectiveness group (dependent variables) and the variables of the personality traits group (dependent variables).

8.1.1.1 Correlation analysis of knowledge sharing enablers (nonparametric Spearman Correlation)

Correlation between knowledge sharing enablers and personality traits

Table 8-1 below represents the correlations between the KS enablers as independent variables and personality traits as dependent variables.

Table	Table 8-1: Correlation between the KS enablers and personality traits						
Code	Extraversion	Agreeableness	Conscientiousness	Openness			
No.	29	30	34	29			
E1		.191*		.220*			
E2		.200*	.232*	.221*			
E3		.248**	.237*	.237*			
E4			.283**	.270**			

E5		.292**	.287**	.214*
E6			.219*	
E7	.232 [*]	.217*	.327**	.198*
E8	.237*	.235*	.277**	.208*
E9	.262**	.199*	.308**	.198*
E10	.256**	.231*	.302**	.223*
E11	.251**	.254**	.262**	.188*
E12	.228*	.395**	.302**	.293**
E13	.326**	.223 [*]	.254**	.217*
E14	.310**	.204*	.336**	
E15	.349**	.228 [*]	.294**	.252**
E16	.388**	.286**	.251**	.256**
E17	.463**	.360**	.383**	.308**
E18	.323**	.304**	.300**	.217*
E19	.233 [*]		.212*	.205*
E20	.272**	.246**	.237*	.188*
E21	.305**	.221*	.264**	.274**
E22	.204*	.280**	.244**	
E23	.291**	.320**	.266**	.269**
E24	.428**	.255**	.354**	.272**
E25	.351**	.202*	.283**	.257**
E26	.212 [*]	.258**	.376**	.252**
E27	.194*	.238 [*]	.308**	
E28	.277**	.237*	.446**	.240*
E29	.363**	.293**	.354**	.252**
E30	.207*		.360**	.207*
E31	.233 [*]	.227*	.312**	
E32			.271**	
E33	.213*	.203*		
E34	.319**	.227*	.383**	.217*
E35	.197*	.285**	.333**	.211*
E36	.277**		.226*	
*. Cor	elation is significar	nt at the 0.01 level (2	-tailed).	

*. Correlation is significant at the 0.05 level (2-tailed).

To illustrate this idea, Table 8-1 above indicates that 29 of KS enablers' independent variables which have significant correlations with the dependent variable of **extraversion as a personality trait**, and all of these correlations are positive. For; There are 30 independent variables in the KS enablers that have significant correlations with the dependent variable of **agreeableness as a personality trait**, and all of the correlations are positive.

However, for the dependent variable of **the conscientiousness personality trait**, out of 36 independent variables in the enablers of KS, most of the enablers' variables have significant correlations with the exception of **E1** and **E33**. For **neuroticism as a personality trait**, out of the 36 independent variables in the enablers of KS, none have any significant correlation with

the dependent variable (**neuroticism**). Finally, for the last personality trait, which is **openness**, 28 of the independent variables of the enablers of KS have significant correlations with the dependent variable (openness). The following variables are significantly correlated with the dependent variable at the p = 0.005 level: **E1**, **E2**, **E3**, **E5**, **E7**, **E8**, **E9**, **E10**, **E11**, **E13**, **E18**, **E19**, **E20**, **E28**, **E30**, **E34**, **and E35**. At the p = 0.001 level, the following variables are significantly correlated: **E29**, **E26**, **E24**, **E25**, **E23**, **E21**, **E15**, **E16**, **E17**, **E12 and E4**; all of the correlations are positive.

In summary, the highest correlation was found for **E17** with the **extraversion** dependent variable where Spearman = .463 at the p = 0.001 level. All of the 122 correlation values are positive and greater than 0.188. Some of them are greater than 0.3, while few were greater than 0.4, which indicates a positive association between the KS variables and the personality traits in general. Also, the KS enablers seem to have the strongest correlation with the conscientiousness personality trait and no correlation with neuroticism.

Correlation between the knowledge sharing enablers and knowledge effectiveness

Tables 8-2, 8-3, 8-4, and 8-5 below represent the correlations between the KS enablers as independent variables and the levels of effectiveness of KS in UAE infrastructural projects as dependent variables.

To illustrate the assertion, Table 8-2 below indicates that for **work sector (Question 6)**, only one of independent variables in the KS enablers (E7) has a significant correlation at the p = 0.005 level, which indicates a moderate association between variables.

Table 8-2:	Table 8-2: Correlation between the KS enablers as independent variables and work sector					
(Q6) as depe	endent variable	S				
Code	Q6					

However, for the KS contribution to project success (Question 7), only 11 of the

independent variables in the KS enablers have significant correlations at the p = 0.005 level

(E7, E8, E15, E21, E29, E24, and E32) and (E13, E28, E35, and E34) the p = 0.001 level.

All of the correlations are positive and between 0.189 and 0.322, which indicates a moderate

association between variables as shown in Table 8-3 below.

 Table 8-3: Correlation between the KS enablers as independent variables and the KS contribution to project success (Q7) as dependent variables

Code	Q7
No. of Var.	11
E7	.198*
E8	.198*
E13	.249**
E15	.189*
E21	.238*
E24	.230*
E28	.273**
E29	.228*
E32	.224*
E34	.281**
E35	.322**

For the current status of the KS culture in the infrastructure sector (Question

8), only three of independent variables in the KS enablers have significant correlations at the

p = 0.005 level (E20 and E25) and the p = 0.001 level (E4). All of the correlations are

positive and fall between 0.195 and 0.324, which indicates a moderate association between

variables as shown in Table 8-4below.

Table 8-4: Correlati	ion betwe	een the KS enablers as independent variables and the current status of the
KS culture in the inf	rastructur	re sector (Q8) as dependent variables
Code	Q8	
No. of Var.	3	
E4	.324**	
E20	.195*	
E25	.219*	
**. Correlation is signifi	cant at the	e 0.01 level (2-tailed).

In addition, for the benefits of KS in infrastructural projects (Question 9), the

quality of the timeliness of KS in infrastructural projects (Question10), and the

effectiveness of KS between stakeholders at each stage of the project lifecycle

(Question11), all of the 36 independent variables in the KS enablers have significant

positive correlations with these dependent variables, as shown in Table 8-5 below.

l able 8-5: (Correlation betwo	een the KS ena	ablers as indep
Code	Q9	Q10	Q11
No. of Var.	36	36	36
E1	.407**	.420**	.357**
E2	.466**	.417**	.427**
E3	.493**	.443**	.409**
E4	.413**	.393**	.511**
E5	.557**	.371**	.359**
E6	.414**	.374**	.306**
E7	.413**	.237*	.267**
E8	.306**	.275**	.377**
E9	.341**	.353**	.355**
E10	.453**	.268**	.296**
E11	.430**	.256**	.251**
E12	.415**	.442**	.399**
E13	.500**	.276**	.244**
E14	.298**	.262**	.206*
E15	.395**	.306**	.275**
E16	.376**	.234*	.322**
E17	.393**	.204*	.237*

E18	.290**	.305**	.286**
E19	.393**	.286**	.190*
E20	.361**	.346**	.316**
E21	.321**	.379**	.278**
E22	.465**	.315**	.257**
E23	.407**	.268**	.310**
E24	.410**	.284**	.272**
E25	.178	.175	.208 [*]
E26	.408**	.323**	.348**
E27	.323**	.299**	.317**
E28	.465**	.300**	.309**
E29	.355**	.279**	.315**
E30	.257**	.326**	.292**
E31	.312**	.296**	.352**
E32	.292**	.282**	.286**
E33	.213 [*]	.225*	.187*
E34	.271**	.344**	.329**
E35	.356**	.286**	.263**
E36	.256**	.238*	.277**
**. Correlation is	s significant at the 0	01 level (two-taile	ed).
. Correlation is	significant at the 0.0	05 level (two-taile	d).
	0	`	,

In summary, each of the KS enablers seem to have the strongest correlation with the benefits of KS in the infrastructural projects (Question 9), the quality of the timeliness of KS in infrastructural projects (Question 10), and the effectiveness of KS between stakeholders (Question 11), while some have moderately positive correlations with the current status of the KS culture in the infrastructure sector (Question 8) and the KS contribution to project success (Question 7). However, the KS enablers seem to have negative significant correlation with work sectors (Question 6).

8.1.1.2 Correlation analysis of knowledge sharing barriers (nonparametric Spearman correlation)

Correlation between the barriers of the success of knowledge sharing and Personality traits

Table 8-6 below represents the correlation between the KS barriers as independent variables

and personality traits as dependent variables.

Table	8-6: Correlation betw	een the KS barri	ers as independent variables and personality
traits a	s dependent variables.		
Code	Conscientiousness	Openness	



Table 8-6 above indicates that for the **personality traits of extraversion, agreeableness, and neuroticism,** no independent variables in the KS barriers have a Spearman correlation with these dependent variables of personality traits.

However, for the **conscientiousness personality trait**, there are only **two** independent variables (**B1 and B10**) that have a Spearman correlation with the dependent variable (**conscientiousness**) at the p = 0.005 level; the correlation coefficients are positive and between 0.193 and less than 0.224, which indicate a moderate association between variables.

Finally, for the last personality trait, which is **openness**, only five of the independent variables from the KS enablers have significant correlations at the p = 0.005 level (**B1, B2, B4, B5, and B17**). All of the correlations are positive and between 0.190 and 0.237, which indicates a moderate association between variables.

In summary, all of the seven correlation values are positive and between 0.190 and 0.237, which indicates a positive and moderate association between the variables in the KS barriers and the personality traits in general. Additionally, the KS barriers seem to have moderate correlations with the **conscientiousness and openness** personality traits and no correlation with the **extraversion, agreeableness, and neuroticism personality traits**.

Correlation between the knowledge sharing barriers and knowledge effectiveness

<u>Spearman Correlation (nonparametric)</u>

Tables 8-7, 8-8, 8-9, 8-10, and 8-11 below represent the correlations between the KS barriers as independent variables and the levels of effectiveness of KS in UAE infrastructural projects as dependent variables.

To illustrate this idea, the tables below indicate that for **work sector (Question 6),** no KS barriers as independent variables have significant correlations, neither at the p = 0.005 level nor at the p = 0.001, which does not indicate an association between variables.

However, for **the KS contribution to project success (Question7)**, only three of KS barriers as independent variables have significant correlations at the p = 0.001 level (**B3**) and at the p = 0.005 level (**B7** and **B9**). All of the correlations are negative and between -0.197 and -0.297, which indicates a moderate association between variables as shown in Table 8-7 below.

Table 8-7: Correlation between the KS barriers as independent variables and the KS contribution to project success (Q7) as dependent variables.

Code	Q7
No of Var	3
B3	297**
B7	188 [*]
B9	197*

**. Correlation is significant at the 0.01 level (two-tailed). *. Correlation is significant at the 0.05 level (two-tailed).

Regarding the dependent variable of the current status of the KS culture in the

infrastructure sector (Question 8), only one of the independent variables among the KS

barriers has a significant negative correlation with the dependent variable at the p = 0.001

level (B15), which indicates a moderate association between variables as shown in table 8-8

below.

 Table 8-8: Correlation between the KS barriers as independent variables and the status of the KS culture in the infrastructure sector (Q8) as dependent variables.

Code	Q8		
No of Var.	1		
B15	284**		
**. Correlation i *. Correlation is	s significant s significant	at the 0.01 level (two-tailed). at the 0.05 level (two-tailed).	

In addition, in terms of the benefits of KS in infrastructural projects (Question 9),

12 of the independent variables in the KS barriers have significant correlations at the p =

0.005 level (**B1**, **B5**, **B6**, **B11**, **B16**, and **B17**) and (**B3**, **B4**, **B7**, **B8**, **B9**, and **B12**) at the p =

0.001 level. All of the correlations are negative and between -0.191 and -0.319, which

indicates a moderate association between variables as shown in Table 8-9 below.

Table 8-9: C KS in infrastr	Correlation betw ructural projec	veen the KS barriers as independent variables and the benefits of ts (Question 9) as dependent variables.
Code	Q9	
No of Var.	12	
B1	249**	
B3	212 [*]	
B4	204*	
B5	273**	
B6	315**	
B7	196 [*]	
B8	231 [*]	
B9	191*	
B11	307**	
B12	230 [*]	
B16	284**	
B17	319**	
**. Correlation is	s significant at the	0.01 level (two-tailed).
 Correlation is 	significant at the	0.05 level (two-tailed).

Moreover, for the dependent variable of the quality of the timeliness of KS in

infrastructural projects (Question 10), only six independent variables of the KS barriers

have significant correlations at the p = 0.005 level (**B11**, **B12**, and **B15**) and (**B1**, **B9**, and

B16) at the p = 0.001. All of the correlations are negative and between -0.199 and -0.296,

which indicates a moderate association between variables as shown in Table 8-10 below.

Table 8-10: C	orrelation betw	een the KS barriers as independent variables and the quality of the
timeliness of k	KS in infrastruct	tural projects (Question 10) as dependent variables.
Code	Q10	
No of Var.	6	
B1	249**	
B9	263**	
B11	203*	
B12	203 [*]	
B15	199*	
B16	296**	
**. Correlation is	significant at the	0.01 level (two-tailed).
*. Correlation is	significant at the	0.05 level (two-tailed).

In addition, for the dependent variable of the effectiveness of KS between

stakeholders at each stage of the project lifecycle (Question 11), all 13

independent variables in the KS barriers have significant positive correlations at the p = 0.005

level for (**B3**, **B5**, **B12**, **B13**, and **B18**) and at the p = 0.001 level (**B1**, **B2**, **B4**, **B6**, **B10**, **B11**,

B16, and B17). All of the correlations are negative and between -0.188 and -0.317, which

indicates a moderate association between variables as shown in table 8-11 below.

Table 8-11: Co stakeholders at e	rrelation between each stage of the	the KS barriers as independent variables and the effectiveness of KS between project lifecycle (Question 11) as dependent variables.
Code	Q11	
No of Var.	13	
B1	317**	
B2	250**	
B3	225 [*]	
B4	243**	
B5	198 [*]	
B6	286**	
B10	289**	
B11	288**	
B12	224 [*]	
B13	188 [*]	
B16	324**	
B17	308**	
B18	202 [*]	
**. Correlation is	significant at the	0.01 level (two-tailed).
*. Correlation is	significant at the	0.05 level (two-tailed).

In summary, each of the KS barriers seem to have a strong correlation with the benefits of KS in infrastructural projects (Question 9), the level of timeliness of KS in infrastructural projects (Question 10), and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Question 11), while some have moderately negative correlations with the KS contribution to project success (Question 7). Only one KS barriers (B15) is significantly correlated with the current status of the KS culture in the infrastructure sector (Question 8) at the p = 0.001 level, but the KS barriers seem to have negative significant correlations with work sector (Question 6).

8.1.1.3 Correlation between knowledge sharing effectiveness and personality traits in infrastructural projects Spearman Correlation (nonparametric):

Table 8-12 below represents the correlation between the dependent variables of the five personality traits (i.e. **extraversion, agreeableness, conscientiousness, neuroticism, and openness**) with the effectiveness of KS in UAE infrastructural projects. The effectiveness of KS in UAE infrastructural projects includes the following variables: work sector (Question 6), the KS contribution to project success (Question 7), the current status of the KS culture in the infrastructure sector (Question 8), the benefits of KS in infrastructural projects (Question 9), the level of timeliness of KS in infrastructural projects (Question 10), and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Question 11).

Table 8-12: Correlation between the dependent variables of the five personality traits with Q6, Q7, Q9, Q10, and Q11.

Code	Agreeableness	Conscientiousness	Neuroticism	Openness	
No. of Var.	1	4	1	4	
Q6		187 [*]		233 [*]	
Q7			198 [*]		
Q9	.282**	.231*		.260**	
Q10		.317**		.205*	
Q11		.202 [*]		.274**	
**. Correlation is significant at the 0.01 level (two-tailed).					

To illustrate, Table 8-12 above indicates that the **extraversion personality trait** is not significantly correlated with any of the dependent variables in the effectiveness of KS in UAE infrastructural projects.

Additionally, for the **agreeableness personality trait**, only **the benefits of KS in infrastructural projects (Question 9)** has a significant positive correlation (0.282) with the dependent variable at the p = 0.001 level.

For the conscientiousness personality trait, work sector (Question 6) has a significant negative correlation (-0.187) at the p = 0.005 level. However, each of the benefits of KS in the infrastructural projects (Question 9) have coefficients of 0.231 at the p = 0.005 level, the quality of the timeliness of KS in infrastructural projects (Question 10) has the coefficient of 0.317 at the p = 0.001 level, and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Question 11) has a significant positive correlation of 0.202 at the p = 0.005 level with the dependent variable (conscientiousness).

In addition, for the neuroticism personality trait, only the KS contribution to project success (Question 7) has a significant negative correlation at -0.198 at the p = 0.005 level.

Finally, the last personality trait, which is **openness**, **work sector** (**Question 6**) has a significant negative correlation with this dependent variable at -0.233 at the p = 0.005 level, and each of **the benefits of KS in the infrastructural projects** (**Question 9**) have coefficients of 0.205 at the p = 0.001 level with this dependent variable (openness). The level of timeliness of KS in infrastructural projects (**Question 10**) has a coefficient of 0.205 at the p = 0.005 level, and **the effectiveness of KS between stakeholders at each stage of the project lifecycle** (**Question 11**) has a significant positive correlation at 0.274 at the p = 0.001 level with the dependent variable (openness).

8.2 Regression Analysis

Regression analysis uses knowledge of one or more variables to predict another variable and to look for significant relationships (Residual Square). Since multiple regressions are applied to estimate the result of a dependent quantity via two or more independent quantities, a linear multiple regression analysis was chosen to be performed for this survey as nonlinear is applied for more complex analyses.

This linear regression analysis was conducted to determine which enablers and barriers of KS (independent variables) contribute to the rate of KS contribution to project success, the benefits that might be gained from timely KS in infrastructural projects, the quality of the timeliness of KS in infrastructural projects, and the effectiveness of KS between stakeholders at each stage of the project lifecycle (dependent variables). The mediating variables are represented by the personality traits of extraversion, agreeableness, conscientiousness, neuroticism, and openness. The main assumption that was made after setting the dependent and independent variables, which determined the nature of relationships and minimised the differences between what is observed and predicted, is that the variables are not equal.

In essence, the regression process includes firstly identifying the dependent, independent, and mediating variables. For this study, the enablers and barriers of KS were selected as the independent variables. On other hand, the rate of KS contribution to project success, the benefits that might be gained from timely KS in the infrastructural projects, the quality of the timeliness of KS in infrastructural projects, and the effectiveness of KS between stakeholders at each stage of the project lifecycle were selected to be dependent variables for this regression analysis. On the other hand, the mediating variables are represented by the first five main personality traits and the culture of KS in the projects. After that, stepwise regression was carried out for each of the KS groups through SPSS scores to create the variables' significance for both the enablers and barriers of KS groups. Consequently, the results were finally determined by using stepwise regression to test and generate the models. Thus, there are multiple significant groups of KS enablers and barriers that are extensively identified in the infrastructural project lifecycle, as was debated previously in Chapters 2 and 3. The enablers and barriers of KS are argued to have noteworthy impact upon the success of the KS in infrastructural projects in the UAE. Evaluating the influences of KS enablers and barriers on project success contributes to reducing the KS deficiency and therefore increases its effectiveness, which in turn leads to increased opportunity for project success. A multiple regression was manipulated in this research in order to establish a model for the relation between KS enablers and barriers and the success of KS in the project lifecycle via the statistical analysis of the main variables to develop the required model.

The impact of both KS enablers and barriers on the success of KS projects can be mapped by knowing the different enablers and barriers in excess of a specific phase for related infrastructure projects. Equation 1 below demonstrates the method utilised for testing linear relationships:

$$y = c + b_1 x_1 + b_2 x_2$$
.....eqn.(1)

Equation 1: Linear equation testing the relationships between variables

For this regression analysis, the independent variables are the KS enablers (E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20, E21, E22, E23, E24, E25, E26, E27, E28, E29, E30, E31, E32, E33, E34, E35, and E36), while the dependent variables are the rate of KS contribution to project success (Q7), the benefits that might be gained from timely KS in infrastructural projects (Q9), the quality of the timeliness of KS in infrastructural projects (Q10), and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11). The mediating variables are represented by the personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness). The main target of the multi-linear models is to record the impact of KS enablers on the project success in UAE infrastructure projects.

Further independent variables are the KS barriers (B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, B12, B13, B14, B15, B16, B17, and B18), while the dependent variables are the rate of KS contribution to project success (Q7), the quality of the timeliness of KS in infrastructural projects (Q10), and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11). As clarified in a previous section, a linear regressions stepwise method was selected to evaluate the factors in **Equation 1**. The main target of the multilinear models is to record the impact of KS enablers and barriers on project success in infrastructure projects in the UAE.

As discussed in Chapter six, there are seven groups of enablers of KS and three groups of barriers of KS. For this reason, there are two main regression analyses to be applied to

uncover the effect of KS enablers on the selected dependent variables, and these analyses are presented in the following subsections. Therefore, these regression results are used to further test and support the output results of the research hypotheses, which are tested by using the ANOVA test and emerge later in this paper. The conceptual model used to perform the regression tests for the KS enablers as independent variables is shown in Figure 8-1 below, whereas the conceptual model used to perform the regression tests for the KS barriers as independent variables is shown in Figure 8-2 below.



Figure 8-1: Conceptual model used to perform the regression tests for the KS enablers independent variables


Figure 8-2: Conceptual model used to perform the regression tests for the KS barriers independent variables

- 1. Modelling the impact of the KS enablers on the rate of knowledge sharing contribution to project success
 - Modelling results:

Table 8-13 is the model summary that represents the R^2 values, which evaluate the goodness fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this idea, small numbers of KS enablers (36 enablers) were picked to estimate the equations. Furthermore, the ANOVA table indicates that the accumulation of variation for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for statistically significant values). These parameters estimate the impact of enablers on the success of KS in the projects (explained by the dependent variable Q7).

The meaning of F-statistical significance value is clarified by the cause of variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variable Q7) because causes of variation are better than guessing from the mean.

The next Table 8-14 illustrates the results summary, including the regression values and change in significance level for the impact of the KS enablers for the different models. Also, these four tables show that all variables in the enablers in all models are significant.

For Model 3 of the dependent variables Q7, the R^2 value represents about 18% variation in the data sample, even though the p value is less $\leq 5\%$. Thus, it was shown that around 82% cannot be explained from the dependent variable Q7 model because of further variation factors which were not involved or because of natural random variations.

227

The standard error predicts more than the model fit. This test was applied to evaluate the

dependent variable dispersal about the mean. A comparison between the error value and

standard deviation of the dependent variable was done. As a result, this value must be less

than 10% of the mean value of the dependent variable.

Table 8-17 indicates that the mean and standard deviation values of **the dependent variable**

Q7 are 4.72 and 0.43, respectively. The standard error approximation of the chosen model is

about 0.94. This illustrates that the error is less than the 10% of the threshold value.

 Table 8-13: Summary of the regression model results (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7])

				Std. Error of	Change Statistics				
		R	Adjusted R	the	R Square	F			Sig. F
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.277ª	.077	.068	.988	.077	9.157	1	110	.003
2	.357 ^b	.127	.111	.965	.051	6.324	1	109	.013
3	.422°	.178	.156	.941	.051	6.704	1	108	.011

a. Predictors: (Constant), E35 b. Predictors: (Constant), E35, E30 c. Predictors: (Constant), E35, E30, E24, d. Dependent Variable: Q7

Table 8-14: Summary of the analysis of variation of the regression model results (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7]) ANOVA^a

			-			
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.947	1	8.947	9.157	.003 ^b
	Residual	107.473	110	.977		
	Total	116.420	111			
2	Regression	14.840	2	7.420	7.962	.001 ^c
	Residual	101.580	109	.932		
	Total	116.420	111			
3	Regression	20.777	3	6.926	7.821	.000 ^d
	Residual	95.642	108	.886		
	Total	116.420	111			

a. Dependent Variable: Q7

b. Predictors: (Constant), E35

c. Predictors: (Constant), E35, E30

d. Predictors: (Constant), E35, E30, E24

• Significance of the Estimated Coefficients:

For the rate of KS contribution to project success (Q7), the estimated coefficients define the contribution of each of the variables towards the dependent variable estimate. Table 8-15 displays the estimated coefficient of the generated regression model. As a result, all coefficients were found to be significant at the 90% confidence level and also at 95% confidence level. This finding verifies that all three selected variables are respectable predictors of the rate of KS contribution to project success (Q7). Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.00), and this implies that it is reliable for outlining the interception point of the regression equation. In addition, it is shown in the table that some KS enablers contribute positively (i.e. E35 and E24) to the rate of KS contribution to project success (Q7), while others contribute negatively (i.e. E30).

The standardised coefficient beta communicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, the combination of the **enablers E35 "Loyalty and hard work to increase project success via knowledge sharing"** ($\beta = .269 [27\%]$, t = 2.676, p = .009), E30 "The characteristics of physical environment as the shape of the offices, spaces; relaxed environments and quiet environment" ($\beta = ..344$ [-34%], t = -3.386, p = .001), and E24 "Ability of social network to simplify the personal relationships and social interactions and facilitate the project knowledge sharing process" ($\beta = .279 [28\%]$, t = 2.589, p = .011) was a significant predictor of KS contribution to project success (Q7).

To conclude, the rate of KS contribution to project success (Q7) can be increased if the enablers of KS in Equation 8-2 are managed and controlled at times to ensure that the enablers are strongly supported such that organisational efforts are directed towards the enablers that have high coefficients. The reason for this is that, supposedly, these are the ones that may increase the opportunity for success of KS in the project through increasing the rate of KS contribution (Q7).

Table 8-15: Results for estimated coefficients extracted from regression models (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7])

				Coe	fficients	S ^a				
		Unstand Coeffi	lardized cients	Standardised Coefficients			95.0% Confi Interval fo		Collinea Statist	arity ics
Мос	del	В	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	3.185	.517		6.165	.000	2.161	4.209		
	E35	.369	.122	.277	3.026	.003	.127	.610	1.000	1.000
2	(Constant)	3.741	.551		6.791	.000	2.649	4.832		
	E35	.486	.128	.365	3.800	.000	.232	.739	.868	1.152
	E30	272	.108	241	- 2.515	.013	486	058	.868	1.152
3	(Constant)	3.491	.546		6.399	.000	2.410	4.572		
	E35	.358	.134	.269	2.676	.009	.093	.624	.751	1.331
	E30	388	.115	344	- 3.386	.001	615	161	.736	1.359
	E24	.311	.120	.279	2.589	.011	.073	.550	.655	1.527

a. Dependent Variable: Q7

• Testing for Correlations of the Independent Variables

The output of the correlation tests of the independent variables is shown in Table 13-9 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variables is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The occurrences of collinearity in the regression analysis are related to the internal correlation amongst independent variables. The collinearity analysis is represented in Table 8-16, which does not show a large condition index for any variable (all indices are shown to be <17). This may imply that there is not enough evidence to prove collinearity for this regression model. On other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results does not exist due to the random sampling of the values for every independent variable's perception spreading.

 Table 8-16: Testing the Collinearity between variables (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7])

-	-			Variance Proportio		oportions	
Model	Dimension	Eigenvalue	Condition Index	(Constant)	E35	E30	E24
1	1	1.984	1.000	.01	.01		
	2	.016	10.973	.99	.99		
2	1	2.953	1.000	.00	.00	.01	
	2	.031	9.778	.13	.17	.99	
	3	.016	13.396	.87	.82	.00	
3	1	3.927	1.000	.00	.00	.00	.00
	2	.031	11.245	.17	.17	.71	.03
	3	.026	12.286	.14	.00	.26	.88
	4	.016	15.723	.68	.83	.03	.09

Collinearity Diagnostics^a

a. Dependent Variable: Q7

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals should not be disrupted. Tables 8-17 prove from the residual statistics results that the residual mean is zero.

Table 8-17: Residuals' Statistics (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7])

	R	esiduals Stat	istics ^a		
	Minimum	Maximum	Mean	Std. Deviation	Ν
Predicted Value	3.25	5.68	4.72	.433	112
Residual	-4.589	1.511	.000	.928	112
Std. Predicted Value	-3.405	2.203	.000	1.000	112
Std. Residual	-4.877	1.605	.000	.986	112

a. Dependent Variable: Q7

From the frequency histogram plot in Figure 8-3 below, it can be seen that the frequency of the standardised residuals nearly follows a normal curve. This possibly suggests that the standardised residuals are fairly close to a normal curve, so the normality assumption is not disrupted for the dependent variables (Q7).



Figure 8-3: Histogram of the frequency of the standardised residuals (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7]) From the P-P plot in Figures 8-4 below, it can be seen that the data points almost represent straight line. However, disrupting the normality assumption is not a main concern for this research since the equation is later manipulated for a random sample in

the Monte Carlo model.



Figure 8-4: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS enablers and the rate of knowledge sharing contribution to project success [Q7])

• Summary of the Regression Modelling (for the KS enabler's independent variables):

This subsection has attempted to map the success of KS in projects (explained by the dependent variables and the rate of KS contribution to project success [Q7]) into the

enablers using a linear regression analysis. The KS enablers were used as independent variables in the regression modelling process, and these enablers were selected according to their significant influence on the estimate of the dependent variable (Q7).

Equation 8-2 is the equation for the selected regression model to predict the variable of the rate of KS contribution to project success (Q7) of infrastructural projects in the UAE. Thus, the strong relationship between the enabler variables **E24**, **E30**, **and E35** and **KS contribution to project success (Q7)** suggests that **E24**, **E30**, **and E35** are very important for predicting **KS contribution to project success**, which confirms the literature review findings. Also, the mediating variables (personality traits) have caused no changes on the outcome of the regression process as shown in the equation below:

KS contribution to PS (Q7) = 3.491+0.358*E35-0.388*E30+0.311*E24

Equation 8-2: Regression model selected to estimate the rate of knowledge sharing contribution to project success [Q7])

The previous equations have attained the following statistical test results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05);
- 2. The adjusted R^2 was 0.156 for Q7;
- 3. Standard error of the estimate was .941 for Q7;
- 4. The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted;
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above, there is an impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each enabler of KS on the success of KS in projects (explained by the rate of knowledge sharing contribution to project success [Q7]).

- 2. Modelling the impact of the KS enablers on the benefits that might be gained from timely knowledge sharing in the infrastructural projects
 - Modelling results:

Table 8-18 shows the model summary that represents the R^2 values, which evaluate the goodness of fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this idea, small numbers of KS enablers (36 enablers) were picked to estimate the equations. Furthermore, the ANOVA table indicates that the accumulation of variation for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for statistically significant values). These parameters estimate the impact of the enablers on the success of KS in the projects (explained by the dependent variables Q7, Q9, Q10, and Q11).

The meaning of the F-statistical significance value is clarified by the cause of variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variables Q7, Q9, Q10, and Q11) because causes of variation are better than guessing from the mean.

Table 8-19 illustrates the results summary, including the regression values and change in significance level for the impact of the KS enablers for the different models. Also, this table shows that all variables of the enablers in all models are significant.

For Model 4 of the dependent variable Q9, the R² value represents about 42% variation in the data sample. Thus, it was shown that around 58% cannot be explained

from the dependent variable Q9 model because of further variation factors which were not involved or because of natural random variations.

Table 8-22 indicates that for the regression of the **dependent variable Q9**, the mean and standard deviation values are 4.1 and .40, respectively. The standard error approximation of the chosen model is about 0.48. This illustrates that the error is more than 10% of the threshold value.

Table 8-18: Summary of the regression model results (regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

Model Summarv^e

				Std. Error		Char	ige Statis	tics	
		R	Adjusted R	of the	R Square	F			Sig. F
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change
1	.538ª	.289	.283	.52396	.289	44.729	1	110	.000
2	.614 ^b	.377	.365	.49289	.088	15.307	1	109	.000
3	.633 ^c	.400	.384	.48566	.024	4.268	1	108	.041
4	.651 ^d	.424	.402	.47831	.023	4.347	1	107	.039

a. Predictors: (Constant), E5

b. Predictors: (Constant), E5, E13

c. Predictors: (Constant), E5, E13, E11

d. Predictors: (Constant), E5, E13, E11, E8

e. Dependent Variable: Q9

Table 8-19: Summary of the analysis of variation of the regression model results (regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

			ANUVA"			
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.280	1	12.280	44.729	.000 ^b
	Residual	30.199	110	.275		
	Total	42.479	111			
2	Regression	15.998	2	7.999	32.927	.000 ^c
	Residual	26.480	109	.243		
	Total	42.479	111			
3	Regression	17.005	3	5.668	24.032	.000 ^d
	Residual	25.474	108	.236		
	Total	42.479	111			
4	Regression	17.999	4	4.500	19.669	.000 ^e
	Residual	24.479	107	.229		
	Total	42.479	111			

a. Dependent Variable: Q9

b. Predictors: (Constant), E5

c. Predictors: (Constant), E5, E13

d. Predictors: (Constant), E5, E13, E11

e. Predictors: (Constant), E5, E13, E11, E8

• Significance of the Estimated Coefficients:

For the benefits that might be gained from timely KS in infrastructural projects (Q9), the estimated coefficients define the contribution of each of the variables towards the dependent variable estimate. Table 8-20 displays the estimated coefficient of the generated regression model. As a result, all coefficients were found to be significant at the 90% confidence level and also at 95% confidence level. This finding verifies that all four selected variables are respectable predictors of KS success in the project. Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.00), and this implies that it is reliable for outlining the interception point of the regression equation. In addition, it is shown in the table that some KS enablers contribute positively (i.e. E5, E13, and E11) to the benefits that might be gained from timely KS in infrastructural projects (Q9), while others contribute negatively (i.e. E8). The standardised coefficient beta communicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, the combination of the enablers E5 "Leadership commitment to support open, honest two-way communication in the projects" ($\beta = .426 [43\%]$, t = 4.503, p = .000), E13 "The ability to communicate between project stakeholders regarding the project

through specific channels" (β = .306 [31%], t = 3.645, p = .000), E11

"Implementation of less formal resources such as social media to share embedded project knowledge" (β = .232 [23%], t = 2.640, p = .010), and E8 "Measurements of KS before and after any project activities"(β = -.202 [20%], t = -2.085, p = 0.039) was a significant predictor of the benefits that might be gained from timely KS in infrastructural projects (Q9). To conclude, the benefits that might be gained from timely KS in infrastructural projects (Q9) can be increased if the enablers of KS in Equation 8-3 are managed and controlled at times to ensure that the enablers are strongly supported such that organisational efforts are directed towards the enablers that have high coefficients. The reason for this is that, supposedly, these are the enablers that may increase the opportunity for success of KS in projects through increasing the benefits that might be gained from timely KS in

infrastructural projects (Q9).

Table 8-20: Results for estimated coefficients extracted from regression models (for regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

				000	molenta					
		Unstand Coeffi	dardized cients	Standardised Coefficients			95.0% Co Interva	onfidence al for B	Collinea Statisti	arity ics
Мо	del	В	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.573	.233		11.038	.000	2.111	3.035		
	E5	.385	.058	.538	6.688	.000	.271	.499	1.000	1.000
2	(Constant)	1.935	.273		7.081	.000	1.393	2.477		
	E5 E13	.286 .253	.060 .065	.400 .326	4.789 3.912	.000 .000	.168 .125	.405 .382	.821 .821	1.218 1.218
3	(Constant)	1.800	.277		6.494	.000	1.250	2.349		
	E5	.245	.062	.342	3.935	.000	.121	.368	.736	1.359
	E13	.221	.066	.285	3.370	.001	.091	.351	.775	1.290
	E11	.116	.056	.175	2.066	.041	.005	.227	.770	1.299
4	(Constant)	1.864	.275		6.787	.000	1.320	2.409		
	E5	.305	.068	.426	4.503	.000	.171	.440	.602	1.662
	E13	.237	.065	.306	3.645	.000	.108	.366	.764	1.308
	E11	.153	.058	.232	2.640	.010	.038	.269	.696	1.436
	E8	130	.062	202	-2.085	.039	254	006	.576	1.736

a. Dependent Variable: Q9

• Testing for Correlations of the Independent Variables

The output of correlation tests of the independent variables is shown in Table 13-10 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variable is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The collinearity analysis is represented in Table 8-21, which does not show a large condition index for any variable (all indices are shown to be <17). This may imply that there is not enough evidence to prove the collinearity for this regression model. On the other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results does not exist due to the random sampling of the values for every independent variable's perception spreading.

 Table 8-21: Testing the collinearity between variables (for regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

			Condition		Variar	nce Proport	ions	
Model	Dimension	Eigenvalue	Index	(Constant)	E5	E13	E11	E8
1	1	1.977	1.000	.01	.01			
	2	.023	9.309	.99	.99			
2	1	2.957	1.000	.00	.00	.00		
	2	.025	10.900	.14	.99	.26		
	3	.019	12.637	.86	.01	.73		
3	1	3.922	1.000	.00	.00	.00	.00	
	2	.035	10.616	.09	.03	.10	.97	
	3	.025	12.600	.10	.96	.21	.03	
	4	.019	14.555	.81	.01	.69	.00	
4	1	4.894	1.000	.00	.00	.00	.00	.00
	2	.036	11.703	.16	.00	.18	.50	.11
	3	.032	12.459	.04	.16	.05	.47	.38
	4	.020	15.672	.00	.78	.17	.03	.48
	5	.018	16.286	.80	.06	.60	.00	.03

Collinearity Diagnostics^a

a. Dependent Variable: Q9

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals should not be disrupted. Tables 8-22 proves that the residual mean is zero from the residuals' statistics results.

 Table 8-22: Residuals' Statistics (for regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

	Res	iduals Statistic	S ^a		
	Minimum	Maximum	Mean	Std. Deviation	Ν
Predicted Value	3.0640	4.8237	4.0964	.40269	112
Residual	-1.69353	1.09856	.00000	.46961	112
Std. Predicted Value	-2.564	1.806	.000	1.000	112
Std. Residual	-3.541	2.297	.000	.982	112

Dependent Variable: Q9

From the frequency histogram plot in Figure 8-5, it can be seen that the frequency of the

standardised residuals nearly follows a normal curve. This possibly suggests that the

standardised residuals are fairly close to a normal curve, so the normality assumption is

not disrupted for the dependent variables (Q9).



Figure 8-5: Histogram of the frequency of the standardised residuals (for regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

From the P-P plot in Figure 8-6, it can be seen that the data points almost represent a straight line. However, disrupting the normality assumption is not a main concern for this research since the equation is later manipulated for a random sample in the Monte Carlo model.



Figure 8-6: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects [Q9])

• Summary of the Regression Modelling (for the KS enabler independent variables):

This subsection has attempted to map the success of KS in projects (explained by the dependent variable of the benefits that might be gained from timely KS in infrastructural projects [Q9]) into the enablers using a linear regression analysis. The KS enablers were used as independent variables in the regression modelling process, and these enablers were selected according to their significant influence on the estimate of the dependent variable (Q9).

Equation 8-3 is the equation for the selected regression model to predict the variable of the benefits that might be gained from timely KS in infrastructural projects (Q9) in the UAE. Thus, the strong relationship between the enabler variables **E5**, **E13**, **E11**, **and E8** and **the benefits that might be gained from timely KS in infrastructural projects** (Q9) suggests that **E5**, **E13**, **E11**, **and E8** are very important for predicting Q9, which confirms the LR findings. Also, the mediating variables (personality traits) have caused no changes to the outcome of the regression process as shown in the equation below:

Benefits from timely KS (Q9) =

1.864+0.305*E5+0.237*E13+0.153*E11-0.130*E8

Equation 8-3: Regression model selected to estimate the benefits that might be gained from timely KS in infrastructural projects (Q9)

The previous equations have attained the following statistical test results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05);
- 2. The adjusted R^2 was 0.402 for Q9;
- 3. Standard error of the estimate was .478 for Q9;
- The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted; and
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above, there is an impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each enabler of KS on the success of KS in projects (explained by the benefits that might be gained from timely KS in infrastructural projects [Q9]).

3. Modelling the impact of the KS enablers on the quality of the timeliness of KS in infrastructural projects

• Modelling results:

Table 8-23 shows the model summary that represents the R^2 values, which evaluate the goodness of fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this, small numbers of KS enablers (36 enablers) were picked to estimate the equations. Furthermore, the ANOVA table indicates that the accumulation of variation for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for statistically significant values). These parameters estimate the impact of the enablers on the success of the KS in the projects (explained by the dependent variables Q10).

The meaning of the F-statistical significance value is clarified by the cause of variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variables Q10) because causes of variation are better than guessing from the mean.

Table 8-24 illustrate the results summary including the regression values and change in significance level for the impact of the KS enablers for the different models. Also, this table shows that all of the variables of the enablers in all models are significant.

242

For Model 2 of the dependent variable Q10, the R² value represents about 24% of the variation in the data sample. Thus, it was shown that around 76% cannot be explained from the dependent variable Q10 model because of further variation factors which were not involved or because of natural random variations.

Table 8-27 displays that for the regression of dependent variable Q10, the mean and

standard deviation values of the dependent variable are 3.80 and .36, respectively. The

standard error approximation of the chosen model is about 0.65. This illustrates that the

error is less than 10% of the threshold value.

Table 8-23: Summary of the regression model results (regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		Char	nge Statis	stics	
					R Square Change	F Change	df1	df2	Sig. F Change
1 2	.423 ^a .484 ^b	.179 .235	.172 .220	.67310 .65302	.179 .055	24.023 7.870	1 1	110 109	.000 .006

a. Predictors: (Constant), E12 b. Predictors: (Constant), E12, E1 c. Dependent Variable: Q10

Table 8-24: Summary of the analysis of variation of the regression model results (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

			ANOVA ^a			
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10.884	1	10.884	24.023	.000 ^b
	Residual	49.837	110	.453		
	Total	60.721	111			
2	Regression	14.240	2	7.120	16.697	.000 ^c
	Residual	46.481	109	.426		
	Total	60.721	111			

a. Dependent Variable: Q10

b. Predictors: (Constant), E12

c. Predictors: (Constant), E12, E1

Significance of the Estimated Coefficients: •

For the timeliness of KS in the infrastructural projects (Q10), the estimated

coefficients define the contribution of each of the variables towards the dependent

variable estimate. Table 8-25 displays the estimated coefficient of the generated regression model. As a result, all coefficients were found to be significant at the 90% confidence level and also at the 95% confidence level. This finding verifies that the two selected variables are respectable predictors of KS success in projects. Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.00), and this implies that it is reliable for outlining the interception point of the regression equation. Also, it is shown in the table that all KS enablers contribute positively to the quality of the timeliness of KS in infrastructural projects (Q10).

The standardised coefficient beta indicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, the combination of the **enablers E12 "Sufficient assets and resources to support project KS processes"** (β = .319 [32%], t = 3.484, p = .001) **and E1 "Clear policy or strategy for project KS"** (β = .257 [26%], t = 2.805, p = .006) was a significant predictor of **the quality of the**

timeliness of KS in infrastructural projects (Q10).

To conclude, the quality of the timeliness of KS in infrastructural projects (Q10) can be increased if the enablers of KS in Equation 8.4 are managed and controlled at times to ensure that the enablers are strongly supported such that organisational efforts are directed towards the enablers that have high coefficients. The reason for this is that, supposedly, these are the enablers that may increase the opportunity for success of KS in projects through increasing the quality of the timeliness of KS in infrastructural projects (Q10).

Table 8-25: Results for estimated coefficients extracted from regression models (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

Unstandar		Coefficients ^a									
Model Coefficie	dized Stan ents Coe	dardised efficients	t	Sig.	95.0% Confidence Interval for B	Collinearity Statistics					

		В	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.430	.286		8.505	.000	1.863	2.996		
	E12	.347	.071	.423	4.901	.000	.207	.487	1.000	1.000
2	(Constant)	1.884	.339		5.564	.000	1.213	2.555		
	E12	.261	.075	.319	3.484	.001	.113	.410	.836	1.196
	E1	.221	.079	.257	2.805	.006	.065	.378	.836	1.196

a. Dependent Variable: Q10

• Testing for Correlations of the Independent Variables

The output of correlation tests of the independent variables is shown in Table 13-11 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variable is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The collinearity analysis is represented in Table 8-26, which does not show a large condition index for any variable (all indices are shown to be <17). This may imply that there is not enough evidence to prove the collinearity for this regression model. On the other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results does not exist due to the random sampling of the values for every independent variable's perception spreading.

Table 8-26: Testing the Collinearity between variables (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

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	Collinearity Diagnostics ^a											
-	-			Variance Proportions								
Model	Dimension	Eigenvalue	Condition Index	(Constant)	E12	E1						
1	1	1.975	1.000	.01	.01							
	2	.025	8.870	.99	.99							

2 1	2.950	1.000	.00	.00	.00
2	.028	10.201	.05	.91	.43
3	.022	11.614	.94	.09	.56

a. Dependent Variable: Q10

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals should not be disrupted. Table 8-27 proves that the residual mean is zero from the residuals' statistics results.

Table 8-27: Residuals' Statistics (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

Residuals Statistics ^a									
	Minimum	Maximum	Mean	Std. Deviation	N				
Predicted Value	2.6282	4.2977	3.7946	.35817	112				
Residual	-3.13102	1.07302	.00000	.64711	112				
Std. Predicted Value	-3.257	1.404	.000	1.000	112				
Std. Residual	-4.795	1.643	.000	.991	112				

a. Dependent Variable: Q10

From the frequency histogram plot in Figure 8-7, it can be seen that the frequency of the standardised residuals nearly follows a normal curve. This possibly suggests that the standardised residuals are fairly close to a normal curve, so the normality assumption is not disrupted for all four of the dependent variables (Q10).



Figure 8-7: Histogram of the frequency of the standardised residuals (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

From the P-P plot below in Figure 8-8, it can be seen that the data points almost represent straight a line. However, disrupting the normality assumption is not a main concern for this research since the equation is later manipulated for a random sample in the Monte Carlo model.



Figure 8-8: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS enablers and the quality of the timeliness of KS in infrastructural projects [Q10])

• Summary of the Regression Modelling (for the KS enabler independent variables): This subsection has attempted to map the success of KS in projects (explained by the dependent variable of the quality of the timeliness of KS in infrastructural projects [Q10]) into the enablers using a linear regression analysis. The KS enablers were used as independent variables in the regression modelling process, and these enablers were selected according to their significant influence on the estimate of the dependent variable (Q10).

Equation 8-4 is the equation of the selected regression model to predict the variable of the quality of the timeliness of KS in infrastructural projects (Q10) in the UAE. Thus, the strong relationship between the enabler variables **E12 and E1** and **the quality of the timeliness of KS in infrastructural projects (Q10)** suggests that **E12 and E1** are very important for predicting **Q10**, which confirms the LR findings. Also, the mediating variables (personality traits) have caused no changes to the outcome of the regression process as shown in the equation below:

The timeliness of KS (Q10) = 1.884+0.261*E12+0.221*E1

Equation 8-4: Regression model selected to estimate the quality of the timeliness of KS in infrastructural projects (Q10)

The previous equations have attained the following statistical test results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05);
- 2. The adjusted R^2 was 0.220 for Q10;
- 3. Standard error of the estimate was 0.653 for Q10;
- 4. The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted; and
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above, there is an impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each enabler of KS on the success of the KS in the projects (explained by the timeliness of KS in the infrastructural projects [Q10]).

- 4. Modelling the impact of the KS enablers on the effectiveness on knowledge sharing between stakeholders at each stage of the project lifecycle
 - Modelling results:

Table 8-28 shows the model summary that represents the R^2 values, which evaluate the goodness of fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this, small numbers of KS enablers (36 enablers) were picked to estimate the equations. Furthermore, the ANOVA table indicates that the accumulation of variation for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for the statistically significant values). These parameters estimate the impact of the enablers on the success of KS in projects (explained by the dependent variables Q11).

The meaning of the F-statistical significance value is clarified by the cause of the variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variables Q11) because causes of variation are better than guessing from the mean.

Table 8-29 illustrates the results summary including the regression values and change in significance level for the impact of the KS enablers for the different models. Also, this table shows that all of the variables of the enablers in all models are significant.

249

For Model 2 of the dependent variables Q11, the R² value represents about 30% of

the variation in the data sample. Thus, it was shown that around 70% cannot be

explained from the dependent variable Q11 model because of further variation factors

which were not involved or because of natural random variations.

Table 8-32 displays that for the regression of **dependent variable Q11**, the mean and

standard deviation values of the dependent variable are 3.62 and 0.43, respectively. The

standard error approximation of the chosen model is about 0.66. This illustrates that the

error is less than 10% of the threshold value.

Table 8-28: Summary of the regression model results (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecvcle [O11])

Model Summary^c

				Std. Error	Change Statistics				
		R	Adjusted R	of the	R Square	F			Sig. F
Model	R	Square	Śquare	Estimate	Change	Change	df1	df2	Change
1	.501ª	.251	.244	.67949	.251	36.858	1	110	.000
2	.548 ^b	.300	.287	.65990	.049	7.627	1	109	.007

a. Predictors: (Constant), E4 b. Predictors: (Constant), E4, E12 c. Dependent Variable: Q11

Table 8-29: Summary of the analysis of variation of the regression model results (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [O11])

Model		Sum of Squares Df		Mean Square	F	Sig.
1	Regression	17.017	1	17.017	36.858	.000 ^b
	Residual	50.787	110	.462		
	Total	67.804	111			
2	Regression	20.338	2	10.169	23.353	.000 ^c
	Residual	47.466	109	.435		
	Total	67.804	111			

ANOVA^a

a. Dependent Variable: Q11

b. Predictors: (Constant). E4

c. Predictors: (Constant), E4, E12

Significance of the Estimated Coefficients:

For the effectiveness of KS between stakeholders at each stage of the project

lifecycle (Q11), the estimated coefficients define the contribution of each of the

variables towards the dependent variable estimate. Table 8-30 displays the estimated

coefficient of the generated regression model. As a result, all coefficients were found to

be significant at the 90% confidence level and also the 95% confidence level. This finding verifies that the two selected variables are respectable predictors of KS success in projects. Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.00), and this implies that it is reliable for outlining the interception point of the regression equation. In addition, it is shown in the table that all KS enablers contribute positively to the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11).

The standardised coefficient beta indicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, the combination of the **enablers E4 "Sufficient reward systems to share knowledge"** (β = .410 [41%], t = 4.739, p = .000) **and E12 "Sufficient assets and resources to support project KS processes"** (β = .239 [24%], t = 2.762, p = .007) was a significant predictor of the **effectiveness of KS between stakeholders at each stage of the project lifecycle** (Q11).

To conclude, the success of the KS in projects can be increased if the enablers of KS in Equation 8-5 are managed and controlled at times to ensure that the enablers are strongly supported such that organisational efforts are directed towards the enablers who have high coefficients. The reason for this is that, supposedly, these are the enablers that may increase the opportunity for KS in the project through increasing the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11).

Table 8-30: Results for estimated coefficients extracted from regression models (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])

		Unstandardiz Coefficient		Standardised Coefficients			95.0% Confidence Interval for B		Collinearity Statistics	
Model		В	Std. Error	Beta	Т	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	2.063	.264		7.816	.000	1.540	2.586		
	E4	.399	.066	.501	6.071	.000	.269	.530	1.000	1.000
2	(Constant)	1.530	.321		4.765	.000	.893	2.166		
	E4	.327	.069	.410	4.739	.000	.190	.464	.856	1.168
	E12	.207	.075	.239	2.762	.007	.058	.355	.856	1.168

Coefficients^a

a. Dependent Variable: Q11

• Testing for Correlations of the Independent Variables

The output of correlation tests of the independent variables is shown in Table 13-12 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variable is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The collinearity analysis is represented in Table 8-31, which does not show a large condition index for any variable (all indices are shown to be <17). This may imply that there is no enough evidence to prove the collinearity for this regression model. On the other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results does not exist due to the random sampling of the values for every independent variable's perception spreading.

Table 8-31: Testing the Collinearity between variables (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])

	Connearry Diagnostics										
	-			Variance Proportions							
Model	Dimension	Eigenvalue	Condition Index	(Constant)	E4	E12					
1	1	1.970	1.000	.02	.02						
	2	.030	8.100	.98	.98						
2	1	2.941	1.000	.00	.01	.00					
	2	.035	9.202	.06	.93	.38					
	3	.025	10.936	.93	.07	.62					

Collinearity Diagnostics^a

a. Dependent Variable: Q11

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals should not be disrupted. Tables 8-29, 8-30, 8-31, and 8-32 prove that the residual mean is zero from the residuals' statistics results

 Table 8-32: Residuals' Statistics (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])

Residuals Statistics ^a									
	Minimum	Maximum	Mean	Std. Deviation	Ν				
Predicted Value	2.2707	4.1999	3.6179	.42805	112				
Residual	-2.39987	1.12723	.00000	.65393	112				
Std. Predicted Value	-3.147	1.360	.000	1.000	112				
Std. Residual	-3.637	1.708	.000	.991	112				

a. Dependent Variable: Q11

From the frequency histogram plot in Figure 8-9, it can be seen that the frequency of the standardised residuals nearly follows a normal curve. This possibly suggests that the standardised residuals are fairly close to the normal curve, so the normality assumption is not disrupted for the dependent variable (Q11).



Figure 8-9: Histogram of the frequency of the standardised residuals (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])

From the P-P plot in Figure 8-10 below, it can be seen that the data points almost represent a straight line. However, disrupting the normality assumption is not a main concern for this research since the equation is later manipulated for a random sample in the Monte Carlo model.



Figure 8-10: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11])

• Summary of the Regression Modelling (for the KS enabler independent variables): This subsection has attempted to map the success of KS in projects (explained by the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11]) into the enablers using a linear regression analysis. The KS enablers were used as independent variables in the regression modelling process, and these enablers were selected according to their significant influence on the estimate of the dependent variable (Q11).

Equation 8-5 is the equation of the selected regression model to predict the variable of the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11) of infrastructural projects in the UAE. Thus, the strong relationship between the enabler variables E4 and E12 and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11) suggests that E4 and E12 are very important for predicting Q11, which confirms the LR findings. Also, the mediating variables (personality traits) have caused no changes to the outcome of the regression process as shown in the equation below:

The effectiveness of KS (Q11) = 1.530+0.327*E4+0.207*E12

Equation 8-5: Regression model selected to estimate the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11)

The previous equations have attained the following statistical tests results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05);
- 2. The adjusted R^2 was and 0.287 for Q11;
- 3. Standard error of the estimate was 0.660 for Q11;
- The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted; and
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above, there is an impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each enabler of KS on the success of the KS in projects (explained by the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11]).

- 5. Modelling the impact of the KS barriers on the rate of KS contribution to project success
 - Modelling results:

Table 8-33 shows the model summary that represents the R^2 values, which evaluate the goodness of fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this, small numbers of KS barriers (18 barriers) were picked to estimate the equations. Furthermore, the ANOVA table indicates that the accumulation of variation for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for the statistically significant values). These parameters estimate the impact of the barriers on the success of KS in projects (explained by the dependent variables Q7).

The meaning of the F-statistical significance value is clarified by the cause of the variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variables Q7, Q10, and Q11) because causes of variation are better than guessing from the mean.

Table 8-34 illustrates the results summary including the regression values and change in significance level for the impact of the KS barriers for the different models. Also, this table shows that all of the variables of the barriers in all models are significant.

For Model 1 of the dependent variables Q7, the R² value represents about 6% of the variation in the data sample, even though the p value is less \leq 5%. Thus, it was shown that around 94% cannot be explained from the dependent variable Q7 model because of further variation factors which were not involved or because of natural random variations.

The standard error predicts more than the model fit. This test was applied to evaluate the dependent variable dispersal about the mean. A comparison between both the error value and standard deviation of the dependent variable was done. As a result, this value must be less than 10% of the mean value of the dependent variable.

Table 8-37 displays that the mean and standard deviation values of **the dependent variable Q7** are 4.72 and 0.43, respectively. The standard error approximation of the chosen model is about 1. This illustrates that the error is less than 10% of the threshold value.

Table 8-33: Summary of the regression model results (for regression between the KS barriers and the rate of KS contribution to project success [Q7])

Model Summary ^b										
				Std. Error	Change Statistics					
		R	Adjusted R	of the	R Square	F			Sig. F	
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change	
1	.237ª	.056	.047	1.000	.056	6.534	1	110	.012	

a. Predictors: (Constant), B3

b. Dependent Variable: Q7

Table 8-34: Summary of the analysis of variation of the regression model results (for regression between the KS barriers and the rate of KS contribution to project success [Q7])

ANOVAª									
Model		Sum of Squares	df	Mean Square	F	Sig.			
1	Regression	6.527	1	6.527	6.534	.012 ^b			
	Residual	109.892	110	.999					
	Total	116.420	111						

a. Dependent Variable: Q7

b. Predictors: (Constant), B3

• Significance of the Estimated Coefficients:

For the rate of KS contribution to project success (Q7), the estimated coefficients define the contribution of each of the variables towards the dependent variable estimate. Table 8-35 displays the estimated coefficient of the generated regression model. As a result, all coefficients were found to be significant at the 90% confidence level and also at the 95% confidence level. This finding verifies that the selected variable is a respectable predictor of the rate of KS contribution to project success (Q7). Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.00), and this implies that it is reliable for outlining the interception point of the regression equation. In addition, it is shown in the table that only one KS barrier contributes negatively to the rate of KS contribution to project success (Q7).

The standardised coefficient beta indicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, only the **barrier (B3)**

"Lack of trust towards others towards sharing project knowledge" ($\beta = -.237$

[24%], t = -2.556, p = .012) was a significant predictor of the rate of KS contribution to project success (**O7**).

To conclude, the rate of KS contribution to project success (Q7) can be increased if the barriers of KS (B3) in Equation 8.6 are managed and controlled at times to ensure that

this barrier (B3) "Lack of trust towards others towards sharing project knowledge"

is strongly avoided because organisational efforts should be directed towards

considering the barrier B3 that has a high coefficients. The reason for this is that,

supposedly, this is the barrier that may decrease the opportunity for success in KS in

projects through increasing the rate of KS contribution to project success (Q7).

Table 8-35: Results for estimated coefficients extracted from regression models (for regression between the KS barriers and the rate of KS contribution to project success [Q7])

		Unstandardized Coefficients		Standardised Coefficients			95.0% Confidence Interval for B		Collinearity Statistics		
Model		В	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF	
1	(Constant)	3.773	.384		9.836	.000	3.013	4.533			
	B3	249	.098	237	- 2.556	.012	.056	.443	1.000	1.000	

Coefficients^a

a. Dependent Variable: Q7

• Testing for Correlations of the Independent Variables

The output of correlation tests of the independent variables is shown in Table 13-13 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variable is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The collinearity analysis is represented in Table 8-36, which does not show a large condition index for any variable. This may imply that there is no enough evidence to prove the collinearity for this regression model. On the other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results

does not exist due to the random sampling of the values for every independent

variable's perception spreading.

Table 8-36: Testing the Collinearity between variables (for regression between the KS barriers and the rate of KS contribution to project success [Q7])

-	-			Variance Proportions	
Model	Dimension	Eigenvalue	Condition Index	(Constant)	B3
1	1	1.969	1.000	.02	.02
	2	.031	7.998	.98	.98

a. Dependent Variable: Q7

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals should not be disrupted. Table 8-37 proves that the residual mean is zero from the residuals' statistics results.

 Table 8-37: Residuals' Statistics (for regression between the KS barriers and the rate of knowledge sharing contribution to project success (Q7))

Residuals Statistics ^a									
	Minimum	Maximum	Mean	Std. Deviation	N				
Predicted Value	4.02	5.02	4.72	.242	112				
Residual	-4.770	1.729	.000	.995	112				
Std. Predicted Value	-2.891	1.221	.000	1.000	112				
Std. Residual	-4.772	1.729	.000	.995	112				

a. Dependent Variable: Q7

The frequency histogram plot in Figure 8-11 below shows that the frequency of the standardised residuals nearly follows a normal curve. This possibly suggests that the standardised residuals are fairly close to a normal curve, so the normality assumption is not disrupted for all four of the dependent variables (Q7).



Figure 8-11: Histogram of the frequency of the standardised (for regression between the KS barriers and the rate of KS contribution towards the PS in the infrastructural projects [Q7]

The P-P plot in Figure 8-12 below shows that the data points almost represent a straight

line. However, disrupting the normality assumption is not a main concern for this

research since the equation is later manipulated for a random sample in the Monte Carlo

model.



Figure 8-12: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS barriers and the rate of knowledge sharing contribution to project success [Q7])
• Summary of the Regression Modelling (for the KS enabler's independent variables):

This subsection has attempted to map the success of KS in projects (explained by the dependent variable of the rate of KS contribution to project success [Q7]) into the barriers using a linear regression analysis. The KS barriers were used as independent variables in the regression modelling process, and these barriers were selected according to their significant influence on the estimate of the dependent variable (Q7).

Equation 8-6 is the equation of the selected regression model to predict the variable of the rate of KS contribution to project success (Q7) of infrastructural projects in the UAE. Thus, the strong relationship between the **B3** variable and **the rate of KS contribution to project success (Q7)** suggests that **B3** is very important for predicting **Q7**, which confirms the LR findings. Also, this finding suggests that the mediating variables (personality traits) did not change the outcome of the regression process as shown in the equation below:

The rate of KS contribution to PS (Q7) = 3.773-0.249*B3

Equation 8-6: Regression model selected to estimate the rate of knowledge sharing contribution to project success (Q7) from the KS barriers.

The previous equations have attained the following statistical test results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05);
- 2. The adjusted R^2 was 0.056 for Q7;
- 3. Standard error of the estimate was 1.000 for Q7;
- 4. The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted; and
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above, there is an impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each barrier of KS on the success of the KS in the projects (explained by the rate of KS contribution to project success [Q7]).

- 6. Modelling the impact of the KS barriers on the quality of the timeliness of KS in the infrastructural projects
 - Modelling results:

Table 8-38 shows the model summary that represents the R^2 values, which evaluate the goodness of fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this, small numbers of KS barriers (18 barriers) were picked to estimate the equations. Furthermore, the ANOVA table indicates the accumulation of variation for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for the statistically significant values). These parameters estimate the impact of the barriers on the success of KS in projects (explained by the dependent variables Q10).

The meaning of the F-statistical significance value is clarified by the cause of the variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variables Q7, Q10, and Q11) because causes of variation are better than guessing from the mean.

For Model 1 of the dependent variables Q10, the R² value represents about 8% of the variation in the data sample. Thus, it was shown that around 92% cannot be explained

from the dependent variable Q10 model because of further variation factors which were not involved or because of natural random variations.

Table 8-39 illustrates the results summary including the regression values and change in significance level for the impact of the KS barriers for the different models. Also, this table shows that all of the variables of the barriers in all models are significant.

The standard error predicts more than the model fit. This test was applied to evaluate the dependent variable dispersal about the mean. A comparison between both the error value and standard deviation of the dependent variable was done. As a result, this value must be less than 10% of the mean value for the dependent variable.

Table 8-42 displays that for the regression of **dependent variable Q10**, the mean and standard deviation values of the dependent variable are 3.79 and .21, respectively. The standard error approximation of the chosen model is about 0.71. This illustrates that the error is less than 10% of the threshold value.

Table 8-38: Summary of the regression model results (regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])

Model Summaryb

	initial y											
		-		Std. Error	Change Statistics							
		R	Adjusted R	of the	R Square	F			Sig. F			
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change			
1	.286ª	.082	.074	.71188	.082	9.819	1	110	.002			

a. Predictors: (Constant), Conscientiousness

b. Dependent Variable: Q10

Table 8-39: Summary of the analysis of variation of the regression model results (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])

	ANOVAª												
Model		Sum of Squares	df	Mean Square	F	Sig.							
1	Regression	4.976	1	4.976	9.819	.002 ^b							
	Residual	55.745	110	.507									
	Total	60.721	111										

a. Dependent Variable: Q10

b. Predictors: (Constant), Conscientiousness

• Significance of the Estimated Coefficients:

For the timeliness of KS in the infrastructural projects (Q10), the estimated coefficients define the contribution of each of the variables towards the dependent variable estimate. Table 8-40 displays the estimated coefficient of the generated regression model. As a result, all coefficients were found to be significant at the 90% confidence level and also at the 95% confidence level. This finding verifies that the selected variable, which is the conscientiousness personality trait, is a respectable predictor of the KS success in projects. Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.00), and this implies that it is reliable for outlining the interception point of the regression equation. In addition, it is shown in the table that the conscientiousness personality trait contributes positively to the quality of the timeliness of KS in infrastructural projects (Q10).

The standardised coefficient beta indicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, only the conscientiousness personality trait (β = .286 [29%], t = 3.133, p = .002) was a significant predictor of **the quality of the timeliness of KS in infrastructural projects (Q10).** To conclude, the timeliness of KS in the infrastructural projects (Q10) can be increased if the conscientiousness personality trait in Equation 8.7 is managed and controlled at times to ensure that this personality trait is strongly supported. Organisational efforts should be directed towards the conscientiousness personality trait personality trait because it has a high coefficient and, supposedly, this trait may increase the opportunity for success of the KS in projects through increasing the timeliness of KS in the infrastructural projects (Q10).

Table 8-40: Results for estimated coefficients extracted from regression models (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])

Madel Unstandardized Standardised Coefficients Std. Std. Revend Talaranaa Esta to Sig Revend Talaranaa		Coemcients												
Std. Lower Upper		Unstandardized Coefficients		Standardised Coefficients			95. Confie Interva	0% dence al for B	Collinea Statisti	arity cs				
Nodel D Enoi Deta L Sig. Bound Bound Tolerance	Model	Std. B Error	odel	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF				
1 (Constant) 2.175 .521 4.172 .000 1.142 3.208	1 (Constant)	2.175 .521	(Constant)		4.172	.000	1.142	3.208						
Conscientiousness .371 .119 .286 3.133 .002 .137 .606 1.000 1	Conscientiousness	.371 .119	Conscientiousn	.286	3.133	.002	.137	.606	1.000	1.000				

Coefficients^a

a. Dependent Variable: Q10

• Testing for Correlations of the Independent Variables

The output of correlation tests of the independent variables is shown in Table 13-14 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variable is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The collinearity analysis is represented in Table 8-41, which does not show a large condition index for any variable. This may imply that there is no enough evidence to prove the collinearity for this regression model. On the other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results does not exist due to the random sampling of the values for every independent variable's perception spreading.

Table 8-41: Testing the Collinearity between variables (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10]) Collinearity Diagnostics^a

	=			Variance Proportions		
					Conscientiousnes	
Model	Dimension	Eigenvalue	Condition Index	(Constant)	S	
1	1	1.992	1.000	.00	.00	
	2	.008	15.434	1.00	1.00	

a. Dependent Variable: Q10

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals should not be disrupted. Table 7-42 proves that the residual mean is zero from the residuals' statistics results.

Table 8-42: Residuals' Statistics (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])

Residuals Statistics ^a										
	Minimum	Maximum	Mean	Std. Deviation	Ν					
Predicted Value	2.9178	4.0321	3.7946	.21172	112					
Residual	-2.64257	1.26505	.00000	.70867	112					
Std. Predicted Value	-4.141	1.122	.000	1.000	112					
Std. Residual	-3.712	1.777	.000	.995	112					

a. Dependent Variable: Q10

The frequency histogram plot in Figure 8-13 shows that the frequency of the standardised residuals nearly follows a normal curve. This possibly suggests that the standardised residuals are fairly close to a normal curve, so the normality assumption is not disrupted for all four of the dependent variables (Q10).



Figure 8-13: Histogram of the frequency of the standardised (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])

The P-P plot in Figure 8-14 below shows that the data points almost represent a straight line. However, disrupting the normality assumption is not a main concern for this research since the equation is later manipulated for a random sample in the Monte Carlo model.



Figure 8-14: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS barriers and the quality of the timeliness of KS in the infrastructural projects [Q10])

• Summary of the Regression Modelling (for the KS enabler independent variables):

This subsection has attempted to map the success of KS in projects (explained by the dependent variable of the timeliness of KS in the infrastructural projects [Q10]) into the barriers using a linear regression analysis. The KS barriers were used as independent variables in the regression modelling process, and these barriers were selected according to their significant influence on the estimate of the dependent variable (Q10).

Equation 8-7 is the equation of the selected regression model to predict the variable of the quality of the timeliness of KS in infrastructural projects (Q10) in the UAE. Thus, the strong relationship between the mediating variable, which is the conscientiousness personality trait, and **the quality of the timeliness of KS in infrastructural projects** (Q10), suggests that this variable is very important for predicting Q10, which confirms

the LR findings. Also, this finding introduces the notion that the KS barrier variables

did not change the outcome of regression process as shown in the equation below:

The timeliness of KS (Q10) = 2.175+0.371*Conscientiousness (Q3) Equation 8-7: Regression model selected to estimate the quality of the timeliness of KS in the infrastructural projects (Q10) from the KS barriers

The previous equations have attained the following statistical test results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05);
- 2. The adjusted R^2 was 0.082 for Q10;
- 3. Standard error of the estimate was 0.712 for Q10;
- The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted; and
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above, there is an impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each barrier of KS on the success of the KS in projects (explained by the quality of the timeliness of KS in infrastructural projects [Q10]).

- 7. Modelling the impact of the KS barriers on the effectiveness of KS between stakeholders
 - Modelling results:

Table 8-43 shows the model summary that represents the R^2 values, which evaluate the goodness of fit of the measured regression equations of every output model. These R^2 values represent the degree of data variation in the estimated equations. From these tables, the unadjusted R^2 is shown to be considerably higher than the adjusted R^2 values. To justify this, small numbers of KS barriers (18 barriers) were picked to estimate the equations. Furthermore, the ANOVA table indicates that the accumulation of variation

for the independent models' parameters is significant (F, df, sig, i.e. p value <.05 for the statistically significant values). These parameters estimate the impact of barriers on the success of KS in projects (explained by the dependent variables Q7, Q10, and Q11).

The meaning of the F-statistical significance value is clarified by the cause of variation described by the model, which has not occurred accidentally. In the same context, the model is used to predict the success of KS in projects (explained by the dependent variables Q7, Q10, and Q11) because causes of variation are better than guessing from the mean.

Table 8-44 illustrates the results summary including the regression values and change in significance level for the impact of the KS barriers for the different models. Also, this table shows that all variables of the barriers in all models are significant.

For Model 2 of the dependent variables Q11, the R² value represents about 11% of the variation in the data sample. Thus, it was shown that around 89% cannot be explained from the dependent variable Q11 model because of further variation factors which were not involved or because of natural random variations.

The standard error predicts more than the model fit. This test was applied to evaluate the dependent variable dispersal about the mean. A comparison between the error value and standard deviation of the dependent variable was done. As a result, this value must be less than 10% of the mean value for the dependent variable.

Table 8-47 displays that for the regression of **dependent variable Q11**, the mean and standard deviation values of the dependent variable are 3.62 and 0.26, respectively. The standard error approximation of the chosen model is about 0.74. This illustrates that the error is less than 10% of the threshold value.

Table	8-43:	Summary	of t	he	regression	model	results	(for	regression	between	the	KS
barrie	parriers and The effectiveness of knowledge sharing between stakeholders [Q11])											
					Mode	I Summ	arvc					

Model Summary	c
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				Std. Error	Change Statistics						
		R	Adjusted R	of the	R Square	F			Sig. F		
Model	R	Square	Square	Estimate	Change	Change	df1	df2	Change		
1	.249ª	.062	.054	.76036	.062	7.280	1	110	.008		
2	.337 ^b	.114	.098	.74249	.052	6.358	1	109	.013		

a. Predictors: (Constant), B12b. Predictors: (Constant), B12, Openness

c. Dependent Variable: Q11

Table 8-44: Summary of the analysis of variation of the regression model results (for regression between the KS barriers and The effectiveness of knowledge sharing between stakeholders [Q11]) ANOV/Aa

Model		Sum of Squares	df	Mean Square	F	Sig.						
1	Regression	4.209	1	4.209	7.280	.008 ^b						
	Residual	63.596	110	.578								
	Total	67.804	111									
2	Regression	7.714	2	3.857	6.996	.001°						
	Residual	60.090	109	.551								
	Total	67.804	111									

a. Dependent Variable: Q11

b. Predictors: (Constant), B12
c. Predictors: (Constant), B12, Openness

Significance of the Estimated Coefficients:

For the effectiveness of KS between stakeholders (Q11), the estimated coefficients define the contribution of each of the variables towards the dependent variable estimate. Table 8-41 displays the estimated coefficient of the generated regression model. As a result, all coefficients were found to be significant at the 90% confidence level and also at the 95% confidence level. This finding verifies that the two selected variables are respectable predictors of KS success in projects. Moreover, the 'significance' value of the assessed constant of regression is below 0.05 (Sig. < 0.04), and this implies that it is reliable for outlining the interception point of the regression equation. In addition, it is shown in the table that all KS barriers contribute negatively to the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11).

The standardised coefficient beta indicates the contribution that the dependent variable makes to the model and the size of that contribution. In this case, the combination of the barrier B12 "The influence of organisational structures changes upon motivation to share knowledge" (β = -.233 [-23%], t = -2.573, p = .011) and the openness personality trait (β = .228 [23%], t = 2.522, p = .013) was a significant predictor of the effectiveness of KS between stakeholders (Q11).

To conclude, the success of KS in projects can be increased if the B12 barrier of KS and openness personality trait in Equation 8.8 are managed and controlled at times to ensure that the barriers are strongly avoided because organisational efforts should be directed towards considering B12 and the openness personality trait that have high coefficients. The reason for this is that, supposedly, this barrier is the one that may decrease the opportunity of KS in projects through increasing the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11).

Table 8-45: Results for estimated coefficients extracted from regression models (for regression between the KS barriers and the effectiveness of knowledge sharing between stakeholders [Q11])

	COEIIICIEIIIS"												
		Unstandardized Coefficients		Standardised Coefficients			95.0% Co Interva	onfidence al for B	Collinea Statist	arity ics			
Model		В	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF			
1	(Constant)	2.737	.334		8.182	.000	2.074	3.399					
	B12	223	.083	249	- 2.698	.008	.059	.386	1.000	1.000			
2	(Constant)	1.615	.552		2.927	.004	.522	2.709					
	B12	208	.081	233	- 2.573	.011	.048	.368	.995	1.005			
	Openness	.300	.119	.228	2.522	.013	.064	.535	.995	1.005			

Coefficients^a

a. Dependent Variable: Q11

• Testing for Correlations of the Independent Variables

The output of correlation tests of the independent variables is shown in Table 13-15 in the appendices. Although correlations among most of the independent variables were found to be weak, there are a few circumstances in which the independent variables showed partial correlation, which indicates that the inter-correlations between the independent variables are not particularly strong. Therefore, the effect of multicollinearity on the reliability of the independent variable is considered to be insignificant.

• Testing for Collinearity of the Independent Variables

The collinearity analysis is represented in Table 8-46, which does not show a large condition index for any variable. This may imply that there is no enough evidence to prove the collinearity for this regression model. On the other hand, this model is later used to perform a random simulation, so the noise of collinearity effects upon the results does not exist due to the random sampling of the values for every independent variable's perception spreading.

 Table 8-46: Testing the Collinearity between variables (for regression between the KS barriers and the effectiveness of knowledge sharing between stakeholders [Q11])

				Variance Proportions				
Model	Dimension	Eigenvalue	Condition Index	(Constant)	B12	Openness		
1	1	1.977	1.000	.01	.01			
	2	.023	9.201	.99	.99			
2	1	2.956	1.000	.00	.01	.00		
	2	.034	9.303	.03	.86	.19		
	3	.010	17.150	.97	.14	.81		

Collinearity Diagnostics^a

a. Dependent Variable: Q11

• Examining Residuals using Plots

Assumption of linearity of the dependent and independent variables for the generated regression models was tested. In general, assumptions of homoscedasticity, independence, and normality of the residuals shouldn't be disrupted. Table 8-47 proves that the residual mean is zero from the residuals' statistics results.

Table 8-47: Residuals' Statistics (for regression between the KS barriers and the effectiveness of knowledge sharing between stakeholders [Q11])

-	Minimum	Maximum	Mean	Std. Deviation	Ν
Predicted Value	2.9718	4.1534	3.6179	.26362	112
Residual	-2.35367	1.77847	.00000	.73577	112
Std. Predicted Value	-2.451	2.032	.000	1.000	112
Std. Residual	-3.170	2.395	.000	.991	112

Residuals Statistics^a

a. Dependent Variable: Q11

The frequency histogram plot in Figure 8-15 below shows that the frequency of the standardised residuals nearly follows a normal curve. This possibly suggests that the standardised residuals are fairly close to a normal curve, so the normality assumption is not disrupted for all four of the dependent variables (Q11).



Figure 8-15: Histogram of the frequency of the standardised (for regression between the KS barriers and the effectiveness of KS between stakeholders [Q11])

The P-P plot in Figure 8-16 below shows that the data points almost represent a straight line. However, disrupting the normality assumption is not a main concern for this research since the equation is later manipulated for a random sample in the Monte Carlo model.



Figure 8-16: Normal P-P plot of regression standardised residual for the dependent variable (for regression between the KS barriers and the effectiveness of knowledge sharing between stakeholders (Q11))

• Summary of the Regression Modelling (for the KS enabler's independent variables):

This subsection has attempted to map the success of KS in projects (explained by the four dependent variables of the effectiveness of KS between stakeholders at each stage of the project lifecycle [Q11]) into the barriers using a linear regression analysis. The KS barriers were used as independent variables in the regression modelling process, and these barriers were selected according to their significant influence on the estimate of the dependent variable (Q11).

Equation 8-8 is the equation of the selected regression model to predict the variable of the effectiveness of knowledge sharing between stakeholders (Q11) of infrastructural projects in the UAE. Thus, the strong relationship between the variables of **B12 and openness (Q5)** and the effectiveness of KS (Q11) suggests that **B12 and Q5** variables are very important for predicting **Q11**, which confirms the LR findings as shown in the equation below:

The effectiveness of KS (Q11) = 1.615-0.208*B12+0.300* Openness (Q5)

Equation 8-8: Regression model selected to estimate the effectiveness of knowledge sharing between stakeholders (Q11)

The previous equations have attained the following statistical test results:

- 1. F-statistic was significant, as it was estimated (Sig. < 0.05)
- 2. The adjusted \mathbb{R}^2 was 0.114 for Q11;
- 3. Standard Error of the Estimate was 0.742 for Q11;
- The significance of the measured coefficients was < 0.10, and all variables have a significance of < 0.05;
- 5. Assumption of independence of the error term was not disrupted; and
- 6. Assumption of normality was not disrupted (P-P plot of the residuals appeared to follow a linear line).

According to what is listed above; there is the impression that none of the major regression assumptions were disrupted. Therefore, the above equations are acceptable to randomly simulate the impact of each barrier of KS on the success of the KS in the projects (explained by the effectiveness of KS between stakeholders [Q11]).

8.3 Chapter Summary

This section has described the Spearman correlation tests to measure the association between two continuous variables of interest and how they both change in respect to time. The results attempt to explain the correlation between the independent variables in the KS enablers groups and KS barriers groups and the dependent variables in the personality traits group and KS effectiveness group. In addition, this section has shown linear multiple regression analyses to predict one variable from the existing knowledge of one or more variables and to look for significant relationships (Residual Square) by using the personality traits as mediating variables and the culture of KS in the projects. The results of implementing a stepwise regression for each of the KS group variables using SPSS scores to create the variables' significance for both the KS enabler and barrier groups were tested to generate the models. The next section includes the aforementioned research hypotheses, which are tested using the ANOVA and correlation and regression tests.

9. Chapter 9: Hypothesis Testing

9.1 Research Hypotheses for ANOVA

This section explains the inferential statistical analysis, which was performed with the aid of the software SPSS, starting with data preparation to discover the potential relationships between data. These relationships are important for examining the 10 hypotheses shown below in Table 9-1 based on the classification of both the KS enablers and barriers to answer the research questions.

Accordingly, ANOVA, which assumes a nominal and continuous data range of the survey's independent variables, was selected to investigate the differences between the respondents' opinions of the KS enablers and barriers according to the experience of their work sector (**construction, governmental, and others**).

The ANOVA test was selected for use as an inferential statistical technique for this study as it is considered to be a test of the differences among or within two or more groups since this study includes three groups of industry sectors. On the other hand, the Mann-Whitney U test was not selected here as it can only be applied to compare ranking between two groups. Moreover, the reason behind not selecting the Kruskal-Wallis H test, which is a non-parametric test, is that ranking tests are used to compare medians of two or more samples and are insufficient for identifying the number of differences between samples or even where they happen. An ANOVA test thus satisfies this study's needs. All of the variables that were identified and established from the literature review are involved in the 10 hypotheses, as shown below, which were tested using the SPSS software. However, the upcoming subsections represent only the inferential significance results of the tests of the response differences among groups with respect to the difference in the specific means of the other groups. For this research, these results are considered as significant only at when p < 0.05. Furthermore, post-hoc tests were applied to conduct pairwise comparisons in cases when the results were found to be significant.

Table 9-1: Research Hypotheses for ANOVA

		Restatement of Research Hypotheses for ANOVA
1a -	- Organisat	ional factors of KS enablers related to the success of KS in projects "Work sector"
1a	H1a: β1a	There is no statistically significant difference between the respondents' perceptions of the idea,
	= 0.	"Organisational factors of KS enablers related to the success of KS in projects".
	HA1a:	There is a statistically significant difference between the respondents' perceptions of the idea,
	β1a ≠ 0.	"Organisational factors of KS enablers related to the success of KS in projects".
1b -	- Motivation	al factors of KS enablers related to the success of KS in projects "Work sector"
1b	H1b: B1b	There is no statistically significant difference between the respondents' perceptions of the idea,
	= 0.	"Motivation factors of KS enablers related to the success of KS in projects".
	HA1b:	There is a statistically significant difference between the respondents' perceptions of the idea.
	$\beta 1b \neq 0.$	"Motivation factors of KS enablers related to the success of KS in projects".
1c -	Process fac	tors of KS enablers related to the success of KS in projects "Work sector"
10	III a Q1a	There is no statistically significant difference between the respondents' percentions of the idea
IC	- 0	"Process factors of KS anablers related to the success of KS in projects"
	= 0.	There is a statistically significant difference between the regrendents' nereartions of the idea
	$P_{1a} \neq 0$	"Process factors of KS anablers related to the success of KS in projects"
1.1	$p_1c \neq 0.$	rical factors of KS anablers related to the success of KS in projects .
1d -		There is no statistically significant difference between the regreendents' normanities of the idea
Iu	HId: BId	"There is no statistically significant difference between the respondents perceptions of the idea,
	$\equiv 0.$	There is a statistically similiant difference between the more dental according of the idea
		"Technological factors of KS anablers related to the success of KS in projects"
1	$\beta Id \neq 0.$	rechnological factors of KS enablers related to the success of KS in projects .
1e –	Social net	working factors of KS enablers related to the success of KS in projects "work sector"
1e	H1e: β1e	There is no statistically significant difference between the respondents' perceptions of the idea,
	= 0.	"Social networking factors of KS enablers related to the success of KS in projects".
	HA1e:	There is a statistically significant difference between the respondents' perceptions of the idea,
	$\beta 1e \neq 0.$	"Social networking factors of KS enablers related to the success of KS in projects".
1f –	Physical e	nvironmental factors of KS enablers related to the success of KS in projects "Work
Sec	tor"	
1f	H1f: β1f	There is no statistically significant difference between the respondents' perceptions of the idea,
	= 0.	"Physical environment factors of KS enablers related to the success of KS in
		projects".
	HAIf:	There is a statistically significant difference between the respondents' perceptions of the idea,
	β If \neq 0.	"Physical environment factors of K5 enablers related to the success of K5 in
1~	اميامانيناميا	projects.
<u>Ig</u> –		S factors of KS enablers related to the success of KS in projects "work sector"
Ig	HIg: BIg	I here is no statistically significant difference between the respondents perceptions of the idea,
	= 0.	
	HAIg:	I here is a statistically significant difference between the respondents perceptions of the idea,
2	$\beta Ig \neq 0.$	Individuals factors of KS enablers related to the success of KS in projects .
2a -	- Individual	factors of KS barriers related to the success of KS in projects "Work sector"
2a	H2a: B2a	There is no statistically significant difference between the respondents' perceptions of the idea,
	= 0.	individual factors of KS barriers related to the success of KS in projects ,
	HA2a:	There is a statistically significant difference between the respondents' perceptions of the idea,
21	$\beta 2a \neq 0.$	"Individual factors of KS barriers related to the success of KS in projects".
2b -	- Organisati	onal factors of KS barriers related to the success of KS in projects "Work sector"
2b	H2b: β 2b	There is no statistically significant difference between the respondents' perceptions of the idea,
	= 0.	Organisational factors of KS partiers related to the success of KS in projects".
	HA2b:	There is a statistically significant difference between the respondents' perceptions of the idea,
1	$\beta 2b \neq 0.$	"Urganisational factors of KS barriers related to the success of KS in projects".

2c -	2c – Technological factors of KS barriers related to the success of KS in projects "Work sector"						
2c	H2c: β2c	There is no statistically significant difference between the respondents' perceptions of the idea,					
	= 0.	"Technological factors of KS barriers related to the success of KS in projects".					
	HA2c:	There is a statistically significant difference between the respondents' perceptions of the idea,					
	$\beta 2c \neq 0.$	"Technological factors of KS barriers related to the success of KS in projects".					
	$\beta 2c \neq 0.$	"rechnological factors of KS barriers related to the success of KS in projects".					

9.1.1 Hypothesis 1a

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations. and variations for all three groups based on the respondents' work sectors (construction, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and this significance level was also used for the F-statistics. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The first hypothesis, "**organisational factors of KS enablers are related to the success of KS in projects**", was tested based on the working sector of the respondents.

H1a: β 1a = 0. There is no statistically significant difference among the respondents' perceptions of the phrase, "organisational factors of KS enablers are related to the success of KS in the projects".

HA1a: $\beta 1a \neq 0$. There is a statistically significant difference among the respondents' perceptions of the phrase, "organisational factors of KS enablers related to the success of KS in the projects".

The ANOVA Table 9.2 represents the output of the ANOVA analysis and shows whether there is any statistically significant difference between the means of the groups. Therefore, there is no statistically significant difference between groups in the rating of organisational factors of KS enabler E1 as determined by the one-way ANOVA (F = 0.777, p = 0.462, which is above 0.05). Similarly, there was no statistically significant difference between groups in rating **E2** (F = 2.434, p = 0.092). For this reason, the null hypothesis is accepted.

		U				
		Sum of Squares	Df	Mean Square	F	Sig.
E1	Between Groups	1.152	2	.576	.777	.462
	Within Groups	80.812	109	.741		
	Total	81.964	111			
E2	Between Groups	3.313	2	1.657	2.434	.092
	Within Groups	74.178	109	.681		
	Total	77.491	111			
E3	Between Groups	6.061	2	3.031	4.470	.014
	Within Groups	73.903	109	.678		
	Total	79.964	111			

Table 9-2: ANOVA test for organisational factors of KS.

However, as the significance values of **E3** are F = 4.470 and p = .014 (which is below 0.05), this indicates there is a statistically significant difference between groups as determined by one-way ANOVA. For this reason, the null hypothesis is rejected. Consequently, through a Tukey post-hoc test, the following multiple comparison Table 9.3 determines which of the specific groups differed.

A Tukey post-hoc test revealed that the E3 factor of KS enablers "organisational commitment to project KS" was statistically significantly lower between the construction and government groups. On the other hand, there was no statistically significant difference between the construction group and the group of others (p = .140) nor between the government group and the group of others (p = 0.994).

This result indicates that the respondents, based on their work sectors, have different concerns about the E3 factor that was rejected. This factor is related to "organisational commitment to project KS", which could influence the success of KS in projects.

Respondents from the construction sector are more concerned about the impact of this factor than respondents from all of the other groups. These differing opinions could be due to different experiences and specialties of applicants regarding organisations' commitment, which could affect the success of KS in the projects.

Dependent Variable	(I) Q6	(J) Q6	Mean Difference (I-J)	Std. Error	Sig.
E3	Others	Construction, Machinery, and Homes	485	.254	.140
		Government	026	.260	.994
	Construction,	Others	.485	.254	.140
	Machinery, and Homes	Government	.459*	.167	.019
	Government	Others	.026	.260	.994
		Construction, Machinery, and Homes	459 [*]	.167	.019

Table 9-3	Post-hoc	test - E3	3 Factor
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To conclude, the ANOVA results indicate that the null hypothesis (H1a: $\beta 1a = 0$) was rejected for one of the three organisational KS enablers, the factor **E3**, while the remaining factors **E1** and **E2** indicate no statistically significant difference between the respondents' perceptions. Furthermore, the respondents, based on their working sectors, have different concerns about the factors that were rejected. These differing opinions are further interpreted in the discussion chapter.

9.1.2 Hypothesis 1b

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (constructions, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and this significance level was also used for the F-statistics. The main assumption that was made for this ANOVA test is

that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The second hypothesis "motivational factors of KS enablers related to the

success of KS in projects" was tested based on the working sectors of the respondents.

H1b: β 1b = 0. There is no statistically significant difference between the respondents' perceptions of the idea, "**motivational factors of KS enablers are related to the success of KS in the projects**"

HA1b: $\beta 1b \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "motivational factors of KS enablers are related to the success of KS in the projects"

The ANOVA Table 9.4 represents the output of the ANOVA analysis and whether there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of motivational factors of KS enabler E4 as determined by one-way ANOVA (F = 1.582, p = 0.210, which is above 0.05).

		Sum of				
		Squares	df	Mean Square	F	Sig.
E4	Between Groups	3.011	2	1.505	1.582	.210
	Within Groups	103.703	109	.951		
	Total	106.714	111			
E5	Between Groups	8.891	2	4.446	6.559	.002
	Within Groups	73.885	109	.678		
	Total	82.777	111			

Table 9-4: ANOVA test for motivation factors of KS.

However, as the significance values of **E5** are F = 6.559 and p = .002 (which is below 0.05), this indicates there was a statistically significant difference between groups as determined by one-way ANOVA, and thus, the null hypothesis is rejected. The following multiple comparison Tables 9.5 determine which of the specific groups differed from the others through a Tukey post-hoc test.

A Tukey post-hoc test revealed that the E5 factor of KS enablers (leadership commitment to supporting open and honest two-way communication in the projects) was statistically significantly lower between the construction and governmental groups (p = 0.008) than the construction and others groups (p = 0.019). However, there was no statistically significant difference between the governmental and others groups (p =.140) nor between the government and others groups (p = 0.994).

This result indicates that the respondents, based on their work sectors, have different concerns about the E5 factor that was rejected. This factor is related to "leadership commitment to support open and honest two-way communication in the projects", which could influence the success of KS in projects. *Respondents from the construction and government work sectors are more concerned about the impact of this factor than respondents from all of the other groups*. Differing opinions could be due to different experiences and specialties of applicants regarding leaderships' commitment, which could affect the success of KS in the projects.

Dependent Variable	(I) Q6	(J) Q6	Mean Difference (I-J)	Std. Error	Sig.
E5	Others	Construction, Machinery, and Homes	698 [*]	.254	.019
		Government	189	.260	.748
	Construction,	Others	.698 [*]	.254	.019
	Machinery, and Homes	Government	.509 [*]	.167	.008
	Government	Others	.189	.260	.748
		Construction, Machinery, and Homes	509 [*]	.167	.008

Table 9-5: Post-hoc test – E5 Factor

To conclude, the ANOVA results indicate that the null hypotheses H1b: β 1b = 0 was rejected for one out of two motivational KS enablers, which is the factor **E5**, while the other factor, **E4**, indicates that there is no statistically significant difference between the respondents' perceptions. Furthermore, the respondents, based on their working sectors, have varying concerns about the factors that were rejected. These differences of opinion are further interpreted in the discussion chapter.

9.1.3 Hypothesis 1c

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (constructions, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and this significance level was also used for the F-statistics. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The third hypothesis "**process factors of KS enablers are related to the success of KS in projects**" was tested based on the working sector of the respondent. H1c: β 1c = 0. There is no statistically significant difference between the respondents' perceptions of the idea, "process factors of KS enablers are related to the success of KS in the projects".

HA1c: $\beta 1c \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "processes factors of KS enablers are related to the success of KS in the projects".

The ANOVA Table 9.6 represents the output of the ANOVA analysis and if there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in their ratings of process factors of KS enablers **E6**, **E7**, **E8**, **E9**, **E10**, **E11**, **E12**, **and E14** as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		Sum of Squares	df	Mean Square	F	Sig.
E6	Between Groups	3.248	2	1.624	2.119	.125
	Within Groups	83.529	109	.766		
	Total	86.777	111			
E7	Between Groups	4.163	2	.082	2.698	.072
	Within Groups	84.087	109	.771		
	Total	88.250	111			
E8	Between Groups	2.833	2	1.417	1.558	.215
	Within Groups	99.086	109	.909		
	Total	101.920	111			
E9	Between Groups	2.737	2	1.369	1.704	.187
	Within Groups	87.540	109	.803		
	Total	90.277	111			
E10	Between Groups	2.073	2	1.037	1.489	.230
	Within Groups	75.891	109	.696		
	Total	77.964	111			
E11	Between Groups	2.063	2	1.031	1.181	.311
	Within Groups	95.214	109	.874		

Table 9-6: ANOVA test for process factors of KS.

	Total	97.277	111			
E12	Between Groups	.226	2	.113	.136	.873
	Within Groups	90.337	109	.829		
	Total	90.563	111			
E13	Between Groups	4.844	2	2.422	4.017	.021
	Within Groups	65.719	109	.603		
	Total	70.563	111			
E14	Between Groups	.653	2	.326	.467	.628
	Within Groups	76.267	109	.700		
	Total	76.920	111			

However, as the significance values of **E13** is F = 4.017 and p = .021 (which is below 0.05), this indicates there was a statistically significant difference between groups as determined by one-way ANOVA, and thus, the null hypothesis is rejected. The following multiple comparison Tables 9.7 determine which of the specific groups differed from the others through a Tukey post-hoc test.

A Tukey post-hoc test revealed that the E13 factor of KS enablers (the ability to communicate between project stakeholders regarding the project through specific channels) was statistically significantly lower between the construction and government groups. However, there was no statistically significant difference between the construction and others groups (p = .314) as well as between the government and others groups (p = 0.940).

This result indicates that the respondents, based on their working sectors, have different concerns about the E13 factor that was rejected. This factor is related to "the ability to communicate between project stakeholders regarding the project through specific channels", which could influence the success of KS in the projects. *Respondents from the government sector are more concerned about the impact of this factor than respondents from all of the other groups about this factor*. Differing opinions could be

due to different experiences and specialties of applicants regarding the ability to communicate, which could affect the success of KS in the projects.

Dependent Variable	(I) Q6	(J) Q6	Mean Difference (I-J)	Std. Error	Sig.
E13	Others	Construction, Machinery, and Homes	350	.239	.314
		Government	.082	.245	.940
	Construction, Machinery,	Others	.350	.239	.314
	and Homes	Government	.432*	.157	.019
	Government	Others	082	.245	.940
		Construction, Machinery, and Homes	432*	.157	.019

 Table 9-7: Post-hoc test – E13 Factor

To conclude, the ANOVA results indicate that the null hypotheses H1c: β 1c = 0 was rejected for one out of nine process KS enablers, which is the factors **E13**, while the rest of the factors **E6**, **E7**, **E8**, **E9**, **E10**, **E11**, **E12**, **and E14** indicate that there is no statistically significant difference between the respondents' perceptions. Furthermore, the respondents, based on their working sectors, have different concerns about these factors that were rejected. These differences are further interpreted in the discussion chapter.

9.1.4 Hypothesis 1d

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (constructions, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, along with detecting the F-statistic. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The fourth hypothesis "**technological factors of KS enablers are related to the success of KS in projects**" was tested based on the working sectors of the respondents.

H1d: β 1d = 0. There is no statistically significant difference between the respondents' perceptions of the idea, "Technological factors of KS enablers are related to the success of KS in the projects".

HA1d: $\beta 1d \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "Technological factors of KS enablers are related to the success of KS in the projects".

The ANOVA Table 9.8 represents the output of the ANOVA analysis and whether there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in their rating of technological factors of KS enablers **E15**, **E16**, **E17**, **E18**, **E19**, **E20**, **and E21** as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		Sum of Squares	df	Mean Square	F	Sig.
E15	Between Groups	.240	2	.120	.217	.806
	Within Groups	60.323	109	.553		
	Total	60.563	111			
E16	Between Groups	3.830	2	1.915	3.028	.053
	Within Groups	68.947	109	.633		
	Total	72.777	111			
E17	Between Groups	3.115	2	1.557	2.340	.101
	Within Groups	72.564	109	.666		
	Total	75.679	111			
E18	Between Groups	1.599	2	.800	1.498	.228
	Within Groups	58.178	109	.534		
	Total	59.777	111			
E19	Between Groups	2.726	2	1.363	2.383	.097
	Within Groups	62.337	109	.572		
	Total	65.063	111			
E20	Between Groups	.482	2	.241	.353	.704
	Within Groups	74.438	109	.683		
	Total	74.920	111			
E21	Between Groups	1.120	2	.560	.704	.497
	Within Groups	86.737	109	.796		
	Total	87.857	111			

Table 9-8: ANOVA test for process factors of KS.

To conclude, the ANOVA results indicate that the null hypotheses H1d: $\beta 1d = 0$ was accepted for all of the factors **E15**, **E16**, **E17**, **E18**, **E19**, **E20**, and **E21**, which indicates that there is no statistically significant difference between the respondents' perceptions.

9.1.5 Hypothesis 1e

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (constructions, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and this significance level was also used for the F-statistics. The main assumption that was made for this ANOVA test is

that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The fifth hypothesis "**social networking factors of KS enablers are related to the success of KS in projects** was tested based on the working sectors of the respondents.

H1e: $\beta 1e = 0$. There is no statistically significant difference between the respondents' perceptions of the idea, "social networking factors of KS enablers are related to the success of KS in the projects".

HA1e: $\beta 1e \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "social networking factors of KS enablers are related to the success of KS in the projects".

The ANOVA Table 9.9 represents the output of the ANOVA analysis and whether there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of the social networking factors of KS enablers **E22**, **E23**, **E24**, **E25**, **E26**, **and E27** as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		Sum of Squares	df	Mean Square	F	Sig.
E22	Between Groups	3.981	2	1.991	2.234	.112
	Within Groups	97.126	109	.891		
	Total	101.107	111			
E23	Between Groups	1.329	2	.664	.768	.467
	Within Groups	94.350	109	.866		
	Total	95.679	111			
E24	Between Groups	1.774	2	.887	1.055	.352
	Within Groups	91.655	109	.841		
	Total	93.429	111			
E25	Between Groups	2.405	2	1.202	1.613	.204
	Within Groups	81.274	109	.746		
	Total	83.679	111			
E26	Between Groups	3.565	2	1.783	2.093	.128
	Within Groups	92.854	109	.852		
	Total	96.420	111			
E27	Between Groups	.824	2	.412	.463	.631
	Within Groups	97.140	109	.891		
	Total	97.964	111			

Table 9-9: ANOVA test for social networking factors of KS.

To conclude, the ANOVA results indicate that the null hypotheses H1e: $\beta 1e = 0$ was accepted for all of the factors **E22**, **E23**, **E24**, **E25**, **E26**, and **E27**, which indicates that there is no statistically significant difference between the respondents' perceptions.

9.1.6 Hypothesis 1f

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (construction, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and the F-statistic was detected. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The sixth hypothesis "**physical environmental factors of KS enablers are related to the success of KS in projects**" was tested based on the working sectors of the respondents.

H1f: β 1f = 0. There is no statistically significant difference between the respondents' perceptions of the idea, "**physical environmental factors of KS enablers are** related to the success of KS in the projects".

HA1f: β 1f \neq 0. There is a statistically significant difference between the respondents' perceptions of the idea, "physical environmental factors of KS enablers are related to the success of KS in the projects".

The ANOVA Table 9.10 represents the output of the ANOVA analysis and whether there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of physical environmental of KS enablers E29 and E30 as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		Sum of Squares	df	Mean Square	F	Sig.
E28	Between Groups	5.376	2	2.688	3.265	.042
	Within Groups	89.731	109	.823		
	Total	95.107	111			
E29	Between Groups	2.253	2	1.126	1.591	.208
	Within Groups	77.176	109	.708		
	Total	79.429	111			
E30	Between Groups	.674	2	.337	.403	.669
	Within Groups	91.103	109	.836		
	Total	91.777	111			

Table 9-10: ANOVA test for physical environmental factors of KS.

However, as the significance values of **E28** are F = 3.265 and p = .042 (which is below 0.05), this indicates there was a statistically significant difference between groups as determined by one-way ANOVA. Thus, the null hypothesis is rejected. The following

multiple comparison tables 9.11 determine which one of the specific groups differed from the others through Tukey post-hoc test.

A Tukey post-hoc test revealed that the E28 factor of KS enablers (sufficient funding, facilities, and technological resources to facilitate project KS) was not statistically significantly difference between the construction and other groups (p = 0.560). Similarly, there was no statistically significant difference between the construction and governmental groups (p = .216) nor between the government and others groups (p = 0.458).

This result indicates that the respondents, based on their work sectors, have different concerns about the factors E28 that was rejected. This factor is related to "sufficient funding, facilities, and technological resources to facilitate project KS", which could have influence on the success of knowledge sharing in the projects. *Respondents from the construction sector are more concerned about the impact of this factor than respondents from all of the other groups*. Different opinions could be due to different experiences and specialties of applicants regarding sufficient funding that could affect the success of KS in projects.

Dependent Variable	(I) Q6	(J) Q6	Mean Difference (I-J)	Std. Error	Sig.
E28	Others	Construction, Machinery, and Homes	652	.280	.056
		Government	343	.286	.458
	Construction,	Others	.652	.280	.056
	Machinery, and Homes	Government	.309	.184	.216
	Government	Others	.343	.286	.458
		Construction, Machinery, and Homes	309	.184	.216

To conclude, the ANOVA results indicate that the null hypotheses H1f: β 1f = 0 was rejected for one out of three organisational KS enablers, the factor **E28**, while the remaining factors **E29** and **E30** indicate no statistically significant difference between the respondents' perceptions. Furthermore, the respondents, based on their work sectors, have different concerns about these factors that were rejected. These differences of opinion are further interpreted in the discussion chapter.

9.1.7 Hypothesis 1g

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (construction, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and the F-statistic was detected. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The seventh hypothesis "individual factors of KS enablers are related to the success of KS in projects" was tested based on the working sectors of the respondents.

H1g: β 1g = 0. There is no statistically significant difference between the respondents' perceptions of the idea, "individual factors of KS enablers are related to the success of KS in the projects".

HA1g: $\beta 1g \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "individual factors of KS enablers are related to the success of KS in the projects".

The ANOVA Table 9.12 represents the output of the ANOVA analysis and whether there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of physical environmental of KS enablers E31, E32, E33, E34, E35, and E36 as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		Sum of Squares	df	Mean Square	F	Sig.
E31	Between Groups	.927	2	.463	.655	.521
	Within Groups	77.038	109	.707		
	Total	77.964	111			
E32	Between Groups	.800	2	.400	.572	.566
	Within Groups	76.191	109	.699		
	Total	76.991	111			
E33	Between Groups	1.759	2	.880	1.274	.284
	Within Groups	75.232	109	.690		
	Total	76.991	111			
E34	Between Groups	.123	2	.062	.092	.913
	Within Groups	73.297	109	.672		
	Total	73.420	111			
E35	Between Groups	.682	2	.341	.571	.567
	Within Groups	65.095	109	.597		
	Total	65.777	111			
E36	Between Groups	1.094	2	.547	.698	.500
	Within Groups	85.469	109	.784		
	Total	86.562	111			

Table 9-12: ANOVA test for individuals' factors of KS.

To conclude, the ANOVA results indicate that the null hypotheses H1g: β 1g = 0 was accepted for all of the factors **E31**, **E32**, **E33**, **E34**, **E35**, and **E36**, which indicates that there is no statistically significant difference between the respondents' perceptions.

9.1.8 Hypothesis 2a

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (construction, governmental, and other). Accordingly, the hypotheses were

tested using the significance level of p = 0.05, and the F-statistic was detected. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The eighth hypothesis "**individual factors of KS barriers are related to the success of KS in projects**" was tested based on the working sectors of the respondents.

H2a: $\beta 2a = 0$. There is no statistically significant difference between the respondents' perceptions of the idea, "individual factors of KS barriers are related to the success of KS in the projects".

HA2a: $\beta 2a \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "individual factors of KS barriers are related to the success of KS in the projects".

The ANOVA Table 9.13 represents the output of the ANOVA analysis and if there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of individuals factors of KS barriers**B1**, **B2**, **B3**, **B4**, **B5**, **and B6** as determined by oneway ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		Sum of Squares	df	Mean Square	F	Sig.
B1	Between Groups	4.673	2	2.337	2.408	.095
	Within Groups	105.747	109	.970		
	Total	110.420	111			
B2	Between Groups	.396	2	.198	.297	.744
	Within Groups	72.667	109	.667		
	Total	73.062	111			
B3	Between Groups	1.089	2	.545	.571	.567
	Within Groups	103.973	109	.954		
	Total	105.062	111			

Table 9-13: ANOVA test for Individuals factors of KS barriers.

B4	Between Groups	.796	2	.398	.488	.615
	Within Groups	88.919	109	.816		
	Total	89.714	111			
B5	Between Groups	3.114	2	1.557	1.434	.243
	Within Groups	118.306	109	1.085		
	Total	121.420	111			
B6	Between Groups	.654	2	.327	.363	.697
	Within Groups	98.337	109	.902		
	Total	98.991	111			

To conclude, the ANOVA results indicate that the null hypotheses H2a: $\beta 2a = 0$ was accepted for all of the factors **B1**, **B2**, **B3**, **B4**, **B5**, and **B6**, which indicates that there is no statistically significant difference between the respondents' perceptions.

9.1.9 Hypothesis 2b

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (construction, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and the F-statistic was detected. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The ninth hypothesis "**organisational factors of KS barriers are related to the success of KS in projects**" was tested based on the working sectors of the respondents.

H2b: $\beta 2b = 0$. There is no statistically significant difference between the respondents' perceptions of the idea, "organisational factors of KS barriers are related to the success of KS in the projects".
HA2b: $\beta 2b \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "organisational factors of KS barriers are related to the success of KS in the projects".

The ANOVA Table 9.14 represents the output of the ANOVA analysis and whether there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of organisational factors of KS barriers **B7**, **B8**, **B9**, **B10**, **B11**, **B12**, **and B13** as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

Table 9-14: ANOVA test for orga	nisational factors of KS barriers.
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		Sum of Squares	df	Mean Square	F	Sig.
B7	Between Groups	3.090	2	1.545	1.583	.210
	Within Groups	106.401	109	.976		
	Total	109.491	111			
B8	Between Groups	.111	2	.056	.061	.941
	Within Groups	98.996	109	.908		
	Total	99.107	111			
B9	Between Groups	2.746	2	1.373	1.540	.219
	Within Groups	97.218	109	.892		
	Total	99.964	111			
B10	Between Groups	.268	2	.134	.146	.864
	Within Groups	99.697	109	.915		
	Total	99.964	111			
B11	Between Groups	.460	2	.230	.223	.800
	Within Groups	112.255	109	1.030		
	Total	112.714	111			
B12	Between Groups	1.599	2	.800	1.048	.354
	Within Groups	83.178	109	.763		
	Total	84.777	111			
B13	Between Groups	1.763	2	.882	1.062	.349
	Within Groups	90.487	109	.830		
	Total	92.250	111			
B14	Between Groups	5.950	2	2.975	4.224	.017
	Within Groups	76.765	109	.704		
	Total	82.714	111			
B15	Between Groups	5.451	2	2.725	3.253	.042
	Within Groups	91.326	109	.838		
	Total	96.777	111			

However, as the significance values of **B14** are F = 4.224 and p = .017 (which is below 0.05) and **B15** are F = 3.253 and p = .042 (which is below 0.05), this indicates there was a statistically significant difference between groups as determined by one-way ANOVA. Thus, the null hypothesis is rejected. The following multiple comparison Tables 9.15 determines which of the specific groups differed from the others through a Tukey post-hoc test.

A Tukey post-hoc test revealed that the B14 factor of KS barriers (lack of a suitable corporate culture of KS) was statistically significantly lower between the construction and government groups (p = 0.19). On the other hand, there was no statistically significant difference between the construction and others groups (p = .217) nor between government and others groups (p = 0.991).

This result indicates that the respondents, based on their working sectors, have different concerns about the factor B14 that was rejected. This factor is related to "lack of a suitable corporate culture of KS", which could influence on success of KS in the projects. *Respondents from the constructions and government sectors are more concerned about the impact of this factor than respondents from all of the other groups*. Different opinions could be due to different experiences and specialties of applicants about corporate culture that could affect the success of KS in the projects.

Also, A Tukey post-hoc test revealed that the B15 factor of KS barriers (the external or macro-environmental, such as global crises, effect on sharing project knowledge processes) was not statistically significantly different between the construction and other groups (p = 0.064). Similarly, there was no statistically significant difference between the construction and governmental groups (p = .185) nor between government and others groups (p = 0.523).

This result indicates that the respondents, based on their working sectors, have different concerns about the factor B15 that was rejected. This factor is related to "the external or macro-environmental, such as global crises, effect on sharing project knowledge process", which could influence the success of KS in projects. *Respondents from the construction sector are more concerned about the impact of this factor than respondents from all other groups*. Different opinions could be due to different experiences and specialties of applicants about external or macro-environmental factors that could affect the success of KS in projects.

Dependent Variable	(I) Q6	(J) Q6	Mean Difference (I-J)	Std. Error	Sig.
B14	Others	Construction, Machinery, and Homes	435	.259	.217
		Government	.033	.265	.991
	Construction,	Others	.435	.259	.217
	Machinery, and Homes	Government	.468*	.170	.019
	Government	Others	033	.265	.991
		Construction, Machinery, and Homes	468 [*]	.170	.019
B15	Others	Construction, Machinery, and Homes	642	.282	.064
		Government	315	.289	.523
	Construction,	Others	.642	.282	.064
	Machinery, and Homes	Government	.327	.185	.185
	Government	Others	.315	.289	.523
		Construction, Machinery, and Homes	327	.185	.185

 Table 9-15: Post-hoc test – B14 and B15 Factors

To conclude, the ANOVA results indicate that the null hypotheses H2b: β 2b = 0 was rejected for two out of three organisational KS barriers, which are the factors **B14 and B15**, while the rest of the factors **B7, B8, B9, B10, B11, B12, and B13** indicate that there is no statistically significant difference between the respondents' perceptions. Furthermore, the respondents, based on their working sectors, have different concerns

about the factors that were rejected. These differences are further interpreted in the discussion chapter.

9.1.10 Hypothesis 2c

A one-way ANOVA analysis was performed via the SPSS software to validate the statistical differences of the groups' responses. This analysis included calculating the means, standard deviations, and variations for all three groups based on the respondents' work sectors (construction, governmental, and other). Accordingly, the hypotheses were tested using the significance level of p = 0.05, and the F-statistic was detected. The main assumption that was made for this ANOVA test is that the independent variables, which are the KS enablers and barriers, were continuous and nominal.

The tenth hypothesis "**technological factors of KS barriers are related to the success of KS in projects**" was tested based on the working sectors of the respondents.

H2c: β 2c= 0. There is no statistically significant difference between the respondents' perceptions of the idea, "technological factors of KS barriers are related to the success of KS in the projects".

HA2c: $\beta 2c \neq 0$. There is a statistically significant difference between the respondents' perceptions of the idea, "technological factors of KS barriers are related to the success of KS in the projects".

The ANOVA Table 9.16 represents the output of the ANOVA analysis and if there is any statistically significant difference between the groups' means. It can be seen that there is no statistically significant difference between groups in the rating of technological factors of KS barriers **B16**, **B17**, and **B18** as determined by one-way ANOVA (p > 0.05). Thus, the null hypothesis is accepted.

		e ganne and and a	. 1401015			
		Sum of Squares	df	Mean Square	F	Sig.
B16	Between Groups	.820	2	.410	.572	.566
	Within Groups	78.037	109	.716		
	Total	78.857	111			
B17	Between Groups	1.005	2	.502	.556	.575
	Within Groups	98.415	109	.903		
	Total	99.420	111			
B18	Between Groups	.125	2	.063	.067	.935
	Within Groups	102.303	109	.939		
	Total	102.429	111			

Table 9-16: ANOVA test for organisational factors of KS barriers.

To conclude, the ANOVA results indicate that the null hypotheses H2c: $\beta 2c = 0$ was accepted for all of the factors **B16**, **B17**, **and B18**, which indicate that there is no statistically significant difference between the respondents' perceptions.

9.2 Hypotheses testing for regression and correlation analysis

9.2.1 Hypothesis 3

H3: The KS enablers are associated with the rate of KS contribution to project success.

Hypothesis 3 was investigated by initially conducting a correlation analysis between the KS enablers and the rate of KS contribution to project success. The correlation analysis showed that 11 of the independent variables of KS enablers have significant correlations at the p = 0.005 level (E7, E8, E15, E21, E29, E24, and E32) and (E13, E28, E35 and E34) the p = 0.001 level. All of the correlations are positive and between 0.189 and 0.322, which indicates a moderate association between variables, as shown previously in Table 7-3. Furthermore, a regression analysis was conducted to examine whether KS enablers predicted the rate of KS contribution to project success. Regression Equation 7-2 was used to examine this relationship (i.e. KS contribution to PS = 3.491+0.358*E35-0.388*E30+0.311*E24). This regression was significant only for E35, E30, and E24, as shown previously in Table 7-13. These findings support

hypothesis 3 such that greater levels of the enabler **E24** (ability of social network to simplify personal relationships and social interactions and facilitate project KS process) **and E35** (loyalty and hard work to increase project success via KS) match higher levels of the rate of KS contribution to project success. On the other hand, the greater levels of the enabler **E30** (the characteristics of physical environment such as the shape of the offices or spaces and a relaxed and quiet environment) match lower levels of the rate of KS contribution to project success.

This results means that in order to enhance the rate of KS contribution to project success, there is a need to further develop programs with more social network abilities in this regard and encourage loyalty and hard work in project stakeholders to support the uses of KS in the project lifecycle. This interruption makes sense, as the KS process was defined earlier in the literature review to be an exchange process between two parties. On the other hand, facilitating a better physical environment in projects was found to cause deficiencies in KS contributions to projects. This can be accepted from the view that better physical environments may disconnect stakeholders from each other.

9.2.2 Hypothesis 4

H4: The KS enablers are associated with the benefits that might be gained from timely KS in the infrastructural projects.

Hypothesis 4 was investigated by initially conducting a correlation analysis between the KS enablers and the benefits that might be gained from timely KS in infrastructural projects. The correlation analysis showed that all 36 of the KS enabler independent variables have significant positive correlations with the benefits that might be gained from timely KS in infrastructural projects, as shown previously in Table 7-5. Furthermore, a regression analysis was conducted to examine whether KS enablers predicted the benefits that might be gained from timely KS in infrastructural projects.

Regression Equation 7-3 was used to examine this relationship (i.e. **Benefits of timely KS [Q9]** = 1.864+0.305*E5+0.237*E13+0.153*E11-0.130*E8). This regression was significant only for E5, E13, E11, and E8, as shown previously in Table 7-18. These findings support Hypothesis 4 such that greater levels of the enabler **E5** (leadership commitment to supporting open and honest two-way communication in the projects), **E11** (implementation of less formal resources such as social media to share embedded project knowledge), **and E13** (the ability to communicate between project stakeholders regarding the project through specific channels) match higher levels of the benefits that might be gained from timely KS in infrastructural projects. On the other hand, the greater levels of the enablers **E8** (measurements of KS before and after any project activity) match higher levels of the benefits that might be gained from timely KS in infrastructural projects.

This results means that in order to increase the benefits that might be gained from timely KS in infrastructural projects, there is a need to further develop the program with more leadership commitment in this regard and further facilitate communication between project stakeholders and implementation of less formal resources, such as social media, to support the uses of KS in the project lifecycle. This interruption is logical as these enablers eventually lead to the enhancement of communication in projects, which may enhance the benefits of KS through sharing lessons learnt from projects, for example. On other hands, the measurements of KS before and after any project activity was found to limit KS benefits. This can be understood through the view of the temporary nature of projects, which limits the accountability or and availability of feedback for every project activity.

9.2.3 Hypothesis 5

H5: The KS enablers are associated with the quality of the timeliness of KS in infrastructural projects.

Hypothesis 5 was investigated by initially conducting a correlation analysis between the KS enablers and the benefits that might be gained from timely KS in the infrastructural projects. The correlation analysis showed that all 36 of the KS enabler independent variables have significant positive correlations with the quality of the timeliness of KS in infrastructural projects, as shown previously in Table 7-5. Furthermore, a regression analysis was conducted to examine whether KS enablers predicted the timeliness of KS in the infrastructural projects. Regression Equation 7-4 was used to examine this relationship (i.e. **the timeliness of KS [Q10]** = 1.884+0.261*E12+0.221*E1). This regression was significant only for E1 and E12, as shown previously in Table 7-23. This finding supports Hypothesis 5 in that greater levels of the enablers **E1** (clear policy or strategy for project **KS) and E12** (sufficient assets and resources to support project KS processes) correspond to higher levels of the quality of the timeliness of KS in infrastructural projects.

This results means that in order to increase the quality of the timeliness of KS in infrastructural projects, there is a need to further develop programs with clearer policies or strategies for projects and to supply sufficient assets and resources to support the uses of KS in the project lifecycle. This interruption is logical as these enablers eventually lead to the enhancement of standard procedures to systemise the process of KS itself in the projects, which leads to enhanced quality through increasing the standards and providing required process resources.

9.2.4 Hypothesis 6

H6: The KS enablers are associated with the effectiveness of KS between stakeholders.

Hypothesis 6 was investigated by initially conducting a correlation analysis between the KS enablers and the effectiveness of KS between stakeholders. The correlation analysis showed that all 36 of the KS enabler independent variables have significant positive correlations with the effectiveness of KS between stakeholders at each stage of the project lifecycle, as shown previously in Table 7-5. Furthermore, a regression analysis was conducted to examine whether KS enablers predicted the effectiveness of KS between stakeholders at each stage of ths used to examine this relationship (i.e. the effectiveness of KS [Q11] =

1.530+0.327*E4+0.207*E12). This regression was significant only for E4 and E12, as shown previously in Table 7-28. This finding supports Hypothesis 6 because greater levels of the enablers **E4** (sufficient reward systems to share knowledge) **and E12** (sufficient assets and resources to support project KS processes) correspond to higher levels of the effectiveness of KS between stakeholders at each stage of the project lifecycle.

This results means that in order to increase the effectiveness of KS between stakeholders at each stage of the project lifecycle, there is a need to further develop programs with sufficient reward systems and provide sufficient assets and resources to support the uses of KS in the project lifecycle. This interruption is logical as these enablers eventually motivate the project stakeholders and streamline the KS process, which lead to enhanced effectiveness of KS through increasing facilitating the KS process.

9.2.5 Hypothesis 7

H7: The KS barriers are associated with the rate of KS contribution to project success.

Hypothesis 7 was investigated by initially conducting a correlation analysis between the KS enablers and the rate of KS contribution to project success. The correlation analysis showed that only three of the KS barrier independent variables have significant correlations with the KS contribution to project success at the p = 0.001 level (**B3**) and the p = 0.005 level (**B7** and **B9**). All of the correlations are negative and between -0.197 and -0.297, which indicates a moderate association between variables, as shown in Table 7-7 previously. Furthermore, a regression analysis was conducted to examine whether KS barriers predicted the rate of KS contribution to project success. Regression Equation 7-6 was used to examine this relationship (i.e. **the rate of KS contribution to PS [Q7]** = 3.773-0.249*B3). This regression was significant only for **B3**, as shown previously in Table 7-33. These findings support Hypothesis 7 such that greater levels of the barrier **B3** (lack of trust towards others towards sharing project knowledge) correspond to lower levels of the rate of KS contribution to project success.

This results means that in order to increase the rate of KS contribution to project success, there is a need to further develop programs to support trust in others towards sharing project knowledge. The interruption that is considered similar to the literature review is that lack of trust is considered as a primary barrier. The similarity takes into consideration the cultural differences between the literature review and this research sampling. In addition, increasing the level of trust may indeed enhance the rate of KS contribution, as the stakeholders may feel more accountable and responsible for KS requirements in projects, and this in turn leads to enhanced rates of KS contribution to project success.

9.2.6 Hypothesis 8

H8: The KS barriers are associated with the quality of the timeliness of KS in the infrastructural projects.

Hypothesis 8 was investigated by initially conducting a correlation analysis between the KS enablers and the timeliness of KS in the infrastructural projects. The correlation analysis showed only six of the KS barrier independent variables have significant correlations at the p = 0.005 level (**B11**, **B12**, and **B15**) and at the p = 0.001 level (**B1**, **B9**, and **B16**). All of the correlations are negative and between -0.199 and -0.296, which indicates a moderate association between variables and the quality of the timeliness of KS in infrastructural projects, as shown in Table 7-10 previously. Furthermore, a regression analysis was conducted to examine whether KS barriers predicted the quality of the timeliness of KS in infrastructural projects. This regression was not significant for any of the independent barriers, as shown in Equation 7-7 and the tables of regression analyses in the appendices. These findings do not support Hypothesis 8 because they imply that the KS barriers are associated with the quality of the timeliness of KS in infrastructural projects.

This results means that the barriers of KS can be neglected in the timeliness of KS in the infrastructural projects. It is possible that the timeliness of KS does not represent a threat to project success, or it also may simply require additional research to be conducted at varied time periods to validate this result.

9.2.7 Hypothesis 9

H9: The KS barriers are associated with the effectiveness of KS between stakeholders.

Hypothesis 9 was investigated by initially conducting a correlation analysis between the KS enablers and the effectiveness of KS between stakeholders at each stage of the project lifecycle. The correlation analysis showed that 13 of the KS barrier independent variables have significant positive correlations at the p = 0.005 level (**B3**, **B5**, **B12**, **B13**, and **B18**) and at the p = 0.001 level (**B1**, **B2**, **B4**, **B6**, **B10**, **B11**, **B16**, and **B17**). All of

the correlations are negative and between -0.188 and -0.317, which indicates a moderate association between variables and the effectiveness of KS between stakeholders at each stage of the project lifecycle, as shown in Table 7-11 previously. Furthermore, a regression analysis was conducted to examine whether KS enablers predicted the effectiveness of KS between stakeholders at each stage of the project lifecycle. Regression Equation 7-8 was used to examine this relationship (i.e. the effectiveness of KS [Q11] = 1.615-0.208*B12+0.300* Openness [Q5]). This regression was significant only for **B12**, as shown previously in Table 7-43. These findings support Hypothesis 9 such that greater levels of the barrier **B12** (lack of motivation policy of KS) correspond to lower levels of the rate of the effectiveness of KS between stakeholders at each stage of the project lifecycle.

This results means that in order to increase the effectiveness of KS between stakeholders at each stage of the project lifecycle, there is a need to further develop programs with more motivational policies regarding KS with the presence of the openness personality traits. The interruption that is considered similar to the literature review is that this research considers a lack of motivational policy for KS as a main barrier. The similarity also takes into consideration that the results exist with the mediating variable of the openness personality trait, so the behaviour of individuals must be open to sharing knowledge. Also, increasing the level of motivational policies of KS may indeed enhance the effectiveness of KS, as the stakeholders may be more keen on informal KS procedures to occur in friendly manners, which in turn may eventually lead to enhanced effectiveness of KS.

9.3 Chapter Summary

This chapter has presented the data analyses via the one-way ANOVA to explain statistical differences between the KS enablers and barriers groups' responses, and it has additionally expressed the analyses of correlation and regression tests to test the research hypotheses. This section has attempted to explain the inferential statistical analysis with the aid of the software SPSS. For this research, these results for research hypotheses are considered as significant only at significance value of p < 0.05. Furthermore, post-hoc tests were applied to conduct pairwise comparisons in case the results were considered significant among the respondents' views. The results showed that five out of 36 KS enablers were found to have statistical differences among the views of respondents. Furthermore, there are two out of 18 KS barriers were shown to have statistical difference among the views of respondents.

The ANOVA analysis findings discovered a variety of interrelationships between the identified enablers and barriers based on respondents' work sectors. The study's conclusions support the vision that there is a need for more organisational commitment, further leadership commitment arrangements to support open and honest two-way communication, and a wider range of communication channels to support the uses of KS in the project lifecycle. In order to facilitate KS during projects, there is a need for sufficient funding, facilities, and technological resources. Furthermore, it is necessary to implement sufficient procedures in order to facilitate communication between different stakeholders and to ensure the establishment of a motivational KS culture in the projects. Moreover, it is obligatory to address external or macro-environmental factors in this regard to support the uses of KS in UAE infrastructural projects.

Furthermore, the correlation and regression outcomes indicate that three enablers influence the rate of KS contribution to project success: the ability of social networks to simplify personal relationships and social interactions and facilitate the project KS process (E24), the characteristics of physical environments (E30), and loyalty and hard work to increase project success via KS (E35). The research findings also show that four enables were assessed to be important for the benefits that might be gained from timely KS in infrastructural projects: leadership commitment to supporting open and honest two-way communication in the projects (E5), measurements of KS before and after any project activities (E8), implementation of less formal resources such as social media to share embedded project knowledge (E11), and the ability to communicate between project stakeholders regarding the project through specific channels (E13). In addition, the results supported that two enablers were assessed to be important for the timeliness of KS in the infrastructural projects: clear policy or strategy for project KS (E1) and sufficient assets and resources to support project KS processes (E12). The results show that the respondents thought two enablers are relevant to the effectiveness of KS between stakeholders at each stage of the project lifecycle: sufficient reward systems for sharing knowledge and sufficient assets and resources to support project KS processes. In the barriers clusters, the respondents agreed on the importance of distrust for others towards sharing project knowledge (B3) for the rate of KS contribution to project success. Only one barrier was deemed important for the effectiveness of KS between stakeholders at each stage of the project lifecycle: the lack of a motivational policy for KS (B12).

10. Chapter 10: Discussion

10.1 Introduction

The aim of this research is to study the effectiveness of KS through the lifecycle of infrastructure development projects. There is a gap in the current understandings of the effective integration of KS in the PM standardisation process. The review of the survey study shows that problem is that many organisations suffer from a KS shortage due to the temporary nature of projects and a lack of communication in their PM lifecycle. From this viewpoint, this problem was chosen to be addressed here in order to examine the approach of integration the KS process and assess its success in the PM of the infrastructure development sector in the UAE with a concentration on the enablers and barriers of KS in creating project success.

Consequently, the aim of this chapter is to present a discussion to relate the questions of this research, which were established from a review of the existing KS in project-based theories. In addition, this research recommends directions for upcoming studies which may extend existing results. These recommendations are constructed mainly by comparing outcomes from the literature review in Chapters 2, 3, and 4 with the outcomes of the data analysis in Chapters 7, 8, and 9. Thus, this section starts firstly by

revisiting the research questions. Then, the focus of this chapter is the findings from the actual study, which is represented by the questionnaire survey in the third section. This includes an explanation of the results from the descriptive analyses, linear regressions, correlations, and inferential statistics.

10.2 Research questions

1. How successful is knowledge sharing between stakeholders in the projects of the UAE's infrastructure development sector?

To develop a strong answer to this key question, research sub-questions were established to split the main research aim into more manageable goals, and these subquestions are the following:

- 1. Which KS enablers are the most influential to the success of KS in the UAE's infrastructural projects from the perspective of the respondents?
- 2. Which KS barriers are the most influential to the success of KS in the UAE's infrastructural projects from the perspective of the respondents?
- 3. Is there a difference between the respondents' opinions regarding the identified KS enablers?
- 4. Is there a difference between the respondents' opinions regarding the identified KS barriers?
- 5. What is the influence of the KS enablers' variables on the success of KS in the UAE's infrastructural projects?

6. What is the influence of the KS barriers variables on the success of KS in the UAE's infrastructural projects?

These questions have been discussed by explaining the statistical results of the questionnaire survey. The explanation of these answers includes identifying all important elements in the KS enablers and barriers which have a significant influence on the success of KS in the infrastructural projects of the UAE. Furthermore, the discussion of this question concentrates on describing several dimensions of the effectiveness of KS between stakeholders at each stage of the project lifecycle in order to implement the data analysis in the descriptive analysis part of Chapter 7. Additionally, this discussion identifies the association between the dependent and independent variables as in the linear regression and correlation portions of Chapters 8 and 9. In addition, ANOVA is the selected methodology to examine the differences between the respondents' opinions of the KS enablers and barriers according to the experiences of their work sector (construction, governmental, and others) in Chapter 9.

10.3 Discussion of questionnaire survey

RQ1. How successful is knowledge sharing between stakeholders in the projects of the UAE's infrastructure development sector?

The aim of this survey analysis is to examine the approach of the integration of KS processes in the PM of the infrastructure development sector. This aim is accomplished through investigating the impact of both KS enablers and barriers on the success of KS in the projects, and this impact has been explained by the rate of KS contribution to project success (Q7), the benefits that might be gained from timely KS in the infrastructural projects (Q9), the quality of the timeliness of KS in infrastructural projects (Q10), and the effectiveness of KS between stakeholders at each stage of the project lifecycle (Q11). Moreover, the survey has attempted to retrieve answers about

the enablers and barriers of KS in UAE infrastructural projects based on the perceptions of the respondents as based on their work industry sectors (construction, governmental, and others) and project management.

The literature review has been used earlier in this paper to construct the most significant enablers and barriers of KS. The result of this classification of KS enablers is categorised into seven groups (organisational, motivational, processes, technological, social networking, physical environmental, and individual enablers). In addition, the KS barriers are categorised into three groups (organisational, technological, and individual barriers). The study implemented both an online and a hard copy survey which was sent to 300 people from different organisations in the UAE. The participants were gathered from a website platform (i.e. Survey Monkey) for online surveys, whereas the hard copies were given out by hand in the organisations' campuses after coordination with them. The questionnaire analysis employs statistical methods of descriptive statistics, reliability, ranking, normality test, correlation, regression, and ANOVA analysis. The research outcomes indicate that that three enablers influence the rate of the KS contribution to project success: ability of social networks to simplify personal relationships and social interactions and facilitate the project KS process (E24), the characteristics of the physical environment such as the shape of the offices or spaces, relaxed environments, and quiet environments (E30); and loyalty and hard work to increase project success via KS (E35). The research findings also show that four enablers were found to be important for receiving benefits that might occur from timely KS in infrastructural projects: leadership commitment to support open and honest twoway communication in projects (E5), measurements of KS before and after any project activities (E8), implementation of less formal resources such as social media to share

embedded project knowledge (E11), and the ability to communicate between project stakeholders regarding the project through specific channels (E13). In addition, the results support that two enablers are important for the quality of the timeliness of KS in infrastructural projects: a clear policy or strategy for project KS (E1) and sufficient assets and resources to support project KS processes (E12). The results appear to show that the respondents believed two enablers to be relevant to the effectiveness of KS between stakeholders at each stage of the project lifecycle: sufficient reward systems for sharing knowledge (E4) and sufficient assets and resources to support project KS processes (E12). In the barriers clusters, the respondents agreed on the importance of a lack of trust for others in sharing project knowledge (B3) in affecting the rate of KS contribution to project success. Only one barrier was deemed important for the effectiveness of KS between stakeholders at each stage of the project lifecycle: lack of a policy to motivate KS (B12).

The ANOVA analysis findings uncover a variety of interrelationships among the identified enablers and barriers based on the respondents' work sector. The study's conclusions support the vision that there is a need for more commitment from organisations, further leadership commitment arrangements to support open and honest two-way communication, a wider range of communication channels, and deeper organisational commitment to support the uses of KS in the project lifecycle. In order to facilitate project KS during the project, there is a need for sufficient funding, facilities, and technological resources. Furthermore, it is necessary to implement sufficient procedures in order to facilitate communication between different stakeholders and to ensure the establishment of a culture that motivates KS in projects. In addition, it is

obligatory to address external or macro-environmental factors in this regard to support the uses of KS in UAE infrastructural projects.

This subsection presents a discussion related to the theories that underlie this research. The next subsection represents the classification of both the enablers and barriers of KS. The second subsection clarifies the findings of each construct investigation. The third section focuses on the ANOVA. The fourth subsection discusses correlations, whereas the last section concentrates on the regression discussion.

10.3.1 The emerging enablers and barriers of KS (From descriptive analysis) <u>What are the most influential KS enablers on the success of KS in the projects of the UAE's</u> <u>infrastructure development sector from the perspective of the respondents?</u>

The objective of the first research question is to determine how to integrate the KS process in infrastructure projects, and the results of this questionnaire suggest there are 36 enablers that influence the success of KS in projects.

A ranking analysis was performed on the enablers and barriers groups to statistically represent the attributes to show their levels of impact on KS in infrastructural projects in the UAE. These reliable enablers were ranked based on their influence on the success of KS in the UAE's infrastructural projects. Table 10-1 illustrates the average mean weight of the seven key enablers. These enablers are discussed more based on these categorisations in the upcoming sections of this chapter.

Table 10-1	l :	Summary	of the	e average	mean	weighted	of K	S factors
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	Organisational_ enablers	Motivation_ enablers	Processes_ enablers	Technologies_ enablers	Social_ networking_ enablers	Physical_ environment_ enablers	Individuals_ enablers
Ranking	3	4	5	1	7	6	2
No of factors	3	2	9	7	6	3	6
Mean	4.0387	3.9241	3.9236	4.0727	3.8348	3.8661	4.0551

As a result, the 10 most influential KS enablers at different phases of the project

lifecycle from the perspective of the respondents are listed as follows:

- 1. Teamwork and teambuilding in UAE infrastructural projects via KS (E34).
- 2. Awareness of the importance of technologies and IT resources for KS in UAE infrastructural projects (E19).
- **3.** Implementation of sufficient technological resources to enhance communication between dispersed project stakeholders (E18).
- 4. Loyalty and hard work to increase project success via KS (E35).
- 5. Awareness of the important role KS has in increasing project success (E2).
- 6. Implementation of technical tools of communication, such as emails and groupware or discussion applications, to share knowledge between dispersed team members (E22).
- 7. The ability to communicate between project stakeholders regarding the project through specific channels (E13).
- 8. Implementation of sufficient technological resources in all of the day-to-day project processes of KS (E15).
- 9. Implementation of sufficient technologies resources to clarify roles and responsibilities of project stakeholders (E17).
- **10.** Implementation of sufficient technological resources for documentation specifically about lessons learnt and best practices (E16).

This research has recognised that the two enablers that contribute most to the success of KS are teamwork and teambuilding in UAE infrastructural projects via KS (E34) and awareness of the importance of technologies and IT resources for KS in UAE infrastructural projects (E19). In other words, organisations that develop teamwork and teambuilding in addition to awareness of the importance of technologies are more successful in integrating KS into their projects.

This result supports the research output through its evaluation of the most important enablers of successful KS between stakeholders at every phase of the lifecycle of infrastructural projects. This finding is similar to the literature review findings, since it was there indicated that KS can be implemented and evaluated through different variables such as written contributions, personal interactions, community interactions, and organisational communication to exchange employees' tacit knowledge (Yi, 2009). It was also recommended that KS is not possible without appropriate motivation, culture, and trust (Shanshan, 2014, p. 8). This means that the factors that influence the effectiveness of KS include, first of all, the organisational culture, organisations' structure and role, the physical environment, and organisations' processes. Furthermore, KS can also be encouraged by individuals, technologies, and environment (Shanshan, 2014, p. 9).

Also, the enablers of KS chosen most often by respondents of this research's study are represented in different papers which have highlighted the most recent frameworks of KS barriers and enablers from the period of 2010 until 2015 (Yeong & Lim, 2010; Li & Zhou, 2011; Sung &Joo, 2011; Najibullah, et al., 2012; Paulienė, 2012; Lipiński & Świrski, 2012; Ajayi, 2013 ; Maalej & Thurimella, 2013; Moskaliuk, et al., 2013; Rudawska, 2013 ; Jayasinghe & Kapurubandara, 2013; Wiewiora, et al., 2014; Saad, et al., 2014; Sharma & Singh, 2014; Shanshan, 2014; AlfazziAljuhani, 2014;Tzortzaki, 2014; Hidayanto, et al., 2015).

Which KS barriers are the most influential to the success of KS in projects from the perspective of the respondents?

The objective of the first research question is to examine how to integrate the KS process in the infrastructure project lifecycle, and the results of this questionnaire display there are 18 barriers which influence the success of KS in the project lifecycle. A ranking analysis was performed on the enablers and barriers groups to statistically represent the attributes to show their levels of impact on KS in infrastructural projects in the UAE. These reliable barriers were ranked based on their influence on the success of KS in UAE infrastructural projects. Table 10-2 illustrates the average mean weight of

the three key barriers. These barriers are discussed more based on these categorisations

in the upcoming sections of this chapter.

	Individuals_barriers	Organisational_barriers	Technological_barriers
Ranking	2	1	3
No of factors	6	9	3
Mean	3 8080	3 8145	3 7946

Table 10-2 : Summary of the average mean weighted KS groups

As a result, the 10 KS barriers that are most influential to the success of KS in different

phases of projects from the perspective of the respondents are listed as follows:

- 1. The influence of organisational structures changes on motivation to share knowledge (B12).
- 2. The use of a strong hierarchy and position occupied by people to intimidate others from KS (B11).
- 3. Lack of a suitable corporate culture of KS (B14).
- 4. Lack of motivation policy of KS (B13).
- 5. Difficulty to communicate and share knowledge with other stakeholders (B6).
- 6. Lack of time to interact and share knowledge with other stakeholders (B4).
- 7. Lack of organisational trust towards sharing project knowledge (B8).
- 8. Lack of provided training on how to use necessary IT tools and equipment to share knowledge (B18).
- 9. Lack of trust towards others towards sharing project knowledge (B3).

10. Lack of internal motivation to share project information (B2).

This research has recognised that the two enablers which contribute most to the success

of KS are teamwork and teambuilding in the UAE's infrastructural projects via KS (E34) and awareness of the importance of technologies and IT resources for sharing knowledge in UAE infrastructural projects (E19). In other words, organisations that develop teamwork and teambuilding in addition to awareness of the importance of technologies are more successful in integrating KS in their projects. On the other hand, the two most important barriers are the influence of organisational structures changes on motivation to share knowledge (B12) and the use of a strong hierarchy and position occupied by people to intimidate others to not share knowledge (B11). In other words, organisations that develop proactive procedures that combat negative effects of

organisational structure changes on motivation and decrease the use of a strong hierarchy are more successful in integrating KS in their projects.

This result supports the research output in its determination of the most important barriers of successful KS between stakeholders at every phase of the lifecycle of infrastructural projects. This finding is similar with the literature review findings, since it was indicated there that the effectiveness of KS can be hindered by many factors, including individual, technological, or organisational factors. Organisations are made by a combination of the above factors; therefore, if any of factors works improperly or is impaired, it automatically affects KS behaviour (Rudawska, 2013, p. 66).

Additionally, the most recognised barriers of KS are represented in different papers which have highlighted the most recent frameworks of KS barriers and enablers from the period of 2010 until 2015 (Yeong & Lim, 2010; Li & Zhou, 2011; Sung &Joo, 2011; Najibullah, et al., 2012; Paulienė, 2012; Lipiński & Świrski, 2012; Ajayi, 2013 ; Maalej & Thurimella, 2013; Moskaliuk, et al., 2013; Rudawska, 2013 ; Jayasinghe & Kapurubandara, 2013; Wiewiora, et al., 2014; Saad, et al., 2014; Sharma & Singh, 2014; Shanshan, 2014; AlfazziAljuhani, 2014;Tzortzaki, 2014; Hidayanto, et al., 2015).

10.3.2 ANOVA

Is there a difference among respondents' opinions regarding the KS enablers identified?

This subsection provides a discussion of the results of both correlation and regression analyses through the perspective of the results of the survey, and it suggests directions for future research that extend current findings. Table 10-3 presents a summary of the ANOVA results of the investigated hypotheses.

Table 10-3 : Summary of the ANOVA results of the investigated hypotheses Results Hypotheses. Results

H1a: There is no statistically significant difference between the respondents' perceptions	Rejected for
of the idea, "Organisational factors of KS enablers are related to the success of KS in the	E3.
projects".	
H1b: There is no statistically significant difference between the respondents' perceptions	Rejected for
of the idea, "Motivational factors of KS enablers are related to the success of KS in the	E5.
projects".	
H1c: There is no statistically significant difference between the respondents' perceptions	Rejected for
of the idea, "Process factors of KS enablers are related to the success of KS in the	E13.
projects".	
H1d: There is no statistically significant difference between the respondents' perceptions	Supported.
of the idea, "Technological factors of KS enablers are related to the success of KS in the	
projects".	
H1e: There is no statistically significant difference between the respondents' perceptions	Supported.
of the idea, "Social networking factors of KS enablers are related to the success of KS in	
the projects".	
H1f: There is no statistically significant difference between the respondents' perceptions	Rejected for
of the idea, "Physical environmental factors of KS enablers are related to the success of	E28.
KS in the projects".	~ .
HIg: There is no statistically significant difference between the respondents' perceptions	Supported.
of the idea, "individual factors of KS enablers are related to the success of KS in the	
projects".	~ .
H2a: There is no statistically significant difference between the respondents' perceptions	Supported.
of the idea, "individual factors of KS barriers are related to the success of KS in the	
projects".	D : 1.6
H2b: There is no statistically significant difference between the respondents' perceptions	Rejected for
of the idea, "Organisational factors of KS barriers are related to the success of KS in the	B14 and
projects".	B15.
H2c: There is no statistically significant difference between the respondents' perceptions	Supported.
of the idea, "technological factors of KS barriers are related to the success of KS in the	
projects".	

10.3.2.1 Organisational enablers which influence the success of KS in UAE infrastructural projects

The KS culture is influenced by the organisational management through regulations and

rules that are enforced. Moreover, organisations should allocate a given amount of

resources from the budget to support the success of KS processes in projects. In fact,

there should be an extensive organisational understanding of the assets and needs of

knowledge within the project itself.

The literature review has verified that most of the previous studies have indicated that

providing a KS culture in an organisation to enhance knowledge among individuals via

different knowledge activities improves the overall management of projects

(Massingham, 2010), and it has also shown that an effective KS strategy in a company

is fundamental to the success of its PM (Kendra & Taplin, 2004). Such strategic

relevance involves having a proper plan of action on how to share information through specific channels (Lipiński & Świrski, 2012;Saad, et al., 2014).

Most respondents in different work sectors confirmed this curiosity in the questionnaire. The average weighted means for the organisational enablers related to the success of KS in projects was 4.039, which indicates that the success of KS in projects requires a strong arrangement of organisational enablers and can benefit from a clear policy or strategy for project KS. This also entails more awareness of the important role that KS plays in increasing project success. Therefore, it must take sufficient procedures to implement organisation-wide commitment to project KS.

Based on the ANOVA findings, which determine any statistically significant difference between groups' means, there is no statistically significant difference between groups in the rating of organisational factors of KS enablers **E1** (a clear policy or strategy for **project KS**) as determined by the one-way ANOVA (F = 0.777, p = 0.462, which is above 0.05). Similarly, there is no statistically significant difference between groups in rating **E2** (awareness of the important role KS has in increasing project success) (F= 2.434, p = 0.092). These findings assert the importance of the enablers of KS success in infrastructural projects, and this is consistent with earlier studies that were summarised at the start of this subsection.

However, the ANOVA results indicate that the respondents, based on their working sectors, have different concerns about the factor **E3** that was rejected, as shown in Table 10-4. This factor describes **"organisational commitment to project KS"**, which could influence the success of KS in projects. Respondents from the construction sector reported more concern about the impact of this factor than respondents from all of the other groups. Different opinions could be due to different experiences and specialties of

applicants about organisational commitment that could affect the success of KS in

projects.

In general, all outcomes support the idea that these organisational factors are significant

enablers of KS success in the project lifecycle. This result indicates that there is a need

for further development of programs with more organisational commitment in this

regard to support the uses of KS in the project lifecycle.

Table 10-4 : Research question related to KS	organisational	enablers	and hypotheses
results.			

Research Question	Are there statistically significant differences among the respondents' perceptions in the different groups on project success KS enablers related to organisational enablers?
Hypothesis	H1a: $\beta 1a = 0$. There is no statistically significant difference between the respondents' perceptions of "organisational factors of KS enablers related to the success of KS in projects".
Results	The ANOVA results indicate the following: There were significant differences between the respondents based on their working sectors, in one out of three of the KS organisational enablers (E3).
Researcher Observation	 The KS organisational enablers were identified based on an inclusive literature review. The respondents, based on their working sectors, have different concerns about this E3 factor that was rejected. This factor is related to organisational commitment to project KS, which could influence the success of KS in projects. Respondents in the "construction, governmental, and other" work sector are more concerned about fears related to this enabler. Different opinions could be due to different experiences and specialties of applicants about organisational commitment that could affect the success of KS in projects. To enhance this enabler, there is a need for further development of programs with more organisational commitment in this regard to support the uses of KS in the project lifecycle. There is a need for further organisational commitment arrangements.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was rejected for this factors E3 .

10.3.2.2 Motivational enablers which influence the success of KS in UAE infrastructural projects

a. What are the motivational enablers that influence the success of KS in UAE infrastructural projects?

The intention to share knowledge by an individual could be motivated by materialistic, philanthropic, selfish, social, or compliance reasons. Whatever the reason, it contributes differently to how much and how well the project members share knowledge.

The literature review has verified that most of the relevant previous studies have indicated that KS behaviour needs to be considered by the board of directors of an organisation in order to establish a collaborative project culture to enhance tacit KS. There are many existing practices to encourage KS within organisations, such as introducing incentives and encouraging supportive leadership styles (Wiewiora, et al., 2014). Recognition and rewarding of positive team members creates role models and increases the motivation to have positive intentions when sharing knowledge they have gathered; some team members may even be more driven by hard work and a willingness to see the success of the project (Shareff, 2014). Moreover, Schmitz (2013) has explained that social exchange theory guides the motivations of people, especially those who are materialistic because they want an advantage in return.

Most respondents from different work sectors have confirmed this concern in the questionnaire of this study. The average weighted means for the motivational enablers related to the success of KS in projects was 3.9241, which indicates that the success of KS in projects requires a sufficient reward system for sharing knowledge. This also entails more leadership commitment to supporting open and honest two-way communication in projects.

Based on the ANOVA findings, which determine any statistically significant difference between the groups' mean, there is no statistically significant difference between groups in the rating of motivational factors of KS enabler **E4 (sufficient reward systems for sharing knowledge)** as determined by the one-way ANOVA (F = 1.582, p = 0.210, which is above 0.05). These findings assert the importance of the enablers of KS success in infrastructural projects, and this is consistent with earlier studies that were summarised at the start of this subdivision.

However, the ANOVA result indicates that the respondents, based on their working sectors, have different concerns about the factor **E5** that was rejected, as shown in Table 10-5. This factor is related to **"leadership commitment to supporting open and honest two-way communication in projects"**, which could influence the success of KS in projects. Respondents from the "construction and government" sector reported more concerned about the impact of this factor than respondents from all of the other groups. Differing opinions could be due to different experiences and specialties of applicants about leadership commitment that could affect the success of KS in projects. In general, all outcomes support the idea that these motivational factors are significant enablers of KS success in the project lifecycle. This indicates that there is a need for further development of programs with more leadership commitment to supporting open and honest two-way communication in this regard to support the uses of KS in the project lifecycle.

Table 10-5 : Research question related to KS **motivational** enablers and hypotheses results.

Research	Is there a statistically significant difference among the perceptions
Question	of respondents' in different groups on project success KS enablers
	related to motivational enablers?
Hypothesis	H1b: $\beta 1b = 0$. There is no statistically significant difference

	between the respondents' perceptions of "motivational factors of
	KS enablers related to the success of KS in the projects".
Results	The ANOVA results indicate the following:
	There were significant differences between the respondents based
	on their working sectors, in one of the two KS motivational
	enablers which is F5
Dosoorahor	The KS motivational anablers were identified based on an inclusive
Ob second the	The KS motivational enablers were identified based on an inclusive
Observation	The factor of the second secon
	The respondents, based on their working sectors, had different
	concerns about this E5 factor that was rejected.
	I his factor is related to leadership commitment to supporting open
	and honest two-way communication in projects, which could
	influence the success of KS in projects.
	Respondents in the "constructions and governmental" work sector
	reported more fears related to this enabler.
	Respondents in the "other" work sector consider that there is no
	impact associated with this another on VS in projects
	impact associated with this enabler on KS in projects.
	Different opinions could be due to different experiences and
	specialties of applicants about leadership commitment that could
	affect the success of KS in the projects
	affect the success of KS in the projects.
	To enhance this enabler, there is a need for further development of
	programs with more leadership commitment to supporting open and
	honest two way communication in this regard to support the uses of
	KS in the grainest lifescule
	KS in the project inecycle.
	There is a need for further leadership commitment arrangements
Conclusion	The null hypothesis $H_{a_0}(n < 0.05)$ was rejected for this factors F5
Conclusion	The num hypothesis πu_0 ($p < 0.03$) was rejected for this factors E5.

10.3.2.3 Processes enablers which influence the success of KS in UAE infrastructural projects

• What are the processes enablers that influence the success of KS in UAE infrastructural projects?

There is a real need for understanding how effectively KS mechanisms can be

integrated into the daily operations of a project (Ajayi, 2013). The goals and objectives

of a project should be aligned to match the KS process so that a positive influence

occurs and benefits the outcomes. This means that there should be extensive

understanding of the assets and needs of knowledge within the project itself.

The literature review has verified that most of the previous studies have indicated that having a structured process and procedure to guide the implementation of KS is an important prerequisite before utilising KS within a project (Tan F. B., 2013). According to Jayasinghe and Kapurubandara (2013), in order for the KS process to be integrated into a project successfully, it is necessary that every member of the project team understands and relates to the subject matter of the project so that they can make relevant contributions. The role of the organisation in this model is to oversee and coordinate the entire process in terms of providing materials, finances, and other facilities support. The role of technology, on the other hand, is to boost the speed and accuracy of the process and the quality of the shared knowledge (Zhang & Vogel, 2013).

There are number of factors required for successful projects through KS include strategic relevance, communication, concept, continuous development, IT, and coordination, among others (Grillitsch, et al., 2007). In addition, technical tools of communication, such as emails and groupware or discussion applications, between dispersed team members for global distributed projects are effective in developing social mechanisms of KS (Kotlarsky & Oshri, 2005). The commitment to the project by managers to ensure that they and subordinates adhere to KS practices is critical, so top management needs to steer project members towards understanding that the project requires every individual's input (Kendra & Taplin, 2004).

Most respondents from different work sectors have confirmed this concern in the questionnaire. The average weighted means for the process enablers related to the success of KS in projects was 3.9236, which indicates that the success of KS in projects requires clear procedures of KS between project stakeholders including sufficient

training for both formal and informal KS content, measurements of KS before and after any project activity, accountability to the evaluation result and feedback about project KS, linking the content of KS with the project job description, implementation of less formal resources such as social media to share embedded project knowledge, sufficient assets and resources to support project KS processes, and effective explanation of project KS practices in documentation and sharing best practices.

Based on the ANOVA findings, which determine any statistically significant difference between the groups' means, there is no statistically significant difference between groups in the rating of process factors of KS enablers E6 (clear procedure of KS between project stakeholders), E7 (sufficient training program of both formal and informal KS content), E8 (measurements of KS before and after any project activities), E9 (accountability to the evaluation result and feedback of project KS), E10 (linking the content of KS with the project job description), E11 (implementation of less formal resources such as social media to share embedded project knowledge), E12 (sufficient assets and resources to support project KS processes), and E14 (effective explanation of the project KS practices in documentation and sharing best practices) as determined by one-way ANOVA (p > 0.05). These findings assert the idea that these factors are the enablers of KS success in infrastructural projects, and this finding is consistent with earlier aforementioned studies.

However, the ANOVA result (Table 10-6) indicates that the respondents, based on their working sectors, have different concerns about the factor **E13** that was rejected, as shown in Table 10-6. This factor is related to **"the ability to communicate between project stakeholders regarding the project through specific channels",** which could

influence the success of KS in the projects. Respondents from the "government" sector are more concerned about the impact of this factor than that of all the other groups about this factor. Differing opinions could be due to different experiences and specialties of applicants regarding communication that could affect the success of KS in the projects. In general, all outcomes demonstrate that these motivational factors are significant enablers of the KS success in the project lifecycle. This indicates that there is a need for further development of the program with a wider range of communication channels and organisational commitment in this regard to support the uses of KS in the project

lifecycle.

Table 10-6 : Research question related to KS	Processes enablers and Hypotheses
results.	

Research	Is there a statistically significant difference among the respondents'
Question	perceptions in the different groups on project success KS enablers
	related to process enablers?
Hypothesis	H1c: β 1c = 0. There is no statistically significant difference among
	the respondents' perceptions of "process factors of KS enablers
	related to the success of KS in the projects".
Results	The ANOVA results indicate that there were significant differences
	between the respondents based on their working sectors in one out of
	nine of the KS processes enablers, which is E13.
Researcher	The KS process enablers were identified based on an inclusive
Observation	literature review.
	The respondents, based on their working sectors, expressed different
	concerns about the E13 factor that was rejected.
	This factor is related to the ability to communicate between project
	stakeholders regarding the project through specific channels, which
	could influence the success of KS in the projects.
	Respondents in the "government" work sector are more concerned
	about fears related to this enabler.
	Respondents in the "construction and other" work sector consider that
	there is no impact associated with this enabler on the KS inside the
	project.
	Differing oninions could be due to different experiences and
	Differing optimions could be due to different experiences and
	speciation of applicants regarding communication that could affect

	 the success of KS in the projects. To enhance this enabler, there is a need for further development of the program with a wider range of communication channels and organisational commitment in this regard to support the uses of KS in the project lifecycle. It is very necessary to implement further procedures in order to facilitate communication between different stakeholders in the projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was rejected for this factors E13 .

10.3.2.4 Technological enablers which influence the success of KS in UAE infrastructural projects

• What are the Technological enablers that influence the success of KS in UAE infrastructural projects?

Technological enablers have become one of the most important areas involved in successful KS in infrastructural projects at the present time. This is because technological enablers facilitate and accelerate the process of KS to allow better flexibility for information exchange between project stakeholders throughout the project lifecycle.

The role of technologies in the KS process can be viewed as it enhances the innovation and facilitate the communication, hence enabling the organisation to implement effective KS. In Addition, for the KS to be effectively implemented within the organisation, it needs to be applicable and occurring in all of the day-to-day processes of the organisation (Alfazzi Aljuhani, 2014, p. 34).

Prior studies have indicated the importance of development of IT tools for communication between dispersed team members to support the KS process (Grillitsch, et al., 2007). In addition, other studies have indicated that IT support, clear roles, and responsibilities, and evaluation of the project process with the access to KS are also very critical factors to consider (Wenger, et al., 2002). In fact, the outcomes of this study show that there are several enablers in this part, including technological factors of KS enablers E15 (implementation of sufficient technological resources in all of the day-to-day project processes of sharing knowledge), E16 (implementation of sufficient technological resources for documentation specific for lessons learnt and best practices), E17 (implementation of sufficient technological resources to clarify roles and responsibilities of project stakeholders), E18 (implementation of sufficient technological resources to enhance communication between dispersed project stakeholders), E19 (awareness of the importance of technologies and IT resources to share knowledge in UAE infrastructural projects), E20 (implementation of sufficient training program and instructions of on how to use of IT tools and equipment for KS content) as determined by one-way ANOVA (p > 0.05). The respondents believe that all of these technological factors pose as significant enablers to the success of KS within infrastructural projects.

The ANOVA analysis (Table 10-7) indicates that there is consensus between the respondents that these factors that pose as significant enablers to the success of KS within infrastructural projects. This result signifies that these technological enablers are important. This finding is supported by previous literature, as mentioned above.

The author believes that these factors should be considered as technological enablers for the success of KS in the projects and suggests that organisations should be concerned with these tools and programs to provide adequate support to such enablers.

Table10-7: Research question related to KS Technological enablers and Hypotheses results.Research
QuestionIs there a statistically significant difference among the respondents'
perceptions in the different groups of project KS success related to

	technological enablers?
Hypothesis	H1d: $\beta 1d = 0$. There is no statistically significant difference between
	the respondents' perceptions of "technological factors of KS enablers
	related to the success of KS in the projects".
Results	The ANOVA results indicate that there were no significant differences
	between the respondents based on their working sectors, in all the
	seven KS technological enablers.
Researcher	Even though no significant differences were identified based on
Observation	respondents' work sectors, the respondents were generally positive in
	regard to the use of KS in UAE infrastructural projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was retained.

10.3.2.5 Social Networking enablers which influence the success of KS in UAE infrastructural projects

• What are the social networking enablers that influence the success of KS in UAE infrastructural projects?

With the rise in social networking platforms and increasing numbers of users across the past few years, social networking has emerged as one of the most important aspects of daily life. This can be viewed from the perspective of users and in regard to the increasing popularity of social network platforms. The role of social networks has drastically expanded in the KS process because knowledge can very easily be shared between people through social networks. Consequently, social network factors have become one of the most important enablers of successful KS in infrastructural projects at the present time. The social networking of KS can be considered from numerous perspectives, such as the social media perspective and the organisational perspective in terms of creating specific networks among employees.

Given the nature of social networking platforms and how information is shared on those social media, there is no doubt that, when used to transfer knowledge, social networks may be the most accurate and appropriate tools (Moskaliuk, et al., 2013, p. 56). For example, in the context of multinational corporations, social networks can encourage employees to become closer. It is important to mention that some organisation or
companies operate in several countries and employ thousands of people (Li & Zhou, 2011, p. 9). Moreover, given the costs involved in employee empowerment and training programs, the use of social networking in KS can save organisations from the burdens associated with costly programs. Given the abilities of social interaction to enhance KS, it is necessary to note that in the history of humanity, no invention has managed to bring together as many people as social networks do today (Moskaliuk, et al., 2013, p. 61).

Various studies have demonstrated the extent to which the combination of social networks and KS is important, and authors have stated that at the organisational level, social networking can be defined as having some specific groups of employees who possess the same characteristics and interests (Li & Zhou, 2011, p. 13). In this case, organisations should provide their employees with the necessary facilities and arrangements in terms of technical assistance, leadership, finances, and coordination in order to ensure compliance with the organisational business goals and objectives (Li & Zhou, 2011, p. 15).

Furthermore, it has been argued that these early adopters have the ability to transfer their knowledge to other employees within the organisation. In this regard, it is necessary to identify those early adopters in for them to introduce the intended skills to others within the organisation. These early adopters are often the most influential people in an organisation and possess advanced knowledge compared to their colleagues (Moskaliuk, et al., 2013, p. 67).

In fact, the outcomes of this study show that there are several enablers in this category, including social networking of KS enablers **E22** (**implementation of technical tools of communication, such as emails and groupware or discussion applications to share knowledge between dispersed team members**), **E23** (**implementation of social**

media to share project knowledge through project), E24 (ability of social network to simplify the personal relationships and social interactions and facilitate the project KS process), E25 (consideration for the social networking platforms as one of the most accurate and appropriate tools to share knowledge aspects of projects daily operations), E26 (designation of influential people in the organisation and managers to rapidly spread the project knowledge and skills on social networking platforms), and E27 (involvement of continuous feedback and measurements in the use of social networking in the KS process) as determined by one-way ANOVA (p > 0.05). The respondents believe that all of these social networking factors are significant enablers to the success of KS in infrastructural projects.

The ANOVA analysis (Table 10-8) indicates that there is consensus among the respondents on these factors that pose as significant enablers to the success of KS in the infrastructural projects. This result signifies that these social networking enablers are important. This finding is supported by previous literature, as mentioned above.

The author believes that these factors should be considered as social networking enablers for the success of KS in the projects and recommends that organisations should be concerned with these tools and programs to provide adequate support to such enablers.

Research Question	Is there a statistically significant difference among the respondents' perceptions in the different groups on project KS success related to social networking enablers?
Hypothesis	H1e: $\beta 1e = 0$. There is no statistically significant difference among the respondents' perceptions of "social networking factors of KS enablers related to the success of KS in the projects".

Table 10-8 : Research question related to KS **Social networking** enablers and Hypotheses results.

Results	The ANOVA results indicate that there were no significant differences between the respondents based on their working sectors in all 6 of the KS social networking enablers.
Researcher Observation	Even no significant differences were identified between respondents' work sectors, the respondents were generally positive in regard to the use of KS in UAE infrastructural projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was retained.

10.3.2.6 Physical environmental enablers which influence the success of KS in UAE infrastructural projects

• What are the physical environmental enablers that influence the success of KS in UAE infrastructural projects?

The main characteristics of physical environment factors are very important for any business's success. Many organisations pay attention to how these physical environment factors affect their daily operations. In the same context, KS as a process must consider the effect of factors in the physical environment.

The literature review has verified that most of the previous studies have indicated that the components of the physical environment of an organisation are important enablers of KS. For instance, some factors of physical environments include the shape of offices, the spaces, a relaxed environment, and a quiet environment. Therefore, depending on the nature of the organisation and its structure, the physical environment has a great role in the KS process (Alfazzi Aljuhani, 2014, p. 41).

Most respondents from different work sectors confirmed this concern in the questionnaire of this study. The average weighted mean for the physical environment enablers related to the success of KS in projects was 3.8661, which indicates that the success of KS in projects requires sufficient tools and instruments to maximise the potential of others to share project knowledge. In addition, KS success depends on the

characteristics of the physical environment, which also entails more funding, facilities, and technological resources to facilitate project KS.

Based on the ANOVA findings, which determine any statistically significant difference between the groups' means, there is no statistically significant difference between groups in the rating of physical environmental factors of KS enablers **E29** (sufficient tools and instruments to maximise potential of others to share project knowledge) and **E30** (the characteristics of physical environment such as the shape of the offices or spaces or a relaxed and quiet environment) as determined by one-way ANOVA (p > 0.05). These findings assert that these factors are enablers of KS success in infrastructural projects, and this is consistent with earlier studies that were indicated at the start of this subdivision.

However, the ANOVA result indicates that the respondents have different concerns based on their work sectors about the factor **E28** that was rejected, as shown in Table 10-9. This factor is related to **"sufficient funding, facilities, and technological resources to facilitate project KS",** which could influence the success of KS in the projects. Respondents from the "construction" sector reported more concern about the impact of this factor than the respondents from all of the other groups. Different opinions could be due to different experiences and specialties of applicants regarding sufficient funding that could affect the success of KS in projects.

In general, all outcomes support the idea that these organisational factors are significant enablers of KS success in the project lifecycle. This indicates that there is a need to further develop programs with higher budgets in this regard to support the uses of KS in the project lifecycle. Table 10-9 : Research question related to KS **Physical environmental** enablers and Hypotheses results.

Research	Is there a statistically significant difference among the respondents'
Question	perceptions in the different groups on project success KS enablers
	related to physical environmental enablers?
Hypothesis	<i>H1f:</i> β <i>If</i> = 0. <i>There is no statistically significant difference between</i>
	the respondents' perceptions of "physical environmental factors of
	KS enablers related to the success of KS in the projects".
Results	The ANOVA results indicate that there were significant differences
	among the respondents based on their working sectors for one out
	of three of the KS physical environmental enablers, which is E28 .
Researcher	The KS physical environmental enablers were identified based on
Observation	an inclusive literature review.
	The respondents, based on their working sectors, reported different
	concerns about this E28 factor, which was rejected.
	This factor is related to sufficient funding, facilities, and
	technological resources to facilitate project KS, which could
	influence the success of KS in projects.
	Respondents from the "construction" work sector are more
	concerned about fears related to this enabler.
	Respondents from the "governmental and other" work sector
	consider that there is no impact associated with this enabler on KS
	in the project.
	Differing opinions could be due to different experiences and
	specialties of applicants about organisational commitment that
	could affect the success of KS in projects.
	To enhance this enabler, there is a need for further development of
	programs with higher budgets in this regard to support the uses of
	KS in the project lifecycle.
	There is a need for sufficient funding, facilities, and technological
	resources to facilitate project KS in projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was rejected for the factors
	E28.

10.3.2.7 Individual enablers which influence the success of KS in UAE infrastructural projects

• What are the individual enablers that influence the success of KS in UAE infrastructural projects?

Individual enablers have become remarkably important for successful KS in

infrastructural projects at the present time. This is because individual factors include

individuals' skill sets, personalities, and interpersonal skills, which all directly affect the

process of KS and determine the nature of information exchanges between project stakeholders throughout the project lifecycle.

Based on reports, individuals' behaviours have a significant impact on their KS behaviours (Hidayanto, et al., 2015, p. 29). Individuals' behaviours consist of individual creativity, innovation, and the ability to interact with others within the organisation, all of which facilitate KS among employees or between employees and managers (Hidayanto, et al., 2015, p. 33).

The literature review has verified that most of the previous studies have indicated that providing individuals' attitudes influence KS attitudes, as the latter is stimulated by a degree of personal interest in being involved. This intention can be derived from emotional encouragement from an organisation or incentives to associate with other employees (Bock & Kim, 2002). In the same context, it has been declared that knowledge inside an organisation should be exploited through human behaviour to increase the organisation's competitive advantages (Hartini, et al., 2006).

In fact, the outcomes of this study show that there are several enablers in this category, including individual factors of KS enablers E31 (self-motivation and value to share knowledge with other project stakeholders), E32 (individual awareness of the social importance of sharing knowledge for achieving the project goals), E33 (individual accountability between project stakeholders to share information in UAE infrastructural projects), E34 (teamwork and teambuilding in UAE infrastructural projects via KS), E35 (loyalty and hard work to increase project success via KS), and E36 (desire to be rewarded to share project information) as determined by the one-way ANOVA (p > 0.05). The respondents believe that all of

these individual factors are significant enablers to the success of KS within infrastructural projects.

The ANOVA analysis (Table 10-10) indicates that there is consensus among

respondents regarding these factors that pose as significant enablers to the success of

KS within the infrastructural projects. This result signifies that these individual enablers

are important. This finding is supported by previous literature, as mentioned above.

The author believes that these factors should be considered as individual enablers for

the success of KS in projects and recommends that organisations be concerned with

these tools and programs to provide adequate support to such enablers.

Table 10-10 :	Research	question r	elated to	KS i	individual	enablers	and hyp	otheses
results.								

Research	Is there a statistically significant difference among the respondents'
Question	perceptions in the different groups on project KS success related to
	individual enablers?
Hypothesis	H1g: β 1g = 0. There is no statistically significant difference
	between the respondents' perceptions of "individual factors of KS
	enablers related to the success of KS in projects".
Results	The ANOVA results indicate that there were no significant
	differences among the respondents based on their working sectors in
	all six of the KS individual enablers.
Researcher	Even no significant differences were identified based on differing
Observation	work sectors, the respondents were generally positive in regard to
	the use of KS in UAE infrastructural projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was retained.

10.3.2.8 Individual barriers which influence the success of KS in UAE infrastructural projects

• What are the individual barriers that influence the success of KS in UAE infrastructural projects?

Individual barriers have become one of the most important enablers for successful KS in

infrastructural projects at the present time. This is because people, as part of an

organisation, are the most important means of helping the organisation to achieve its objectives and goals.

Prior studies have indicated that the individual fears of sharing knowledge or lack of time to interact with other employees can hinder the effectiveness of KS. In addition, low realisation or awareness of the importance of sharing knowledge with others is another individual barrier to KS (Sharma & Singh, 2014, p. 47).

Prior studies have indicated the individual barriers to KS within an organisation include a lack of trust in others and the use of a strong hierarchy and position occupied by people to intimidate others.

In fact, the outcomes of this study show that there are several barriers in this regard, including individuals factors of KS barriers **B1** (threat of losing some of the individual's power towards sharing project knowledge), **B2** (lack of internal motivation to share project information), **B3** (lack of trust towards others and sharing project knowledge), **B4** (lack of time to interact and share knowledge with other stakeholders), **B5** (lack of awareness of the importance of sharing knowledge with other project stakeholders), and **B6** (difficulty communicating and sharing knowledge with other stakeholders) as determined by one-way ANOVA (p > 0.05). The respondents believe that all of these technological factors pose as significant barriers to the success of KS in infrastructural projects.

The ANOVA analysis (Table 10-11) indicates that there is consensus among the respondents about these factors in that they are significant barriers to the success of KS in infrastructural projects. This result signifies that these individual barriers are important. This finding is supported by previous literature, as mentioned above.

The author believes that these factors should be considered as individual barriers for the

success of KS in projects and recommends that organisations be concerned with these

tools and programs to provide adequate proactive procedures to such barriers.

Table 10-11: Research question related to KS **individual** barriers and hypotheses results.

Research Question	Is there a statistically significant difference among the respondents' perceptions in the different groups on project KS success related to individual barriers?
Hypothesis	H2a: $\beta 2a = 0$. There is no statistically significant difference among the respondents' perceptions of "individual factors of KS barriers related to the success of KS in projects".
Results	The ANOVA results indicate that there were no significant differences among the respondents based on their working sectors in any of the six KS individual barriers.
Researcher Observation	Even though no significant differences were identified based on respondents' work sectors, the respondents were generally positive in regard to the use of KS in UAE infrastructural projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was retained.

10.3.2.9 Organisational barriers which influence the success of KS in UAE infrastructural projects

• What are the organisational barriers that influence the success of KS in UAE infrastructural projects?

An organisation is composed of a combination of the above factors; therefore, if any of

them works improperly or is impaired, KS behaviour is automatically affected

(Rudawska, 2013, p. 66). In order to critically assess various organisational barriers to

KS, it is important to understand that most organisations seek to align their programs

with the organisation's goals (Sharma & Singh, 2014, p. 52).

The literature review has verified that most of the previous studies have indicated that different organisational factors affect the effectiveness of knowledge. To illustrate, organisational barriers include the organisation's structure, the external or macro-environmental factors, a lack of policy to motivate KS within an organisation, the corporate culture, and the physical work environment (Sharma & Singh, 2014, p. 52). Moreover, a lack of leadership and a poor environment for KS are reported to be among the barriers of KS effectiveness (Rudawska, 2013, p. 66).

Most respondents from different work sectors have confirmed this concern in the questionnaire. The average weighted mean of the organisational barriers related to the success of KS in projects was 3.8145, which indicates that the success of KS in projects requires proactive steps to avoid a shortage of the following: organisational encouragement of knowledge sharing, organisational trust towards sharing project knowledge, a suitable physical work environment for KS, resources for KS, and a motivational policy to support KS. This also entails more efforts to overcome the use of a strong hierarchy and position occupied by people to intimidate others to avoid KS and to overcome the influence of organisational structure changes on the motivation to share knowledge as well.

Based on the ANOVA findings, which determine any statistically significant difference between the groups' means, there is no statistically significant difference between groups in the rating of individuals factors of KS barriers **B7** (lack of organisational encouragement of KS), **B8** (lack of organisational trust towards sharing project knowledge), **B9** (lack of a suitable physical work environment for KS), **B10** (lack of resources for KS), **B11** (the use of a strong hierarchy and position occupied by people to intimidate to avoid KS), **B12** (The influence of organisational structures

changes upon motivation to share knowledge), and B13 (lack of motivation policy of KS) as determined by one-way ANOVA (p > 0.05). These findings declare the enablers of KS success in infrastructural projects, and this is consistent with earlier studies that were stated at the start of this subsection.

However, the ANOVA result (Table 10-12) indicates that the respondents, based on their work sectors, have differing concerns about the factor **B14**, which was rejected. This factor is related to a **"lack of a suitable corporate culture of KS"**, which could influence the success of KS in projects. Respondents from the "construction and government" sectors are more concerned about the impact of this factor than those from all of the other sectors. Different opinions could be due to different experiences and specialties of applicants about corporate cultures that could affect the success of KS in projects. Also, this result indicates that the respondents, based on their working sectors, have different concerns about the factors **B15**, which was rejected. This factor is related to **"the external or macro-environmental factors such as global crises towards sharing project knowledge"**, which could influence the success of KS in projects. Respondents from the "construction" sector are more concerned about the impact of this factor than respondents from all of the other groups. Different opinions could be due to different experiences and specialties of applicants regarding external or macroenvironmental factors that could affect the success of KS in projects.

In general, all outcomes support that these organisational factors are significant barriers of KS success in the project lifecycle. This indicates that there is a need for further development of programs with more flexibility towards external or macroenvironmental factors in this regard to support the uses of KS in the project lifecycle. Table 10-12 : Research question related to KS **organisational** barriers and hypotheses results.

Research Question	Is there a statistically significant difference among the respondents' perceptions in the different groups on KS project success related to organisational barriers?
Hypothesis	H2b: $\beta 2b = 0$. There is no statistically significant difference among the respondents' perceptions of "organisational factors of KS barriers related to the success of KS in the projects".
Results	The ANOVA results indicate that there were significant differences among the respondents based on their working sectors in two out of the nine KS organisational enablers, which are B14 and B15 .
Researcher	The KS organisational barriers were identified based on an inclusive
Observation	literature review.
	The respondents, based on their working sectors, have different concerns about the B14 and B15 factors, which were rejected.
	These barriers factors are related to the lack of a suitable corporate culture of KS and the external or macro-environmental factors, such as global crises, impact on sharing project knowledge, which could influence the success of KS in projects.
	Respondents in the "construction and governmental" work sectors are more concerned about fears related to this enabler.
	Respondents in the "other" category consider that there is no impact associated with this barrier on the KS inside projects.
	Different opinions could be due to different experiences and specialties of respondents about suitable corporate culture or external or macro-environmental factors that could affect the success of KS in projects.
	To avoid these barriers, there is a need for further development of programs with more flexibility towards external or macro- environmental factors in this regard to support the uses of KS in the project lifecycle.
	It is very important to take sufficient steps in order to ensure the establishment of a culture that motivates KS in projects.
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was rejected for the factors B14 and B15 .

10.3.2.10 Technological barriers which influence the success of KS in UAE infrastructural projects

• What are the technological barriers that influence the success of KS in UAE infrastructural projects?

Technological barriers must be considered as important barriers of successful KS in

infrastructural projects at the present time. This is because technological barriers can

cause obstacles and may slow the effectiveness of information exchange among project

stakeholders throughout the project lifecycle.

Within an organisation, the effectiveness of KS can be hindered by many factors, such as individual, technological, or organisational factors. Since organisations rely on technology in all aspects of their operations, they also need technologies to implement some of their initiatives, including KS.

Prior studies have indicated that a lack of technical and IT facilities within an organisation can hinder the effectiveness of its operations. Additionally, technology plays a vital role in communication and training employees, just to name a few areas (Sharma & Singh, 2014, p. 44). Therefore, when an organisation lacks access to technology, it greatly decrease KS behaviours.

In fact, the outcomes of this study show that there are several barriers in this regard, including technological factors of KS barriers **B16** (lack of technical and IT resources and other necessary project assets for KS), B17 (lack of access to technology for KS), and B18 (lack of provided training on how to use necessary IT tools and equipment to share knowledge) as determined by one-way ANOVA (p > 0.05). The respondents believe that all of these technological factors are significant barriers to the success of KS within infrastructural projects.

The ANOVA analysis (Table 10-13) indicates that there is consensus among the respondents on these factors in that they pose as significant barriers to the success of KS within infrastructural projects. This result signifies that these technological barriers are important. This finding is supported by previous literature, as mentioned above.

The author believes that these factors should be considered as technological barriers for the success of KS in projects and suggests that organisations concern themselves with these tools and programs to provide adequate proactive procedures to such barriers. Table 10-13 : Research question related to KS **technological** barriers and hypotheses results.

Research Question	Is there a statistically significant difference among the					
	respondents' perceptions in the different groups on project					
	success KS barriers related to technological barriers?					
Hypothesis	H2c: $\beta 2c = 0$. There is no statistically significant difference					
	among the respondents' perceptions of "technological factors					
	of KS barriers related to the success of KS in projects"					
Results	The ANOVA results indicate that there were no significant					
	differences among the respondents based on their working					
	sectors in any of the three KS technological barriers.					
Researcher	Even though there were no significant differences identified					
Observation	based on the respondents' work sectors, the respondents were					
	generally positive in regard to the use of KS in UAE					
	infrastructural projects.					
Conclusion	The null hypothesis Ha_0 ($p < 0.05$) was retained.					

10.3.3 Correlation and Regression

This subsection provides a discussion of the results of both the correlation and regression analyses in this study through the perspective of the results of previous research. The section also suggests directions for future research that extend the current findings. Both correlation and regression analyses were conducted to test the

relationships between KS enablers and barriers with the dependent variables that are

associated with the success of KS in projects, such as the rate of KS contribution to

project success, benefits of KS, quality of KS, and effectiveness of KS. Table 10-14 and

Table 10-15 represent a summary of the correlation and regression results of the

investigated hypotheses.

Hypotheses.	Results		
H3: The KS enablers are	Supported (only 11 of the KS enabler independent variables have		
associated with the rate of KS	significant correlations: $E7$, $E8$, $E15$, $E21$, $E29$, $E24$, and $E32$ at the p =		
contribution to project success.	0.005 level and E13 , E28 , E35 , and E34 at the p = 0.001 level. All of the		
	correlations are positive and between 0.189 and 0.322, which indicates a		
	moderate association between variables).		
H4: The KS enablers are	Supported (all 36 of the KS enabler independent variables have		
associated with the benefits that	significant positive correlations with these independent variables).		
might be gained from timely KS			
in infrastructural projects.			
H5: The KS enablers are	Supported (all 36 of the KS enabler independent variables have		
associated with the quality of the	significant positive correlations with these independent variables).		
timeliness of KS in			
infrastructural projects.			

Table10-14: Summary of the correlation results of the investigated hypotheses.

H6: The KS enablers are associated with the effectiveness of KS between stakeholders.	Supported (all 36 of the KS enabler independent variables have significant positive correlations with these independent variables).
H7: The KS barriers are associated with the rate of KS contribution to project success.	Supported (only 3 of the KS barrier independent variables have significant correlations: B3 at the $p = 0.001$ level and B7 and B9 at the $p = 0.005$. All of the correlations are negative and between -0.197 and -0.297, which indicates a moderate association between variables).
H8: The KS barriers are associated with the quality of the timeliness of KS in infrastructural projects.	Supported (only 6 of the KS barrier independent variables have significant correlations: B11 , B12 , and B15 at the $p = 0.005$ level and B1 , B9 and B16 at the $p = 0.001$ level. All of the correlations are negative and between -0.199 and -0.296, which indicates a moderate association between variables).
H9: The KS barriers are associated with the effectiveness of KS between stakeholders.	Supported (13 of the KS barrier independent variables have significant inverse correlations: B3 , B5 , B12 , B13 , and B18 at the $p = 0.005$ level and B1 , B2 , B4 , B6 , B10 , B11 , B16 , and B17 at the $p = 0.001$ level. All of the correlations are negative and rely between -0.188 and -0.317, which indicates a moderate association between variables).

Table10-15: Summary of the regression results of the investigated hypot

Hypotheses.	Results		
H3: The KS enablers are	Supported (greater levels of the enablers E24 and E30 correspond to		
associated with the rate of KS	higher levels of the rate of KS contribution to project success, whereas		
contribution to project	greater levels of the enabler E35 correspond to higher levels of the rate		
success.	of KS contribution to project success).		
H4: The KS enablers are	Supported (greater levels of the enablers E5, E11, and E13 correspond		
associated with the benefits	to higher levels of the benefits that might be gained from timely KS in		
that might be gained from	infrastructural projects, whereas greater levels of the enabler E8		
timely KS in infrastructural	correspond to lower levels of the benefits that might be gained from		
projects.	timely KS in infrastructural projects).		
H5: The KS enablers are	Supported (greater levels of the enablers E1 and E12 correspond to		
associated with the quality of	higher levels of the quality of the timeliness of KS in infrastructural		
the timeliness of KS in	projects).		
infrastructural projects.			
H6: The KS enablers are	Supported (greater levels of the enablers E4 and E12 correspond to		
associated with the	higher levels of the effectiveness of KS between stakeholders at each		
effectiveness of KS between	stage of the project lifecycle).		
stakeholders.			
H7: The KS barriers are	Supported (greater levels of the barrier B3 correspond to lower levels		
associated with the rate of KS	of the rate of KS contribution to project success).		
contribution to project			
success.			
H8: The KS barriers are	Rejected (but there is a mediating effect of the conscientiousness		
associated with the quality of	variable on the dependent variables).		
the timeliness of KS in			
infrastructural projects.			
H9: The KS barriers are	Supported (greater levels of the barrier B12 correspond to lower levels		
associated with the	of the rate of the effectiveness of KS between stakeholders at each stage		
effectiveness of KS between	of the project lifecycle with the mediating variable of the openness		
stakeholders.	personality trait).		

10.3.3.1 The knowledge sharing enablers and rate of knowledge sharing contribution to project success.

The results of correlational and regression analyses indicate that the enablers ${\bf E24}$

(ability of social networks to simplify personal relationships and social interactions

and facilitate the project KS process) and E30 (the characteristics of physical environments such as the shape of the offices or spaces and relaxed and quiet environment) significantly and positively predict the rate of KS contribution to project success, whereas the enabler E35 (loyalty and hard work to increase project success via KS) significantly and negatively predicts the rate of KS contribution to project success, thus confirming Hypothesis 3.

For E24 (ability of social networks to simplify personal relationships and social interactions and facilitate the project KS process), the results of this research support the previous studies conducted by Mueller, 2015; Wiewiora, et al., 2014 and Mat, et al., 2012. Mueller (2015) has indicated that sharing tacit knowledge among project team members can be predicted by the degree of flexibility of the project team in addition to the effectiveness of communication. According to Wiewiora et al. (2014), the KS systems of project-based organisations rely on employees, organisational social networks, and other technological elements. In addition, Mat et al. (2012) has shown that project teams must have high-quality knowledge, skill sets, and experiences; teams also require the social sharing of project knowledge to accomplish their project tasks.

For E30 (the characteristics of physical environment), the results of this research support the studies conducted by Alfazzi Aljuhani (2014). Accordingly, the components of the physical environment of the organisation including the shape of the offices, the spaces, how relaxed the environment is, and if it is quiet, and all of these factors play great roles in the KS process. This role depends on the nature of the organisation and its structure (Alfazzi Aljuhani, 2014, p. 41). This study confirms the positive influence of the physical environment on increasing individuals' intentions to share knowledge in projects.

For E35 (loyalty and hard work to increase project success via KS), the results of this research support the studies conducted by Shareff (2014) and Schmitz (2013). According to Schmitz (2013), social exchange theory guides the motivations of people, especially those who are materialistic because they want to receive benefits in return. However, some team members are driven by hard work and the willingness to see the success of the project, and thus they are likely to contribute more knowledge because they do not have materialistic expectations. On the other hand, Shareff (2014) elaborated the idea that as much some project members are loyal and hardworking, it does not mean that their work should not be rewarded. He added that recognition and rewarding of such team members will create role models and increase their motivation to have positive intentions when sharing the knowledge they have gathered.

10.3.3.2 The knowledge sharing enablers and benefits that might be gained from timely knowledge sharing in infrastructural projects.

The results of correlational and regression analyses indicated that the enablers E5 (leadership commitment to supporting open and honest two-way communication in projects), E11 (implementation of less formal resources such as social media to share embedded project knowledge), and E13 (the ability to communicate between project stakeholders regarding the project through specific channels) significantly and positively predict the benefits that might be gained from timely KS in infrastructural projects, whereas the enabler E8 (measurements of KS before and after any project activities) significantly and negatively predicts the benefits that might be gained from timely KS in the infrastructural projects, thus confirming

Hypothesis 4.

For E5 (leadership commitment to supporting open and honest two-way communication in projects), the results of this research support the studies conducted by Wiewiora, et

al., 2014. Wiewiora, et al. (2014) debated that KS behaviour needs to be considered from the board of directors of an organisation in order to establish a collaborative culture to enhance tacit KS. In addition, this study suggested that there are many existing practices to encourage KS inside organisations, such as introducing incentives and supportive leadership styles (Wiewiora, et al., 2014).

For E8 (measurements of KS before and after any project activities), the results of this research support the studies conducted by Ajayi (2013) and Yeong & Lim(2010). Ajayi (2013) has insisted that there is need to understand how effectively the KS mechanisms can be integrated into the daily operations of a project. He claimed that the goals and objectives of a project should be aligned to match the KS process so that it can positively influence the outcomes. This means that there should be extensive understanding of the assets and needs of knowledge processes within the project process itself.

Yeong and Lim (2010) have illustrated that KM practices in PM comprise managing content and documentation, sharing best practices, and coordinating lessons learned. In addition, KM systems are embedded in PM to build a culture that motivates effective KS through different practices.

For E11 (implementation of less formal resources such as social media to share embedded project knowledge), the results of this research support the studies conducted by Maalej and Thurimella (2013) and Carrillo (2005). Maalej and Thurimella (2013) explained that KS behaviour is composed of two areas, one tacit and the other explicit, which are formalised and designed to meet specific needs. Accordingly, internal systems in a project designed to enhance communication, information sharing, and customer relations all contribute to KS from a specific perspective with that ideal

objective of offering a solution to a pre-determined problem (Maalej & Thurimella, 2013). On the other hand, Carrillo (2005) has explained that tacit knowledge is informal and shared through less formal resources such as social media and friendly chats. Such studies have confirmed the positive influence of organisational structures changes on the success of KS.

For E13 (the ability to communicate between project stakeholders regarding the project through specific channels), the results of this research support the previous studies (Lipiński & Świrski 2012 ;Hong et al. .2008&Wenger et al. , 2002). According to Lipiński and Świrski (2012), utilising the theory of reasoned action and theory of planned behaviour, the attitude of the people sharing information and the attitude of the recipients are important. This is where the role of communication and employee relations enters. Employees need to be able to communicate well and objectively regard the project in question, thus enhancing their ability to acquire specific pieces of information. Hong et al. (2008) argued that KS contributes positively to projects by transferring tacit knowledge or know-how between team members through effective communication. In this regard, sharing knowledge between project team members enhances performance and increases opportunities for innovation. Wenger et al. (2002) explained that IT support, clear roles and responsibilities, and evaluations of project

10.3.3.3 The knowledge sharing enablers and quality of timeliness of KS in infrastructural projects.

The results of correlational and regression analyses indicated that the enablers **E1** (clear policy or strategy for project KS) and **E12** (sufficient assets and resources to support project KS processes) significantly and positively predict the quality of the timeliness of KS in infrastructural projects, thus confirming Hypothesis 5.

For E1 (clear policy or strategy for project KS), the results of this research support the previous studies (Saad, et al., 2014; Tan, 2013; Jayasinghe & Kapurubandara, 2013 ;Lipiński & Świrski, 2012 ; Kendra & Taplin ,2004 &Kasvi, et al ,2003). Most critically, Saad et al. (2014) noted that significance, relevance, and influence within the project all aid in creating consistent and proper supervision, hence fostering success of KS. According to Jayasinghe and Kapurubandara (2013), in order for the KS process to be successfully integrated into a project, there is need for certain conditions to be ideal. It is necessary that every member of the project team understands and relates to the subject matter of the project so that they can make relevant contributions. Another prerequisite before utilising KS within a project is to have a structured process and procedure to guide the implementation, according to Tan (2013). The researcher explained that a procedure or a process is critical because it helps to reduce wastage of resources, such as time. Meanwhile, Lipiński and Świrski (2012) also debated that strategic relevance must involve having a proper plan of action on how to share information through specific channels in the projects. According to Kendra and Taplin (2004), in order for any KS process to work, certain preconditions must be met. The commitment to the project by managers to ensure that they and subordinates adhere to KS is critical, so the top management must steer the project members towards understanding that the project requires every individual's input. According to Kasvi et al. (2003), in order to manage knowledge in projects, a codification or a personalisation strategy should be developed. A codification strategy usually corresponds to codifying knowledge and storing it in accessible databases within the organisation, whereas a personalisation strategy corresponds to when the knowledge is connected to personnel who create and transfer it to others via face-to-face interactions, like meetings.

Form the explanation of these experts, these factors must be present in order for there to be success in KS and success in the project overall. To illustrate this assertion, strategic relevance involves having a proper plan of action of how to share information through specific channels. These channels must avoid duplication, wastage of resources, and delays that might lead to time constraints.

For E12 (sufficient assets and resources to support project KS processes), the results of this research support the previous studies (Kerzner, 2009; Grillitsch et al., 2007& Kotlarsky&Oshri ,2005). In a study conducted by Grillitsch et al. (2007) on the successful sharing of project knowledge, the researchers outlined numerous critical points for the success of a project through KS. According to Grillitsch et al. (2007), some of the factors required for a successful project through KS include strategic relevance, communication, concept, continuous development, IT, and coordination, among others. Moreover, Kotlarsky and Oshri (2005) suggested the development of social mechanisms of KS such as collective knowledge in addition to transitive memory and technical tools of communication, such as emails and groupware or discussion applications between dispersed team members for global distributed projects. Kerzner (2009) explained that many times, the knowledge learnt during the early stages of a project is useful during the mature stages, since it is used to makes changes and improvements with time. He added that the knowledge used to make projects succeed does not have to be learnt from past projects altogether, but could be learnt systematically from daily operations. Such studies confirm the positive influence of sufficient assets and resources to support project KS processes on the success of KS in projects overall.

10.3.3.4 The knowledge sharing enablers and effectiveness of knowledge sharing between stakeholders.

The results of correlational and regression analyses indicated that the enablers **E4** (sufficient reward systems for sharing knowledge) and **E12** (sufficient assets and resources to support project KS processes) significantly and positively predict the effectiveness of KS between stakeholders at each stage of the project lifecycle, thus confirming Hypothesis 6.

For E4 (sufficient reward systems to share knowledge), the results of this research support the previous studies (Shareff ,2014; Yeong & Lim ,2010 &BreitenöDer, 2009). According to BreitenöDer (2009), having records and documentation specifically for lessons learnt and best practices during the project lifecycle and from past projects is a critical way to ensure KS. However, the overall outcome of the success of utilising KS depends on the willingness of the people sharing information, the amount of useful information, and the commitment of the team towards the project. Yeong and Lim (2010) have added that supportive leadership styles and a motivating culture through recognition and rewards in the PM may increase opportunities for successful KS. Shareff (2014) expanded this idea with the notion that recognition and rewarding of such team members creates role models and increases motivation to have positive intentions when sharing the knowledge they have gathered.

For E12 (sufficient assets and resources to support project KS processes), the results of this research support the previous studies (Kerzner ,2009 ; Grillitsch et al.,2007& Kotlarsky&Oshri ,2005). In a study conducted by Grillitsch et al. (2007) on the successful sharing of project knowledge, the researchers outlined numerous critical points for the success of a project through KS. According to Grillitsch et al. (2007), some of the factors required for a successful project through KS include strategic

relevance, communication, concept, continuous development, IT, and coordination, among others. To support this idea, Kotlarsky and Oshri (2005) suggested the development of social mechanisms of KS such as collective knowledge and transitive memory in addition to technical tools of communication, such as emails and groupware or discussion applications between dispersed team members for global distributed projects. Kerzner (2009) explained that many times, the knowledge learnt during the early stages of a project is useful during the mature stages, since it is used to makes changes and improvements with time. He added that the knowledge used to make projects succeed does not have to be learnt from past projects altogether, but it could be learnt systematically from daily operations. Such studies confirm the positive influence of sufficient assets and resources to support project KS processes upon success of KS in the project overall.

10.3.3.5 The knowledge sharing barriers and rate of knowledge sharing contribution to project success.

The results of the correlational and regression analyses indicate that the barriers **B3** (lack of trust towards others towards sharing project knowledge) significantly and negatively predict the rate of KS contribution to project success, thus confirming

Hypothesis 7.

For B3 (lack of trust for others regarding sharing project knowledge), the results of this research supported the studies conducted by(Sharma & Singh, 2014). Based on the work by Sharma and Singh (2014, p. 47), the individual's fear of sharing knowledge or the lack of time to interact with other employees can hinder the success of KS because people in the organisation conduct operations using knowledge received through many channels. Furthermore, they added that people, as parts of the organisation, are important for helping the organisation to achieve its objectives and goals.

10.3.3.6 The knowledge sharing barriers and quality of timeliness of KS in the infrastructural projects.

Data and analyses from this study showed no significant relationship between the KS barriers and the quality of the timeliness of KS in infrastructural projects (**Hypothesis 8**). There seems to be no confusion in regard to the quality of shared knowledge between KS barriers and other KS enablers in spite of rational correlations with both the quality of the timeliness of KS and the effectiveness of KS (Hypotheses 5 and 6, respectively) as the dimensions of the KS barriers loaded on factors are unique to barriers.

This result in this research contradicts studies conducted by Rudawska (2013).

Rudawska(2013) claimed that the success of KS within an organisation can be hindered by many factors such as individual, technological, or organisational factors. He also added that organisations are composed of a combination of the above factors; therefore, if any of them work improperly or are impaired, it will automatically affect the KS behaviour (Rudawska, 2013, p. 66).

The lack of any significant relationship between the KS barriers and the quality of the timeliness of KS in the infrastructural projects can be justified by the cultural difference of the research data sampling.

10.3.3.7 The knowledge sharing barriers and effectiveness of knowledge sharing between stakeholders.

The results of correlational and regression analyses indicated that the barrier **B12** (the influence of organisational structures changes upon motivation to share knowledge) significantly and negatively predicts the effectiveness of KS between

stakeholders at each stage of the project lifecycle with the mediating variable being the

openness personality trait, thus confirming Hypothesis 9.

For B12 (the influence of organisational structures changes upon motivation to share knowledge), the results of this research support the studies conducted by Najibullah, et al., (2012). Najibullah et al.(2012, p. 13) believed that the organisational culture has a great role to play in the KS process because all practices and operations that are carried out within a given organisation reflect the culture, values, and ethics of that organisation. In addition, the KS culture is influenced by an organisation's management through regulations and rules that are enforced. Based on past studies, the culture implemented within an organisation determines the social interactions and how employees judge the importance of KS (Najibullah, et al., 2012, p. 14). This study confirms the negative influence of organisational structures changes upon motivation to share knowledge as organisations where advised to be progressively focusing on the development of KS culture.

For the openness personality trait factor, Matzler and Müller (2011) have observed that openness is the most influential personality trait in forecasting the KS behaviour out of the five included personality traits.

10.4 Summary of Chapter

This chapter has delivered a comprehensive discussion of all of the results, the suggestions of those results from the literature review, the successful integration of KS in infrastructure projects with emerging enablers and barriers, and the recognition of knowledge over the lifecycle of projects.

A discussion has been offered on these enablers and barriers based on the ANOVA, correlation, and regression results in this study to explain the research hypotheses and questions. The classification of enablers of KS success comprises seven main groups, including 36 enablers that were ranked according to their impact on the success of KS in

the project lifecycle. There are also three main classifications for the barriers of KS success, including 18 barriers that were ranked according to their impact on the success of KS in the project lifecycle.

The outcomes of the research contribute to understandings of the enablers and barriers that influence the success of KS in the project lifecycle. In order to craft a more comprehensive image and a more focused study of the enablers and barriers examined in this study, additional research should be conducted at varied time periods to discover the different enablers and barriers that impact the utilisation of KS in the infrastructure development sector.

11. Chapter 11: Conclusion

11.1 Overview

This chapter represents the key conclusions of this dissertation. For this reason, this section starts firstly by discussing the robustness of the research methodology. Then, the focus of this chapter is to illustrate the achievement of the research objectives that were initially established through a review of the existing KS in project theories. The third section presents the main research limitations. After that, the fourth section concentrates on the research contributions. The last section focuses on underlining the recommended instructions for future research.

11.2 Robustness of the Research Methodology

Chapter 5 has provided a broad and expanded description of the implemented methodology for this research. As discussed before, a quantitative methodology was applied for this research. The existing research gaps that were derived from the broad literature review were represented as the key inspiration for this research. Similarly, the theoretical framework that is in Chapter 4 was developed mainly from the literature

review to address the targeted concepts. According to the criteria in the literature, the data collection was designed to solve the research issues in an efficient manner to avoid any redundant responses. In addition, the response rate for the survey was sufficient and valid through the use of hard copies together with the web tools. There were extensive varieties of analytical techniques to expand the analysis advantages, including reliability, descriptive analysis, ranking analysis, normality test, correlation, regression analysis, and ANOVA.

11.3 Research Objectives

This main aim of this research is to study the success of KS through the lifecycle of infrastructure development projects. The following research objectives were established to achieve the research aim:

- Review the integration of KS in the lifecycle of projects in the UAE's infrastructure development sector.
- Investigate the enablers and barriers associated with the success of KS the projects of the UAE's infrastructure development sector.
- Investigate the association of enablers and barriers with the success of KS in the projects of the UAE's infrastructure development sector.

- Evaluate the emerging KS enablers and barriers from different users' points of view.

The information gathered through these objectives can provide industry practitioners with a better empirical framework for assessing the success of KS that is implemented or integrated to utilise lessons learned in UAE infrastructural projects with consideration for PM standards. Furthermore, the researcher carried out an extensive literature review to recognise the most important elements that impact the success of KS in infrastructural projects. These enablers and barriers include individuals' characteristics, organisational factors, technological constraints, social networking involvement, physical environmental differences, motivational factors, and KS process characteristics. Most of the literature recognised some version of these enablers and barriers according to the studies' research objectives. In this study, these enablers and barriers have been inspected from the perspective of organisational handling of the success of KS in infrastructural projects. Merely a subset of KS enablers and barriers that were found in the literature were the underlying concern of this project. The other KS enablers and barriers were ignored due to their negligible impact on the success of KS in projects. The significance of these enablers and barriers has been defined though the data analyses.

As part of achieving this objective, numerous statistical methods and assessments were applied to recognise the associations between the dependent and independent variables. Overall, these assessments indicate strong reliance on the dependent and independent variables. For instance, there is very strong dependence on the effectiveness of KS in projects and having sufficient assets and resources to support project KS processes (E12). This statement advises that there is vast significance concerning possessing sufficient assets and resources to support project KS processes of KS in projects. Organisations that ensure sufficient assets and resources as a possibility for supporting project KS opportunities are more effective in such KS in projects.

11.4 Conclusion

The next conclusion that is drawn from this research has accomplished the research objectives as follows:

- Previous KS literature neglected clear definitions of knowledge components at each knowledge area of the project lifecycle. This research has attempted to overcome this existing problem of KS deficiency in PM through defining the knowledge flow among different project stakeholders via classifications of knowledge in projects, products, and process. The intention of these definitions is to show where the knowledge components are and determine how knowledge can be shared and with whom. Thus, this research has found a new mapping of 312 knowledge components in the general project lifecycle based on the 10 knowledge areas in the PMBOK® guide.
- Findings from this research reveal that three enablers influence the rate of KS contribution to project success: ability of social networks to simplify personal relationships and social interactions and facilitate the project KS process (E24), the characteristics of physical environments such as the shape of the offices or spaces and relaxed or quiet environments (E30), and loyalty and hard work to increase project success via KS (E35). The research findings also show that four enables were assessed to be important for the benefits that might be gained from timely KS in infrastructural projects: leadership commitment to supporting open and honest two-way communication in projects (E5), measurements of KS before and after any project activities (E8), implementation of less formal resources such as social media to share embedded project knowledge (E11), and the ability to communicate between project stakeholders regarding the project through specific channels (E13). In addition, the results show that two enablers were assessed to be important for the timeliness of KS in the infrastructural projects: a clear policy or strategy for project KS (E1) and sufficient assets and resources to support project KS processes (E12).

The results also indicate that the respondents thought two enablers are relevant to the effectiveness of KS between stakeholders at each stage of the project lifecycle: sufficient reward systems to share knowledge and sufficient assets and resources to support project KS processes.

- This study has found that only the barrier of lack of trust for others regarding sharing project knowledge (B3) has an important negative impact on the rate of KS contribution to project success. Only one barrier was deemed important for the effectiveness of KS between stakeholders at each stage of the project lifecycle: lack of motivation policy of KS (B12).
- In addition, this study recommends that openness is considered as the most influential personality trait in forecasting the KS behaviour out of the five chosen traits.
- The results of this research have an important practical and theoretical implication that stems from the ANOVA findings, which discovered a variety of interrelationships among the identified enablers and barriers based on respondents' work sectors. In a practical sense, the research results reveal that there is a need for more organisational commitment, further leadership commitment to supporting open and honest two-way communication, and a wider range of communication channels to support the uses of KS in the project lifecycle. In order to facilitate KS in the project, there is a need for sufficient funding, facilities, and technological resources. Furthermore, it is very necessary to implement further procedures in order to facilitate communication between different stakeholders and to ensure the establishment of a culture that motivates KS in projects. Moreover, it is obligatory to address external or macro-environmental factors in this regard to support the uses of

KS in the UAE's infrastructural projects. In theory, this research has contributed to the current research in many ways. 1) It empirically proves the validity of the relationships among identified enablers and barriers of KS success in projects. 2) It adds the UAE's perspective about enablers and barriers to the growing body of Middle Eastern research on KS so that promoting the current understanding of how infrastructural projects in the UAE and Middle East can impact of KS enablers and barriers of the success of KS process in projects.

11.5Generalizability, Applicability, and Implications ofFindings

The focus of this research is the UAE's infrastructure development sector, which is characterised by unique cultural and leadership features of the UAE government. Because of that, these specific cultural features have been highly considered especially in the questionnaire. To illustrate, the questionnaire involved the specific dependent variables of the KS quality, benefits, and effectiveness measures in projects, which are considered in the infrastructural sector of the UAE.

On the other hand, the analyses suggest that these features have not significantly affected project stakeholders' attitudes toward KS. The theme of the questionnaire in this research focuses more on involving how the working sector and personality traits may influence the enablers and barriers of KS success in projects. This theme covers all outcomes of this study.

To conclude, this research can be generalised to other cultures. In addition, it can be considered very applicable to all modern projects worldwide. Furthermore, recommendations from this research outcome may be very applicable and helpful to those who are concerned with both knowledge management and project management topics.

11.6 Research Limitations

Every research task is subject to some limitations that result from different causes. In the same manner, this research has suffered from the following limitations:

- One of the key research limitations is the inability to investigate the live integration of KS at each stage of the project lifecycle to create project success due to time restrictions. This is due to the selection of the survey tool, which does not allow investigations of changes across time and their impacts for each project stage. Such possibility would consume too much time, as some infrastructural projects last for more than five years. This introduces an opportunity for future research in this field by having longer research periods and using other methods such as the domain mapping matrix methods via implementing social networking analysis tools.
- Another research limitation is the difficulty of the validation process in which the KS questionnaire was given to academic experts on project management and knowledge management. However, such necessity was very difficult and time consuming to implement and assure.
- In addition, the main emphasis of this research is the UAE's infrastructure development sector, which is characterised by unique cultural and leadership features of the UAE government. The themes of this research can be much enhanced if other regions are involved to increase the research generalisation opportunities.

11.7 Research Contribution

There is extensive literature that addresses the success of KS in projects. This study adds to the present body of this knowledge with these key contributions:

- This research focuses on governmental organisations in the UAE's infrastructural development sector, as most current works in the literature are concerned with private construction organisations. Governmental organisations work under many strict regulations and procedures, which may limit the organisations' capability to support KS in projects. It seems that there is a shortage of formidable proof about this difference in capability and how the strong hierarchy and position generally influence the success of KS in projects.
- The research has recognised new clusters of KS enablers and barriers that have a direct impact on the success of KS in projects. Namely, these enabler clusters are individual, organisational, technological, social networking, physical environmental, motivational, and KS process enablers. The barriers are clustered as individual, organisational and technological.
- This research has recognised that the two enablers which contributes most to the success of KS are teamwork and teambuilding in UAE infrastructural projects via KS (E34) and awareness of the importance of technologies and IT resources for sharing knowledge in UAE infrastructural projects (E19). In other words, organisations that develop teamwork and teambuilding and awareness of the importance of technologies are more successful in integrating KS into their projects. In addition, the two most important barriers are the influence of organisational structures changes on motivation to share knowledge (B12) and the use of a strong hierarchy and position occupied by people to intimidate others from KS (B11). In

other words, organisations that develop proactive procedures to combat the effects of organisational structure changes on motivation and decrease the use of a strong hierarchy are more successful in integrating KS into their projects.

- This research has focused on knowledge components to display the KS interactions over unique project activities in the entire project lifecycle, which are usually neglected when mapping project knowledge. Public sector and private sector organisations have many differences in the way that they hire, train, and reward employees. Having more specific project knowledge components significantly enhances the value of the research for developing a specific mapping of KS interactions that exist in the UAE's infrastructural projects. This difference marks it critical for researchers to represent the process of KS at each stage of the project lifecycle through identifying the knowledge flow between project stakeholders.
- This research has concentrated on the impact of enablers and barriers and the impact of personality characteristics (the big five personality traits) on the success of KS in projects. The results of this research indicate significant relationships among the openness personality trait and KS between project stakeholders. Accordingly, the research results contribute to the present literature since it offers practical evidence of the influence of individual characteristics on KS behaviour.

11.8 Recommendations for further research

As declared previously, there is an increasing necessity to carry out research concerning KS in the project lifecycle. Complicated processes like KS in all stages of the project lifecycle could not be examined by this one research work. According to the knowledge underlying this research, the researcher recommends the following future studies ideas.

- In the UAE region, there are different policies and procedures. For instance, in each of the seven Emirates, there are two sources of regulations and governmental standards local and federal authority sources. This issue can directly affect the PM standardisation process and thereby affect the KS process. It would be very interesting to conduct a comparative case study in order to explore the role of policies and procedures in facilitating the KS processes in the projects of the UAE region.
- In addition, investigating the live integration of KS at each stage of the project lifecycle to create project success may deliver more information about the KS process in projects. To illustrate this idea, one can consider how the changes across time impact each project stage and might affect the successful integration of KS as a process into the project lifecycle.
- This research can be expanded in the future by applying social networking tools to analyse the interactions of knowledge flow among different stakeholders.

11.9 Chapter Summary

This chapter fundamentally discusses the main research conclusions and outcomes. At the start, the robustness of the research methodology was highlighted. After that, research objectives, limitations, and contributions were discussed, and recommendations for how this research can be expanded in the future were offered.

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13. Appendices

Appendix 1 Knowledge components at each PM process group

Table 13-1:Knowledge components at each PM process group

	Knowledge Component	Project
		Stage
S1K1	Data about project purpose or justification.	
S1K2	Data about the outcomes of past projects choice decisions and past projects performance.	
S1K3	Data about measurable project objectives and related success criteria.	
S1K4	Data about project high-level requirements.	Р
S1K5	Data about project assumptions and constraints.	ro
S1K6	Data about advanced project description and limits.	je
S1K7	Data about advanced risks.	Ċ
S1K8	Data about summary milestone schedule.	
S1K9	Data about summary budget.	ni
S1K10	Data about stakeholder list.	tic
S1K11	Data about project success necessities.	Iti
S1K12	Data about assigned project manager, responsibility, and authority level.	<u>o</u>
S1K13	Data about name and authority of the sponsor or other person(s) authorizing the project	n
	charter.	sta
S1K14	Data about stakeholders' identification.	<i>6</i> r
S1K15	Data about stakeholders' assessment.	e
S1K16	Data about stakeholder classification.	
S2K17	Data about life cycle selected for the project and the processes that will be applied to each	
	phase.	
S2K18	Data about project management processes selected by the project management team.	
S2K19	Data about level of implementation for each selected process.	
S2K20	Data about the tools and techniques to be used for accomplishing those processes.	
S2K21	Data about how the selected processes will be used to manage the specific project, including	
	the dependencies and interactions among those processes and the essential inputs and	~
	outputs.	br
S2K22	Data about how work will be executed to accomplish the project objectives.	9.
S2K23	Data about change management plan that documents how changes will be monitored and controlled.	ect
S2K24	Data about configuration management plan that documents how configuration management	p
	will be performed.	la
S2K25	Data about how the integrity of the project baselines will be maintained.	n
S2K26	Data about requirements and techniques for communication among stakeholders.	1 ii
S2K27	Data about key management reviews for content, the extent of, and timing to address, open	9n
	issues and pending decisions.	S
S2K28	Data about a detailed project scope statement.	ta
S2K29	Data about how the WBS will be maintained and approved.	\mathcal{G}
S2K30	Data about how formal acceptance of the completed project deliverables will be obtained.	0)
S2K31	Data about how requests for changes to the detailed project scope statement will be	
	processed.	
S2K32	Data about how requirements activities will be planned, tracked, and reported.	
S2K33	Data about configuration management activities such as: how changes to the product will be	
	initiated, how impacts will be analyzed, how they will be traced, tracked, and reported, as	

	well as the authorization levels required to approve these changes.	
S2K34	Data about requirements prioritization process.	
S2K35	Data about product metrics that will be used and the rationale for using them.	
S2K36	Data about traceability structure to reflect which requirement attributes will be captured on	
	the traceability matrix.	
S2K37	Data about business and project objectives for traceability.	
S2K38	Data about business rules for the performing organization.	
52K39 52K40	Data about guiding principles of the organization.	
S2K40	Data about impacts to other organizational areas.	
S2K41 S2K42	Data about impacts to other entries inside or outside the performing organization.	
S2K43	Data about scatchology and standard compliance requirements	
S2K44	Data about support and training requirements	
S2K45	Data about quality requirements.	
S2K46	Data about reporting requirements.	
S2K47	Data about levels of service, performance, safety, compliance requirements.	
S2K48	Data about acceptance criteria.	
S2K49	Data about transition requirements.	
S2K50	Data about requirements assumptions, dependencies, and constraints.	
S2K51	Data about business needs, opportunities, goals, and objective.	
S2K52 S2K52	Data about project objectives descriptions.	
52K55 \$2K54	Data about project scope/WBS deliverables descriptions.	
S2K55	Data about product design descriptions.	
S2K56	Data about product development descriptions.	
S2K57	Data about test survey and test scenarios.	
S2K58	Data about product scope description.	
S2K59	Data about acceptance criteria in the project scope statement.	
S2K60	Data about deliverables in the project scope statement.	
S2K61	Data about identification of what is excluded from the project.	
S2K62	Data about the constraints in the project scope statement.	
S2K63	Data about the assumptions in the project scope statement.	
S2K64	Data about code of account identifier information in the WBS dictionary.	
S2K65	Data about work information in the WBS dictionary.	
S2K00 S2K67	Data about assumptions and constraints information in the WBS dictionary.	
S2K68	Data about responsible organization information in the WBS dictionary.	
S2K69	Data about schedule innestones in the WBS dictionary	
S2K70	Data about resources required in the WBS dictionary.	
S2K71	Data about cost estimates in the WBS dictionary.	
S2K72	Data about quality requirements in the WBS dictionary.	
S2K73	Data about acceptance criteria in the WBS dictionary.	
S2K74	Data about technical references in the WBS dictionary.	
S2K75	Data about agreement in the WBS dictionary.	
S2K76	Data about project schedule model development	
S2K77	Data about acceptable range used in determining realistic activity duration estimates.	
52K78	Data about Identification of each unit of measure for each of the resources.	
S=117	bata about the framework for the schedule management plan, allowing for consistency with	
S2K80	Data about the process used to update the status and record progress of the project in the	
	schedule model during the execution of the project.	
S2K81	Data about variance thresholds for monitoring schedule performance to indicate an agreed-	
	upon amount of variation to be allowed before some action needs to be taken.	
S2K82	Data about rules for establishing percent complete.	
S2K83	Data about measurements of control accounts at which management of progress and	
\$21.64	Schedule.	
52K04 52K85	Data about earned value measurement techniques.	
521105	bata about schedule performance measurements used to assess the magnitude of variation to the original schedule baseline	
S2K86	Data about identification of the formats and frequency for the various schedule reports	
S2K87	Data about each of the schedule management processes.	
S2K88	Data about all schedule activities required on the project to understand what work is	
	required to be completed.	
S2K89	Data about activity attributes which are used for schedule development and for selecting,	
	ordering, and sorting the planned schedule activities.	
S2K90	Data about milestone list which is identifying all project milestones and indicates whether	
\$28.01	the milestone is mandatory based upon historical information.	
521571	Data about a graphical representation of the logical relationships or dependencies, among	

	the project schedule activities as in project schedule network diagram.	
S2K92	Data about of the logical sequence of work specificity of the resource requirement	
	descriptions for each activity in a work nackage to obtain the greatest efficiency given all	
	account on the reaction of the second se	
S2K93	Project constraints.	-
	complete the activity which allows more accurate cost and duration estimates	
S2K94	Complete the activity synch anows more acturate tost and unration estimated.	
521174	and about activity scope of work, required resource types, estimated resource quantities,	
\$28.05	and resource calendars to estimate activity durations.	-
32K73	Data about the review and revision of duration estimates and resource estimates to create	
	the project schedule model to establish an approved project schedule that can serve as a	
	baseline to track progress.	
S2K96	Data about resource requirements by time period, often in the form of a resource histogram.	
S2K97	Data about alternative schedules, such as best-case or worst-case, not resource-leveled, or	
	resource-leveled, with or without imposed dates.	
S2K98	Data about scheduling of contingency reserves.	
S2K99	Data about identification of working days and shifts that are available for scheduled activities	
	in the project calendar.	
S2K100	Data about guidance and direction on how the project costs will be managed throughout the	
	project.	
S2K101	Data about each unit used in measurements for each of the resources	
S2K102	Data about the degree to which activity cost estimates will be rounded up or down based on	
	the score of the activities and magnitude of the project	
S2K103	Data about the accontable range used in determining realistic estimity sect estimates	
S2K 104	Data about the acceptable range used in determining realistic activity cost estimates.	
54K104	Data about variance thresholds for monitoring cost performance to indicate an agreed-upon	
COT 107	amount of variation to be allowed before some action needs to be taken.	
S2K105	Data about the points in the WBS at which measurement of control accounts will be	
	performed.	
S2K106	Data about the earned value measurement techniques to be used.	
S2K107	Data about the tracking methodologies and the earned value management computation	
	equations for calculating projected estimate at completion forecasts to provide a validity	
	check on the bottom-up.	
S2K108	Data about the formats and frequency for the various cost reports.	
S2K109	Data about each of the other cost management processes.	
S2K110	Data about strategic funding choices.	
S2K111	Data about how to account for fluctuations in currency exchange rates.	
S2K112	Data about project cost recording.	
S2K113	Data about the amount of cost required to complete project work	
S2K114	Data about an antitative assessments of the probable costs required to complete project	
	work	
S2K115	Work.	-
S2K116	Data about all assumptions made for the activity cost estimates	•
S2K117	Data about an assumptions made for the activity cost estimates.	-
\$21/118	Data about any known constraints for the activity cost estimates.	-
52K110	Data about the range of possible estimates to indicate that the item is expected for the	
6317110	activity cost estimates.	
52K119	Data about the confidence level of the final activity cost estimates.	
S2K120	Data about all the funds requirements and periodic funding requirements authorized to	
	execute the project.	
S2K121	Data about guidance and direction on how quality will be managed and validated throughout	
	the project.	
S2K122	Data about process boundaries in the quality management plan.	
S2K123	Data about process configuration in the quality management plan.	
S2K124	Data about process metrics.	
S2K125	Data about targets for improved performance in the quality management plan.	
S2K126	Data about a project or product attribute and how the control quality process will measure it.	
S2K127	Data about project's requirements and practices to ensure consistency in frequently	
	performed tasks.	
S2K128	Data about the roles and responsibilities needed to complete a project for HR planning	
S2K129	Data about project team members and their reporting relationships for HD planning	
S2K130	Data about planning the acquisition of project team members for UD planning	
S2K131	Data about planning the acquisition of project team members for fix planning.	
5211151	bata about necessary time frames for project team members, either individually of	
	conecuvery, as wen as when acquisition activities such as recruiting should start for HR	
S21/122	pianning.	
52K132	Data about the methods and timings of releasing team members benefits both the project and	
001/100	team members for HR planning.	
S2K133	Data about training needs for the team members for HR planning.	
S2K134	Data about criteria for rewards and a planned system for their use help promote and	
	reinforce desired behaviors for HR planning.	
621/125		
52K155	Data about strategies for complying with applicable government regulations, union contracts,	

S2K136	Data about policies and procedures that protect team members from safety hazards can be
S2K137	Included in the staffing management plan as well as in the risk register.
S2K138	Data about stakeholder communication requirements.
	level of detail.
S2K139	Data about reason for the distribution of that project information.
52K140	Data about time frame and frequency for the distribution of required information and receipt of acknowledgment or response if applicable
S2K141	Data about person responsible for communicating the project information.
S2K142	Data about person responsible for authorizing release of confidential project information.
S2K143	Data about person or groups who will receive the project information.
S2K144	Data about methods or technologies used to convey the project information, such as memos, a-mail, and /or pross releases
S2K145	Data about resources allocated for communication activities, including time and budget.
S2K146	Data about escalation process identifying time frames and the management chain (names)
SOV 147	for escalation of issues that cannot be resolved at a lower staff level.
52K147	Data about methods for updating and refining the communications management plan as the project progresses and develops
S2K148	Data about glossary of common terminology.
S2K149	Data about flow charts of the information flow in the project, workflows with possible
\$2¥ 150	sequence of authorization, list of reports, and meeting plans, etc.
52K150	regulation technology and
	organizational policies, etc.
S2K151	Data about the approaches, tools, and data sources that will be used to perform risk
\$2K152	management on the project.
52R152	the risk management plan, and clarifies their responsibilities.
S2K153	Data about estimation the funds needed based on assigned resources, for inclusion in the cost
	baseline and establishment the protocols for application of contingency and management
S2K154	reserves.
52K154	bata about when and now often the risk management processes will be performed throughout the project life cycle, establishment the protocols for application of schedule
	contingency reserves, and establishes risk management activities for inclusion in the project
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	scheune.
S2K155	Data about a means for grouping potential causes of risk, definitions of risk probability and impact
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	the project and the organization's risk thresholds.	
S2K178	Data about lessons learned on the issues and risks as well as techniques that worked well that can be	
	applied to future projects.	
S2K179	Data about risk management issues in the procurement plan.	
S2K180	Data about guidance for whether independent estimates will be used and whether they are	
	needed as evaluation criteria in the procurement plan.	
S2K181	Data about guidance for those actions the project management team can take unilaterally, if	
	the performing organization has a prescribed procurement, contracting, or purchasing	
(101)	department.	-
S2K182	Data about guidance for standardized procurement documents, if needed.	-
S2K183	Data about guidance for managing multiple suppliers.	
S2K184	Data about guidance for coordinating procurement with other project aspects, such as	
	scheduling and performance reporting.	
S2K185	Data about guidance for any constraints and assumptions that could affect planned	
621/19/	procurements.	-
52K180	Data about guidance for handling the long lead times to purchase certain items from sellers	
	and coordinating the extra time needed to procure these items with the development of the	
S2K187	project schedule.	
521107	Data about guidance for nanumig the make-or-buy decisions and mixing them into the	
S2K188	estimate activity resources and develop schedule datas in each contract for the contract	
521100	deliverables and coordinating with the schedule development and control processes	
S2K189	Data about guidance for identifying requirements for performance bonds or insurance	
	contracts to mitigate some forms of project risk	
S2K190	Contracts to initiate some torms of project risk.	
	and maintaining a work broaddown structure (WRS)	
S2K191	Data about guidance for establishing the form and format to be used for the	
	nrocurement/contract statements of work	
S2K192	Data about guidance for identifying pregualified sellers, if any, to be used.	
S2K193	Data about guidance for procurement metrics to be used to manage contracts and evaluate	
	sellers.	
S2K194	Data about desired and current engagement levels of key stakeholders.	
S2K195	Data about scope and impact of change to stakeholders	
S2K196	Data about identified interrelationships and notential overlan between stakeholders.	
S2K197	Data about stakeholder communication requirements for the current project phase.	
S2K198	Data about what to be distributed to stakeholders, including language, format, content, and	
	level of detail.	
S2K199	Data about reasons for the distribution of that information and the expected impact to	
	stakeholder engagement.	
S2K200	Data about time frame and frequency for the distribution of required information to	
	stakeholders.	
S2K201	Data about methods for updating and refining the stakeholder management plan as the	
	project progresses and develops.	
S3K202	Data about project deliverables.	
S3K203	Data about work completed.	
S3K204	Data about key performance indicators.	
S3K205	Data about technical performance measures.	
S3K206	Data about start and finish dates of schedule activities to perform the project work.	
S3K207	Data about number of change requests to perform the project work.	
S3K208	Data about number of defects to perform the project work.	
S3K209	Data about actual costs to perform the project work.	
S3K210	Data about actual duration's to perform the project work.	
S3K211	Data about project management plan.	
S3K212	Data about requirements updates.	
S3K213	Data about project logs updates.	
S3K214	Data about risk register updates.	
S3K215	Data about stakeholder register updates.	
S3K216	Data about change request to allow full consideration of the recommended improvements to	
	perform quality assurance.	
S3K217	Data about quality audit reports to perform quality assurance.	
S3K218	Data about training plans to perform quality assurance.	
S3K219	Data about process documentation to perform quality assurance.	
S3K220	Data about roles and responsibilities defining the positions, skills, and competencies that the	
	project demands.	
S3K221	Data about project organization charts indicating the number of people needed for the project.	
S3K222	Data about staffing management plan delineating the time periods each project team	
0277222	member will be needed and other information important to engage the project team.	
S3K223	Data about human resources including availability, competency levels, prior experience,	
1	interest in working on the project and their cost rate.	

S3K224	Data about understanding of each person's availability and schedule constraints, including	
COVIDAD	time zones, work hours, vacation time, local holidays, and commitments to other projects.	
S3K225	Data about formal or informal assessments of the project team's effectiveness using skills,	
S3K226	Competencies, stall turnover rate and team conssiveness improvements indictors.	
5011220	assessments	
S3K227	Data about identification of staffing changes.	
S3K228	Data about roles description.	
S3K229	Data about performance reports, deliverables status, schedule progress, and cost incurred to	
\$38230	manage communications.	
5511250	types of lessons learned about communications management.	
S3K231	Data about selected sellers.	
S3K232	Data about agreement components which includes: statement of work or deliverables,	
	schedule baseline, performance reporting, period of performance, roles and responsibilities,	
	seller's place of performance, pricing, payment terms, place of delivery, inspection and	
	negative criteria, warrancy, product support, minitation of natinity, new and retainer, negatives, incentives, insurance and performance bonds, subordinate subcontractor	
	approvals, change request handling, and termination clause and alternative dispute	
	resolution (adr) mechanisms which can be decided in advance as a part of the procurement	
~~~~	award.	
S3K233	Data about the quantity and availability of contracted resources and those dates on which	
S3K234	Data about review and disposition of change requests to the project management plan to	
	conduct procurement.	
S3K235	Data about resolved issues, approved changes, and general project status that may be	
	provided to stakeholders.	
S3K236	Data about formal and informal project reports describe project status and include lessons	
S3K237	learned, issue logs, project closure reports, and outputs from other knowledge areas.	
5011207	stakeholders.	
S3K238	Data about project records include correspondence, memos, meeting minutes, and other	
	documents describing the project.	
S3K239	Data about feedback from stakeholders.	
S3K240	Data about the root cause analysis of issues faced, reasoning behind the corrective action	
S4K241	Data about organizational communication requirements	
S4K242	Data about financial controls procedures.	
S4K243	Data about issue and defect management procedures defining issue and defect controls, issue	
	and defect identification, and resolution and action item tracking.	
S4K244	Data about change control procedures, including those for scope, schedule, cost, and quality	
S4K245	Variances.	
5411240	impact, and probability and impact matrix.	
S4K246	Data about measurement on processes and products.	
S4K247	Data about changes that occur during a project and their impact to the project in terms of	
047240	time, cost, and risk.	
S4K248	Data about rejected change requests.	
S4K250	Data about any subsidially plans. Data about baselines that are subject to the formal change control process	
S4K251	Set a set of the set o	
	Data about formal documentation received from the customer or sponsor acknowledging	
S4K252	formal stakeholder acceptance of the project's deliverables.	
1	formal stakeholder acceptance of the project's deliverables. Data about change requests to the completed deliverables that have not been formally	c
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S4K253 S4K254 S4K255 S4K255 S4K256 S4K257 S4K258	Data about formal documentation received from the customer or sponsor acknowledging formal stakeholder acceptance of the project's deliverables.         Data about change requests to the completed deliverables that have not been formally accepted, along with the reasons for non-acceptance of those deliverables.         Data about work performance about project progress, such as which deliverables have started, their progress, which deliverables have finished, or which have been accepted.         Data about work performance on how the project scope is performing compared to the scope baseline including the categories of the changes received, the identified scope variances and their causes, how they impact schedule or cost, and the forecast of the future scope performance.         Data about change request to the scope baseline or other components of the project management plan.         Data about causes of variances.         Data about causes of variances.	c c
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S4K253 S4K254 S4K255 S4K255 S4K255 S4K255 S4K257 S4K258 S4K259 S4K260 S4K261	Data about formal documentation received from the customer or sponsor acknowledging formal stakeholder acceptance of the project's deliverables. Data about change requests to the completed deliverables that have not been formally accepted, along with the reasons for non-acceptance of those deliverables. Data about work performance about project progress, such as which deliverables have started, their progress, which deliverables have finished, or which have been accepted. Data about work performance on how the project scope is performing compared to the scope baseline including the categories of the changes received, the identified scope variances and their causes, how they impact schedule or cost, and the forecast of the future scope performance. Data about change request to the scope baseline or other components of the project management plan. Data about causes of variances. Data about causes of variances. Data about corrective action chosen and the reasons. Data about corrective action chosen and the reasons. Data about time performance indicators for WBS components, in particular the work packages and control accounts. Data about teamed value performance indicators that could impact the project in the future	, ,

S4K262	Data about lessons learned from project schedule control.
S4K263	Data about work performance on the calculated cost and values for WBS components, in
	particular the work packages and control accounts.
S4K264	Data about forecasting costs.
S4K265	Data about a change request to the cost baseline or other components of the project
	management plan.
S4K266	Data about lessons learned from project cost control.
S4K267	Data about quality control measurements in the format that was specified through the plan
	quality management process.
S4K268	Data about any changed or repaired items are inspected and will be either accepted or
	rejected
S4K269	Data about the correctness of deliverables.
S4K270	Data about work performance on the project requirements fulfillment such as causes for
	rejections, rework required, or the need for process adjustments.
S4K271	Data about quality standards.
S4K272	Data about agreements to control quality
S4K273	Data about quality audit renorts and change logs sunnorted with corrective action plans
S4K274	Data about training name reports and assassments of affactiveness
S4K275	Data about using the seven hasic quality tools or the quality management and control tools
S4K276	Data about using the seven basic quarty tools of the quarty management and control tools.
S4K277	Data about completed the characterists.
54112/7	bata about causes of variances, the reasoning bening the corrective action chosen, and other types of lossons logrand from control quality
S4K278	Data about project management plan to control communication including stable balder
5-114/0	communication requirements reason for the distribution of the information timeframe and
	frequency for the distribution of required information individual or group responsible for
	requerty for the instribution of required mormation, mutvitual or group responsible for communication of the information and individual or group receiving the information
S4K279	Communication of the more matching, and mutvidual of group receiving the miorimation.
S4K280	Data about templates to control communications.
S4K281	Data about poincies, standards, and procedures that define communications.
S4K201	Data about anowed communication metric to control communication.
S4K202	Data about record recention policies to control communication.
S4K203	Data about specific communication technologies available to control communication.
54K284	Data about security requirements to control communication.
54K285	Data about outcomes of risk reassessments, risk audits, and periodic risk reviews.
548280	Data about actual outcomes of the project's risks and of the risk responses.
S4K287	Data about templates for the risk management plan, including the probability and impact
0417000	matrix and risk register.
54K280	Data about risk breakdown structure.
S4K289	Data about lessons learned from the project risk management activities.
S4K290	Data about identification of current or potential problems to support later claims or new
0412001	
546291	procurements.
	procurements. Data about reporting compliance of contracts, which provides procuring organizations a
6412202	procurements. Data about reporting compliance of contracts, which provides procuring organizations a mechanism to track specific deliverables expected and received from vendors.
S4K292	procurements.       Data about reporting compliance of contracts, which provides procuring organizations a mechanism to track specific deliverables expected and received from vendors.         Data about the direction provided by the buyer or actions taken by the seller, which the other
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S4K304	Data about project operations concerns that can be distributed and used to modify or	
	improve future performance of the project received from stakeholders.	
S4K305	Data about the root cause analysis of issues faced, reasoning behind the corrective action	
	chosen, and other types of lessons learned about stakeholder management.	
S5K306	Data about project or phase closure guidelines or requirements.	
S5K307	Data about approved products, delivery receipts, and work performance documents for the	Pr
	accepted project deliverables.	<u>e</u>
S5K308	Data about the issues and risks as well as techniques that worked well that can be applied to	st
	future projects.	age to
S5K309	Data about requirements for formal procurement closure.	lo
S5K310	Data about procurement file; containing the closed contract documents.	Su
S5K311	Data about requirements for formal deliverable acceptance.	re
S5K312	Data about process improvement recommendations for future procurements.	

(Adapted from: PMI 2013 and Beiryaei & Vaghefi 2010).

## **Appendix 2 Letter of study Invitation**

To Mr. /Ms. _____ UAE 20.12.2016

### Re: Research Study: Knowledge sharing in the UAE infrastructural projects.

Dear Sir,

I'm a candidate of project management PhD at British University in Dubai. My current research is regarding knowledge sharing within the infrastructural projects of the UAE. It's strongly supposed that outcomes of this study will add to the project performance enhancement within the infrastructure development sector.

Understanding how knowledge sharing is being successfully utilized to create project success in the infrastructure development sector is the main goal of this study. Study object is presented as the following:

### a) To examine how to integrate the KS process in the infrastructure projects life cycle.

Your organization is represented as amongst the excellent firms in the Middle East in terms of successful projects. As a result, I am very pleased to invite you to contribute to my study's success as a survey respondent. In doing so, multiple recommendations will be drawn out of your current practices of project management related to knowledge-sharing perspectives for educational purposes. The survey is expected to include twenty questions and last for about 60 minutes. As per your decision, the survey might be performed at your company and during working hours or as an online survey link. Also, at beginning of survey, you might be required to sign a consent form. In addition, you are allowed to reject or to withdraw from the survey participation. The respondent's privacy and copyrights will be provided to you as well.

Your choice with regard to being involved in this survey is highly anticipated, and your answer will be expected within 10 working days within the date of this letter. If you accept to participate in this survey or have any queries, please do send an email as soon as possible.

Thank you for your cooperation and support. Best Regards, Mohamed Aldhanhani Email: dhanhani.mohamed@gmail.com Mobile: +971504782992 Signature: _____ 23.02.2017

# **Appendix 3 Consent Form**

I ______ have read and am aware about what's in the invitation letter in regard to participating at the study, titled **Knowledge sharing in the UAE** 

### infrastructural projects.

I have the requisite information regarding this research and recognize my involvement. I am aware that this study. I am also aware of my participation rights, together with withdrawing from the study whenever I decide to.

I declare my agreement of contribution towards this research.

Name: _____

Signature:

Date: _____

Signature of Researcher:	
--------------------------	--

Date: _____

# Appendix 4 Questionnaire Survey



Knowledge Sharing in the UAE Infrastructural Projects مشاركة المعرفة في مشاريع البنية التحتية لدولة الإمارات العربية المتحدة

### Dear Sir/ Madam,

Most projects require knowledge management to take advantage of the information available to resolve the problems and some general challenges which have influence on the project outcomes. It's highly supported that knowledge sharing contributes to achieve the fast completion of organizational projects and development of new products. Hence, the main aim of the research is to examine how knowledge sharing is being effectively utilised to create project success in the UAE infrastructure development sector.

Your input can help us to understand the project knowledge sharing activities which lead to project success for the infrastructure sector in the UAE. We estimate that it will take you approximately 10-15 minutes to complete the survey. All individual responses will remain confidential and study data will be amalgamated and analysed as a whole. Results will be reported in summary form to protect confidentiality.

However, if you have any questions or concerns about the questionnaire or about participating in this research, you may contact. Alternatively, you may communicate my director of studies, Prof A. Boussabaine.

Thank you for your time and support and I look forward to share the outcomes of this survey with all of the participants.

Yours faithfully, Mohamed Aldhanhani PhD Candidate British university in Dubai Mobile: 0504782992 E-mail: 2014132001@student.buid.ac.ae The research directed by: Prof H Boussabaine British University in Dubai Tel: 04 279 1437 E-mail: halim@buid.ac.ae * 1.

Please rate your agreement with the following statements. I see myself as someone who يرجى تقييم موافقتك على العبارات التالية. أنا أرى نفسي كشخص

	Disagree strongly لا أوافق بشدة	Disagree a little لا أو افق فليلا	Neutral محايد	Agree a little أوافق قليلا	Agree strongly أوافق بشدة
ls talkative محب اللکلام	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Is full of energy حيوي ومليء بالطاقة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Generates a lot of enthusiasm أصنع الكثير من الحماس	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Has an assertive personality أملك شخصية حازمة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls outgoing, sociable اجتماعي ومؤنس	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

#### * 2.

Please rate your agreement with the following statements. I see myself as someone who يرجى تقييم موافقتك على العبارات التالية. أنا أرى نفسي كشخص

	Disagree strongly لا أوافق بشدة	Disagree a little لا أو افق فليلا	Neutral محايد	Agree a little أوافق قليلا	Agree strongly أوافق بشدة
ls helpful and unselfish with others مفید وغیر أناقي مع الأخرین	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Has a forgiving nature لدي طبيعة متسامحة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls generally trusting شدید الثقة بشکل علم	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls considerate and kind to almost مراعي لمشاعر الآقرين	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$
Likes to cooperate with others أحب أن أتعاون مع الأخرين	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0

#### * 3.

Please rate your agreement with the following statements. I see myself as someone who يرجى تقييم موافقتك على العبارات التالية. أنا أرى نفسي كشخص

	Disagree strongly لا أوافق بشدة	Disagree a little لا أو افق فليلا	Neutral محايد	Agree a little أوافق قليلا	Agree strongly أوافق بشدة
Does a thorough job اقوم بعمل دقيق	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls a reliable worker أنا عامل موثوق	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Perseveres until the task is finished أثابر حتى يتم الانتهاء من المهمة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Does things efficiently أفعل الأشياء بكفاءة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Makes plans and follows through with them أصنع الخطط و أتبعها	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0

#### * 4.

Please rate your agreement with the following statements. I see myself as someone who يرجى تقييم موافقتك على العبارات التالية. أنا أرى نفسي كشخص

	Disagree strongly لا أوافق بشدة	Disagree a little لا أو افق قليلا	Neutral محايد	Agree a little أوافق قليلا	Agree strongly أوافق بشدة
ls depressed, blue مُديد الاكتاب	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Can be tense ممکن آن آکون متوتر	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Worries a lot کثیر القلق	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Can be moody ممکن أن أکون متقلب المزاج	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Gets nervous easily اکون عصبی ہسپولڈ	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

#### * 5.

Please rate your agreement with the following statements. I see myself as someone who يرجى تقييم موافقتك على العبارات التالية. أنا أرى نفسى كشخص

	Disagree strongly لا أوافق بشدة	Disagree a little لا أوافق فليلا	Neutral محايد	Agree a little أوافق قليلا	Agree strongly أوافق
ls original, comes up with new ideas مینکر و آئی پافکار چدیدۂ	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls curious about many different things محب للاطلاع على كثير من الأشياء مختلفة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls ingenious, a deep thinker عبقري وأفكر بعنق	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Has an active imagination لدي خيال نشط	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Likes to reflect, play with ideas أحب أن أفكر والعب مع الأفكار	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
ls sophisticated in art, music, or literature متطور في الفن، والموسيقي، والأنب	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

* 6. What industry does your organization belong to?

إلى أي قطاع تنتمي مؤسستك الحالية؟

#### * 7.

How would you rate the knowledge sharing contribution to project success?

كيف تقيم نسبة مساهمة مشاركة المعرفة في نجاح المشروع؟

0% 2.5% 5% 7.5%	) 10%

$\bigcirc$	More (Please state how much)	أكثر (برجى التحديد)
$\sim$		

* 8. Please rate the culture of knowledge sharing in the projects of your organization.

الرجاء تقييم ثقافة مشاركة المعرفة في مشاريع المؤسسة الخاصىة بكم

\$

* 9.

Please rate the benefits that might be gained from timely knowledge sharing in the infrastructural projects

الرجاء تقييم فوائد مشاركة المعرفة في الوقت المناسب بمشاريع البنية التحتية كالتالي

					Moderately	,
		Very low منخفض جدا	Low منخفضية	Medium مترسط	high مرتفع نسبيا	very high مرتفع جدا
Stakeholder Satisfaction E	تحقيق رضا الأشخاص المعنيين بالمشرو	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Add value to the project	إضبافة قيمة للمشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Contribute to project succes	المساهمة بنجاح المشروع s	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Reduce project dispute	تقليل الخلافات في المشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Reduce cost overheads	نقليل تكلفة المشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Please state any other benefit جي ذكر آية فراند آخري في حالة وجوده	ls if exist پر					

#### * 10.

Personally how would you rate the quality of timeliness of shared knowledge in the infrastructural projects? شخصيا كيف نقيم جودة المعرفة التي يتم مشاركتها في الوقت المناسب لدى مشاريع البنية التحتية

كالتالى؟

ç-uu						
		Very اow منخفض جدا	Low منخفض	Medium متوسط	Moderately high مرتفع نسبيا	Very high مرتفع
Availability of information	توافر المعلومات	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Reliability of information	مصداقية المعلومات	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Response Time of communicatio	وقت الاستجابة للتواصل n	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Relevance to project tasks	صبلة المعلومة لمهام المشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Representational	سهولة عرض المعلومات	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Accessible of information	إمكانية الوصول للمعلومات	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

#### * 11.

Please rate the effectiveness of knowledge sharing between stakeholders at every phase of the life cycle of projects

الرجاء تقييم فعالية مشاركة المعرفة بين الأشخاص المعنيين بالمشروع في كل مرحلة من مراحل دورة حياة المشاريع

	Not effective غير فعلة	Somewhat effective فعالة إلى حد ما	Effective فعلة	Very effective فعالهٔ جدا	Extremely effective فعالة لأبعد الحدود
Knowledge sharing is done on time مشاركة المعرفة في الوقت المحدد	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Knowledge sharing is associated with depth content مشاركة المعرفة مرتبطة بمحتوى عميق	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Availability of shared knowledge on time توافر المعرفة التي يتم مشاركتها في الوقت المحدد	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Usability of shared knowledge سهولة استخدام المعرفة التي يتم مشاركتها	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Knowledge sharing is associated with personally ownership مشاركة المعرفة مرتبطة بملكية أشخاص	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

#### * 12.

يرجى تقييم تأثير العوامل المساعدة التالية على نجاح مشاركة المعرفة في المشاريع .

Please rate the influence of the following enablers on the success of knowledge sharing in the projects.

	NO impact عدم وجود تاثير	Low impact تأثير منخفض	Moderate impact تاثیر متوسط	Moderately high impact تأثير مرتفع نسبيا	Very High impact تأثير مرتفع جدا
Clear policy or strategy for project knowledge sharing. سياسة أو استراتيجية واضحة لمشاركة المعرفة المتعلقة بالمشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Awareness of the important role of knowledge sharing has in increasing the project success. الوعي بالدور الهام للمشاركة المعرفة لها في زيادة نجاح المشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Organizational commitment to project knowledge sharing. الائتزام المؤسسي لمشاركة المعرفة المتعلقة بالمشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Sufficient reward systems to share knowledge. أنظمة كافية للمكافأت والتحفيز لمشاركة المعرفة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Leadership commitment to support open, honest two-way communication in the projects. التزام القيادة المؤسسية بدعم الاتصالات المفتوحة والصادقة بين مختلف الجواتب في المشاريع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Clear procedure of knowledge sharing between project stakeholders. إجراءات واضحة لمشاركة المعرفة بين الأشخاص المعنيين في المشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Please state any other enablers if exist يرجى نکر آية عوامل مساعدة آخرى في حالة وجودها					]

#### * 13.

### يرجى تقييم تأثير العوامل المساعدة التالية على نجاح مشاركة المعرفة في المشاريع .

	No impact مدم رجود تأثير	Low impact تأثير منخفض	Moderate impact تأثیر مترسط	Moderately high impact تأثير مرتفع نسبيا	Very High impact تأثير
Sufficient training program of both formal and informal knowledge sharing content. توافر يرنامج تدريب كاف من حيث المضمون الرسمي وغير الرسمي لمشاركة المعرفة المتعقة بالمشروع	0	0	0	0	0
Measurements of knowledge sharing before and after any project activities. قواس أثر مشاركة المعرفة قبل ويعد أي نشاط بالمشروع	$\bigcirc$	0	$\bigcirc$	$\bigcirc$	$\bigcirc$
Accountability to the evaluation result and feedbacks of project knowledge sharing. توافر المساطة تحو تتيجة التقييم والآراء بشأن مشاركة المعرفة المتعقة بالمشروع	0	0	0	0	0
Linking the content of knowledge sharing with the project job description. ريط معترى مشاركة المعرفة مع الوصف الوظيفي للمشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Implementation of less formal resources such as social media to share embedded project knowledge. تتفيذ موارد أقل رسمية المشاركة المعارف الضمنية المتطقة بالمشروع مثل وسائل الإعلام الاجتماعية	0	0	0	0	0
Sufficient assets and resources to support project knowledge sharing processes. توفر الأصول والموارد الكافية لدعم عمليات مشاركة المعرفة المتعلقة بالمشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Please state any other enablers if exist یرجی ذکر آیة عوامل مساعدة آخری فی حالة وجودها					

* 14.

### يرجى تقييم تأثير العوامل المساعدة التالية على نجاح مشاركة المعرفة في المشاريع .

	No impact عدم رجود تأثير	Low impact تأثير منخفض	Moderate impact تأثیر مترسط	Moderately high impact تأثير مرتفع	Very High impact تأثير
The ability of communication between project stakeholders regarding the project through specific channels. القدرة على التواصل بين الأشخاص المغيين في المشروع بما يختص بالمشروع من خلال قتوات محددة	0	0	0	$^{\circ}$	0
Effective comprise of the project knowledge sharing practices in documentation and sharing best practices. فعلية المعارسات المطبقة في مشاركة المعرقة المتطقة بالمشروع في توثيق ومشاركة أفضل المعارسات للمشروع	0	0	0	0	0
Implementation of sufficient technologies resources in all the day-to-day project processes of sharing knowledge. تطبيق موارد نقلية كافية في جميع عمليات المشروع يوما بعد يوم من مشاركة المعرفة	0	0	0	0	0
Implementation of sufficient technologies resources for documentation specific for lessons learnt and best practices. تنفيذ وتطبيق موارد تقنية الكافية للتوثيق المحدد للدروس المستفادة وأفضل المعارسات في المشروع	0	0	0	0	0
Implementation of sufficient technologies resources to clarify roles and responsibilities of project stakeholders. احتواء موارد نقتية كافية لتوضيح ادرار ومسزوليات اصحاب المصلحة في المشروع	0	0	0	$\circ$	0
Implementation of sufficient technologies resources to enhance communication between dispersed project stakeholders. احتواء موارد ثقنية الثاقية لتعزيز التواصل بين الأشخاص المخيين في المشروع بالمواقع المتفرقة	0	0	0	0	0
Please state any other enablers if exist پرجی ذکر آیة عرامل مساعدة آخری فی حالة رجردها					

* 15.

# يرجى تقييم تأثير العوامل المساعدة التالية على نجاح مشاركة المعرفة في المشاريع .

	No impact عدم رجود تأثير	t Low impact تأثير منخفض	Moderate impact تأثير مترسط	Moderately high impact تأثير مرتفع	Very High impact نائیر مرتفع جدا
Awareness of the importance of technologies and IT resources to share knowledge in the project life cycle. الوعي بأهمية الثقتية وموارد تكلولوجيا المعلومات لمشاركة المعارف في دورة حياة المشروع	0	0	0	0	0
Implementation of sufficient technologies resources for knowledge sharing feedback and measurements. تطبيق الموارد والثقتيات الكافية لقياس وتقييم مشاركة المعرفة	0	0	0	0	0
Sufficient training program and instructions of on how to use of IT tools and equipment for knowledge sharing content. توفر برنامج التدريب والتعليمات بشكل كافي بشأن كيفية استخدام أدوات ومحات تكلولوجيا المطومات لمشاركة المعرفة	0	0	0	0	0
Implementation of technical tools of communication, such as emails and groupware or discussion applications to share knowledge between dispersed team members. احتواء الأفوات الثقلية للاتصال، مثل رستل البريد الإلكتروني والمجموعات الالكترونية بالمشروع	0	0	0	0	0
Implementation of the social media to share project knowledge through project. احتواء وسائل الاعلام الاجتماعية مناسبة لمشاركة المعارف المتعلقة بالمشروع أثناء دورة المشروع	0	0	0	0	0
Ability of social network to simplify the personal relationships and social interactions and facilitate the project knowledge sharing process. القدرة على الثواصل بالشيكات اجتماعية لتبسيط العلاقات الشخصية والثقاعلات الاجتماعية وتسهيل عملية المشاركة	0	0	0	0	0
Please state any other enablers if exist برجی ذکر آیة عرامل مساعدة آغری فی حالة رجردها					]

### * 16.

يرجى تقييم تأثير العوامل المساعدة التالية على نجاح مشاركة المعرفة في المشاريع .

	No impact عدم رجود تأثير	Low impact تأثير متخفض	Moderate impact تاثیر مترسط	Moderately high impact تأثير مرتفع نسبيا	Very High impact تأثير مرتفع جدا
Consideration the social networking platforms to be one of the most accurate and appropriate tools to share knowledge aspects of projects daily operations. النظر في منصات الشيكات الاجتماعية واعتيارها لتكون والحدة من أكثر الأفوات دقة ومناسية	0	0	0	$^{\circ}$	0
Designation of the influential people in the organization, managers to rapidly spread the project knowledge and skills on the social networking platforms. تعيين المدراء والمسؤولين في المنظمة لتشر المعرفة المتعلقة بالمشاريع على الشبكات الإجتماعية	$\bigcirc$	0	$\bigcirc$	$\bigcirc$	$\bigcirc$
Involvement of continuous feedback and measurements in the use of social networking of knowledge sharing process. لحتواء التقييمات والقياسات المستمرة في استخدام الشبكات الاجتماعية لعملية مشاركة المعرفة بالمشروع	0	0	0	$^{\circ}$	0
Sufficient funding, facilities and technological resources to facilitate project knowledge sharing. توفر التمويل الكافي والتسهيلات والموارد التكنولوجية لتسهيل مشاركة المعرفة المنطقة بالمشروع	$\bigcirc$	0	0	$\bigcirc$	0
Sufficient tools and instruments to maximize potential of others to share project knowledge. توفر الأدوات والوسائل الكافية لتحقيق أقصى قدر من إمكانات للأفراد لمشاركة المعارف المتحقة بالمشروع	0	0	0	0	0
The characteristics of physical environment as the shape of the offices, spaces; relaxed environments and quiet environment. خصائص البينة المادية مثل شكل المكتب والمسلحات و. توافر بينات مريحة ويينة هادنة	0	0	0	$\bigcirc$	$\bigcirc$
Please state any other enablers if exist پرچی ذکر آیة عوامل مساعدة آخری فی حالة وجوده					

### * 17.

# يرجى تقييم تأثير العوامل المساعدة التالية على نجاح مشاركة المعرفة في المشاريع .

	No impact عدم رجود تأثير	Low impact تأثير منخفض	Moderate impact تأثیر مترسط	Moderately high impact تأثير مرتفع نسبيا	Very High impact تأثير
Self motivation and value to share knowledge with other project stakeholders. التحقيز الذاتي وإبراز قيمة مشاركة المعارف مع الأشخاص المعليين في المشروع	$\bigcirc$	$\odot$	0	0	0
Individual awareness of the social importance of sharing knowledge in achieving the project goals. الوعي الفردي بالأهمية الاجتماعية لمشاركة المعرفة في تحقيق أهداف المشروع	0	0	0	$\bigcirc$	0
Individual accountability between project stakeholders to share information in the project life cycle. المساجلة الفردية لمشاركة معلومات المشروع بين الأشخاص المغيين أثناء دورة المشروع	0	0	0	0	0
Teamwork & team building in the project life cycle via knowledge sharing. العمل الجماعي ويناء الفريق في دورة حياة المشروع من خلال مشاركة المعرفة	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0
Loyalty and hardworking to increase project success via knowledge sharing. الولاء والعمل الدزوب لزيادة تجاح المشروع من خلال مشاركة المعرفة	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	0
Desire to be rewarded to share project information. الرغبة في المكافأة من خلال مشاركة مطومات المشروع	0	$\bigcirc$	0	0	0
Please state any other enablers if exist يرجى ذكر أية عرامل مساعدة آخرى في حالة وجردها					1

* 18. Please rate the influence of the following barriers on the success of knowledge sharing in the projects.

i 	No mpact عدم رجود تأثير	Low impact تگیر منغنص	Moderate impact تأثير مترسط	Moderately high impact تأثير مرتفع نسبيا	Very High impact تأثیر مرتقع جدا
Threats to lose some of individual's power towards sharing project knowledge. التهديدات يفقد بعض من قوة القرد في حال مشاركة المعرفة المتطقة بالمشروع	0	0	0	0	0
Lack of internal motivation to share project information. عدم وجود الدافع الدلغلي لمشاركة معومات المشروع	0	0	0	$\bigcirc$	0
Lack of trust towards others towards sharing project knowledge. الحام الثقة تجاه الأخرين نحو مشاركة المعرفة المتطقة بالمشروع	$\odot$	$\bigcirc$	0	$\odot$	0
Lack of time to interact and share knowledge with other stakeholders. عدم وجود الوقت اللازم للتقاعل ومشاركة المعرفة مع الأشخاص المغيين في المشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Lack of awareness of the importance of sharing knowledge with other project stakeholders. عدم وجود الوعي بأهمية مشاركة المعرفة الأشخاص المغيين في المشروع	0	0	0	0	0
Difficulty to communicate and share knowledge with other stakeholders. الصعوية في التواصل ومشاركة المعرفة مع الأشفاص المغيين في المشروع	0	0	0	0	$\bigcirc$
Please state any other barriers if exist يرجى ذكر أية معرقات أخرى في حالة رجردها					1

يرجى تقييم تأثير المعوقات التالية على نجاح مشاركة المعرفة في المشاريع

ن نجاح مشاركة المعرفة في المشاريع	يرجى تقييم تأثير المعوقات التالية علو
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	No impact عدم رجرد تأثير	Low impact تگیر منخلص	Moderate impact تأثير	Moderately high impact تاثیر مرتفع نسبیا	Very High impact تأثير مرتفع جدا
Lack of organizational encouragement of knowledge sharing. عدم وجود التشجيع المزمسي التنظيمي لمشاركة المعرفة	$\odot$	$\odot$	0	0	0
Lack of organizational trust towards sharing project knowledge. الحام الثقة التنظيمية تحو مشاركة المعرفة المنطقة بالمشروع	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0
Lack of a suitable physical work environment for the knowledge sharing. عدم وجود بينة العمل المادية المناسبة لمشاركة المعرفة	$\odot$	$\bigcirc$	0	0	0
Lack of resources for the knowledge sharing. عم وجود الموارد اللازمة لمشاركة المعرفة	$\bigcirc$	$\bigcirc$	0	0	0
The use of strong hierarchy and position occupied by people to intimidate others from knowledge sharing. استخدام التسلسل الهرمي القري مما يزدي لتخويف الأفراد الآخرين من مشاركة المعرفة	0	0	0	0	0
The influence of organizational structures changes upon motivation to share knowledge. تأثير تغير الهياكل التنظيمية على التحقييز المزمسي لمشاركة المعرفة	0	0	$\bigcirc$	0	0
Please state any other barriers if exist پرجی ذکر آیة معرقات آخری فی حالة وجودها					

* 20. Please rate the influence of the following barriers on the success of knowledge sharing in the projects.

	No impact عدم رجود نائیر	Low impact تگر	Moderate impact تأثير	Moderately high impact تأثير مرتفع نسبيا	Very High impact تأثير مرتفع جدا
Lack of motivation policy of knowledge sharing. عدم وجود سياسة تحقيز لمشاركة المعرفة	0	0	0	0	0
Lack of a suitable corporate culture of knowledge sharing. عدم وجود ثقافة مؤسسية مناسبة لمشاركة المعارف	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	0
The external or macro-environmental factors such as global crises towards sharing project knowledge process. العرامل الغارجية مثل الأزمات العالمية السليية تجاه عمليات مثباركة المعرفة المتعلقة بالمشروع	0	0	0	0	0
Lack of technical and IT resources and other necessary project assets for the knowledge sharing. عدم وجود الموارد الثقلية وتكلولوجيا المعلومات وأصول المشروع اللازمة من أجل مشاركة المعرفة	0	0	0	0	0
Lacks of project access to technology for the knowledge sharing. افتقار المشروع إلى صلاحيات الوصول إلى التكلولوجيا اللازمة لمشاركة المعرفة	0	0	0	0	0
Lack of provided training on how to use necessary IT tools and equipment to share knowledge. عدم توفير الكدريب الكافي على كيفية استخدام أدوات ومحات تكلولوجيا المطومات اللازمة لمشاركة المعارف	0	0	0	0	0
Please state any other barriers if exist برجي ذكر أية معرقات أخرى في حالة وجردها					

## يرجى تقييم تأثير المعوقات التالية على نجاح مشاركة المعرفة في المشاريع

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# **Appendix 5 Regressions results**

Table 13-2: Excluded variables for the regression analysis of KS enablers and the rate of KS contribution to PS (Q7)

					Co	llinearity Sta	atistics
				Partial		,	Minimum
Model	Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance
1 E1	.051 ^b	.533	.595	.051	.916	1.092	.916
E2	040 ^b	406	.686	039	.859	1.164	.859
E3	.083 ^b	.856	.394	.082	.902	1.108	.902
E4	.102 ^₀	1.072	.286	.102	.931	1.074	.931
E5	.017º	.171	.865	.016	.887	1.128	.887
E6	.050°	.506	.614	.048	.864	1.157	.864
E7	.021°	.193	.847	.018	.691	1.448	.691
E8	.119º	1.164	.247	.111	.797	1.254	.797
E9	.014 ^b	.135	.893	.013	.811	1.233	.811
E10	.037°	.385	.701	.037	.903	1.108	.903
E11	.097	.988	.325	.094	.863	1.159	.863
E12	041°	394	.695	038	.780	1.282	.780
E13	.122	1.200	.233	.114	.809	1.237	.809
E14	012 ^b	122	.904	012	.850	1.176	.850
E15	.030 ^b	.278	.781	.027	.730	1.370	.730
E16	056 ^₀	543	.588	052	.797	1.254	.797
E17	048 ^b	459	.647	044	.781	1.280	.781
E18	105 [°]	-1.063	.290	101	.856	1.168	.856
E19	.107 ⁵	1.064	.290	.101	.824	1.213	.824
E20	.020 ⁵	.196	.845	.019	.//2	1.295	.772
E21	.109 ⁵	.951	.344	.091	.639	1.565	.639
E22	.007 ⁵	.062	.951	.006	.743	1.345	.743
E23	.107 ⁵	1.023	.309	.097	.762	1.313	.762
E24	.137°	1.315	.191	.125	.773	1.294	.773
E25	.062 ⁶	.638	.525	.061	.889	1.125	.889
E26	010 ⁵	096	.924	009	.826	1.211	.826
E27	.021°	.206	.837	.020	.837	1.195	.837
E28	.150°	1.458	.148	.138	.781	1.281	.781
E29	.053°	.486	.628	.046	./18	1.392	./18
E30	241°	-2.515	.013	234	.868	1.152	.868
E31	040°	367	./15	035	.709	1.411	.709
E32	.040°	.358	.721	.034	.000	1.503	C00.
E33	108°	-1.053	.295	100	.796	1.257	.796
E34	.044°	.323	.748	.031	.445	2.240	.445
E30	131- 005b	-1.170	.241	112	.072	1.407	.072
	005 115 ^b	052	.909	005	.909	1.032	.909
Conscientiousness	115 035 ^b	363	.223	110	.900	1 113	.900
Neuroticism	.000 - 100 ^b	-1 188	.710	.000	.030	1.115	.090
Openness	103 010 ^b	-1.100	.237	113	.905	1.013	.905
2 F1	010 056°	595	553	010	.901	1.040	.901
E2	.000 018°	185	.853	018	.852	1.174	.776
E3	.097°	1.033	.304	.099	.899	1.112	.803
E4	.201°	2.078	.040	.196	.828	1.207	.773
E5	.087°	.881	.380	.084	.823	1.215	.806
E6	.117℃	1.184	.239	.113	.811	1.233	.801
E7	.095°	.854	.395	.082	.647	1.545	.647
E8	.154°	1.535	.128	.146	.784	1.275	.734
E9	.077°	.754	.452	.072	.765	1.307	.761
E10	.136°	1.362	.176	.130	.793	1.261	.763
E11 E12	.208	2.053	.043	.194	./5/	1.321	./57
E12	.038°	.357	.122	.034	.711	1.406	.711

Excluded Variables^a

	E13	.151°	1.520	.131	.145	.799	1.252	.740
	E14	.051°	.505	.615	.049	.799	1.251	.791
	E15	.104 ^c	.958	.340	.092	.682	1.465	.682
	E16	025°	245	.807	024	.785	1.274	.734
	E17	.028°	.266	.791	.026	.716	1.397	.716
	E18	024 ^c	234	.816	022	.754	1.326	.754
	E19	.167°	1.670	.098	.159	.787	1.270	.767
	E20	.160°	1.424	.157	.136	.630	1.587	.630
	E21	.217°	1.865	.065	.177	.578	1.731	.578
	E22	.056°	.525	.601	.050	.719	1.390	.700
	E23	.196°	1.857	.066	.176	.700	1.428	.700
	E24	.279°	2.589	.011	.242	.655	1.527	.655
	E25	.136°	1.385	.169	.132	.825	1.212	.806
	E26	.109 ^c	1.015	.312	.097	.688	1.453	.688
	E27	.128°	1.223	.224	.117	.724	1.381	./24
	E28	.243°	2.350	.021	.221	./16	1.396	./16
	E29	.170°	1.510	.134	.144	.626	1.598	.626
	E31	.100°	1.280	.201	.123	.479	2.087	.479
	E32	.129*	1.131	.201	.100	.012	1 410	.012
	L00 E24	U20°	202 705	.194	025	.709	1.410	.709
	L04 E36	. 100°	.130	.404 202	.071	.404	∠.303 1 747	.434
	Estraversion	030*	252	.002 821	024	.572	1.747	.572 851
	Agreeableness	- 020	.214 -1 041	300	.021	.900 028	1.043	.034 820
	Conscientiousness	037 106°	1 086	280	100	.920	1 199	.025
	Neuroticism	- 074°	- 809	420	- 078	958	1 044	.000
	Openness	.022°	.236	.814	.023	.943	1.060	.852
3	E1	.003 ^d	.032	.974	.003	.869	1.150	.622
	E2	096 ^d	974	.332	094	.782	1.279	.601
	E3	011 ^d	108	914	010	776	1 289	565
	E0 E4	140 ^d	1 406	163	135	757	1 322	598
	E5	0034	027	978	.100	728	1 373	580
	ES E6	000.	.027	.570	.003	.720	1.070	.500
	E0	.002°	.030	.404	.001	.793	1.201	.041
	E7	019 ⁻	102	.072	016	.546	1.000	.540
	E8	.077°	./38	.462	.071	.696	1.437	.581
	E9	034°	310	./5/	030	.637	1.569	.546
	E10	.070 ^d	.683	.496	.066	.729	1.3/1	.602
	E11	.115°	1.021	.310	.098	.604	1.656	.523
	E12	046 ^d	419	.676	041	.648	1.542	.597
	E13	.071 ^d	.675	.501	.065	.698	1.432	.573
	E14	014 ^d	142	.887	014	.748	1.337	.613
	E15	.045 ^d	.413	.681	.040	.648	1.543	.622
	E16	093 ^d	916	.362	088	.738	1.356	.616
	E17	088 ^d	789	.432	076	.609	1.643	.557
	E18	141 ^d	-1.309	.193	126	.649	1.542	.563
	E19	.088 ^d	.837	.405	.081	.689	1.451	.573
	E20	.066 ^d	.557	.578	.054	.548	1.824	.548
	E21	.109 ^d	.857	394	083	.010	2,128	470
	==: E22	- 041 ^d	- 377	707	- 036	633	1 579	577
	F23	072d	58/	561	056	.000	2 007	110. ARR
	E25	.012 010d	167	960	.030	.+30 607	1 505	400
	E20	-010.	.107	.000	.010	.027	1.090	.490
	L20	UZ3°	192	.048	019	.538	1.000	.512
	E21	.006°	.051	.959	.005	.567	1.764	.513
	E28	.182ª	1./0/	.091	.163	.658	1.520	.601
	E29	.068ª	.567	.572	.055	.530	1.889	.530
	E31	.107 ^d	.834	.406	.080	.462	2.167	.462
	E32	.079 ^d	.696	.488	.067	.591	1.692	.591
	E33	088 ^d	829	.409	080	.678	1.475	.626
	E34	022 ^d	156	.876	015	.381	2.622	.381
	E36	053 ^d	457	.649	044	.569	1.758	.569
	Extraversion	062 ^d	661	.510	064	.856	1.168	.585
	Agreeableness	132 ^d	-1.450	.150	139	.910	1.099	.642

Conscientiousness	.074 ^d	.768	.444	.074	.819	1.222	.643
Neuroticism	056 ^d	627	.532	061	.952	1.050	.651
Openness	009 ^d	101	.919	010	.926	1.079	.644

a. Dependent Variable: Q7 b. Predictors in the Model: (Constant), E35 c. Predictors in the Model: (Constant), E35, E30 d. Predictors in the Model: (Constant), E35, E30, E24

Table 13-3: Excluded variables for the regression analysis of KS enablers and the benefits of KS (Q9)

			Exe	cluded Var	iablesª			
						Co	llinearity Sta	atistics
					Partial			Minimum
Model		Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance
1	E1	.087 ^b	.853	.396	.081	.618	1.618	.618
	E2	.162 [⊳]	1.531	.129	.145	.569	1.757	.569
	E3	.183 [⊳]	1.607	.111	.152	.490	2.040	.490
	E4	.086 ^b	.845	.400	.081	.626	1.597	.626
	E6	.171 ^b	1.773	.079	.167	.682	1.466	.682
	E7	.134 ^b	1.350	.180	.128	.653	1.532	.653
	E8	049 ^b	498	.619	048	.661	1.514	.661
	E9	.155⁵	1.771	.079	.167	.830	1.204	.830
	E10	.252 ^b	2.942	.004	.271	.822	1.217	.822
	E11	.243 ^b	2.815	.006	.260	.816	1.226	.816
	E12	.190 ^b	2.124	.036	.199	.779	1.283	.779
	E13	.326 ^b	3.912	.000	.351	.821	1.218	.821
	E14	.135 ^b	1.605	.111	.152	.895	1.117	.895
	E15	.236 ^b	2.796	.006	.259	.851	1.175	.851
	E16	.159 ^b	1.797	.075	.170	.806	1.241	.806
	E17	.228 ^b	2.664	.009	.247	.834	1.199	.834
	E18	.061 ^b	.681	.497	.065	.808	1.238	.808
	E19	.200 ^b	2.303	.023	.215	.822	1.216	.822
	E20	.153 ^b	1.700	.092	.161	.789	1.267	.789
	E21	.113 ^b	1.268	.207	.121	.814	1.229	.814
	E22	.243 ^b	2.754	.007	.255	.785	1.274	.785
	E23	.172 ^b	1.805	.074	.170	.697	1.436	.697
	E24	.189 ^b	2.068	.041	.194	.754	1.327	.754
	E25	.059 ^b	.702	.484	.067	.920	1.086	.920
	E26	.224 ^b	2.563	.012	.238	.803	1.245	.803
	E27	.113⁵	1.253	.213	.119	.794	1.259	.794
	E28	.223 ^b	2.373	.019	.222	.705	1.419	.705
	E29	.120 ^b	1.306	.194	.124	.761	1.314	.761
	E30	.063 ^b	.731	.466	.070	.872	1.146	.872
	E31	.093 ^b	1.059	.292	.101	.830	1.204	.830
	E32	.049 ^b	.546	.586	.052	.797	1.254	.797
	E33	.016 ^b	.182	.856	.017	.850	1.177	.850
	E34	.068 ^b	.777	.439	.074	.841	1.190	.841
	E35	.201 ^b	2.399	.018	.224	.887	1.128	.887
	E36	.109 ^b	1.311	.193	.125	.928	1.077	.928
	Extraversion	.056 ^b	.692	.490	.066	.983	1.018	.983
	Agreeableness	.140 ^b	1.695	.093	.160	.928	1.078	.928
	Conscientiousness	.127 ^b	1.540	.126	.146	.938	1.066	.938
	Neuroticism	.045 ^b	.557	.579	.053	.994	1.006	.994
	Openness	.149 ^b	1.843	.068	.174	.968	1.033	.968
2	E1	.051°	.529	.598	.051	.612	1.634	.564
	E2	.076°	.733	.465	.070	.539	1.856	.539
	E3	006 ^c	049	.961	005	.393	2.543	.393
	E4	.049 ^c	.503	.616	.048	.620	1.614	.572
	E6	.069°	.719	.474	.069	.620	1.612	.620
	E7	.014°	.136	.892	.013	.580	1.723	.580
	E8	123℃	-1.298	.197	124	.637	1.570	.614
	E9	002 ^c	017	.986	002	.639	1.566	.632

	E10	.175°	2.048	.043	.193	.759	1.318	.746
	E11	.175°	2.066	.041	.195	.770	1.299	.736
	E12	.116°	1.315	.191	.126	.733	1.364	.712
	E14	074 ^c	744	.458	071	.586	1.706	.538
	E15	.124°	1.376	.172	.131	.702	1.425	.677
	F16	.020°	.211	.833	.020	.653	1.530	.653
	E10 F17	.020 099°	1.065	289	102	655	1.528	645
	E18	- 081°	- 880	.200	- 084	.000	1.020	683
	E10	01/0	136	.001	.004	.000	1.404	.000
	E 20	.014	144	280.	.013	.540	1.669	.540
	E21	014	144	.000	014	.000	1.000	.000
	E21	058	005	.047	036	.020	1.597	.020
	E22	.092°	.916	.362	.088	.500	1.767	.000
	E23	.106°	1.153	.252	.110	.670	1.493	.644
	E24	.073°	.783	.435	.075	.652	1.534	.652
	E25	021°	253	.801	024	.861	1.161	.768
	E26	.115°	1.269	.207	.121	.687	1.455	.687
	E27	005 ^c	054	.957	005	.696	1.438	.696
	E28	.084 ^c	.841	.402	.081	.570	1.756	.570
	E29	090 ^c	871	.386	084	.538	1.858	.538
	E30	.026 ^c	.318	.751	.031	.860	1.163	.754
	E31	008 ^c	090	.929	009	.751	1.332	.743
	E32	070 ^c	775	.440	074	.707	1.414	.707
	E33	121°	-1.370	.173	131	.731	1.367	.707
	E34	053 ^c	603	.548	058	.734	1.362	.717
	E35	.104 ^c	1.221	.225	.117	.780	1.281	.723
	E36	- 002°	- 022	983	- 002	808	1 238	715
	Extraversion	- 022°	- 276	783	- 027	918	1 089	767
	Agreeableness	110 ^c	1 522	131	145	.010	1.000	782
	Conscientiousness	.110	1.022	254	.143	023	1.004	705
	Nouroticicm	.030	1.140	.234	.110	.923	1.003	.735
	Opoppoo	.033	.427	.070	.041	.993	1.007	.015
2	Openness	.110	1.312	.133	.144	.900	1.040	.010
3		.054	.302	.575	.054	.012	1.034	.521
	E 2	061d	620	E20	061	E07	1 060	<b>515</b>
	E2	.064 ^d	.629	.530	.061	.537	1.862	.515
	E2 E3	.064 ^d 025 ^d	.629 207	.530 .836	.061 020	.537 .391	1.862 2.558	.515 .391
	E2 E3 E4	.064 ^d 025 ^d .013 ^d	.629 207 .133	.530 .836 .894	.061 020 .013	.537 .391 .599	1.862 2.558 1.670	.515 .391 .553
	E2 E3 E4 E6	.064 ^d 025 ^d .013 ^d .068 ^d	.629 207 .133 .717	.530 .836 .894 .475	.061 020 .013 .069	.537 .391 .599 .620	1.862 2.558 1.670 1.612	.515 .391 .553 .596
	E2 E3 E4 E6 E7	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d	.629 207 .133 .717 523	.530 .836 .894 .475 .602	.061 020 .013 .069 050	.537 .391 .599 .620 .525	1.862 2.558 1.670 1.612 1.904	.515 .391 .553 .596 .525
	E2 E3 E4 E6 E7 E8	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d 202 ^d	.629 207 .133 .717 523 -2.085	.530 .836 .894 .475 .602 .039	.061 020 .013 .069 050 198	.537 .391 .599 .620 .525 .576	1.862 2.558 1.670 1.612 1.904 1.736	.515 .391 .553 .596 .525 .576
	E2 E3 E4 E6 E7 E8 E9	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d 202 ^d 108 ^d	.629 207 .133 .717 523 -2.085 -1.037	.530 .836 .894 .475 .602 .039 .302	.061 020 .013 .069 050 198 100	.537 .391 .599 .620 .525 .576 .514	1.862 2.558 1.670 1.612 1.904 1.736 1.945	.515 .391 .553 .596 .525 .576 .514
	E2 E3 E4 E6 E7 E8 E9 E10	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d 202 ^d 108 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886	.530 .836 .894 .475 .602 .039 .302 .378	.061 020 .013 .069 050 198 100 .085	.537 .391 .599 .620 .525 .576 .514 .413	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423	.515 .391 .553 .596 .525 .576 .514 .413
	E2 E3 E4 E6 E7 E8 E9 E10 E12	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d 202 ^d 108 ^d .103 ^d .033 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328	.530 .836 .894 .475 .602 .039 .302 .378 .743	.061 020 .013 .069 050 198 100 .085 .032	.537 .391 .599 .620 .525 .576 .514 .413 .545	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834	.515 .391 .553 .596 .525 .576 .514 .413 .545
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132	.061 020 .013 .069 050 198 100 .085 .032 145	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d 202 ^d .108 ^d .033 ^d 155 ^d .075 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423	.061 020 .013 .069 050 198 100 .085 .032 145 .078	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .108 ^d .033 ^d .033 ^d .155 ^d .075 ^d .008 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .103 ^d .033 ^d .155 ^d .075 ^d .008 ^d .038 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .103 ^d .033 ^d .033 ^d .075 ^d .075 ^d .008 ^d .038 ^d .038 ^d .038 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .108 ^d .033 ^d .033 ^d .075 ^d .075 ^d .008 ^d .038 ^d .167 ^d .066 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167 059	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .108 ^d .033 ^d .155 ^d .075 ^d .075 ^d .008 ^d .038 ^d .167 ^d .066 ^d .137 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167 059 121	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .108 ^d .033 ^d .155 ^d .075 ^d .075 ^d .008 ^d .038 ^d .167 ^d .066 ^d .137 ^d .110 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.263 -1.137	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167 059 121 109	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22	.064 ^d 025 ^d .013 ^d .068 ^d 202 ^d 108 ^d .103 ^d .033 ^d 155 ^d .075 ^d .075 ^d .075 ^d .075 ^d .038 ^d .167 ^d 167 ^d .137 ^d .110 ^d .044 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167 059 121 109 .041	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .108 ^d .033 ^d .155 ^d .075 ^d .075 ^d .075 ^d .075 ^d .075 ^d .075 ^d .075 ^d .157 ^d .075 ^d .075 ^d .075 ^d .075 ^d .075 ^d .075 ^d .075	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167 059 121 109 .041 .034	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24	.064 ^d 025 ^d .013 ^d .068 ^d 054 ^d .202 ^d .108 ^d .033 ^d .155 ^d .075 ^d .077 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 164	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 008 .038 167 059 121 109 .041 .034 016	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25	.064 ^d 025 ^d .013 ^d 054 ^d 202 ^d 108 ^d .103 ^d .033 ^d 155 ^d .075 ^d 008 ^d .038 ^d 167 ^d 066 ^d 137 ^d 110 ^d .044 ^d .035 ^d 017 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 164 863	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 E26	.064 ^d 025 ^d .013 ^d 054 ^d 202 ^d 108 ^d .103 ^d .033 ^d 155 ^d .075 ^d 008 ^d .038 ^d 167 ^d 066 ^d 137 ^d .110 ^d .044 ^d .035 ^d 017 ^d .072 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 164 863 .771	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .516 .711 .640
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 E26 E27	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .08 ^d .038 ^d .157 ^d .08 ^d .038 ^d .167 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 164 863 .771 .804	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .508
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 E26 E27 E28	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .08 ^d .08 ^d .167 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 164 863 .771 894 .386	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .70	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 086 .037	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .591 .531 .558 .516 .795 .640 .598 .598 .598	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .558 .516 .511 .558 .516 .711 .640 .598
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 E26 E27 E28 E29	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .033 ^d .155 ^d .075 ^d .075 ^d .08 ^d .33 ^d .167 ^d .086 ^d .137 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .072 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 .1.137 .428 .353 -1.64 863 .771 894 .386	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .370 .146	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 083 .074	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598 .516 .795	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.096	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .135 ^d .075 ^d .076 ^d .038 ^d .155 ^d .076 ^d .038 ^d .167 ^d .066 ^d .137 ^d .066 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .039 ^d .039 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .722	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 086 .037 140	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598 .516 .795 .640 .598 .539 .504	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .516 .514
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .103 ^d .155 ^d .075 ^d .075 ^d .008 ^d .137 ^d .066 ^d .137 ^d .066 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .072 ^d .039 ^d .039 ^d .039 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464 356	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 086 .037 140 .034	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598 .516 .795 .640 .598 .539 .504 .772	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .539 .504 .691
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E22	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .075 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .030 ^d .030 ^d .030 ^d .030 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 164 863 .771 894 .386 -1.464 356 860 860	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723 .392	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 059 121 09 .041 .034 083 .074 086 .037 140 034 034 034	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .598 .475 .591 .531 .558 .516 .795 .640 .598 .539 .504 .772 .641	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296 1.514	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .539 .504 .691 .601
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E32	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .075 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .072 ^d .039 ^d .039 ^d .153 ^d .039 ^d .039 ^d .039 ^d .039 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464 356 1496 1496	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723 .392 .138	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 086 .037 140 034 034 083 143 083	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .598 .475 .591 .531 .558 .516 .795 .640 .598 .539 .504 .772 .661 .642 .542	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296 1.514 1.558	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .539 .504 .691 .661 .642
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E32 E32	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .075 ^d .076 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .039 ^d .153 ^d .030 ^d .039 ^d .153 ^d .030 ^d .039 ^d .153 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464 356 860 -1.496 1815	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723 .392 .138 .072	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 086 .037 140 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 035 1430 034 035 1430 034 035 1430 034 035 1430 034 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 1430 035 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 0350 03500 03500 03500 03500 03500 03500 03500 -	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598 .516 .795 .640 .598 .539 .504 .772 .661 .642 .707	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296 1.514 1.558 1.415	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .539 .504 .691 .642 .689
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E32 E33 E33 E34	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .075 ^d .075 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .072 ^d .039 ^d .153 ^d .039 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464 356 860 -1.496 -1.815 986	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723 .392 .138 .072 .326	.061 020 .013 .069 050 198 100 .085 .032 145 .078 008 .038 167 059 121 109 .041 .034 016 083 .074 086 .037 140 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 034 035 143 173 095	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598 .516 .795 .640 .598 .539 .504 .772 .661 .642 .707 .712	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296 1.514 1.558 1.415	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .539 .504 .691 .642 .689 .697
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E32 E33 E34 E32	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .075 ^d .075 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .072 ^d .030 ^d .153 ^d .030 ^d .153 ^d .030 ^d .153 ^d .030 ^d .072 ^d .030 ^d .072 ^d .030 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464 356 860 -1.496 -1.815 986 .837	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723 .392 .138 .072 .326 .405	.061 .020 .013 .069 .050 .198 .100 .085 .032 .145 .078 .008 .038 .167 .059 .121 .109 .041 .034 .016 .083 .074 .086 .037 .140 .086 .037 .140 .034 .086 .037 .140 .083 .074 .086 .037 .140 .034 .086 .037 .140 .086 .037 .140 .086 .037 .140 .086 .037 .140 .086 .037 .140 .086 .037 .140 .088 .034 .083 .074 .083 .074 .083 .143 .095 .081	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .795 .640 .598 .516 .598 .516 .598 .539 .504 .772 .661 .642 .707 .712 .749	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296 1.514 1.558 1.415 1.404 1.335	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .516 .711 .640 .598 .539 .504 .691 .642 .689 .697 .704
	E2 E3 E4 E6 E7 E8 E9 E10 E12 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E32 E33 E34 E35 E36 E3	.064 ^d .025 ^d .013 ^d .068 ^d .202 ^d .108 ^d .103 ^d .033 ^d .155 ^d .075 ^d .075 ^d .075 ^d .086 ^d .137 ^d .110 ^d .044 ^d .035 ^d .017 ^d .044 ^d .035 ^d .017 ^d .072 ^d .072 ^d .030 ^d .153 ^d .030 ^d .153 ^d .030 ^d .153 ^d .030 ^d .057 ^d .030 ^d .057 ^d .030 ^d .057 ^d .030 ^d .057 ^d .030 ^d .057 ^d .057 ^d .030 ^d .057 ^d .057 ^d .057 ^d .057 ^d .057 ^d .057 ^d .057 ^d .057 ^d .057 ^d .057 ^d	.629 207 .133 .717 523 -2.085 -1.037 .886 .328 -1.516 .804 081 .391 -1.750 613 -1.263 -1.137 .428 .353 -1.64 863 .771 894 .386 -1.464 356 860 -1.496 -1.815 986 .837 667	.530 .836 .894 .475 .602 .039 .302 .378 .743 .132 .423 .936 .697 .083 .541 .209 .258 .670 .725 .870 .390 .443 .373 .700 .146 .723 .392 .138 .072 .326 .405 .506	.061 .020 .013 .069 .050 .198 .100 .085 .032 .145 .078 .008 .038 .167 .059 .121 .109 .041 .034 .016 .083 .074 .086 .037 .140 .034 .086 .037 .140 .034 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .074 .083 .140 .034 .083 .140 .034 .083 .074 .083 .074 .083 .140 .083 .140 .083 .140 .083 .140 .083 .140 .084 .095 .081 .064	.537 .391 .599 .620 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .598 .475 .591 .531 .558 .516 .795 .640 .598 .516 .598 .516 .598 .539 .504 .772 .661 .642 .707 .712 .749 .736	1.862 2.558 1.670 1.612 1.904 1.736 1.945 2.423 1.834 1.905 1.568 1.562 1.733 1.672 2.103 2.134 1.691 1.884 1.793 1.938 1.258 1.561 1.673 1.855 1.986 1.296 1.514 1.558 1.415 1.404 1.335 1.359	.515 .391 .553 .596 .525 .576 .514 .413 .545 .525 .638 .640 .577 .598 .475 .469 .591 .531 .558 .516 .711 .640 .598 .539 .504 .691 .642 .689 .697 .704 .702

	Agreeableness	.101 ^d	1.298	.197	.125	.909	1.100	.714
	Conscientiousness	.068 ^d	.871	.386	.084	.904	1.106	.724
	Neuroticism	.022 ^d	.297	.767	.029	.988	1.012	.728
	Openness	.108 ^d	1.415	.160	.136	.952	1.050	.730
4	E1	.080 ^e	.849	.398	.082	.602	1.662	.470
	E2	.122 ^e	1.185	.239	.114	.505	1.979	.480
	E3	.030 ^e	.245	.807	.024	.373	2.683	.373
	E4	.031°	.328	.743	.032	.594	1.685	.488
	E6	.086 ^e	.914	.363	.088	.615	1.625	.517
	E7	.089 ^e	.731	.467	.071	.367	2.726	.367
	E9	042 ^e	382	.703	037	.458	2.185	.458
	E10	.170 ^e	1.454	.149	.140	.389	2.573	.389
	E12	.082 ^e	.800	.426	.077	.520	1.923	.520
	E14	117 ^e	-1.127	.262	109	.503	1.990	.503
	E15	.113°	1.210	.229	.117	.618	1.619	.558
	E16	.014 ^e	.147	.884	.014	.632	1.581	.569
	E17	.086 ^e	.870	.386	.084	.550	1.819	.549
	E18	127 ^e	-1.299	.197	125	.563	1.775	.542
	E19	034 ^e	319	.751	031	.465	2.150	.465
	E20	087 ^e	784	.435	076	.440	2.275	.440
	E21	089 ^e	925	.357	090	.584	1.712	.569
	E22	.024 ^e	.234	.815	.023	.526	1.902	.526
	E23	.048 ^e	.490	.625	.048	.556	1.800	.541
	E24	.008 ^e	.081	.936	.008	.509	1.965	.509
	E25	061 ^e	739	.462	072	.791	1.264	.573
	E26	.085 ^e	.919	.360	.089	.638	1.568	.574
	E27	062 ^e	646	.520	063	.588	1.701	.567
	E28	.086 ^e	.839	.403	.081	.516	1.936	.516
	E29	103 ^e	956	.341	092	.468	2.138	.468
	E30	038 ^e	451	.653	044	.770	1.298	.575
	E31	035 ^e	378	.706	037	.622	1.608	.542
	E32	095 ^e	-1.004	.318	097	.599	1.671	.537
	E33	142 ^e	-1.631	.106	156	.699	1.430	.570
	E34	045 ^e	495	.622	048	.668	1.498	.540
	E35	.123°	1.408	.162	.136	.704	1.420	.542
	E36	048 ^e	561	.576	054	.734	1.363	.574
	Extraversion	025 ^e	319	.751	031	.891	1.122	.569
	Agreeableness	.094 ^e	1.219	.226	.118	.907	1.102	.575
	Conscientiousness	.080 ^e	1.028	.306	.099	.900	1.111	.573
	Neuroticism	.041°	.548	.585	.053	.975	1.026	.568
	Openness	.110 ^e	1.465	.146	.141	.952	1.050	.576

a. Dependent Variable: Q9 b. Predictors in the Model: (Constant), E5 c. Predictors in the Model: (Constant), E5, E13 d. Predictors in the Model: (Constant), E5, E13, E11 e. Predictors in the Model: (Constant), E5, E13, E11, E8

### Table 13-4: Excluded variables for the regression analysis of KS enablers and the quality of KS (Q10)

Excluded variables"										
					Collinearity Statistics					
				Partial			Minimum			
Model	Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance			
1 E1	.257 ^b	2.805	.006	.259	.836	1.196	.836			
E2	.202 ^b	2.104	.038	.198	.785	1.273	.785			
E3	.269 ^b	2.786	.006	.258	.755	1.325	.755			
E4	.239 ^b	2.625	.010	.244	.856	1.168	.856			
E5	.182 ^b	1.877	.063	.177	.779	1.283	.779			
E6	.167 ^b	1.800	.075	.170	.847	1.181	.847			
E7	.042 ^b	.421	.674	.040	.767	1.303	.767			
E8	.055 ^b	.541	.590	.052	.715	1.399	.715			

## Excluded Variables^a

E	E9	.122 ^b	1.148	.253	.109	.664	1.507	.664
E	E10	.004 ^b	.035	.972	.003	.689	1.452	.689
E	E11	019 ^b	169	.866	016	.606	1.651	.606
E	E13	.100 ^b	1.066	.289	.102	.845	1.183	.845
E	E14	.068 ^b	.689	.492	.066	.772	1.295	.772
	F15	.114 ^b	1,114	.268	.106	.716	1.396	.716
	E16	072 ^b	735	464	070	789	1 268	789
	E10 E17	- 003b	- 028	978	- 003	725	1 378	725
r i	E17 E18	106 ^b	1 049	207	100	.723	1 369	.723
	E10	.100 072 ^b	717	.201	.100	738	1 356	738
L L	E 20	.072 120 ^b	1 218	226	.009	658	1.530	.750
	E20	.123 217 ^b	2 137	.220	201	.000	1.320	.000
	E21	.217	2.137	.000	.201	.701	1.420	.701
	L22	.090	.920	.550	.000	.002	1.010	.002
	E23	.099 101b	.992	.024	.095	.749	1.333	.743
l l	E24 E25	.101°	.997	.321	.095	.733	1.004	.733
	E20	.110-	1.220	.223	.117	.925	1.001	.920
	E20	.142°	1.440	.150	.137	.707	1.303	.707
	E27	.000 ⁻	.070	.500	.005	./4/	1.339	./4/
	E20	.082	.810	.420	.077	.123	1.384	.723
	E29	.036	.345	.731	.033	.699	1.430	.699
	E3U	.140	1.483	.141	.141	.828	1.208	.828
	E31	.139°	1.453	.149	.138	.805	1.243	.805
	E32	.102°	1.046	.298	.100	./83	1.278	.783
t t	E33	.074 ⁵	.800	.426	.076	.871	1.148	.871
t t	E34	.187	1.902	.060	.179	.753	1.329	.753
L L	E35	.105 [°]	1.077	.284	.103	.780	1.282	.780
L L	E36	.117°	1.293	.199	.123	.903	1.107	.903
t	Extraversion	.034	.384	.702	.037	.967	1.034	.967
		11060	- u'/h		- 088	.893	1.120	.893
	Agreeableness	063*	520	.307	.000		4 004	010
(	Agreeableness Conscientiousness	085* .179 ^b	2.009	.047	.189	.916	1.091	.916
1	Agreeableness Conscientiousness Neuroticism	.179 ^b .094 ^b	2.009 1.084	.047 .281	.189 .103	.916 .997	1.091 1.003	.916 .997
2	Agreeableness Conscientiousness Neuroticism Openness E2	.179 ^b .094 ^b .121 ^b	2.009 1.084 1.376 492	.047 .281 .172	.189 .103 .131 047	.916 .997 .955 480	1.091 1.003 1.048 2.084	.916 .997 .955 480
2	Agreeableness Conscientiousness Neuroticism Openness E2 E3	085 .179 ^b .094 ^b .121 ^b .060 ^c 163 ^c	2.009 1.084 1.376 .492 1.307	.047 .281 .172 .624 194	.189 .103 .131 .047 .125	.916 .997 .955 .480 451	1.091 1.003 1.048 2.084 2.217	.916 .997 .955 .480 451
2	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4	083 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c 147 ^c	2.009 1.084 1.376 .492 1.307 1.405	.337 .047 .281 .172 .624 .194 .163	.189 .103 .131 .047 .125 .134	.916 .997 .955 .480 .451	1.091 1.003 1.048 2.084 2.217 1.580	.916 .997 .955 .480 .451 618
2 [	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5	083 .179 ^b .094 ^b .121 ^b .060° .163° .147° 056°	2.009 1.084 1.376 .492 1.307 1.405 501	.337 .047 .281 .172 .624 .194 .163 .617	.189 .103 .131 .047 .125 .134 048	.916 .997 .955 .480 .451 .633 560	1.091 1.003 1.048 2.084 2.217 1.580 1.785	.916 .997 .955 .480 .451 .618 .560
2	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E5 E6	083 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 656	.337 .047 .281 .172 .624 .194 .163 .617 .513	.189 .103 .131 .047 .125 .134 .048 .063	.916 .997 .955 .480 .451 .633 .560 679	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472	.916 .997 .955 .480 .451 .618 .560 .671
2	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 - 192	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848	.189 .103 .131 .047 .125 .134 .048 .063 .018	.916 .997 .955 .480 .451 .633 .560 .679 729	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371	.916 .997 .955 .480 .451 .618 .560 .671 .709
2 6	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c 019 ^c 030 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 - 288	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651
2 1	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c 019 ^c .030 ^c .063 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627
2 [ 2 [ 1 ] 1 ] 1 ] 1 ] 1 ] 1 ] 1 ] 1 ] 1 ] 1 ]	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .067 ^c 019 ^c .030 ^c .063 ^c .063 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636
2 [	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c 019 ^c 030 ^c .063 ^c .063 ^c 039 ^c 027 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13	063 .179 ^b .094 ^b .121 ^b .060° .163° .147° .056° .067° 019° 030° .030° .063° 039° 027° .050°	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .024 .052	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14	063 .179 ^b .094 ^b .121 ^b .060° .163° .147° .056° .067° 019° .030° .063° .063° 027° .020° .050° 022°	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .024 .052 .002	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15	063 .179 ^b .094 ^b .121 ^b .060° .163° .147° .056° .067° 019° .063° .063° .039° 027° .050° .002° .060°	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .028 .057 .036 .024 .052 .024 .052 .002	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .030 ^c .039 ^c .027 ^c .050 ^c .020 ^c .002 ^c .060 ^c .027 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .594 .283	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778	.000 .189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .002	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E13 E14 E15 E16 E17	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .039 ^c .027 ^c .050 ^c .002 ^c .060 ^c .027 ^c .027 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .534 .283 .283 .283 .2462	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .027 .027 .044	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E13 E14 E15 E16 E17 E18	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .030 ^c .039 ^c .039 ^c .027 ^c .050 ^c .002 ^c .060 ^c .027 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .027 .027 .044 .043	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.472 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E16 E17 E18 E19	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .047 ^c .056 ^c .067 ^c .039 ^c .039 ^c .027 ^c .050 ^c .002 ^c .060 ^c .027 ^c .060 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 462 .443 056	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .022 .057 .027 .044 .043 .055	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E16 E17 E18 E19 E19 E20	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .039 ^c .039 ^c .027 ^c .050 ^c .027 ^c .060 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .045 ^c .006 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 056 .710	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .027 .027 .044 .043 .005 .005 .068	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E16 E17 E18 E19 E20 E21	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .039 ^c .039 ^c .027 ^c .050 ^c .027 ^c .060 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .045 ^c .075 ^c .075 ^c .075 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 056 .710 1.687	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .095	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .024 .057 .027 .044 .043 .005 .068 .160	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E17 E18 E19 E20 E21 E22	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .039 ^c .039 ^c .027 ^c .050 ^c .027 ^c .060 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .075 ^c .170 ^c .066 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 462 .443 056 .710 1.687 .636	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .095 .526	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .027 .044 .043 .005 .068 .160 .061	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .653	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653 .609
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E16 E17 E18 E19 E20 E21 E22 E23	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .039 ^c .027 ^c .027 ^c .026 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .075 ^c .170 ^c .066 ^c .025 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 056 .710 1.687 .636 .244	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .095 .526 .807	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .026 .024 .052 .002 .057 .027 .044 .043 .005 .068 .160 .061 .024	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .653 .690	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530 1.449	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653 .609 .690
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E19 E12 E18 E19 E20 E21 E22 E23 E24	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .030 ^c .039 ^c .027 ^c .050 ^c .027 ^c .050 ^c .027 ^c .060 ^c .027 ^c .046 ^c .045 ^c .045 ^c .075 ^c .170 ^c .066 ^c .025 ^c .025 ^c .064 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 249 .537 249 .537 249 .537 249 .537 249 .537 249 .537 249 .537 249 .537 249 .537 249 .556 .379 .249 .557 .249 .556 .379 .249 .557 .249 .556 .379 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .557 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .249 .556 .240	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .955 .526 .807 .523	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .024 .052 .002 .057 .027 .044 .043 .005 .068 .160 .061 .024 .062	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .653 .690 .719	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530 1.449 1.391	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653 .609 .690 .690
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .019 ^c .030 ^c .030 ^c .039 ^c .027 ^c .027 ^c .050 ^c .027 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .075 ^c .170 ^c .066 ^c .025 ^c .066 ^c .025 ^c .064 ^c .025 ^c .066 ^c .025 ^c .064 ^c .025 ^c .066 ^c .066 ^c .068 ^c .068 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 056 .710 1.687 .636 .244 .641 .763	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .095 .526 .807 .523 .447	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .024 .052 .002 .057 .027 .044 .043 .005 .068 .160 .061 .024 .062 .073	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .653 .690 .719 .894	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530 1.449 1.391 1.118	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653 .609 .690 .690 .690 .609
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .039 ^c .039 ^c .027 ^c .050 ^c .027 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .050 ^c .075 ^c .066 ^c .025 ^c .066 ^c .025 ^c .068 ^c .086 ^c .086 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .534 .537 019 .594 .283 462 .443 462 .443 056 .710 1.687 .636 .244 .641 .763 .873	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .095 .526 .807 .523 .447 .384	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .028 .057 .024 .052 .002 .057 .027 .044 .052 .027 .027 .044 .043 .005 .068 .160 .061 .024 .062 .073 .084	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .633 .690 .719 .894 .728	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530 1.449 1.391 1.118 1.373	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653 .609 .690 .690 .690 .690 .690
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .147 ^c .056 ^c .067 ^c .030 ^c .030 ^c .039 ^c .027 ^c .050 ^c .027 ^c .050 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .050 ^c .075 ^c .170 ^c .066 ^c .025 ^c .066 ^c .066 ^c .025 ^c .066 ^c .066 ^c .025 ^c .066 ^c .066 ^c .025 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 056 .710 1.687 .636 .244 .641 .763 .873 .873 .293	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .659 .956 .479 .095 .526 .807 .523 .447 .384 .770	.189 .103 .131 .047 .125 .134 .048 .063 -018 028 .057 036 024 .052 002 .057 .027 044 .052 .002 .057 .027 .044 .043 .005 .068 .160 .061 .024 .062 .073 .084 .028	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .653 .690 .719 .894 .728 .731	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530 1.449 1.391 1.118 1.373 1.368	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .667 .716 .665 .682 .679 .620 .653 .682 .679 .620 .653 .609 .690 .690 .690 .669 .807 .709 .680
	Agreeableness Conscientiousness Neuroticism Openness E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E22 E23 E24 E25 E26 E27 E28	063 .179 ^b .094 ^b .121 ^b .060 ^c .163 ^c .056 ^c .067 ^c .019 ^c .030 ^c .030 ^c .039 ^c .027 ^c .050 ^c .027 ^c .050 ^c .027 ^c .027 ^c .046 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .045 ^c .066 ^c .025 ^c .025 ^c .066 ^c .025 ^c .025 ^c .066 ^c .025 ^c .025 ^c .066 ^c .025 ^c	320 2.009 1.084 1.376 .492 1.307 1.405 .501 .656 192 288 .596 379 249 .537 019 .594 .283 462 .443 462 .443 056 .710 1.687 .636 .244 .641 .763 .873 .293 .355	.337 .047 .281 .172 .624 .194 .163 .617 .513 .848 .774 .552 .706 .804 .593 .985 .554 .778 .645 .554 .778 .645 .559 .956 .479 .095 .526 .807 .523 .447 .384 .770 .723	.189 .103 .131 .047 .125 .134 .048 .063 .018 .028 .057 .036 .024 .052 .002 .057 .027 .027 .027 .044 .052 .002 .057 .027 .044 .043 .005 .068 .160 .061 .024 .062 .073 .084 .028 .034	.916 .997 .955 .480 .451 .633 .560 .679 .729 .651 .634 .674 .605 .810 .720 .688 .766 .708 .692 .679 .632 .677 .653 .690 .719 .894 .728 .731 .701	1.091 1.003 1.048 2.084 2.217 1.580 1.785 1.472 1.371 1.535 1.578 1.484 1.652 1.234 1.389 1.454 1.306 1.412 1.446 1.474 1.582 1.478 1.530 1.478 1.530 1.478 1.530 1.478 1.530 1.478 1.530	.916 .997 .955 .480 .451 .618 .560 .671 .709 .651 .627 .636 .547 .761 .718 .665 .682 .679 .620 .653 .682 .679 .620 .653 .609 .690 .669 .807 .709 .680 .667

E30	.154°	1.689	.094	.160	.826	1.211	.701
E31	.088°	.922	.359	.088	.769	1.300	.734
E32	.038°	.391	.697	.038	.734	1.362	.724
E33	.025°	.273	.785	.026	.837	1.195	.777
E34	.122 [℃]	1.220	.225	.117	.696	1.436	.696
E35	.073°	.764	.447	.073	.768	1.302	.701
E36	.094 ^c	1.057	.293	.101	.894	1.118	.783
Extraversion	.024 ^c	.285	.776	.027	.966	1.036	.817
Agreeableness	087°	986	.326	094	.893	1.120	.762
Conscientiousness	.164 ^c	1.894	.061	.179	.913	1.095	.786
Neuroticism	.075°	.884	.379	.085	.990	1.010	.830
Openness	.102°	1.189	.237	.114	.948	1.055	.814

a. Dependent Variable: Q10b. Predictors in the Model: (Constant), E12c. Predictors in the Model: (Constant), E12, E1

### Table 13-5: Excluded variables for the regression analysis of KS enablers and the effectiveness of KS (Q11)

		Excl	uded Var	iables ^a			
					Colli	nearity Sta	atistics
				Partial			Minimum
Model	Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance
1 E1	.134 ^b	1.320	.190	.125	.657	1.522	.657
E2	.169 ^b	1.675	.097	.158	.655	1.526	.655
E3	.155 ^b	1.448	.151	.137	.589	1.697	.589
E5	.101 ^b	.969	.335	.092	.626	1.597	.626
E6	001 ^b	011	.991	001	.643	1.554	.643
E7	.051 ^b	.563	.574	.054	.826	1.211	.826
E8	.181 ^b	1.978	.050	.186	.790	1.266	.790
E9	.186 ^b	2.059	.042	.193	.808	1.238	.808
E10	.108 ^b	1.195	.235	.114	.837	1.194	.837
E11	.057 ^b	.624	.534	.060	.834	1.198	.834
E12	.239 ^b	2.762	.007	.256	.856	1.168	.856
E13	.071 ^b	.815	.417	.078	.890	1.123	.890
E14	.000 ^b	.001	.999	.000	.836	1.196	.836
E15	.102 ^b	1.147	.254	.109	.854	1.171	.854
E16	.143 ^b	1.609	.111	.152	.846	1.181	.846
E17	.124 ^b	1.439	.153	.137	.905	1.105	.905
E18	.161 ^b	1.878	.063	.177	.902	1.109	.902
E19	.081 ^b	.924	.358	.088	.877	1.141	.877
E20	.096 ^b	.980	.329	.093	.708	1.413	.708
E21	.143 ^b	1.598	.113	.151	.841	1.189	.841
E22	.109 ^b	1.250	.214	.119	.886	1.129	.886
E23	.137 ^b	1.486	.140	.141	.796	1.256	.796
E24	.084 ^b	.907	.367	.087	.796	1.257	.796
E25	.103 ^b	1.176	.242	.112	.890	1.124	.890
E26	.152 ^b	1.562	.121	.148	.709	1.410	.709
E27	.140 ^b	1.536	.127	.146	.804	1.243	.804
E28	.080 ^b	.850	.397	.081	.763	1.311	.763
E29	.138 ^b	1.526	.130	.145	.819	1.221	.819
E30	.099 ^b	1.101	.273	.105	.845	1.183	.845
E31	.137 ^b	1.448	.150	.137	.754	1.326	.754
E32	.128 ^b	1.440	.153	.137	.852	1.174	.852
E33	.019 ^b	.202	.840	.019	.806	1.240	.806
E34	.165 ^b	1.824	.071	.172	.819	1.221	.819

	E35	.152 ^b	1.797	.075	.170	.931	1.074	.931
	E36	.155 ^b	1.799	.075	.170	.894	1.118	.894
	Extraversion	.015 ^b	.178	.859	.017	.984	1.016	.984
	Agreeableness	.088 ^b	1.059	.292	.101	.991	1.009	.991
	Conscientiousness	.030 ^b	.354	.724	.034	.929	1.076	.929
	Neuroticism	.068 ^b	.826	.411	.079	.995	1.005	.995
	Openness	.133 ^b	1.573	.119	.149	.943	1.060	.943
2	E1	.072 ^c	.701	.485	.067	.618	1.619	.618
	E2	.091°	.869	.387	.083	.588	1.702	.588
	E3	.060°	.536	.593	.052	.515	1.942	.515
	E5	.011°	.105	.917	.010	.560	1.786	.560
	E6	066 ^c	640	.524	061	.612	1.635	.612
	E7	050 ^c	522	.603	050	.703	1.422	.703
	E8	.089 ^c	.889	.376	.085	.638	1.567	.638
	E9	.085°	.824	.412	.079	.608	1.645	.608
	E10	011 ^c	106	.916	010	.646	1.548	.646
	E11	116 ^c	-1.092	.277	104	.572	1.747	.572
	E13	001°	007	.994	001	.807	1.240	.776
	E14	108°	-1.143	.255	109	.714	1.401	.714
	E15	008 ^c	081	.936	008	.678	1.474	.678
	E16	.064 ^c	.681	.497	.065	.733	1.363	.733
	E17	.021°	.221	.825	.021	.712	1.405	.673
	E18	.070 ^c	.733	.465	.070	.715	1.399	.679
	E19	027 ^c	284	.777	027	.709	1.411	.692
	E20	042 ^c	387	.699	037	.539	1.855	.539
	E21	.039°	.390	.697	.038	.659	1.518	.659
	E22	018 ^c	179	.858	017	.646	1.548	.624
	E23	.045 ^c	.456	.650	.044	.669	1.495	.669
	E24	024 ^c	241	.810	023	.657	1.523	.657
	E25	.065 ^c	.749	.456	.072	.864	1.157	.800
	E26	.067°	.654	.515	.063	.619	1.615	.619
	E27	.049 ^c	.497	.620	.048	.673	1.486	.673
	E28	033°	321	.748	031	.626	1.597	.626
	E29	.032 ^c	.320	.750	.031	.644	1.552	.644
	E30	.026 ^c	.283	.778	.027	.763	1.311	.763
	E31	.063°	.642	.522	.062	.679	1.473	.679
	E32	.044 ^c	.472	.638	.045	.732	1.366	.732
	E33	040 ^c	438	.662	042	.763	1.310	.750
	E34	.079 ^c	.817	.416	.078	.687	1.456	.687
	E35	.069°	.757	.451	.073	.772	1.296	.710
	E36	.110 ^c	1.273	.206	.122	.853	1.172	.809
	Extraversion	018 ^c	220	.827	021	.963	1.038	.838
	Agreeableness	.019 ^c	.226	.821	.022	.892	1.121	.771
	Conscientiousness	019 ^c	221	.826	021	.888	1.127	.818
	Neuroticism	.089°	1.104	.272	.106	.987	1.013	.848
	Openness	.104 ^c	1.247	.215	.119	.925	1.081	.830

a. Dependent Variable: Q11 b. Predictors in the Model: (Constant), E4 c. Predictors in the Model: (Constant), E4, E12

Table 13-6: Excluded variables for the regression analysis of KS barriers and the rate of contribution of KS (Q7)

Excluded Variables^a

					Co	llinearity St	atistics
				Partial			Minimum
Model	Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance
1 B1	013 ^b	135	.892	013	.893	1.119	.893
B2	224 ^b	-1.720	.088	163	.498	2.007	.498
B4	135 ^b	-1.266	.208	120	.756	1.324	.756
B5	127 ^b	-1.058	.293	101	.590	1.695	.590
B6	139 ^b	-1.226	.223	117	.663	1.508	.663
B7	100 ^b	792	.430	076	.542	1.844	.542
B8	142 ^b	-1.065	.289	101	.479	2.086	.479
B9	.108 ^b	1.006	.317	.096	.739	1.354	.739
B10	.004 ^b	.043	.966	.004	.804	1.244	.804
B11	130 ^b	-1.151	.252	110	.667	1.498	.667
B12	202 ^b	-1.918	.058	181	.751	1.331	.751
B13	.089 ^b	.795	.428	.076	.684	1.463	.684
B14	112 ^b	-1.063	.290	101	.770	1.299	.770
B15	187 ^b	-1.947	.054	183	.905	1.105	.905
B16	060 ^b	553	.581	053	.739	1.353	.739
B17	107 ^b	896	.372	086	.604	1.656	.604
B18	.093 ^b	.873	.384	.083	.756	1.323	.756
Extraversion	.045 ^b	.482	.631	.046	1.000	1.000	1.000
Agreeableness	024 ^b	262	.794	025	.997	1.003	.997
Conscientiousness	.101 ^b	1.086	.280	.103	.993	1.007	.993
Neuroticism	161 [♭]	-1.747	.084	165	.994	1.006	.994
Openness	.040 ^b	.430	.668	.041	1.000	1.000	1.000

a. Dependent Variable: Q7 b. Predictors in the Model: (Constant), B3

### Table 13-7: Excluded variables for the regression analysis of KS barriers and the quality of KS (Q10)

		E	cluded V	ariables ^a			
					Coll	inearity St	atistics
			ļ	Partial			Minimum
Model	Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance
1 B1	.013 ^b	.138	.890	.013	.952	1.050	.952
B2	.021 ^b	.230	.819	.022	.986	1.015	.986
B3	043 ^b	466	.642	045	.993	1.007	.993
B4	.062 ^b	.675	.501	.065	.986	1.014	.986
B5	025 ^b	267	.790	026	1.000	1.000	1.000
B6	.121 ^b	1.325	.188	.126	.992	1.008	.992
B7	026 ^b	279	.780	027	1.000	1.000	1.000
B8	001 ^b	006	.995	001	.997	1.003	.997
B9	.100 ^b	1.096	.276	.104	.995	1.005	.995
B10	.113 ^b	1.221	.225	.116	.971	1.030	.971
B11	.111 ^b	1.218	.226	.116	.996	1.004	.996
B12	.160 ^b	1.757	.082	.166	.987	1.013	.987
B13	.024 ^b	.261	.795	.025	.998	1.002	.998
B14	.073 ^b	.780	.437	.075	.952	1.050	.952
B15	.101 ^b	1.109	.270	.106	.999	1.001	.999
B16	.113 ^b	1.237	.219	.118	.992	1.008	.992
B17	.034 ^b	.363	.717	.035	.973	1.028	.973
B18	031 ^b	330	.742	032	.977	1.024	.977
Extraversion	015 ^b	145	.885	014	.820	1.220	.820
Agreeableness	077 ^b	758	.450	072	.808	1.237	.808
Neuroticism	.095 ^b	1.037	.302	.099	.992	1.008	.992
Openness	.111 ^b	1.124	.263	.107	.849	1.178	.849

a. Dependent Variable: Q10

b. Predictors in the Model: (Constant), Conscientiousness

			Excl	uded Var	riablesª			
-				ſ		Colli	nearity St	atistics
				l l	Partial			Minimum
Model		Beta In	t	Sig.	Correlation	Tolerance	VIF	Tolerance
1 B1		.022 ^b	.223	.824	.021	.886	1.128	.886
B2		021 ^b	194	.847	019	.766	1.305	.766
B3		.011 ^b	.102	.919	.010	.751	1.331	.751
B4		.091 ^b	.889	.376	.085	.807	1.239	.807
B5		.022 ^b	.207	.836	.020	.748	1.336	.748
B6		.059 ^b	.570	.570	.054	.796	1.256	.796
B7		058 ^b	520	.604	050	.689	1.451	.689
B8		.033 ^b	.313	.755	.030	.778	1.285	.778
B9		.087º	.857	.393	.082	.824	1.214	.824
B10		.093 ⁰	.914	.363	.087	.833	1.201	.833
B11		.128º	.975	.332	.093	.495	2.020	.495
B13		124°	-1.073	.286	102	.636	1.573	.636
B14		.055°	.496	.621	.047	.692	1.445	.692
B15		.168 ⁰	1.619	.108	.153	.781	1.280	.781
B16		.058°	.563	.575	.054	.807	1.239	.807
B17		006°	050	.960	005	.681	1.469	.681
B18		106°	-1.056	.293	101	.850	1.1//	.850
Extrav	/ersion	.056°	.598	.551	.057	.992	1.008	.992
Agree	ableness	.131° 125h	1.420	.158	.135	1.000	1.000	1.000
Consc	cientiousness	.135°	1.466	.146	.139	.987	1.013	.987
Neuro	iticism	.072°	./0/	.445	.073	.983	1.017	.983
2 B1	ness	.228~	2.522	.013	.∠აວ - 038	.995	1.005	.995
2 B1 B2		040 - 051°	400	.090	030	.033	1.200	.033
B3		031 015°	148	883	0 <del>-</del> .7	751	1 331	747
B4		.013 049°	483	630	.01-	783	1 277	783
B5		- 003°	- 032	974	- 003	741	1 349	741
B6		000 061°	605	546	.000	796	1 256	793
B7		- 032°	- 289	773	- 028	683	1 465	680
B8		.002 071°	.683	.496	.066	.762	1.312	.762
B9		.091°	.000	.364	.087	.823	1,214	.819
B10		.086°	.871	.386	.083	.832	1.202	.830
B11		.138°	1.080	.283	.103	.495	2.022	.492
B13		092°	803	.424	077	.627	1.595	.625
B14		.040°	.368	.713	.035	.690	1.449	.690
B15		.151°	1,488	.140	.142	.778	1.285	.778
B16		.029°	.287	.775	.028	.796	1.256	.796
B17		039°	349	.728	034	.671	1.490	.671
B18		119°	-1,221	.225	117	.847	1.180	.847
Extrav	version	039°	396	.693	038	.842	1.188	.842
Agree	ableness	.090°	.974	.332	.093	.962	1.040	.957
Consc	cientiousness	.056 ^c	.567	.572	.054	.842	1.188	.842
Neuro	oticism	.098 ^c	1.071	.286	.103	.972	1.029	.972

Table 13-8: Excluded variables for the regression analysis of KS barriers and the effectiveness of KS (Q11)

a. Dependent Variable: Q11
b. Predictors in the Model: (Constant), B12
c. Predictors in the Model: (Constant), B12, Openness

			1	-			1	1			1	1			1		1		1	-		-						-	-	-						1	-	-				_
Correlations	Q7	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33	E34	E35	E36	Extraversion	Agreeableness	ness	Neuroticism	Openness
۵7	1.00 0	.127	690.	.161	.168	.108	.145	.169	.220	.132	.120	.187	.098	.220	760.	.166	.080	.092	.015	.205	.148	.236	.145	.217	.238	.148	.108	.129	.247	.185	- .109	.121	.187	.039	.226	.277	020.	.044	- .037	.120	- .142	.045
E1	.127	1.00 0	.693	.705	.586	.618	.533	.373	.446	.393	.337	.273	.405	.330	.402	.371	.325	.331	.391	.430	.384	.364	.321	.425	.318	.270	.376	.318	.347	.258	.123	.351	.390	.314	.418	.291	.212	.109	.142	.171	.054	.159
E2	690.	693.	1.00 0	.823	.587	.657	.666	.491	.554	.467	.402	.355	.463	.435	.393	.441	.418	.409	.526	.515	.468	.430	.394	.390	.422	.260	.423	.436	.502	.420	.216	.370	.481	.442	.518	.375	.291	.132	.134	.229	- .023	.154
E3	.161	.705	.823	1.00 0	.641	.714	.649	.479	.578	.520	.431	.415	.495	.584	.498	.501	.431	.371	.516	.508	.568	.466	.498	.450	.453	.264	.485	.502	.531	.479	.167	.405	.446	.472	.464	.312	.314	.110	.171	.217	- 600	.160
E4	.168	.586	.587	.641	1.00 0	.611	.597	.417	.459	.438	.403	.407	.379	.331	.405	.383	.392	308.	.313	.351	.540	398.	.338	.452	.452	.332	683.	.442	.487	.425	.394	.496	.385	.440	.426	.263	.325	.126	.094	.266	.069	.239
E5	.108	.618	.657	.714	.611	1.00 0	.564	.589	.583	.412	.422	.429	.470	.423	.324	.386	.441	.408	.439	.422	.459	.432	.464	.551	.496	.282	.443	.454	.543	.489	.357	.412	.450	.388	665.	.337	.268	.131	.269	.249	- .075	.179
E6	.145	.533	.666	.649	.597	.564	1.00 0	.473	.420	.470	.339	.300	.391	.464	.463	.446	.330	.374	.414	.465	.510	.387	.410	.307	.363	.135	.378	.378	.475	.369	.349	.402	.366	.403	.427	.369	.239	.012	.037	.250	- 099	.112
E7	.169	.373	.491	.479	.417	.589	.473	1.00 0	.745	.637	.515	.517	.482	.493	.432	.436	.370	.535	.515	.510	.546	.505	.384	.449	.595	.358	.457	.471	.598	.597	.396	.558	.544	.411	.548	.556	.368	.231	.157	.302	- .035	.152
E8	.220	.446	.554	578	.459	.583	.420	.745	1.00 0	.575	.547	.500	.534	.385	.448	.454	.412	.496	.524	.467	.553	.429	.335	.464	.494	.310	.403	.465	.531	.547	.270	.507	.529	.383	.479	.450	.312	.228	.162	.247	.067	.145
E9	.132	.393	.467	.520	.438	.412	.470	.637	.575	00.1	.594	.580	.580	.571	609.	.427	.387	.538	.579	.583	.635	.490	.469	.411	.570	.291	.488	.531	.492	.547	.357	.514	.491	.455	.565	.435	.322	.216	.167	.288	.020	.168
E10	.120	.337	.402	.431	.403	.422	.339	.515	.547	.594	1.00 0	.751	.558	.406	.516	.438	.439	.548	.474	.497	.563	.313	.351	.412	.467	.277	.432	.532	.496	.418	.422	.526	.426	.322	.389	.312	.364	.228	.155	.300	.114	.158
E11	.187	.273	.355	.415	.407	.429	.300	.517	.500	.580	.751	00.1 0	.628	.375	.475	.470	.374	.510	.519	.518	.608	.442	.463	.565	.605	.399	.453	.536	.465	.474	.438	.501	.482	.378	.371	.370	.424	.217	.233	.255	.035	.150
E12	860.	.405	.463	.495	.379	.470	.391	.482	.534	.580	.558	.628	1.00 0	.393	.477	.533	.460	.524	.519	.512	.585	.547	.581	.501	.516	.274	.482	.503	.527	.548	.415	.442	.466	.359	.497	.469	.311	.181	.327	.289	- .056	.213
E13	.220	.330	.435	.584	.331	.423	.464	.493	.385	.571	.406	.375	.393	1.00 0	.641	.513	.540	.556	.505	.660	.589	.575	.620	.382	.499	.340	.496	.477	.563	.634	.251	.430	.462	.476	.465	.438	.428	.286	.176	.216	.007	.177
E14	.097	.402	.393	.498	.405	.324	.463	.432	.448	609.	.516	.475	.477	.641	00.1 0	.633	.550	.566	.538	.573	.633	.473	.513	.401	.446	.313	.501	.499	.544	.509	.351	.530	.532	.493	.475	.387	.365	.264	.156	.294	000	600.
E15	.166	.371	.441	.501	.383	.386	.446	.436	.454	.427	.438	.470	.533	.513	.633	1.00 0	.643	.615	579	.521	.621	.524	.478	.478	.472	.325	.496	.463	.542	.526	.391	.551	.455	.470	.501	.520	.462	.338	.179	.263	- .014	.227
E16	.080	.325	.418	.431	.392	.441	.330	.370	.412	.387	.439	.374	.460	.540	.550	.643	00.1 0	.630	.442	.495	.486	.477	.554	.503	.429	.224	.446	.428	.551	.426	.267	.437	.388	.335	.436	.450	.458	.364	.236	.199	- 042	.215
E17	.092	.331	.409	.371	.308	.408	.374	.535	.496	.538	.548	.510	.524	.556	.566	.615	.630	1.00 0	.713	.583	.529	.579	.531	.519	.576	.337	.523	.458	.471	.586	.408	.571	.525	.459	.478	.467	.462	.446	.308	.357	.031	.255
E18	.015	.391	.526	.516	.313	.439	.414	.515	.524	.579	.474	.519	.519	.505	.538	.579	.442	.713	00. L	.680	.575	.575	.467	.459	.553	.364	.478	.476	.491	.629	.435	.464	.577	.504	.525	.379	.364	.265	.220	.300	.027	.169
E19	.205	.430	.515	.508	.351	.422	.465	.510	.467	.583	.497	.518	.512	.660	.573	.521	.495	.583	.680	1.00 0	.636	.658	.544	.471	.519	.344	.490	.462	.564	.563	.331	.402	.497	.469	.468	.419	.364	.171	.149	.203	.063	.181
E20	.148	.384	.468	.568	.540	.459	.510	.546	.553	.635	.563	.608	.585	.589	.633	.621	.486	.529	.575	.636	1.00 0	.667	.606	.515	.588	.416	.539	.662	.574	.612	.525	.614	.580	.619	.571	.477	.499	.216	.190	.195	.065	.155
E21	.236	.364	.430	.466	.398	.432	.387	.505	.429	.490	.313	.442	.547	.575	.473	.524	.477	.579	.575	.658	.667	1.00 0	.640	.580	.637	.429	.542	.486	.540	.619	.449	.508	.608	.608	.659	.601	.490	.253	.213	.239	-010	.237
E22	.145	.321	.394	.498	.338	.464	.410	.384	.335	.469	.351	.463	.581	.620	.513	.478	.554	.531	.467	.544	.606	.640	00.1 0	.630	.532	.250	.403	.405	.547	.566	.329	.527	.579	.443	.450	.506	.466	.179	.228	.252	- .128	.089
E23	.217	.425	390	.450	.452	.551	.307	.449	.464	.411	.412	.565	.501	.382	.401	.478	.503	.519	.459	.471	.515	.580	.630	1.00 0	.681	.462	.499	.495	.487	.533	.408	.502	.522	.359	.440	.488	.490	.296	.313	.234	- 044	.241
E24	.238	.318	.422	.453	.452	.496	.363	.595	.494	.570	.467	.605	.516	.499	.446	.472	.429	.576	.553	.519	.588	.637	.532	.681	1.00 0	.606	.640	.629	.506	609.	.493	.529	.471	.459	.577	.477	.428	.378	.258	.339	- .065	.244
E25	.148	.270	.260	.264	.332	.282	.135	.358	.310	.291	.277	.399	.274	.340	.313	.325	.224	.337	.364	.344	.416	.429	.250	.462	.606	1.00 0	.574	.620	.376	.510	.356	.305	.370	.370	.339	.334	.386	.318	.206	.271	.124	.260
E26	.108	.376	.423	.485	.539	.443	.378	.457	.403	.488	.432	.453	.482	.496	.501	.496	.446	.523	.478	.490	.539	.542	.403	.499	.640	.574	1.00 0	.759	.564	.580	.497	.491	.368	.438	.474	.418	.439	.211	.263	.369	.114	.237
E27	.129	.318	.436	.502	.442	.454	.378	.471	.465	.531	.532	.536	.503	.477	.499	.463	.428	.458	.476	.462	.662	.486	.405	.495	.629	.620	.759	1.00 0	.620	.580	.460	.474	.435	.481	.481	.404	.471	.166	.218	.255	.036	.171
E28	.247	.347	.502	.531	.487	.543	.475	.598	.531	.492	.496	.465	.527	.563	.544	.542	.551	.471	.491	.564	.574	.540	.547	.487	.506	.376	.564	.620	1.00 0	.664	.406	.526	.594	.489	.551	.468	.384	.261	.203	.415	- .019	.197
E29	.185	.258	.420	.479	.425	.489	.369	.597	.547	.547	.418	.474	.548	.634	.509	.526	.426	.586	.629	.563	.612	.619	.566	.533	609.	.510	.580	.580	.664	1.00 0	.476	.523	.638	.511	.495	.531	.476	.346	.234	.342	.002	.236
E30	- 109	.123	.216	.167	.394	.357	.349	396	.270	.357	.422	.438	.415	.251	.351	.391	.267	.408	.435	.331	.525	.449	.329	.408	.493	.356	.497	.460	.406	.476	00.1 0	.642	.426	.438	.368	.363	.503	.161	.168	.352	.108	.197
E31	.121	.351	.370	.405	.496	.412	.402	.558	.507	.514	.526	.501	.442	.430	.530	.551	.437	.571	.464	.402	.614	.508	.527	.502	.529	.305	.491	.474	.526	.523	.642	0.1.00	.736	.607	.549	.540	.586	.230	.220	.284	.132	.069

Table 13-9: Correlations between independent variables (for regression between the KSenablers and the rate of knowledge sharing contribution to project success (Q7))

Ope	Neur	Con	Agre	Extr	E36	E35	E34	E33	E32
.045	- .142	.120	- .037	.044	020.	277	.226	.039	.187
.159	.054	.171	.142	.109	.212	.291	.418	.314	.390
.154	- .023	.229	.134	.132	.291	.375	.518	.442	.481
.160	- 000	.217	.171	.110	.314	.312	.464	.472	.446
.239	690.	.266	.094	.126	.325	.263	.426	.440	.385
.179	- .075	.249	.269	.131	.268	.337	668.	.388	.450
.112	- 099	.250	.037	.012	.239	.369	.427	.403	.366
.152	- .035	.302	.157	.231	368.	.556	.548	.411	.544
.145	.067	.247	.162	.228	.312	.450	.479	.383	.529
.168	.020	.288	.167	.216	.322	.435	.565	.455	.491
.158	.114	.300	.155	.228	.364	.312	.389	.322	.426
.150	.035	.255	.233	.217	.424	.370	.371	.378	.482
.213	- .056	.289	.327	.181	.311	.469	.497	.359	.466
.177	200.	.216	.176	.286	.428	.438	.465	.476	.462
600.	000.	.294	.156	.264	.365	.387	.475	.493	.532
.227	- .014	.263	.179	.338	.462	.520	.501	.470	.455
.215	- .042	.199	.236	.364	.458	.450	.436	.335	.388
.255	.031	.357	.308	.446	.462	.467	.478	.459	.525
.169	.027	.300	.220	.265	.364	.379	.525	.504	.577
.181	.063	.203	.149	.171	.364	.419	.468	.469	.497
.155	.065	.195	.190	.216	.499	.477	.571	.619	.580
.237	- .010	.239	.213	.253	.490	.601	.659	.608	.608
.089	- .128	.252	.228	.179	.466	.506	.450	.443	.579
.241	- .044	.234	.313	.296	.490	.488	.440	.359	.522
.244	- .065	.339	.258	.378	.428	.477	.577	.459	.471
.260	.124	.271	.206	.318	.386	.334	.339	.370	.370
.237	.114	.369	.263	.211	.439	.418	.474	.438	.368
.171	.036	.255	.218	.166	.471	.404	.481	.481	.435
.197	- .019	.415	.203	.261	.384	.468	.551	.489	.594
.236	.002	.342	.234	.346	.476	.531	.495	.511	.638
.197	.108	.352	.168	.161	.503	.363	.368	.438	.426
690'	.132	.284	.220	.230	.586	.540	.549	.607	.736
.063	.061	.246	.160	.175	.575	.579	.601	.662	1.00
.133	.077	.162	.179	.155	.550	.452	.601	1.00 0	.662
.169	- .022	.342	.192	.250	.446	.745	1.00 0	.601	.601
.197	- .123	.319	.256	.175	.572	1.00 0	.745	.452	.579
.150	.096	.192	.073	.237	1.00 0	.572	.446	.550	.575
.393	- .149	.425	.348	1.00 0	.237	.175	.250	.155	.175
.196	- .189	.438	1.00 0	.348	.073	.256	.192	.179	.160
.389	- .087	1.00 0	.438	.425	.192	.319	.342	.162	.246
-	1.00 0	- .087	- .189	- .149	960.	- .123	- .022	.077	.061
0.1	-	.389	.196	.393	.150	.197	.169	.133	.063

Table 13-10: Correlations between independent variables (for regression between the KS enablers and the benefits that might be gained from timely knowledge sharing in the infrastructural projects (Q9))

												l	l							
Onenness	.240	.159	.154	.160	.239	c/0.	.112	.152	.145	.168	.158	.150	.213	.177	600	.227	.215	.255	.169	.181
Nauroticiem	004	054	ľ	'	0690	'	'	'	067	020	114	035	'	007	000	'	'	031	7.00	063
Conscientiousness	253	171	229	217	266	249	250	302	247	28.8	300	255	289	216	204	263	199	357	300	203
Agreeableness	.275	.142	.134	.171	.094	.269	.037	.157	.162	.167	.155	.233	.327	.176	.156	.179	.236	.308	.220	.149
Extraversion	.126	.109	.132	.110	.126	.131	.012	.231	.228	.216	.228	.217	.181	.286	.264	.338	.364	.446	.265	.171
E36	.245	.212	.291	.314	.325	.268	.239	.368	.312	.322	.364	.424	.311	.428	.365	.462	.458	.462	.364	.364
E35	.359	.291	.375	.312	.263	.337	.369	.556	.450	.435	.312	.370	.469	.438	.387	.520	.450	.467	.379	.419
E34	.272	.418	.518	.464	.426	399	.427	.548	.479	.565	.389	.371	.497	.465	.475	.501	.436	.478	.525	.468
E33	.222	.314	.442	.472	.440	.388	.403	.411	.383	.455	.322	.378	.359	.476	.493	.470	.335	.459	.504	.469
E32	.281	.390	.481	.446	.385	.450	.366	.544	.529	.491	.426	.482	.466	.462	.532	.455	.388	.525	.577	.497
E31	.299	.351	.370	.405	.496	.412	.402	.558	.507	.514	.526	.501	.442	.430	.530	.551	.437	.571	.464	.402
E30	.247	.123	.216	.167	.394	.357	.349	.396	.270	.357	.422	.438	.415	.251	.351	.391	.267	.408	.435	.331
E29	.354	.258	.420	.479	.425	.489	.369	.597	.547	.547	.418	.474	.548	.634	.509	.526	.426	.586	.629	.563
E28	.449	.347	.502	.531	.487	.543	.475	.598	.531	.492	.496	.465	.527	.563	.544	.542	.551	.471	.491	.564
E27	.333	.318	.436	.502	.442	.454	.378	.471	.465	.531	.532	.536	.503	.477	.499	.463	.428	.458	.476	.462
E26	.419	.376	.423	.485	.539	.443	.378	.457	.403	.488	.432	.453	.482	.496	.501	.496	.446	.523	.478	.490
E25	.206	.270	.260	.264	.332	.282	.135	.358	.310	.291	.277	.399	.274	.340	.313	.325	.224	.337	.364	.344
E24	.409	.318	.422	.453	.452	.496	.363	.595	.494	.570	.467	.605	.516	.499	.446	.472	.429	.576	.553	.519
E23	.416	.425	.390	.450	.452	.551	.307	.449	.464	.411	.412	.565	.501	.382	.401	.478	.503	.519	.459	.471
E22	.440	.321	.394	.498	.338	.464	.410	.384	.335	.469	.351	.463	.581	.620	.513	.478	.554	.531	.467	.544
E21	.324	.364	.430	.466	.398	.432	.387	.505	.429	.490	.313	.442	.547	.575	.473	.524	.477	.579	.575	.658
E20	.367	.384	.468	.568	.540	.459	.510	.546	.553	.635	.563	.608	.585	.589	.633	.621	.486	.529	.575	.636
E19	.391	.430	.515	.508	.351	.422	.465	.510	.467	.583	.497	.518	.512	.660	.573	.521	.495	.583	.680	1.00 0
E18	.285	.391	.526	.516	.313	.439	.414	.515	.524	.579	.474	.519	.519	.505	.538	.579	.442	.713	00.1 0	.680
E17	.410	.331	.409	.371	.308	.408	.374	.535	.496	.538	.548	.510	.524	.556	.566	.615	.630	1.00 0	.713	.583
E16	.365	.325	.418	.431	.392	.441	.330	.370	.412	.387	.439	.374	.460	.540	.550	.643	1.00 0	.630	.442	.495
E15	.409	.371	.441	.501	.383	.386	.446	.436	.454	.427	.438	.470	.533	.513	.633	1.00 0	.643	.615	673.	.521
E14	.295	.402	.393	.498	.405	.324	.463	.432	.448	609'	.516	.475	.477	.641	00.1 0	.633	.550	.566	.538	.573
E13	.495	.330	.435	.584	.331	.423	.464	.493	.385	.571	.406	.375	.393	1.00 0	.641	.513	.540	.556	505.	.660
E12	.401	.405	.463	.495	379	.470	.391	.482	.534	.580	.558	.628	1.00 0	.393	.477	.533	.460	.524	.519	.512
E11	.429	.273	.355	.415	.407	.429	.300	.517	.500	.580	.751	00.1 0	.628	.375	.475	.470	.374	.510	.519	.518
E10	.434	337	.402	.431	.403	.422	339	.515	.547	.594	1.00 0	.751	.558	.406	.516	.438	.439	.548	.474	.497
E9	.350	.393	.467	.520	.438	.412	.470	.637	.575	1.00 0	.594	.580	.580	.571	609	.427	.387	.538	.579	.583
E8	.281	.446	.554	.578	.459	.583	.420	.745	00.1	.575	.547	.500	.534	.385	.448	.454	.412	.496	.524	.467
E7	.404	.373	.491	.479	.417	.589	.473	1.00 0	.745	.637	.515	.517	.482	.493	.432	.436	.370	.535	.515	.510
E6	.420	.533	.666	.649	.597	.564	00.1 0	.473	.420	.470	.339	.300	.391	.464	.463	.446	.330	.374	.414	.465
E5	.538	.618	.657	.714	.611	1.00 0	.564	.589	.583	.412	.422	.429	.470	.423	.324	.386	.441	.408	.439	.422
E4	.383	.586	.587	.641	00.1	.611	.597	.417	.459	.438	.403	.407	.379	.331	.405	.383	.392	.308	.313	.351
E3	.474	.705	.823	1.00 0	.641	.714	.649	.479	.578	.520	.431	.415	.495	.584	.498	.501	.431	.371	.516	.508
E2	.445	.693	1.00 0	.823	.587	.657	.666	.491	.554	.467	.402	.355	.463	.435	.393	.441	.418	.409	.526	.515
E1	.386	1.00 0	669.	.705	.586	.618	.533	.373	.446	.393	.337	.273	.405	.330	.402	.371	.325	.331	.391	.430
60	00.1	.386	.445	.474	.383	.538	.420	.404	.281	.350	.434	.429	.401	.495	.295	.409	.365	.410	.285	.391
Correlations	<b>0</b> 9	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19

E20	.367	.384	.468	.568	.540	.459	.510	.546	.553	.635	.563	.608	.585	.589	.633	.621	.486	.529	.575	.636	00.1 0	.667	.606	.515	.588	.416	.539	.662	.574	.612	.525	.614	.580	.619	.571	.477	.499	.216	.190	.195	.065	.155
E21	.324	.364	.430	.466	.398	.432	.387	.505	.429	.490	.313	.442	.547	.575	.473	.524	.477	.579	.575	.658	.667	1.00 0	.640	.580	.637	.429	.542	.486	.540	.619	.449	.508	.608	.608	.659	.601	.490	.253	.213	.239	- 010	.237
E22	.440	.321	.394	.498	.338	.464	.410	.384	.335	.469	.351	.463	.581	.620	.513	.478	.554	.531	.467	.544	.606	.640	1.00 0	.630	.532	.250	.403	.405	.547	.566	.329	.527	.579	.443	.450	.506	.466	.179	.228	.252	- .128	.089
E23	.416	.425	.390	.450	.452	.551	.307	.449	.464	.411	.412	.565	.501	.382	.401	.478	.503	.519	.459	.471	.515	.580	.630	1.00 0	.681	.462	.499	.495	.487	.533	.408	.502	.522	.359	.440	.488	.490	.296	.313	.234	- .044	.241
E24	.409	.318	.422	.453	.452	.496	.363	.595	.494	.570	.467	.605	.516	.499	.446	.472	.429	.576	.553	.519	.588	.637	.532	.681	1.00 0	.606	.640	.629	.506	609.	.493	.529	.471	.459	.577	.477	.428	.378	.258	.339	- .065	.244
E25	.206	.270	.260	.264	.332	.282	.135	.358	.310	.291	.277	.399	.274	.340	.313	.325	.224	.337	.364	.344	.416	.429	.250	.462	.606	1.00 0	.574	.620	.376	.510	.356	.305	.370	.370	.339	.334	.386	.318	.206	.271	.124	.260
E26	.419	.376	.423	.485	.539	.443	.378	.457	.403	.488	.432	.453	.482	.496	.501	.496	.446	.523	.478	.490	.539	.542	.403	.499	.640	.574	1.00 0	.759	.564	.580	.497	.491	.368	.438	.474	.418	.439	.211	.263	.369	.114	.237
E27	.333	.318	.436	.502	.442	.454	.378	.471	.465	.531	.532	.536	.503	.477	.499	.463	.428	.458	.476	.462	.662	.486	.405	.495	.629	.620	.759	1.00 0	.620	.580	.460	.474	.435	.481	.481	.404	.471	.166	.218	.255	.036	.171
E28	.449	.347	.502	.531	.487	.543	.475	.598	.531	.492	.496	.465	.527	.563	.544	.542	.551	.471	.491	.564	.574	.540	.547	.487	.506	.376	.564	.620	1.00 0	.664	.406	.526	.594	.489	.551	.468	.384	.261	.203	.415	- 019	.197
E29	.354	.258	.420	.479	.425	.489	.369	.597	.547	.547	.418	.474	.548	.634	509	.526	.426	.586	.629	.563	.612	.619	.566	.533	609.	.510	.580	.580	.664	1.00 0	.476	.523	.638	.511	.495	.531	.476	.346	.234	.342	.002	.236
E30	.247	.123	.216	.167	.394	.357	.349	.396	.270	.357	.422	.438	.415	.251	.351	.391	.267	.408	.435	.331	.525	.449	.329	.408	.493	.356	.497	.460	.406	.476	1.00 0	.642	.426	.438	.368	.363	.503	.161	.168	.352	.108	.197
E31	.299	.351	.370	.405	.496	.412	.402	.558	507	.514	.526	.501	.442	.430	.530	.551	.437	.571	.464	.402	.614	.508	.527	.502	.529	.305	.491	.474	.526	.523	.642	1.00 0	.736	.607	.549	.540	.586	.230	.220	.284	.132	.069
E32	.281	.390	.481	.446	.385	.450	.366	.544	.529	.491	.426	.482	.466	.462	.532	.455	.388	.525	.577	.497	.580	.608	.579	.522	.471	.370	.368	.435	.594	.638	.426	.736	00.1 0	.662	.601	.579	.575	.175	.160	.246	.061	.063
E33	.222	.314	.442	.472	.440	.388	.403	.411	.383	.455	.322	.378	.359	.476	.493	.470	.335	.459	.504	.469	.619	.608	.443	.359	.459	.370	.438	.481	.489	.511	.438	.607	.662	1.00 0	.601	.452	.550	.155	.179	.162	.077	.133
E34	.272	.418	.518	.464	.426	.399	.427	.548	.479	.565	.389	.371	.497	.465	.475	.501	.436	.478	.525	.468	.571	.659	.450	.440	.577	.339	.474	.481	.551	.495	.368	.549	.601	.601	1.00 0	.745	.446	.250	.192	.342	- .022	.169
E35	.359	.291	.375	.312	.263	.337	.369	.556	.450	.435	.312	.370	.469	.438	.387	.520	.450	.467	.379	.419	.477	.601	.506	.488	.477	.334	.418	.404	.468	.531	.363	.540	.579	.452	.745	1.00 0	.572	.175	.256	.319	- .123	.197
E36	.245	.212	.291	.314	.325	.268	.239	.368	.312	.322	.364	.424	.311	.428	.365	.462	.458	.462	.364	.364	.499	.490	.466	.490	.428	.386	.439	.471	.384	.476	.503	.586	.575	.550	.446	.572	1.00 0	.237	.073	.192	960.	.150
Extr	.126	.109	.132	.110	.126	.131	.012	.231	.228	.216	.228	.217	.181	.286	.264	.338	.364	.446	.265	.171	.216	.253	.179	.296	.378	.318	.211	.166	.261	.346	.161	.230	.175	.155	.250	.175	.237	1.00 0	.348	.425	- .149	.393
Agre	275	.142	.134	.171	.094	.269	.037	.157	.162	.167	.155	.233	.327	.176	.156	.179	.236	.308	.220	.149	.190	.213	.228	.313	.258	.206	.263	.218	.203	.234	.168	.220	.160	.179	.192	.256	.073	.348	1.00 0	.438	- 189	.196
Con	.253	.171	.229	.217	.266	.249	.250	.302	.247	.288	.300	.255	.289	.216	.294	.263	.199	.357	.300	.203	.195	.239	.252	.234	.339	.271	.369	.255	.415	.342	.352	.284	.246	.162	.342	.319	.192	.425	.438	1.00 0	- .087	.389
Neur	.004	.054	-023	- 600	690.	-075	- 660	- .035	.067	.020	.114	.035	- 056	700.	000.	- .014	- 042	.031	.027	.063	.065	-010	- 128	- 044	-065	.124	.114	.036	- 019	.002	.108	.132	.061	.077	022	.123	960.	- .149	- .189	- 087	1.00 0	- 660.
Ope	.240	.159	.154	.160	.239	.179	.112	.152	.145	.168	.158	.150	.213	.177	600.	.227	.215	.255	.169	.181	.155	.237	080.	.241	.244	.260	.237	.171	.197	.236	.197	690.	.063	.133	.169	.197	.150	.393	.196	.389	- 660	1.00

Table 13-11: Correlations between independent variables (for regression between the KS enablers and the quality of timeliness of shared knowledge in the infrastructural projects (Q10))

Correlations	Q10	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	E17	E18	E19	E20	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33	E34	E35	E36	Extraversion	Agreeableness	Conscientiousness	Neuroticism
Q10	1.00 0	.386	.355	.413	.365	.340	.307	.236	.266	.326	.239	.254	.423	.251	.254	307	.251	.220	.297	.270	.333	.384	.311	.286	.292	.218	.313	.264	.283	257	.292	.299	277	.216	.351	.281	.238	.109	.063	.286	020.
E1	.386	1.00 0	.693	.705	.586	.618	.533	.373	.446	.393	.337	.273	.405	.330	.402	.371	.325	.331	.391	.430	.384	.364	.321	.425	.318	.270	.376	.318	.347	.258	.123	.351	.390	.314	.418	.291	.212	.109	.142	.171	.054
E2	.355	693.	1.00 0	.823	.587	.657	.666	.491	.554	.467	.402	.355	.463	.435	.393	.441	.418	.409	.526	.515	.468	.430	.394	.390	.422	.260	.423	.436	.502	.420	.216	.370	.481	.442	.518	.375	.291	.132	.134	.229	1
E3	.413	.705	.823	1.00 0	.641	.714	.649	.479	.578	.520	.431	.415	.495	.584	.498	.501	.431	.371	.516	.508	.568	.466	.498	.450	.453	.264	.485	.502	.531	.479	.167	.405	.446	.472	.464	.312	.314	.110	.171	.217	'
E4	.365	.586	.587	.641	1.00 0	.611	.597	.417	.459	.438	.403	.407	.379	.331	.405	.383	.392	.308	.313	.351	.540	.398	.338	.452	.452	.332	.539	.442	.487	.425	.394	.496	.385	.440	.426	.263	.325	.126	.094	.266	690.
E5	.340	.618	.657	.714	.611	1.00 0	.564	.589	.583	.412	.422	.429	.470	.423	.324	.386	.441	.408	.439	.422	.459	.432	.464	.551	.496	.282	.443	.454	.543	.489	.357	.412	.450	.388	399	.337	.268	.131	.269	.249	. 150
E6	.307	.533	.666	.649	.597	.564	00.1	.473	.420	.470	.339	.300	.391	.464	.463	.446	.330	.374	.414	.465	.510	.387	.410	.307	.363	.135	.378	.378	.475	.369	.349	.402	.366	.403	.427	.369	.239	.012	.037	.250	- 000

E7	.236	.373	.491	.479	.417	.589	.473	1.00 0	.745	.637	.515	.517	.482	.493	.432	.436	.370	.535	.515	.510	.546	.505	.384	.449	.595	.358	.457	.471	.598	.597	.396	.558	.544	.411	.548	.556	.368	.231	.157	.302	- .035	.152
E8	.266	.446	.554	.578	.459	.583	.420	.745	00.1 0	.575	.547	.500	.534	.385	.448	.454	.412	.496	.524	.467	.553	.429	.335	.464	.494	.310	.403	.465	.531	.547	.270	.507	.529	.383	.479	.450	.312	.228	.162	.247	.067	.145
E9	.326	.393	.467	.520	.438	.412	.470	.637	.575	1.00 0	.594	.580	.580	.571	609.	.427	.387	.538	.579	.583	.635	.490	.469	.411	.570	.291	.488	.531	.492	.547	.357	.514	.491	.455	.565	.435	.322	.216	.167	.288	.020	.168
E10	.239	.337	.402	.431	.403	.422	.339	.515	.547	.594	1.00 0	.751	.558	.406	.516	.438	.439	.548	.474	.497	.563	.313	.351	.412	.467	.277	.432	.532	.496	.418	.422	.526	.426	.322	.389	.312	.364	.228	.155	.300	.114	.158
E11	.254	.273	.355	.415	.407	.429	.300	.517	.500	.580	.751	1.00 0	.628	.375	.475	.470	.374	.510	.519	.518	.608	.442	.463	.565	.605	.399	.453	.536	.465	.474	.438	.501	.482	.378	.371	.370	.424	.217	.233	.255	.035	.150
E12	.423	.405	.463	.495	.379	.470	.391	.482	.534	.580	.558	.628	1.00 0	.393	.477	.533	.460	.524	.519	.512	.585	.547	.581	.501	.516	.274	.482	.503	.527	.548	.415	.442	.466	.359	.497	.469	.311	.181	.327	.289	- .056	.213
E13	.251	.330	.435	.584	.331	.423	.464	.493	.385	.571	.406	.375	.393	1.00 0	.641	.513	.540	.556	.505	.660	.589	.575	.620	.382	.499	.340	.496	.477	.563	.634	.251	.430	.462	.476	.465	.438	.428	.286	.176	.216	.007	.177
E14	.254	.402	.393	.498	.405	.324	.463	.432	.448	609.	.516	.475	.477	.641	1.00 0	.633	.550	.566	.538	.573	.633	.473	.513	.401	.446	.313	.501	.499	.544	.509	.351	.530	.532	.493	.475	.387	.365	.264	.156	.294	000.	600.
E15	.307	.371	.441	.501	.383	.386	.446	.436	.454	.427	.438	.470	.533	.513	.633	1.00 0	.643	.615	.579	.521	.621	.524	.478	.478	.472	.325	.496	.463	.542	.526	.391	.551	.455	.470	.501	.520	.462	.338	.179	.263	- .014	.227
E16	.251	.325	.418	.431	.392	.441	.330	.370	.412	.387	.439	.374	.460	.540	.550	.643	1.00 0	.630	.442	.495	.486	.477	.554	.503	.429	.224	.446	.428	.551	.426	.267	.437	.388	.335	.436	.450	.458	.364	.236	.199	- .042	.215
E17	.220	.331	.409	.371	.308	.408	.374	.535	.496	.538	.548	.510	.524	.556	.566	.615	.630	1.00 0	.713	.583	.529	.579	.531	.519	.576	.337	.523	.458	.471	.586	.408	.571	.525	.459	.478	.467	.462	.446	.308	.357	.031	.255
E18	.297	.391	.526	.516	.313	.439	.414	.515	.524	.579	.474	.519	.519	.505	.538	.579	.442	.713	00.1	.680	.575	.575	.467	.459	.553	.364	.478	.476	.491	.629	.435	.464	.577	.504	.525	379	.364	.265	.220	.300	.027	.169
E19	.270	.430	.515	.508	.351	.422	.465	.510	.467	.583	.497	.518	.512	.660	.573	.521	.495	.583	.680	1.00 0	.636	.658	.544	.471	.519	.344	.490	.462	.564	.563	.331	.402	.497	.469	.468	.419	.364	.171	.149	.203	.063	.181
E20	.333	.384	.468	.568	.540	.459	.510	.546	.553	.635	.563	.608	.585	.589	.633	.621	.486	.529	.575	.636	1.00 0	.667	.606	.515	.588	.416	.539	.662	.574	.612	.525	.614	.580	.619	.571	.477	.499	.216	.190	.195	.065	.155
E21	.384	.364	.430	.466	.398	.432	.387	.505	.429	.490	.313	.442	.547	.575	.473	.524	.477	579	.575	.658	.667	1.00 0	.640	.580	.637	.429	.542	.486	.540	.619	.449	.508	.608	.608	.659	.601	.490	.253	.213	.239	- .010	.237
E22	.311	.321	.394	.498	.338	.464	.410	.384	.335	.469	.351	.463	.581	.620	.513	.478	.554	.531	.467	.544	.606	.640	1.00 0	.630	.532	.250	.403	.405	.547	.566	.329	.527	.579	.443	.450	.506	.466	.179	.228	.252	- .128	.089
E23	.286	.425	.390	.450	.452	.551	.307	.449	.464	.411	.412	.565	.501	.382	.401	.478	.503	.519	.459	.471	.515	.580	.630	00.1 0	.681	.462	.499	.495	.487	.533	.408	.502	.522	.359	.440	.488	.490	.296	.313	.234	- 044	.241
E24	.292	.318	.422	.453	.452	.496	.363	.595	.494	.570	.467	.605	.516	.499	.446	.472	.429	.576	.553	.519	.588	.637	.532	.681	1.00 0	.606	.640	.629	.506	609.	.493	.529	.471	.459	.577	.477	.428	.378	.258	.339	- .065	.244
E25	.218	.270	.260	.264	.332	.282	.135	.358	.310	.291	277	.399	.274	.340	.313	.325	.224	.337	.364	.344	.416	.429	.250	.462	606.	1.00 0	.574	.620	.376	.510	.356	.305	.370	.370	.339	.334	.386	.318	.206	.271	.124	.260
E26	.313	.376	.423	.485	.539	.443	.378	.457	.403	.488	.432	.453	.482	.496	.501	.496	.446	.523	.478	.490	.539	.542	.403	.499	.640	.574	1.00 0	.759	.564	.580	.497	.491	.368	.438	.474	.418	.439	.211	.263	.369	.114	.237
E27	.264	.318	.436	.502	.442	.454	.378	.471	.465	.531	.532	.536	.503	.477	.499	.463	.428	.458	.476	.462	.662	.486	.405	.495	.629	.620	.759	1.00 0	.620	.580	.460	.474	.435	.481	.481	.404	.471	.166	.218	.255	.036	.171
E28	.283	.347	.502	.531	.487	.543	.475	.598	.531	.492	.496	.465	.527	.563	.544	.542	.551	.471	.491	.564	.574	.540	.547	.487	.506	.376	.564	.620	1.00 0	.664	.406	.526	.594	.489	.551	.468	.384	.261	.203	.415	- 019	.197
E29	.257	.258	.420	.479	.425	.489	.369	.597	.547	.547	.418	.474	.548	.634	509.	.526	.426	.586	.629	.563	.612	.619	.566	.533	609.	.510	.580	.580	.664	1.00 0	.476	.523	.638	.511	.495	.531	.476	.346	.234	.342	.002	.236
E30	.292	.123	.216	.167	.394	.357	.349	.396	.270	.357	.422	.438	.415	.251	.351	.391	.267	.408	.435	.331	.525	.449	.329	.408	.493	.356	.497	.460	.406	.476	00.1 0	.642	.426	.438	.368	.363	.503	.161	.168	.352	.108	.197
E31	.299	.351	.370	.405	.496	.412	.402	.558	.507	.514	.526	.501	.442	.430	.530	.551	.437	.571	.464	.402	.614	.508	.527	.502	.529	305	.491	.474	.526	.523	.642	1.00 0	.736	.607	.549	.540	.586	.230	.220	.284	.132	.069
E32	.277	.390	.481	.446	.385	.450	.366	.544	.529	.491	.426	.482	.466	.462	.532	.455	.388	.525	.577	.497	.580	.608	.579	.522	.471	.370	.368	.435	.594	.638	.426	.736	1.00	.662	.601	.579	.575	.175	.160	.246	.061	.063
E33	.216	.314	.442	.472	.440	.388	.403	.411	.383	.455	.322	.378	.359	.476	.493	.470	.335	.459	.504	.469	.619	.608	.443	.359	.459	.370	.438	.481	.489	.511	.438	.607	.662	1.00 0	.601	.452	.550	.155	.179	.162	.077	.133
E34	.351	.418	.518	.464	.426	399	.427	.548	.479	.565	.389	.371	.497	.465	.475	.501	.436	.478	.525	.468	.571	.659	.450	.440	.577	.339	.474	.481	.551	.495	.368	.549	.601	.601	1.00 0	.745	.446	.250	.192	.342	- .022	.169
E35	.281	.291	.375	.312	.263	.337	.369	.556	.450	.435	.312	.370	.469	.438	.387	.520	.450	.467	.379	.419	.477	.601	.506	.488	.477	.334	.418	.404	.468	.531	.363	.540	.579	.452	.745	1.00 0	.572	.175	.256	.319	.123	.197
E36	.238	.212	.291	.314	.325	.268	.239	.368	.312	.322	.364	.424	.311	.428	.365	.462	.458	.462	.364	.364	.499	.490	.466	.490	.428	.386	.439	.471	.384	.476	.503	.586	.575	.550	.446	.572	1.00 0	.237	.073	.192	960.	.150
Extr	.109	.109	.132	.110	.126	.131	.012	.231	.228	.216	.228	.217	.181	.286	.264	.338	.364	.446	.265	.171	.216	.253	.179	.296	.378	.318	.211	.166	.261	.346	.161	.230	.175	.155	.250	.175	.237	1.00 0	.348	.425	- .149	.393
Agre	.063	.142	.134	.171	.094	.269	.037	.157	.162	.167	.155	.233	.327	.176	.156	.179	.236	.308	.220	.149	.190	213	.228	.313	.258	.206	.263	.218	.203	.234	.168	.220	.160	.179	.192	.256	.073	.348	00.1	.438	- 189	.196
Con Scie	.286	.171	.229	.217	.266	.249	.250	.302	.247	.288	.300	.255	.289	.216	.294	.263	.199	.357	.300	.203	.195	.239	.252	.234	.339	.271	.369	.255	.415	.342	.352	.284	.246	.162	.342	.319	.192	.425	.438	1.00 0	- .087	.389
Neur	.070	.054	- 023	- 600.	.069	-075	- 660.	- 035	.067	.020	.114	.035	- 0.56	.007	000.	- 014	- 042	.031	.027	.063	.065	- 010	.128	- 044	-065	.124	.114	.036	- 019	.002	.108	.132	.061	.077	.022	.123	960.	- 149	- 189	- 087	00.1	- 660
Ope	.206	.159	.154	.160	.239	.179	.112	.152	.145	.168	.158	.150	.213	.177	600.	227	.215	.255	.169	.181	.155	237	.089	.241	244	.260	.237	.171	.197	.236	.197	.069	.063	.133	.169	.197	.150	.393	.196	.389	- 660	1.00 0

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	SU	Ļ	1	2	e	4	5	9	7	8	6	0	Ļ	2	3	4	2	9	2	8	6	50	21	22	53	24	52	56	7	28	50	80	31	32	33	34	35	36	ersio	olene	tious	ticisr	ness
	latio	ò	ш	ш	ш	ш	ш	ш	ш	ш	Ŵ	ш	ш	ш	ш	ш	ш	ш	ш	ш	ш	E	Ш	E	Ш	E2	Ш	Ш	Ш	E	Ш	Ш	Ш	Ш	Ш	Ш	Ш	Ш	ctrav	reeat	cient	euro	Den
	Corre																																						ш	Agi	Suo	Ž	Ŭ
211	•	00.	381	405	412	501	370	298	251	373	370	292	251	395	230	203	279	318	267	303	247	339	320	266	335	293	258	378	335	305	326	281	352	302	236	348	273	302	078	134	162 <b>C</b>	102	245
5		381	00.1	.693	705	586	618	533	373	446	393	337	273	405	330	402	371	325	331	391	430	384	364	321	425	318	270	376	318	347	258	123	351	390	314	418	291	212	.109	142	171	.054	159
E2 E		.405	.693	00.1	.823	.587	.657	.666	.491	.554	.467	.402	.355	.463	.435	.393	.441	.418	.409	.526	.515	.468	.430	.394	.390	.422	.260	.423	.436	.502	.420	.216	.370	.481	.442	.518	.375	.291	.132	.134	.229	023	.154
E3		.412	.705	.823	00.1	.641	.714	.649	.479	.578	.520	.431	.415	.495	.584	.498	.501	.431	.371	.516	.508	.568	.466	.498	.450	.453	.264	.485	.502	.531	.479	.167	.405	.446	.472	.464	.312	.314	.110	.171	.217	- 600	.160
E4		.501	.586	.587	.641	1.00	.611	.597	.417	.459	.438	.403	.407	.379	.331	.405	.383	.392	.308	.313	.351	.540	.398	.338	.452	.452	.332	.539	.442	.487	.425	.394	.496	.385	.440	.426	.263	.325	.126	.094	.266	690.	.239
E5		.370	.618	.657	.714	.611	00.1	.564	.589	.583	.412	.422	.429	.470	.423	.324	.386	.441	.408	.439	.422	.459	.432	.464	.551	.496	.282	.443	.454	.543	.489	.357	.412	.450	.388	.399	.337	.268	.131	.269	.249	- 075	.179
E6		.298	.533	.666	.649	.597	.564	00.1 0	.473	.420	.470	.339	.300	.391	.464	.463	.446	.330	.374	.414	.465	.510	.387	.410	.307	.363	.135	.378	.378	.475	.369	.349	.402	.366	.403	.427	.369	.239	.012	.037	.250	- 660	.112
E7		.251	.373	.491	.479	.417	.589	.473	00.1	.745	.637	.515	.517	.482	.493	.432	.436	.370	:535	.515	.510	.546	.505	.384	.449	.595	358	.457	.471	.598	.597	.396	.558	.544	.411	.548	.556	.368	.231	.157	.302	- .035	.152
E8		.373	.446	.554	.578	.459	.583	.420	.745	00.1	.575	.547	.500	.534	.385	.448	.454	.412	.496	.524	.467	.553	.429	.335	.464	.494	.310	.403	.465	.531	.547	.270	.507	.529	.383	.479	.450	.312	.228	.162	.247	.067	.145
E9		.370	.393	.467	.520	.438	.412	.470	.637	.575	00. L	.594	.580	.580	.571	609.	.427	.387	.538	.579	.583	.635	.490	.469	.411	.570	.291	.488	.531	.492	.547	.357	.514	.491	.455	.565	.435	.322	.216	.167	.288	.020	.168
E10		.292	.337	.402	.431	.403	.422	.339	.515	.547	.594	00.1 0	.751	.558	.406	.516	.438	.439	.548	.474	.497	.563	.313	.351	.412	.467	.277	.432	.532	.496	.418	.422	.526	.426	.322	.389	.312	.364	.228	.155	.300	.114	.158
E11		.251	.273	.355	.415	.407	.429	.300	.517	.500	.580	.751	00.1	.628	.375	.475	.470	.374	.510	.519	.518	.608	.442	.463	.565	.605	399	.453	.536	.465	.474	.438	.501	.482	.378	.371	.370	.424	.217	.233	.255	.035	.150
E12		395	.405	.463	.495	.379	.470	.391	.482	.534	.580	.558	.628	00.1	.393	.477	.533	.460	.524	.519	.512	.585	.547	.581	.501	.516	.274	.482	.503	.527	.548	.415	.442	.466	.359	.497	.469	.311	.181	.327	.289	-056	.213
E13		.230	.330	.435	.584	.331	.423	.464	.493	.385	.571	.406	.375	.393	00.1	.641	.513	.540	.556	.505	.660	.589	.575	.620	.382	.499	.340	.496	.477	.563	.634	.251	.430	.462	.476	.465	.438	.428	.286	.176	.216	.007	.177
E14		.203	.402	.393	.498	.405	.324	.463	.432	.448	609.	.516	.475	.477	.641	00.1	.633	.550	.566	.538	.573	.633	.473	.513	.401	.446	.313	.501	.499	.544	.509	.351	.530	.532	.493	.475	.387	.365	.264	.156	.294	000	600.
E15		.279	.371	.441	.501	.383	.386	.446	.436	.454	.427	.438	.470	.533	.513	.633	00.1	.643	.615	.579	.521	.621	.524	.478	.478	.472	.325	.496	.463	.542	.526	.391	.551	.455	.470	.501	.520	.462	.338	.179	.263	- 014	.227
E16		.318	.325	.418	.431	.392	.441	.330	370	.412	.387	.439	.374	.460	.540	.550	.643	00.1	.630	.442	.495	.486	.477	.554	.503	.429	.224	.446	.428	.551	.426	.267	.437	.388	.335	.436	.450	.458	.364	.236	.199	- 042	.215
E17		.267	.331	.409	.371	.308	.408	.374	.535	.496	.538	.548	.510	.524	.556	.566	.615	.630	00.1	.713	.583	.529	.579	.531	.519	.576	.337	.523	.458	.471	.586	.408	.571	.525	.459	.478	.467	.462	.446	.308	.357	.031	.255
E18		.303	.391	.526	.516	.313	.439	.414	.515	.524	.579	.474	.519	.519	.505	.538	.579	.442	.713	00.1 0	.680	.575	.575	.467	.459	.553	.364	.478	.476	.491	.629	.435	.464	.577	.504	.525	.379	.364	.265	.220	.300	.027	.169
E19		.247	.430	.515	.508	.351	.422	.465	.510	.467	.583	.497	.518	.512	.660	.573	.521	.495	.583	.680	00'L	.636	.658	.544	.471	.519	.344	.490	.462	.564	.563	.331	.402	.497	.469	.468	.419	.364	.171	.149	.203	.063	.181
E20		.339	.384	.468	.568	.540	.459	.510	.546	.553	.635	.563	.608	.585	.589	.633	.621	.486	.529	575.	.636	00.1 0	.667	.606	.515	.588	.416	.539	.662	.574	.612	.525	.614	.580	.619	.571	.477	.499	.216	.190	.195	.065	.155
E21		.320	.364	.430	.466	398	.432	.387	.505	.429	.490	.313	.442	.547	.575	.473	.524	.477	.579	.575	.658	.667	1.00 0	.640	.580	.637	.429	.542	.486	.540	.619	.449	.508	.608	.608	.659	.601	.490	.253	.213	.239	-010	.237
E22		.266	.321	.394	.498	.338	.464	.410	.384	.335	.469	.351	.463	.581	.620	.513	.478	.554	.531	.467	.544	.606	.640	1.00 0	.630	.532	.250	.403	.405	.547	.566	.329	.527	.579	.443	.450	.506	.466	.179	.228	.252	-128	.089
E23		.335	.425	390	.450	.452	.551	.307	.449	.464	.411	.412	.565	.501	.382	.401	.478	.503	.519	.459	.471	.515	.580	.630	00.1	.681	.462	.499	.495	.487	.533	.408	.502	.522	.359	.440	.488	.490	.296	.313	.234	- 044	.241
E24		.293	.318	.422	.453	.452	.496	.363	.595	.494	.570	.467	.605	.516	.499	.446	.472	.429	.576	.553	.519	.588	.637	.532	.681	00.1	909.	.640	.629	.506	609.	.493	.529	.471	.459	.577	.477	.428	.378	.258	.339	- 065	.244
E25		.258	.270	.260	.264	.332	.282	.135	.358	.310	.291	.277	399	.274	.340	.313	.325	.224	.337	.364	.344	.416	.429	.250	.462	.606	00.1	.574	.620	.376	.510	.356	.305	.370	.370	.339	.334	.386	.318	.206	.271	.124	.260
E26		.378	.376	.423	.485	.539	.443	.378	.457	.403	.488	.432	.453	.482	.496	.501	.496	.446	.523	.478	.490	.539	.542	.403	.499	.640	.574	00. L	.759	.564	.580	.497	.491	.368	.438	.474	.418	.439	.211	.263	.369	.114	.237
E27		.335	.318	.436	.502	.442	.454	.378	.471	.465	.531	.532	.536	.503	.477	.499	.463	.428	.458	.476	.462	.662	.486	.405	.495	.629	.620	.759	00.1	.620	.580	.460	.474	.435	.481	.481	.404	.471	.166	.218	.255	.036	.171
E28		.305	.347	.502	.531	.487	.543	.475	598	.531	.492	.496	.465	.527	.563	.544	.542	.551	.471	.491	.564	.574	.540	.547	.487	.506	.376	.564	.620	00.1 0	.664	.406	.526	.594	.489	.551	.468	.384	.261	.203	.415	- 019	.197
E29		.326	.258	.420	.479	.425	.489	.369	.597	.547	.547	.418	.474	.548	.634	.509	.526	.426	.586	.629	.563	.612	.619	.566	.533	609.	.510	.580	.580	.664	00.1 0	.476	.523	.638	.511	.495	.531	.476	.346	.234	.342	.002	.236
E30		.281	.123	.216	.167	.394	.357	.349	.396	.270	.357	.422	.438	.415	.251	.351	.391	.267	.408	.435	.331	.525	.449	.329	.408	.493	.356	.497	.460	.406	.476	00.1 0	.642	.426	.438	.368	.363	.503	.161	.168	.352	.108	.197

 Table 13-12: Correlations between independent variables (for regression between the KS enablers and the effectiveness of knowledge sharing between stakeholders (Q11))

E31	.352	.351	.370	.405	.496	.412	.402	.558	.507	.514	.526	.501	.442	.430	.530	.551	.437	.571	.464	.402	.614	.508	.527	.502	.529	.305	.491	.474	.526	.523	.642	00.1	.736	.607	.549	.540	.586	.230	.220	.284	.132	690.
E32	.302	.390	.481	.446	.385	.450	.366	.544	.529	.491	.426	.482	.466	.462	.532	.455	.388	.525	.577	.497	.580	.608	.579	.522	.471	.370	.368	.435	.594	.638	.426	.736	00.1 0	.662	.601	.579	.575	.175	.160	.246	.061	.063
E33	.236	.314	.442	.472	.440	.388	.403	.411	.383	.455	.322	.378	.359	.476	.493	.470	.335	.459	.504	.469	.619	.608	.443	.359	.459	.370	.438	.481	.489	.511	.438	.607	.662	00.1 0	.601	.452	.550	.155	.179	.162	.077	.133
E34	.348	.418	.518	.464	.426	.399	.427	.548	.479	.565	.389	.371	.497	.465	.475	.501	.436	.478	.525	.468	.571	.659	.450	.440	.577	.339	.474	.481	.551	.495	.368	.549	.601	.601	00.1 0	.745	.446	.250	.192	.342	- 00	.169
E35	.273	.291	.375	.312	.263	.337	.369	.556	.450	.435	.312	.370	.469	.438	.387	.520	.450	.467	.379	.419	.477	.601	.506	.488	.477	.334	.418	.404	.468	.531	.363	.540	.579	.452	.745	00.1 0	.572	.175	.256	.319	123	.197
E36	.302	.212	.291	.314	.325	.268	.239	.368	.312	.322	.364	.424	.311	.428	.365	.462	.458	.462	.364	.364	.499	.490	.466	.490	.428	.386	.439	.471	.384	.476	.503	.586	.575	.550	.446	.572	00.1 0	.237	.073	.192	960.	.150
Extr aver sion	.078	.109	.132	.110	.126	.131	.012	.231	.228	.216	.228	.217	.181	.286	.264	.338	.364	.446	.265	.171	.216	.253	.179	.296	.378	.318	.211	.166	.261	.346	.161	.230	.175	.155	.250	.175	.237	1.00 0	.348	.425	- 149	.393
Agre eabl enes s	.134	.142	.134	.171	.094	.269	.037	.157	.162	.167	.155	.233	.327	.176	.156	.179	.236	.308	.220	.149	.190	.213	.228	.313	.258	.206	.263	.218	.203	.234	.168	.220	.160	.179	.192	.256	.073	.348	00.1	.438	- 189	.196
Con scie ntiou snes s	.162	.171	.229	.217	.266	.249	.250	.302	.247	.288	.300	.255	.289	.216	.294	.263	.199	.357	.300	.203	.195	.239	.252	.234	.339	.271	.369	.255	.415	.342	.352	.284	.246	.162	.342	.319	.192	.425	.438	00.1	- 087	.389
Neur otici sm	.102	.054	-023	600°	690'	-075	- 099	- 035	.067	.020	.114	.035	- 056	200.	000.	-014	.042	.031	.027	.063	.065	-010	-128	044	-065	.124	.114	.036	-019	.002	.108	.132	.061	270.	- 00	-123	960.	- 149	- 189	- 087	00.1	- -
Ope nnes s	.245	.159	.154	.160	.239	.179	.112	.152	.145	.168	.158	.150	.213	.177	600.	.227	.215	.255	.169	.181	.155	.237	680.	.241	.244	.260	.237	.171	.197	.236	.197	690.	.063	.133	.169	.197	.150	.393	.196	.389	- 099	00.1

Table 13-13:Correlations between independent variables (for regression between the KS barriers and the rate of knowledge sharing contribution to project success (Q7))

Correlatio ns																				-	ŝ	ess		
	Q7	B1	B2	В3	В4	В5	В6	В7	В8	В9	B1 0	B1 1	B1 2	B1 3	B1 4	B1 5	B1 6	B1 7	B1 8	Extraversion	Agreeablenes	Conscientiousn	Neuroticism	Openness
Q7	1. 00 0	.0 65	.0 56	.2 37	.0 15	.0 76	.0 45	.1 06	.1 03	.2 01	.1 08	.0 50	- .0 34	.1 94	.0 27	- .0 96	.0 77	.0 84	.1 87	.0 44	- .0 37	.1 20	- .1 42	.0 45
B1	.0 65	1. 00 0	.4 25	.3 27	.2 57	.2 51	.2 76	.2 64	.2 30	.2 54	.0 64	.2 48	.3 37	.2 98	.1 95	.1 62	.2 07	.2 97	.1 74	.0 64	.0 41	.2 18	.0 59	.2 55
B2	.0 56	.4 25	1. 00 0	.7 08	.4 94	.5 13	.5 20	.4 98	.5 24	.4 14	.4 14	.4 60	.4 84	.5 53	.4 86	.2 98	.4 41	.4 96	.3 84	.0 49	.0 63	.1 20	.0 46	.1 34
B3	.2 37	.3 27	.7 08	1. 00 0	.4 94	.6 40	.5 80	.6 77	.7 22	.5 11	.4 43	.5 77	.4 99	.5 62	.4 80	.3 08	.5 11	.6 29	.4 94	- .0 04	- .0 53	.0 84	.0 76	.0 21
B4	.0 15	.2 57	.4 94	.4 94	1. 00 0	.6 08	.5 08	.4 12	.4 50	.4 40	.5 36	.4 11	.4 39	.4 73	.4 33	.3 51	.3 87	.4 70	.4 60	.0 32	- .0 36	.1 19	.1 14	.1 86
B5	.0 76	.2 51	.5 13	.6 40	.6 08	1. 00 0	.7 36	.6 98	.7 02	.5 66	.6 20	.5 58	.5 02	.5 28	.4 32	.3 67	.4 66	.6 59	.4 98	.0 00	.0 15	.0 12	.0 82	.1 20
B6	.0 45	.2 76	.5 20	.5 80	.5 08	.7 36	1. 00 0	.6 45	.6 72	.4 92	.5 23	.4 87	.4 51	.4 41	.3 69	.1 74	.4 39	.5 81	.4 40	- .0 17	.0 32	.0 87	.0 12	.0 25
B7	.1 06	.2 64	.4 98	.6 77	.4 12	.6 98	.6 45	1. 00 0	.7 42	.5 66	.5 47	.6 56	.5 57	.5 21	.4 61	.3 34	.4 82	.6 57	.4 14	.0 11	- .0 42	.0 20	.1 13	- .0 40
B8	.1 03	.2 30	.5 24	.7 22	.4 50	.7 02	.6 72	.7 42	1. 00 0	.5 95	.5 74	.6 06	.4 71	.4 78	.4 76	.3 17	.4 99	.5 94	.4 05	- .0 22	- .0 38	- .0 52	۔ 0. 16	- .0 90
B9	.2 01	.2 54	.4 14	.5 11	.4 40	.5 66	.4 92	.5 66	.5 95	1. 00 0	.6 20	.4 22	.4 20	.4 71	.4 16	.4 18	.4 23	.5 25	.4 12	.0 19	.0 34	.0 70	.1 23	.0 19
B10	.1 08	.0 64	.4 14	.4 43	.5 36	.6 20	.5 23	.5 47	.5 74	.6 20	1. 00 0	.4 69	.4 09	.3 67	.4 27	.4 28	.6 03	.5 65	.5 50	.0 22	.0 06	.1 70	.0 00	.0 53
B11	.0 50	.2 48	.4 60	.5 77	.4 11	.5 58	.4 87	.6 56	.6 06	.4 22	.4 69	1. 00 0	.7 11	.4 46	.4 53	.3 07	.4 39	.6 08	.3 62	.0 42	.0 45	.0 65	.0 82	.0 29
B12	- .0 34	.3 37	.4 84	.4 99	.4 39	.5 02	.4 51	.5 57	.4 71	.4 20	.4 09	.7 11	1. 00 0	.6 04	.5 55	.4 68	.4 39	.5 65	.3 87	.0 90	.0 14	.1 12	.1 29	.0 73

B13	.1 94	.2 98	.5 53	.5 62	.4 73	.5 28	.4 41	.5 21	.4 78	.4 71	.3 67	.4 46	.6 04	1. 00 0	.5 78	.4 27	.2 70	.5 21	.4 48	- .0 53	۔ 0. 66	.0 39	.1 89	- .0 50
B14	.0 27	.1 95	.4 86	.4 80	.4 33	.4 32	.3 69	.4 61	.4 76	.4 16	.4 27	.4 53	.5 55	.5 78	1. 00 0	.5 15	.4 88	.5 11	.4 44	.0 99	.0 89	.2 18	.1 29	.0 86
B15	- .0 96	.1 62	.2 98	.3 08	.3 51	.3 67	.1 74	.3 34	.3 17	.4 18	.4 28	.3 07	.4 68	.4 27	.5 15	1. 00 0	.5 16	.4 15	.4 86	.0 21	.0 24	.0 30	.2 09	.0 93
B16	.0 77	.2 07	.4 41	.5 11	.3 87	.4 66	.4 39	.4 82	.4 99	.4 23	.6 03	.4 39	.4 39	.2 70	.4 88	.5 16	1. 00 0	.6 17	.5 75	.0 74	.0 33	.0 91	.0 60	.1 36
B17	.0 84	.2 97	.4 96	.6 29	.4 70	.6 59	.5 81	.6 57	.5 94	.5 25	.5 65	.6 08	.5 65	.5 21	.5 11	.4 15	.6 17	1. 00 0	.6 49	.1 34	.1 50	.1 64	.0 08	.1 38
B18	.1 87	.1 74	.3 84	.4 94	.4 60	.4 98	.4 40	.4 14	.4 05	.4 12	.5 50	.3 62	.3 87	.4 48	.4 44	.4 86	.5 75	.6 49	1. 00 0	.1 21	- .0 13	.1 52	.1 45	.0 78
Extraversio n	.0 44	.0 64	.0 49	- .0 04	.0 32	.0 00	- .0 17	.0 11	- .0 22	.0 19	.0 22	.0 42	.0 90	- .0 53	.0 99	.0 21	.0 74	.1 34	.1 21	1. 00 0	.3 48	.4 25	- .1 49	.3 93
Agreeablen ess	- .0 37	.0 41	.0 63	- .0 53	- .0 36	.0 15	.0 32	- .0 42	- .0 38	.0 34	.0 06	.0 45	.0 14	- .0 66	.0 89	.0 24	.0 33	.1 50	- .0 13	.3 48	1. 00 0	.4 38	- .1 89	.1 96
Conscientio usness	.1 20	.2 18	.1 20	.0 84	.1 19	.0 12	.0 87	.0 20	- .0 52	.0 70	.1 70	.0 65	.1 12	.0 39	.2 18	.0 30	.0 91	.1 64	.1 52	.4 25	.4 38	1. 00 0	- .0 87	.3 89
Neuroticis m	- .1 42	.0 59	.0 46	.0 76	.1 14	.0 82	.0 12	.1 13	- .0 16	.1 23	.0 00	.0 82	.1 29	.1 89	.1 29	.2 09	.0 60	.0 08	.1 45	.1 49	- .1 89	- .0 87	1. 00 0	- .0 99
Openness	.0 45	.2 55	.1 34	.0 21	.1 86	.1 20	.0 25	- .0 40	- .0 90	.0 19	.0 53	.0 29	.0 73	- .0 50	.0 86	.0 93	.1 36	.1 38	.0 78	.3 93	.1 96	.3 89	- .0 99	1. 00 0

Table 13-14:Correlations between independent variables (for regression between the KS barriers and the quality of timeliness of shared knowledge in the infrastructural projects (Q10))

Correlatio ns	Q1 0	B1	B2	В3	Β4	В5	B6	B7	B8	В9	B1 0	B1 1	B1 2	B1 3	B1 4	B1 5	B1 6	B1 7	B1 8	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Q10	1. 00 0	.0 75	.0 55	- .0 19	.0 95	- .0 21	.1 45	- .0 20	.0 15	.1 20	.1 58	.1 29	.1 90	.0 35	.1 32	.1 10	.1 38	.0 80	.0 13	.1 09	.0 63	.2 86	.0 70	.2 06
B1	.0 75	1. 00 0	.4 25	.3 27	.2 57	.2 51	.2 76	.2 64	.2 30	.2 54	.0 64	.2 48	.3 37	.2 98	.1 95	.1 62	.2 07	.2 97	.1 74	.0 64	.0 41	.2 18	.0 59	.2 55
B2	.0 55	.4 25	1. 00 0	.7 08	.4 94	.5 13	.5 20	.4 98	.5 24	.4 14	.4 14	.4 60	.4 84	.5 53	.4 86	.2 98	.4 41	.4 96	.3 84	.0 49	.0 63	.1 20	.0 46	.1 34
В3	- .0 19	.3 27	.7 08	1. 00 0	.4 94	.6 40	.5 80	.6 77	.7 22	.5 11	.4 43	.5 77	.4 99	.5 62	.4 80	.3 08	.5 11	.6 29	.4 94	- .0 04	- .0 53	.0 84	.0 76	.0 21
B4	.0 95	.2 57	.4 94	.4 94	1. 00 0	.6 08	.5 08	.4 12	.4 50	.4 40	.5 36	.4 11	.4 39	.4 73	.4 33	.3 51	.3 87	.4 70	.4 60	.0 32	- .0 36	.1 19	.1 14	.1 86
B5	- .0 21	.2 51	.5 13	.6 40	.6 08	1. 00 0	.7 36	.6 98	.7 02	.5 66	.6 20	.5 58	.5 02	.5 28	.4 32	.3 67	.4 66	.6 59	.4 98	.0 00	.0 15	.0 12	.0 82	.1 20
B6	.1 45	.2 76	.5 20	.5 80	.5 08	.7 36	1. 00 0	.6 45	.6 72	.4 92	.5 23	.4 87	.4 51	.4 41	.3 69	.1 74	.4 39	.5 81	.4 40	- .0 17	.0 32	.0 87	.0 12	.0 25
B7	- .0 20	.2 64	.4 98	.6 77	.4 12	.6 98	.6 45	1. 00 0	.7 42	.5 66	.5 47	.6 56	.5 57	.5 21	.4 61	.3 34	.4 82	.6 57	.4 14	.0 11	- .0 42	.0 20	.1 13	- .0 40
B8	.0 15	.2 30	.5 24	.7 22	.4 50	.7 02	.6 72	.7 42	1. 00 0	.5 95	.5 74	.6 06	.4 71	.4 78	.4 76	.3 17	.4 99	.5 94	.4 05	- .0 22	- .0 38	- .0 52	- .0 16	- .0 90

B9	.1	.2	.4	.5	.4	.5	.4	.5	.5	1. 00	.6	.4	.4	.4	.4	.4	.4	.5	.4	.0	.0	.0	.1	.0
	20	54	14	11	40	66	92	66	95	0	20	22	20	/1	16	18	23	25	12	19	34	70	23	19
B10	.1 58	.0 64	.4 14	.4 43	.5 36	.6 20	.5 23	.5 47	.5 74	.6 20	1. 00 0	.4 69	.4 09	.3 67	.4 27	.4 28	.6 03	.5 65	.5 50	.0 22	.0 06	.1 70	0. 00	.0 53
B11	.1 29	.2 48	.4 60	.5 77	.4 11	.5 58	.4 87	.6 56	.6 06	.4 22	.4 69	1. 00 0	.7 11	.4 46	.4 53	.3 07	.4 39	.6 08	.3 62	.0 42	.0 45	.0 65	.0 82	.0 29
B12	.1 90	.3 37	.4 84	.4 99	.4 39	.5 02	.4 51	.5 57	.4 71	.4 20	.4 09	.7 11	1. 00 0	.6 04	.5 55	.4 68	.4 39	.5 65	.3 87	.0 90	.0 14	.1 12	.1 29	.0 73
B13	.0 35	.2 98	.5 53	.5 62	.4 73	.5 28	.4 41	.5 21	.4 78	.4 71	.3 67	.4 46	.6 04	1. 00 0	.5 78	.4 27	.2 70	.5 21	.4 48	- .0 53	- .0 66	.0 39	.1 89	- .0 50
B14	.1 32	.1 95	.4 86	.4 80	.4 33	.4 32	.3 69	.4 61	.4 76	.4 16	.4 27	.4 53	.5 55	.5 78	1. 00 0	.5 15	.4 88	.5 11	.4 44	.0 99	.0 89	.2 18	.1 29	.0 86
B15	.1 10	.1 62	.2 98	.3 08	.3 51	.3 67	.1 74	.3 34	.3 17	.4 18	.4 28	.3 07	.4 68	.4 27	.5 15	1. 00 0	.5 16	.4 15	.4 86	.0 21	.0 24	.0 30	.2 09	.0 93
B16	.1 38	.2 07	.4 41	.5 11	.3 87	.4 66	.4 39	.4 82	.4 99	.4 23	.6 03	.4 39	.4 39	.2 70	.4 88	.5 16	1. 00 0	.6 17	.5 75	.0 74	.0 33	.0 91	.0 60	.1 36
B17	.0 80	.2 97	.4 96	.6 29	.4 70	.6 59	.5 81	.6 57	.5 94	.5 25	.5 65	.6 08	.5 65	.5 21	.5 11	.4 15	.6 17	1. 00 0	.6 49	.1 34	.1 50	.1 64	.0 08	.1 38
B18	.0 13	.1 74	.3 84	.4 94	.4 60	.4 98	.4 40	.4 14	.4 05	.4 12	.5 50	.3 62	.3 87	.4 48	.4 44	.4 86	.5 75	.6 49	1. 00 0	.1 21	۔ 0. 13	.1 52	.1 45	.0 78
Extraversio n	.1 09	.0 64	.0 49	- .0 04	.0 32	.0 00	۔ 0. 17	.0 11	۔ 0. 22	.0 19	.0 22	.0 42	.0 90	- .0 53	.0 99	.0 21	.0 74	.1 34	.1 21	1. 00 0	.3 48	.4 25	.1 49	.3 93
Agreeablen ess	.0 63	.0 41	.0 63	- .0 53	- .0 36	.0 15	.0 32	- .0 42	- .0 38	.0 34	.0 06	.0 45	.0 14	- .0 66	.0 89	.0 24	.0 33	.1 50	۔ 0. 13	.3 48	1. 00 0	.4 38	- .1 89	.1 96
Conscientio usness	.2 86	.2 18	.1 20	.0 84	.1 19	.0 12	.0 87	.0 20	.0 52	.0 70	.1 70	.0 65	.1 12	.0 39	.2 18	.0 30	.0 91	.1 64	.1 52	.4 25	.4 38	1. 00 0	۔ 0. 87	.3 89
Neuroticis m	.0 70	.0 59	.0 46	.0 76	.1 14	.0 82	.0 12	.1 13	.0 16	.1 23	.0 00	.0 82	.1 29	.1 89	.1 29	.2 09	.0 60	.0 80	.1 45	- .1 49	.1 89	- .0 87	1. 00 0	.0 99
Openness	.2 06	.2 55	.1 34	.0 21	.1 86	.1 20	.0 25	.0 40	.0 90	.0 19	.0 53	.0 29	.0 73	.0 50	.0 86	.0 93	.1 36	.1 38	.0 78	.3 93	.1 96	.3 89	.0 99	1. 00 0

Table	13-15:	Correlatio	ns betwee	n independen	t variables	(for	regression	between	the	KS
barrie	rs and	the effectiv	eness of k	nowledge sha	ring betwee	en sta	akeholders	( <b>Q11</b> ))		

Correlatio ns	Q1 1	B1	В2	B3	В4	В5	В6	В7	B8	В9	B1 0	B1 1	B1 2	B1 3	B1 4	B1 5	B1 6	B1 7	B1 8	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Q11	1. 00 0	.1 03	.1 05	.1 32	.1 83	.1 42	.1 60	.0 99	.1 43	.1 77	.1 79	.2 40	.2 49	.0 71	.1 76	.2 48	.1 56	.1 37	.0 07	.0 78	.1 34	.1 62	.1 02	.2 45
B1	.1 03	1. 00 0	.4 25	.3 27	.2 57	.2 51	.2 76	.2 64	.2 30	.2 54	.0 64	.2 48	.3 37	.2 98	.1 95	.1 62	.2 07	.2 97	.1 74	.0 64	.0 41	.2 18	.0 59	.2 55
B2	.1 05	.4 25	1. 00 0	.7 08	.4 94	.5 13	.5 20	.4 98	.5 24	.4 14	.4 14	.4 60	.4 84	.5 53	.4 86	.2 98	.4 41	.4 96	.3 84	.0 49	.0 63	.1 20	.0 46	.1 34
В3	.1 32	.3 27	.7 08	1. 00 0	.4 94	.6 40	.5 80	.6 77	.7 22	.5 11	.4 43	.5 77	.4 99	.5 62	.4 80	.3 08	.5 11	.6 29	.4 94	- .0 04	- .0 53	.0 84	.0 76	.0 21
B4	.1 83	.2 57	.4 94	.4 94	1. 00 0	.6 08	.5 08	.4 12	.4 50	.4 40	.5 36	.4 11	.4 39	.4 73	.4 33	.3 51	.3 87	.4 70	.4 60	.0 32	- .0 36	.1 19	.1 14	.1 86
B5	.1 42	.2 51	.5 13	.6 40	.6 08	1. 00 0	.7 36	.6 98	.7 02	.5 66	.6 20	.5 58	.5 02	.5 28	.4 32	.3 67	.4 66	.6 59	.4 98	.0 00	.0 15	.0 12	.0 82	.1 20
B6	.1 60	.2 76	.5 20	.5 80	.5 08	.7 36	1. 00 0	.6 45	.6 72	.4 92	.5 23	.4 87	.4 51	.4 41	.3 69	.1 74	.4 39	.5 81	.4 40	- .0 17	.0 32	.0 87	.0 12	.0 25

B7	.0 99	.2 64	.4 98	.6 77	.4 12	.6 98	.6 45	1. 00 0	.7 42	.5 66	.5 47	.6 56	.5 57	.5 21	.4 61	.3 34	.4 82	.6 57	.4 14	.0 11	- .0 42	.0 20	.1 13	- .0 40
B8	.1 43	.2 30	.5 24	.7 22	.4 50	.7 02	.6 72	.7 42	1. 00 0	.5 95	.5 74	.6 06	.4 71	.4 78	.4 76	.3 17	.4 99	.5 94	.4 05	- .0 22	- .0 38	- .0 52	- .0 16	.0 90
B9	.1 77	.2 54	.4 14	.5 11	.4 40	.5 66	.4 92	.5 66	.5 95	1. 00 0	.6 20	.4 22	.4 20	.4 71	.4 16	.4 18	.4 23	.5 25	.4 12	.0 19	.0 34	.0 70	.1 23	.0 19
B10	.1 79	.0 64	.4 14	.4 43	.5 36	.6 20	.5 23	.5 47	.5 74	.6 20	1. 00 0	.4 69	.4 09	.3 67	.4 27	.4 28	.6 03	.5 65	.5 50	.0 22	.0 06	.1 70	.0 00	.0 53
B11	.2 40	.2 48	.4 60	.5 77	.4 11	.5 58	.4 87	.6 56	.6 06	.4 22	.4 69	1. 00 0	.7 11	.4 46	.4 53	.3 07	.4 39	.6 08	.3 62	.0 42	.0 45	.0 65	.0 82	.0 29
B12	.2 49	.3 37	.4 84	.4 99	.4 39	.5 02	.4 51	.5 57	.4 71	.4 20	.4 09	.7 11	1. 00 0	.6 04	.5 55	.4 68	.4 39	.5 65	.3 87	.0 90	.0 14	.1 12	.1 29	.0 73
B13	.0 71	.2 98	.5 53	.5 62	.4 73	.5 28	.4 41	.5 21	.4 78	.4 71	.3 67	.4 46	.6 04	1. 00 0	.5 78	.4 27	.2 70	.5 21	.4 48	- .0 53	- .0 66	.0 39	.1 89	- .0 50
B14	.1 76	.1 95	.4 86	.4 80	.4 33	.4 32	.3 69	.4 61	.4 76	.4 16	.4 27	.4 53	.5 55	.5 78	1. 00 0	.5 15	.4 88	.5 11	.4 44	.0 99	.0 89	.2 18	.1 29	.0 86
B15	.2 48	.1 62	.2 98	.3 08	.3 51	.3 67	.1 74	.3 34	.3 17	.4 18	.4 28	.3 07	.4 68	.4 27	.5 15	1. 00 0	.5 16	.4 15	.4 86	.0 21	.0 24	.0 30	.2 09	.0 93
B16	.1 56	.2 07	.4 41	.5 11	.3 87	.4 66	.4 39	.4 82	.4 99	.4 23	.6 03	.4 39	.4 39	.2 70	.4 88	.5 16	1. 00 0	.6 17	.5 75	.0 74	.0 33	.0 91	.0 60	.1 36
B17	.1 37	.2 97	.4 96	.6 29	.4 70	.6 59	.5 81	.6 57	.5 94	.5 25	.5 65	.6 08	.5 65	.5 21	.5 11	.4 15	.6 17	1. 00 0	.6 49	.1 34	.1 50	.1 64	.0 08	.1 38
B18	.0 07	.1 74	.3 84	.4 94	.4 60	.4 98	.4 40	.4 14	.4 05	.4 12	.5 50	.3 62	.3 87	.4 48	.4 44	.4 86	.5 75	.6 49	1. 00 0	.1 21	.0 13	.1 52	.1 45	.0 78
Extraversio n	.0 78	.0 64	.0 49	- .0 04	.0 32	.0 00	- .0 17	.0 11	- .0 22	.0 19	.0 22	.0 42	.0 90	- .0 53	.0 99	.0 21	.0 74	.1 34	.1 21	1. 00 0	.3 48	.4 25	- .1 49	.3 93
Agreeablen ess	.1 34	.0 41	.0 63	- .0 53	- .0 36	.0 15	.0 32	- .0 42	- .0 38	.0 34	.0 06	.0 45	.0 14	- .0 66	.0 89	.0 24	.0 33	.1 50	- .0 13	.3 48	1. 00 0	.4 38	- .1 89	.1 96
Conscientio usness	.1 62	.2 18	.1 20	.0 84	.1 19	.0 12	.0 87	.0 20	- .0 52	.0 70	.1 70	.0 65	.1 12	.0 39	.2 18	.0 30	.0 91	.1 64	.1 52	.4 25	.4 38	1. 00 0	- .0 87	.3 89
Neuroticis m	.1 02	.0 59	.0 46	.0 76	.1 14	.0 82	.0 12	.1 13	- .0 16	.1 23	.0 00	.0 82	.1 29	.1 89	.1 29	.2 09	.0 60	.0 08	.1 45	- .1 49	- .1 89	- .0 87	1. 00 0	- .0 99
Openness	.2 45	.2 55	.1 34	.0 21	.1 86	.1 20	.0 25	- .0 40	- .0 90	.0 19	.0 53	.0 29	.0 73	- .0 50	.0 86	.0 93	.1 36	.1 38	.0 78	.3 93	.1 96	.3 89	- .0 99	1. 00 0