

**Innovation in Public Private Partnership (PPP) in the
UAE Construction Industry**

الإبتكار في الشراكة بين القطاعين العام و الخاص في الصناعات
الإنشائية في دولة الإمارات العربية المتحدة

by

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**A dissertation submitted in fulfilment
of the requirements for the degree of
MSc PROJECT MANAGEMENT**

at

The British University in Dubai

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October 2017

DECLARATION

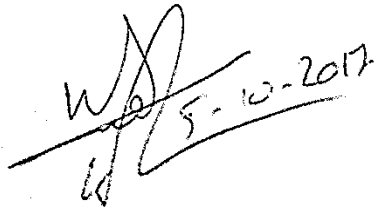
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Abstract

Recently, private public partnership (PPP) has become a research hotspot owing to the advantages it offers in sparing experience and expertise of the private sector in order to best manage public services. However, innovation in PPP was seldom reported in literature for construction projects that are particularly vital for the UAE industry where such procurement methods are uncommon. Consequently, this work aims to identify the impact of innovation implementation elements on the delivery of successful UAE PPPs Projects and enhancement to the projects constraints. A total of 56 innovation experts participated in this research via an online questionnaire. It consisted of 5 major components, namely, innovation drivers, enablers, inputs, barriers, and benefits; further, the questionnaire consisted of 36 questions in total. Results revealed that innovation promote projects success by providing benefits affecting all constraints including decrease in construction duration, increase in client satisfaction, Public and Private sectors long term profitability and future business collaboration. However several barrier factors are impacting innovation such as financial shortage and lack of expertise. The findings of this paper are expected to facilitate both sectors adoption practices to stimulate innovation in UAE PPP developments, and accordingly, to effect the enhancement of projects constraints and assurance of their success.

الخلاصه

في السنوات الاخيره, زاد الاهتمام بفكره الشركه بين القطاعين العام و الخاص للفوائد المستقاه من هذا التعاون, على الرغم من هذه الاهميه فانه من الملاحظ قله الابحاث والمراجع التي تطرح موضوع الحلول الابتكاريه في هذا النوع من التعاون بين القطاعين في المشاريع الانشائيه حيث ان قطاع الانشاء يعد من اهم المقومات الاقتصاديه في دوله الامارات العربيه. هدف هذه الدراسه هو فهم تاثير اسس وعوامل تحفيز الابتكار في المشاريع التي تقوم على اساس الشركه بين القطاعين العام والخاص على نجاح هذه المشاريع وتحسين ادائها العام, من اجل تحقيق هذا الهدف تم اجراء استبيان على 56 خبير في مجال الابتكار, يتحدث الاستبيان عن 5 عناصر هي, محفزات الابتكار و عوامل مساعده ومدخلات العمليه ومعوقات الابتكار بالاضافه الى الفوائد, ويتالف الاستبيان من 36 سؤال. في هذه الدراسه تم التوصل الى ان استخدام اساليب مبتكره في الانشاءات يزيد نسبه نجاح هذه المشاريع حيث تقل مدة التنفيذ وتزيد الكفاءه والانتاجيه بالاضافه الى زياده الربحيه. ولكن في نفس الوقت العوامل المعوقه تؤثر سلبا على الابتكار واهمها نقص التمويل و قلة الكفاءات, نتائج هذه الدراسه سوف تساعد كلا القطاعين في تبني ممارسات عمليه لتحفيز الابتكار في الصناعات الانشائيه و تحديدا في المشاريع التي تقوم على الشركه بين القطاعين العام و الخاص في الامارات العربيه المتحده.

Contents

1. Introduction.....	1
1.1 Problem Statement.....	4
1.2 Research Aim.....	5
1.3 Research Objectives.....	5
1.4 The scope of this paper.....	6
1.5 Research Questions.....	6
1.6 Research Structure.....	7
2. Literature review	9
2.1 Innovation:.....	9
2.1.1 Innovation Dynamics.....	13
2.1.2 Innovation Drivers.....	14
2.1.3 Innovation Barriers.....	16
2.1.4 Innovation Enablers	17
2.1.5 Innovation Inputs	19
2.1.6 Innovation Outputs (Benefits (Outcomes)).....	21
2.2 Public Private Partnership (PPP)	26
2.2.1 Public Private Partnership (PPP's) benefits (Outcomes).....	28
2.2.2 Public Private Partnership (PPP's) and Innovation.....	29
2.2.3 Innovation in the private sector.....	31
2.2.4 Innovation in the Public sector	32
2.2.5 Innovation outcomes in PPP	34
3. Conceptual framework	40
4. Hypothesis.....	41
5. Research Methodology	44
5.1 Theoretical background.....	44
5.2 Sample and Procedures.....	45
5.3 Variables and measures	46
6. Data analysis, Finding and Discussion	47

6.1 Variables and measures	47
6.1.1 Designation	47
6.1.2 Number of innovation experts in participants organizations	47
6.1.3 Interaction between innovation experts and other employees	48
6.1.4 Participants satisfaction regarding the organizations innovation strategies.....	48
6.1.5 Participation in innovation practices	48
6.1.6 Participants organizations engagement in PPP contracts.....	48
7. Results	52
7.1 Reliability test.....	55
7.2 Correlation test (Pearson's Product-Moment Correlation)	56
7.3 Regression test	57
7.3.1 Innovation drivers factors	58
7.3.2 Innovation Enablers factors	60
7.3.3 Innovation Inputs factors	61
7.3.4 Innovation Barriers factors.....	63
8. Discussion.....	66
8.1 Influence of innovation drivers	68
8.2 Influence of innovation enablers	71
8.3 Influence of innovation Inputs	75
8.4 Impact of innovation Barriers	78
9. Conclusion	83
9.1 Recommendations	86
9.2 Limitations of the study	88
9.3 Future researchers:	88
References	89
Appendices	94
Appendix 1 Questionnaire	94

List of Figures

Figure 1: The power of technology and market requirements in innovation. (Preez and Louw, 2008)	2
Figure 2: Innovation benefits (Outcomes)/impacts (Ozorhon et al. 2010)	23
Figure 3: Typical PPP Concession Arrangement (Siemiatycki, 2012)	26
Figure 4: PPP innovation conceptual model	40
Figure 5: Drivers influence on Innovation benefits	69
Figure 6: Enablers influence on Innovation benefits	72
Figure 7: Inputs influence on Innovation benefits	76
Figure 8: Barriers impact on Innovation benefits	79
Figure 9: Innovation benefits influence on PPP projects success	82

List of Tables

Table 1: Innovation types/focus areas	2
Table 2: Examples of PPP collaboration types	3
Table 3: Innovation types	12
Table 4: Innovation Factors	23
Table 5: Questionnaire general information data analysis	49
Table 6: Factors mean, variance and standard deviation	52
Table 7: Cronbach Alpha values	55
Table 8: Survey Correlation values	56
Table 9: Innovation drivers Regression test analysis	58
Table 10: Innovation enablers Regression test analysis	60
Table 11: Innovation inputs Regression test analysis	62
Table 12: Innovation barriers Regression test analysis	63

1. Introduction

The construction industry is evolving at an astounding rate. Consequently, managers find it severely challenging to control the tremendous amount of uncertainties related to their projects, secured strategies, adequate planning as well as proper practices, organisations' performance, and perfection. Nowadays, new challenges have been created with the progressive influence of global economy, politics, competency, and technology that require to be addressed. Developing conditions such as these have resulted in a rising necessity for innovation.

The success of projects in the business environment of the 21st century depends on several important factors. One of these factors is the smart implementation of innovation, regardless of the organisation climate, function, or size. Sustainability and longevity in *fast-moving markets* have become closely interconnected with the ability to adopt the culture of innovation and the way in which these firms' processes are focused towards such methodologies (Hidalgo and Albors, 2008).

Since the beginning of the twentieth century, many researchers attempted to establish a clear definition of innovation. In the 1930s, Joseph Shumpeter, a pioneer researcher and economist in innovation, categorised innovation into five types based on its purpose and characteristics. In Shumpeter's approach, innovation is related to the creation of supply sources, industrial processes' enhancement, new products, or qualitative modifications for a particular product to explore new industries and alterations in the organisation of markets. This classification was the source from which most lecturers derived their definition of innovation in the following years. For example, Zott and Amit (2007) defined innovation as the discovery of new rationales and improved methods for organisations to create profits and define value propositions for clients, partners, and suppliers, and lastly, to perceive additional values for its stakeholders. As an example of Joseph Shumpeter's types, the following

model presents the domination of the industry requirements and the technological competency involved in innovations:

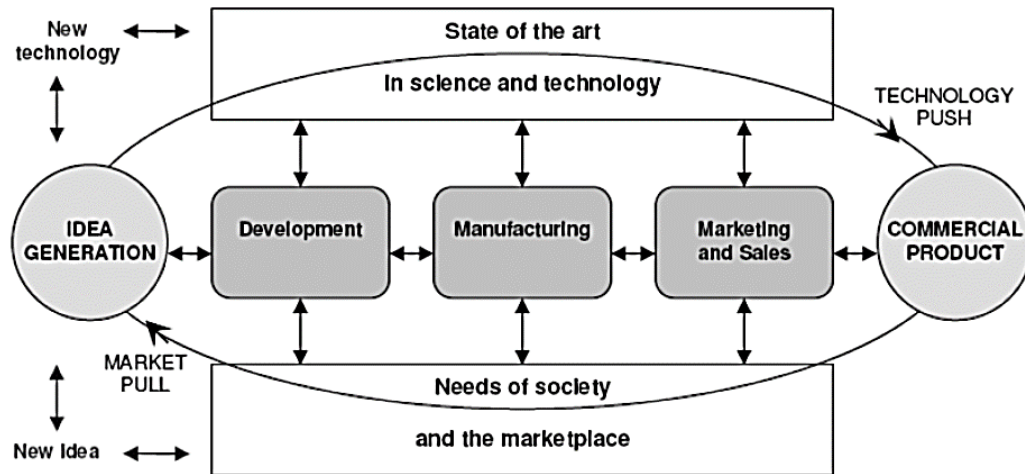


Figure 1: The power of technology and market requirements in innovation. (Preez and Louw, 2008)

The following table displays the central types of innovation/areas of focus, and the respective authors who addressed these types in their studies.

Table 1: Innovation types/focus areas.

No.	Types of Innovation/Focusing area	Author/s
1	Products	Ulwick 2005, Hohmann 2006, Cagan & Vogel 2002
2	Process	Nonaka 1990, Guan & Chen 2010, Goedhuys & Veugelers 2012
3	Business model	Week 2000, Chesbrough 2007, Chesbrough 2010,
4	Source of supply	Swan 1970, Lee 2002, Martínez, D.R.S.,

		Gracia et al., 2017
5	Mergers and Divestments	Hitt et al. 1996, Selgin & Turner 2011, Lougui & Broström 2016

Innovation in methods to stimulate the economy by enhancing the factors that initiate mega projects' construction has led to the creation of a new form of agreement between governments and private companies. Since the 1990s, the significance of public and private sectors' cooperation has witnessed a massive increase; the government is no longer considered solely responsible for a country's development and the central body regulating the economy. Since concentrating on both sectors' goals will maximise the efficiency of each entity's targeted objectives and developing outcomes that neither can achieve independently (mutual added value). This understanding has resulted in the formation of fresh collaborative framework including Governance Collaboration and PPP.

Table 2 presents examples of the various types of collaboration and the corresponding authors who addressed these types in their previous studies.

Table 2: Examples of PPP collaboration types

No.	Types of Collaboration	Author/s
1	Governance Collaboration	Ansell and Gash 2008, Emerson <i>et al.</i> 2012, Sorensen & Torfing 2012
2	PPP	Fosler & Berger 1982, Osborne 2002, Cruz & Cruz 2017

Barlow et al. (2013) have defined PPP as a long-term relationship in which the governmental (Public) sector and the private sector engage under pre-agreed terms, time, and conditional contracts. In such a collaboration, the private party is

responsible for investment in, financing, and operation of the public services or projects. The remuneration derived from these developments is usually repaid during the operation phase and mainly obtained from the end users of the development or the service in question (Akintoye et al. 2002).

The central driving factors in the adoption of PPP have transformed, since their foundation in the 1990s. When PPP was promoted, the scarcity of funds was the main factor behind such arrangements. However, nowadays, PPPs are stimulated by alternative factors such as seeking further enhancement of the public service projects' quality and efficiency, and the creation of synergy to effect higher benefits from both parties. The collaboration in this type is generally concentrated on mega infrastructure projects including those on transport, energy, water, public health, and national security (Tvarno 2014).

Consequently, the concept of PPP was considered a non-traditional model of innovation for complicated and enormous projects, in which public sector attains enhanced results and greater values, benefitting from the expertise and professionalism of the private sector in the following aspects:

- Risk and cost management and identification
- Assessing market capacity and requirements
- Raising finance for projects
- Enhancement of the efficiency and quality of services
- Coordinating the operational whole of life cost with capital cost

1.1 Problem Statement

A strategic integration of organisations' tendency towards innovation, and its synergic management has invariably caused the advancement of individual and team performances, and eventually, the ability to deliver a successful project. Nevertheless, this practice was implemented and highlighted by researchers merely for traditional procurements routes in which public sector, private sector, and operators work

separately, focusing efforts to deliver independent scope, strategic goals, and objectives. In addition, it was observed that the studies concerning innovation in the UAE construction industry and PPP based projects in particular, are limited.

At the same time, innovation and PPP were discussed on a different platform in which PPP was indicated as a driving factor for innovation. Witters et al. (2012) emphasised this perspective with the claim that PPPs is a critical instrument for innovation; it drives a broader set of talents and skills. In addition to the promotion of a more responsive and diligent work environment in government machineries, which forms a firm foundation for creativity and innovative thinking, innovation further provides the private sector the opportunity to practice it in the management of extensive capital and financial resources that exceed their traditional capacities.

Furthermore, innovation in PPPs is inadequately understood and requires further research and elaboration to narrow the gap between innovation in PPPs and its conceptual framework (Veiko Lember et al. 2014)

1.2 Research Aim

The aim of this research is to identify the impact of the implementation of elements of innovation on the delivery of successful PPP projects and enhancement to the projects constraints

1.3 Research Objectives

- Identify the main drivers and enablers factors for innovation in PPP Developments.
- Identify main barriers factors for innovation in PPP Developments.
- Identify the main input factors for innovation in PPP Developments.
- Set up a conceptual framework that links innovation implementation elements (innovation performance determinants) and performance indicators (innovation benefits (Outcomes)) to the enhancement to the PPP construction constraints (time, cost, quality, etc.) in the UAE

- Investigate the impact of processes, services and products innovations on the enhancement to the PPP construction constraints (time, cost and quality) throughout all stages.

1.4 The scope of this paper

Due to the increasing significance of innovation for organisations outstanding performance and its significant role in today's business environment, emphasising this significance is extremely for PPP development and UAE construction projects in general. Based on this study, a questionnaire was conducted for relevant business personnel to evaluate the influence/impact of implementation of elements of innovation (innovation drivers, enablers, inputs, and barriers) and performance indicators (Outcomes) on the delivery of successful PPP projects and enhancement of the projects' constraints through all the stages, from initiation and operation of the project to the public sector's taking over.

Based on that, a set of recommendations will be formulated. The findings of the research are indicative due to the limitation constituted by the number of participants and the selected practices.

1.5 Research Questions

The following questions are forming the main structure of the questionnaire and the conceptual model will be built reflecting these questions

- What are the innovation implementation elements (driver, enabler, input and barrier factors) in PPP developments in the UAE?
- What is the influence / impact of innovation implementation elements (drivers, enablers and inputs factors) on innovation benefits in PPP developments in the UAE?
-
- What are the innovation performance indicators (innovation benefits Outcomes)) in PPP developments in the UAE?

- What is the impact of performance indicators (innovation benefits (Outcomes)) on PPP developments in the UAE?

1.6 Research Structure

This paper will be structured into two parts; the first part forms the qualitative analysis of innovation for construction projects and PPP projects in particular; the second part will contain the quantitative analysis of the questionnaire completed by a group of professionals for innovation in PPP developments in the UAE construction industry.

The paper is divided into the following chapters:

- **Introduction:** The introduction provides a brief description of the topic, the definition of innovation, and PPP procurement. Further, it furnishes the emphasis laid on this subject by scholars and researchers in existing literature, the statement of the problem that explains the rationale behind conducting this research, the aim, objectives and scope of this paper. In addition, it briefly states the research questions utilised for constructing the questionnaire.
- **Literature review:** This section contains a review of the literature that highlights and introduce the theoretical underpinning of innovation practices, their positive effects on projects, enablers, drivers, barriers to innovation, their impact on projects, and further, discusses innovation and PPP in aa single context.
- **Conceptual model:** A conceptual framework that associates elements of the innovation of implementation (innovation performance determinants) and performance indicators (Outcomes) for the enhancement of PPP construction constraints (time, cost, quality, among others) in the UAE.
- **Hypothesis:** Based on the literature review pertaining to different components of innovation in the PPP construction industry, a set of hypotheses will be developed and tested.

- **The methodology:** This part will clarify the methods that have been considered to elaborate on the assumed hypothesis, answer the questionnaire's structural methodology, and eventually, validate the purpose of this research.
- **Data analysis, findings, and discussion:** The survey data will be analysed through a correlation test, regression test, and reliability test; findings will be formed accordingly and results will be discussed and explained.
- **Conclusions, recommendations, and limitations:** Based on the literature review, conceptual model, questionnaire, and data analysis, a set of conclusions and recommendations will be formulated, highlighting the limitations of this study for future research to build upon.

2. Literature review

2.1 Innovation:

During the early 90s of the 20th century, an increased pressure has been put on the construction industry to enhance the effectiveness and efficiency of the process, methods and techniques practiced in this sector, this pressure have arises from few factors including Public sector limitation in resources, more demanding clients, challenges such as global competition increasing competition and environmental legislation.

The theory that says innovation solutions are driven by the nature of the problem was adopted by Rosenberg (1982), Nam & Tatum (1992) highlighted the same where they stated that investigating innovative solution is a direct result of encountering obstacles in the construction industry and this came from the conservative nature of this industry, on the other hand innovation in the construction sector can be defined as the first implementation of a technology within the organization (Kadhim 2010), as stated by Slaughter (1998), innovation is the use of nontraditional techniques to apply improvement and changes in the system, process or product that is novel to the operation of the institute. Accordingly innovation led to translation of the production by the knowledge which significantly affected by intelligence in all stages, this translation combined with intangible factors that come in association with time in connection with the difficulty within political and social constraints (Kale and Ardit, 2009).

To some people, innovation is the art of welcoming uncertainties and risks regardless of whether its immeasurable or measurable where the success is not guaranteed, as of that the anxiety came from the inevitably (Kuczmariski 2003), to him innovation is instinctive rather that a linear process, in terms of corporate psychology; innovation is a pervasive attitude, a mindset, an ongoing commitment to newness, an emotional state, a feeling that needs tremendous change in the way of

thinking, or to go beyond the present into the future, similarly, other scholars pointed innovation as an action-oriented practical result, developing a philosophy and methodology for achieving profits and growth (Bacon and Butler 1998), according to Drucker (2014) any kind of business needs rational and systematic approach, this approach comes for stress which consider the innovation source.

Historically, a number of different context have been development to categorize and define types of innovation, these approaches generally took the sources of innovation from previous accomplishments or attempt to recognize where to find new innovation in the future, accordingly based on the objectives and approaches taken in frameworks; different types of innovation were categorized.

For example four generic principle dimensions of innovation were identified by Higgins (1995), these principles are products, management, marketing and processes, the aim of innovation in products is to generate superior products in terms of quality, a new products or enhancement to an old product or service may result from this innovation, management innovation is the improvement of the way a firm or an organization is managed and directed, marketing innovation focusses in functions production rather than product development, its management process responsible for customers' requirements satisfaction by anticipating, identifying and planning future actions, this task is related to the marketing function of promotion, pricing and distribution, innovation in process results in organizations improved processes, example of this is higher efficiency of corporate standard operation.

On the other hand Keeley, et. al (2013) and others have identified ten innovation types from industrial pattern categorized in three categories which are, configuration, offering and experience, these categories include the following types of innovation;

Profit mode (The way to make money), this model aim to find new ways to translate the organizations offerings and sources into money, focusing on where cash opportunities might lie and what costumers are appreciating, type two is network

innovation, this mode power comes from organizations ability to take advantages of other firms any and every component of a business including technologies, offerings, processes, brands and channels (Wade 2013), according to Euchner (2014) type three of innovation is the ability to align the company assets and talents in an organized structure, and creating value from these tangible and intangible resources, innovation in process depends on how you use superior methods or signature to operate, in this type innovation needs a dramatic transformation from business as usual to unique capabilities adapt quickly, build market leading margins and function efficiently, product performance innovation explains how firms create distinguishing features and functionality, this type of innovation includes developing a new products as well as adding substantial values by updates and line extension to existing products (Kovidvisith 2013), innovation in services concentrate in amplifying and the firms capacity to support and magnify the value of their offerings, by enhancing the apparent value of an offering, utility and performance, they aim to make a product easier to use, try and enjoy, it may include also revealing new features and functionality that ease consumer experience, in addition to fix problems and issues faced by these costumers, the next type of innovation is related to market channels and in specific in the way firms delivers their products and services to users and customers, it is the connection criteria of companies offerings with users and customers(Euchner and Ganguly 2014).

Keeley, et. al (2013) stated that type number nine of innovation focusses in the way you provide contributions and business, it helps to warrant that users and customers distinguish, remember and favor your products and offering to those of substitutes ore opponents, this type rely on well-crafted tactics that are in place over many interactions between your firm and end users, including environments, channels advertising, communication, employee and service interfaces and trade partner product, the last type of innovation is related to customer engagement in the ways firms foster compelling interactions, it's all about understanding the inside placed

ambitions of users and customers, and using these visions to create meaningful linking between companies and them.

As mentioned earlier there are many frameworks were used to categorize the type of innovation, I have gave two examples above, furthermore the following table represent summery of different types of innovation categorized based on the objectives and approach inherent in the framework:

Table 3: Innovation types

Framework (Categories)	Innovation type	Authors (Adaptors)
In the context of the category life cycle	<ul style="list-style-type: none"> - Disruptive - Application - Product - Platform - Line-extension - Enhancement - Marketing - Experiential - Value-engineering - Integration - Process - Value-mitigation - Organic - acquisition 	<ul style="list-style-type: none"> - McDermott and O'Connor (2002) - Moore (2005) - Samavi and Topaloglou (2009) - O'Sullivan and Dooley (2008)
Industrial pattern	<ul style="list-style-type: none"> - Business model - Networking - Enabling process - Core process - Product performance 	<ul style="list-style-type: none"> - Keeley, et. al (2013) - Wade (2013) - Euchner (2014) - Kovidvisith (2013) - Euchner and Ganguly (2014)

Framework (Categories)	Innovation type	Authors (Adaptors)
	<ul style="list-style-type: none"> - Product system - Service - Channel - Brand - Customer experience 	
Change impact or scope	<ul style="list-style-type: none"> - Incremental innovation - Radical (or breakthrough) innovation - Transformational (Disruptive) innovation. 	<ul style="list-style-type: none"> - Herrmann et. al. (2007) - Assink (2006)
Impact to current business	<ul style="list-style-type: none"> - Cannibalization - Market creation - Competitor disruption 	<ul style="list-style-type: none"> - Debruyne and Reibstein (2005) - Hurmelinna-Laukkanen et. Al. (2008)
Innovation source	<ul style="list-style-type: none"> - Manufacturer innovation - End-user (Open market) innovation 	<ul style="list-style-type: none"> - Franke (2003) - Rothwell (1992)
Framework to enable innovation measurement	<ul style="list-style-type: none"> - Product (good or service) - Process - Marketing methods - New organizational method in business practices 	<ul style="list-style-type: none"> - Wellner (2015) - Kennerley and Neely (2002)

2.1.1 Innovation Dynamics

The mechanism of innovation takes place in seminal/breakthrough/radical innovation at one end, and incremental with spectral and progressive innovation at the other

(Gomory 1992), he has defined the progressive innovation as a series model of innovation include a flat continuous process, resulting in a continuous and stable enhancement of the product or process, in addition he defined influential innovation as a tree paradigm of innovation that new products or processes are established from, Utterback and Abernathy (1975) on the other hand stressed that three tiers classifications have to be consider when defining innovation, accordingly to them; innovation has three types; type that change the charisma of industry which is the radical breakthroughs, the complex systems that have many elements and the nuts and bolts innovations which evolve within the organization, similarly, Freeman (1995) defined three types of innovation, radical, incremental and revolutionary, according to him, the revolutionary innovations is usually lead to significant market changes, and it exceeds the radical and the incremental innovations.

From another perspective Moore (2002) claimed that the level of change categorizes the behavior vis-à-vis innovating, in which continuous innovation refers to the usual promotion of product not demanding a change in behavior, in contrast discontinuous innovations need alteration in other wanted products, or a change in the current behavior.

2.1.2 Innovation Drivers

It characterize the key causes for the development stakeholders to decide to invest in innovation, some of these factors are identified in this thesis which drive the construction innovation:

According to Brandon and Lu (2009), clients requirements are the most important and main driver for innovation in the construction industry, it does encourage the project team to enhance the response and to enhance the strategic methods to mitigate impacts of the unforeseen deviations (Gann and Salter 2000), furthermore the owners have primary positions to foster innovation by increasing the requirements for high specs, and they act as leaders to encourage new ideas for a cooperative work atmosphere (Manley 2008).

Scholars have noticed that organizations competitive atmosphere has led to increasing the interest in innovation due to the advantages that comes from this environment as firms aim to enhance their performance by increasing their innovation skills (Slaughter 2000), accordingly construction companies came to believe that quality, time and cost in addition to other performance measurements can be improved by innovative practices which will eventually lead to successful projects (Aouad et al. 2010), apart from that, the increase use of new materials, communication and information technologies have helped organizations to develop innovative solutions for typical construction issues by utilizing others technology outcomes (Nam & Tatum 1992).

Accordingly to Reichstein et al. (2008), new legislations and regulations whether it come from the governmental Authorities or from the organizations it selves are also playing huge part for stimulating innovation by applying pressure for companies to comply with these requirements by creating innovative solutions and process, on the other hand commitments of organizations to provide satisfaction to the clients and to improve their image in the market in order to maintain their sustainability and growth play strong factors to create innovation (Borger and Kruglianskas 2006), furthermore Ozorhon et al. (2015) emphasized on the ability of design trends to drive innovation as it synchronize market needs, prospects and methodological capabilities and accordingly it can be seen that there is increase stress on creators to offer more competitive designs and to produce more innovation, in order to do so designers have to utilize integrated technology in advanced levels to create new ideas that show new insight in the construction industry.

Other innovation drivers includes the tendency of the industrial companies to adapt and create new sustainable products to reduce the significant impact on the environment, these new strategies are driven by regulations or by self-motivation and it include the use of products delivery systems, procedures, products and sustainable production equipment (Miozzo and Dewick 2002).

2.1.3 Innovation Barriers

Barriers can be defined as the innovation challenges and blockers that stop organizations from investing in innovation, for example; according to Slaughter (1993), being the most important element in the construction companies development process, financial resources have huge impact on innovation, and lack of these resources is considered as the major blocker for organizations to innovate as innovation requires dedicated investment capitals, other scholars like Egan (1988), blamed the narrow cultural aspects of organizations for limiting innovation, according to him some industries have rejection attitude toward creating and adopting new methodologies and operations in which it widely criticize innovation and refuse to absorb new management process and technologies, this is noted in specific in the construction industry, where on the other hand Aronson and Lechler (2009) highlighted, an organization culture, which is proactive, ready to take calculated risk, trusting and adopt constructive methodology that enhance testing and open discussion between the teams and consequently in such philosophy, teams are open to conversion and innovation, so unsupportive managerial culture and refusal to change is one of the major barriers for innovation.

It was noted also that the temporary nature of projects has considered as one of the barriers for innovation, as projects are usually operated in a short term basis and carried out by a diverse teams and this combination leads to challenges to deliver projects outcomes, similarly this lead to limitations for innovation creation (Sexton and Barrett 2003), further more; unavailability of materials have limited innovation in the construction industry, in which several advantages was brought by standardization of construction products and the construction industry nature is resistant to modularization of component, pre assembly and prefabrication, however these urges for modularized and standardized buildings needs enhanced material and these material are not always easy to supply, the unavailability of these material and accordingly in manufactured products increase difficulty to innovate Ozorhon et al. (2015).

Innovation requires highly skilled staff from all levels to create effectiveness in operation of construction companies, it is indicated that innovation might be fostered by teams that consider the newest technology and can take risks, innovation is usually starts from individual on high positions who can take decisions like directors, facilitators and technology managers, in contrast, the lack of qualifications and lack of knowledge among the project staff have negative impact on creativity and accordingly lead to technical limitations in adopting new methods for innovation, therefore to foster innovation its very critical to have experienced managers who can be considered as the innovation champions (Aronson and Lechler 2009).

The lack of clear benefits (Outcomes) play big impact as a huge barrier for innovation, since the margins of returns are considerably low in the construction market, hence, incomes must be clearly calculated and wise decisions for investments should be made, since the new products might be used only in a single development, directors and decision makers usually experience complications in guaranteeing the return on investment of these innovation practices(Grossman and Helpman 1993), also time limitations handicap innovation, as construction firms experience stresses in the completion of projects within budget and time limits, these constraints usually hinder the development of new products and ideas, and prevent analyzing new systems and products, Davidson (2001) claims that the construction industry shows lack of interest in innovation due to the time shortage nature of projects, this is clearly noticed in small construction organizations, similarly Hardie and Newell (2011) indicated that the needed ttime for technical innovation to be tested and developed present barrier for innovation in medium and small sized firms.

2.1.4 Innovation Enablers

The enablers are those elements that facilitate innovation in building developments, according to Manley et al. (2009) effective innovation needs effective coordination, cooperation among projects stakeholders including clients, consultants, contractors, sub-contractors, architects and suppliers in the construction projects, this collaboration and integration leads to more cooperative environment which helps

innovation to take part of development, and many studies show lack of innovation accruing in isolated environment (Shieh 2010), in addition researchers have emphasize on the importance of building interactions for technological innovation and such cooperation present powerful enabler for innovation in the construction industry (Carlsson et al. 2002), Dulaimi et al. (2003) highlighted that interoperation between the creator of the innovation notion and the associate firms whose support is necessary to implement innovation; increase the contribution in innovation practices and eventually produce innovation.

Scholar have emphasize on the advantages of early involvement of contractors, therefore, early engagement of construction projects parties play big role in building trust among development stakeholders and is an enabler of innovation, Korczynski (1996) states that contribution of contractors in the early design stages add remarkable benefits (Outcomes) and enhancement by the way cooperative work environment is created, in addition, early contractors involvement might motivate staff members for the efficient formation and coming up with value adding solutions.

Being defined as one of the major enablers for innovation, leadership was highlighted by many scholars and researchers for the part it play in fostering innovation, according to Ozorhon et al. (2015) leadership plays a critical role in shaping the spirit of the project and the main players are the managers who motivate the team members and direct their attention to attract and foster creation and innovation, on the other hand commitment of organization toward innovation enable innovation from many aspects, this commitment includes the company policies and philosophy which influence construction innovation, accordingly firms have to have a tolerance for taking risks, doing mistakes and failure in order to promote innovation (Tatum 1989), Dulaimin et al. (2003) highlighted that alignment and high commitment of inspiration between diverse stakeholder affect positively the creation of innovation ideas, therefore, construction projects parties must express commitment and engagement in innovation to guarantee a successful implementation.

Knowledge controlling is known as a tool through which enhanced business performance and innovation are possible, accordingly managers and directors should create in place the tools and mechanisms that promote sharing of knowledge within the team members to facilitate innovation Al-Ghassani et al. (2004), effective knowledge sharing is crucial for feeding the correct ideas in the construction projects and for affective communication for these ideas to the entire project stakeholders and to the future projects Ozorhon (2014), this knowledge sharing platform requires strategies for management in addition to investments in knowledge and information workers product in the innovation efforts.

Recognition of innovators act as enabler for successful innovation, so in order to facilitate innovation, a reward system and schemes for recognition need to be adopted in the form of innovation promotion, in which staff taking share in the application stage of innovation must be remunerated separately from the comparative success of innovation relative to the company and construction project goals, its preferred to have this recognition in the form of basic rewards, that offer personnel challenges and pride to the personnel involved in the innovation practices (Dulaimi et al.2002). in addition, corporations must be able to accept shifting market circumstances to survive and to maintain their competitive advantages, to enhance that organizations have to implement innovation training policies and human resources departments must provide learning courses which allows the staff to be educated about innovation and utilize the innovation , these trainings have to be specialized for the different innovation types, and to be conducted on firms offices and project site location to diffuse the best knowledge (Cross 1983).

2.1.5 Innovation Inputs

Construction innovation requires inputs to insure success, these includes resources that are utilized to implement innovation such as financial, human and organizational resources, as example of this is organization capital, construction firms capabilities are extended and increased by investing in adopting research and development (R&D), organization practices and new knowledge (Teece 1996), The fact that

construction developments are complex and big investments are required, similarly designing new products or specialized tools and equipment need huge financial resources, another inputs is investment in R&D, managers refer to R&D as a portion of project organization practices, anyhouw they don't consider R&D into consideration in developing innovation, this is due to the fact that construction is considered to be a low-innovation sector where limited obligation on R&D expenditure are in place, accordingly investing in R&D is a must to facilitate innovation (Audretsch and Feldman 1996).

Knowledge is essential ingredients for innovation, this knowledge has two types, the first one is the internal knowledge resources, in this type organizations learn from their own experiences and teams, difficulties and problems arising during the construction activities might foster innovation, accordingly, project site personnel and project management team is critical for the innovation process, furthermore, firms need to organize workshops on a periodically basis to come up with innovation solutions, apart from that, managers have to stimulate innovation by coordinating and directing the team to generate creative ideas (Ozorhon et al. (2013).

The second type is the external knowledge resources, advantages can be gained by the multiple number of parties involved in construction projects, sharing knowledge of suppliers, engineers, designers, clients, constructors and end used represent major inputs for innovation creation and implementation, highlighting that in the construction industry most companies import new technologies from other industries and example of this is information transfer between research universities / institutions and construction companies (Salter and Gann 2003).

Adding to that consultancy have a very crucial part in fostering innovation, by offering valuable information to clients, consultants develop business contacts with clients, cooperating with technology firms to collect new technologies, gather preceding understanding in knowledge management system, archives, or expertise directories, and formalize strategic management practices, accordingly it was noted

that hiring of external firms with different expertise bases is useful for innovation as the collaborating organizations recognize the add value of information and apply it strategically (Barlow et al. 2013), finally human resources is very important for success of construction projects and accordingly for innovation if the R&D teams is correctly directed and supported (Sun and Pan 2011).

2.1.6 Innovation Outputs (Benefits (Outcomes))

Benefits (Outcomes) from process, product and services innovation can be identified in tow levels; development level and corporate level.

Outcomes of innovation in projects level can be summarized in four points, the first one is project duration, being one of the most important constraints in construction and an indicator for project team success, it was highlighted by scholars that innovation provide significant advantages in the early completion of projects without jeopardizing the other constraints (Ozorhon et al. 2015), on the other hand innovation have positive impact on reduction of projects cost, as the same present critical factor for the relationship between clients and service providers including the contractors, accordingly innovation have proof enhancement to projects closeout cost (Gann and Salter 2000), in addition, Gann and Salter (2000) explain that organizations and firms adopting innovation practices in process and products shows increase in efficiency and productivity, finally studies showed that the level of clients satisfaction compared to expectations are higher when innovation is implemented, hence, most of the highly ranked firms promote strategies to manage and control the innovation process Ling (2003).

Benefits (Outcomes) of innovation in corporate level have different characteristics in which it have a long term nature, these benefits (Outcomes) can be summarized as follows;

Organizations adopting and implementing innovation have advanced experience, in which a new knowledge are used on diverse kinds of projects, with positive impacts and promoting additional benefits (Outcomes) in many

presentations, it may be taken as standard exercises for the organization, this needs awareness and recognition by the operational parties engaged in the schemes, and the experience gained by innovation can be implemented to upcoming projects (Tatum 1989), other benefit include the improvement of firms image and position, as known in the industry the bad image that construction company have, innovation with the advantages it provides including more productive and safer design can enhance this image and provide these adopting companies with positive reputation in the market (Ozorhon et al. 2015).

Researchers and scholars highlighted the benefits (Outcomes) that include improvement of managerial and technical capabilities, as the use of new technologies develop rich source for improvement by adopting new ideas, and staff and teams become more flexible to create methods in cooperation with other teams and colleagues, also implementing innovation and problem solving help improve supervisory abilities (Ozorhon et al. 2014), in addition innovation bring long term profitability for firms, as innovation in the construction industry needs multiple demands form construction companies, and the alignment to these requirements is essential especially for enhancing performance in specific development, success in innovation shall develop competitive advantages for organizations by positively impact the long term direction of the organization and its business plans, and the result usually is affecting the benefits (Outcomes) of the companywide (Tatum 1989).

Innovation has indirect benefits (Outcomes) like intellectual property, according to Williams (2013), patents and trademarks which represent intellectual property rights allow incentives in process, products and services innovations by leading to a outstanding share of public incomes in research investments, regardless of the fact that construction fimrs tend to invest less in R&D and creating new patents is very rare in this industry, finally successful innovation increase the client satisfaction which leads to higher opportunities for future work collaborations and market share (Ozorhon et al. 2014). Scholars even went further to rate innovation benefits (Outcomes) impact on firms:

Outcomes of innovation	Mean
Better company image	4.7
Improvement of services	4.4
Improvement of client satisfaction	4.4
Improvement of product quality	4.4
Improvement of processes	4.3
Increase in technical capability	4.3
Increase in organizational effectiveness	4.2
New services	4.1
New products	4.1
New processes	4.1
Market penetration and growth	4.0
Revenue growth due to new products or services	3.8
Short and long-term profitability	3.8
Improvement of organizational structure	3.6
Improvement of human resources	3.6
Intellectual property (patents, trademarks, designs)	3.5

Figure 2: Innovation benefits (Outcomes)/impacts (Ozorhon et al. 2010)

A summary of innovation factors and literature review of the same is shown in the next table:

Table 4: Innovation Factors

Factors Category	Factors	Researchers
Innovation drivers factors	Client Requirements	Brandon and Lu (2009), Gann and Salter (2000), Manley (2008)
	Competition advantages	Slaughter (2000)
	Improvement in performance	Aouad et al. (2010)

Factors Category	Factors	Researchers
	Technological Development	Nam & Tatum (1992)
	Regulation and Legislation	Reichstein et al. (2008)
	Higher client satisfaction	Kruglianskas (2006)
	Design trend	Ozorhon et al. (2015)
	Environmental and sustainability requirements	Miozzo and Dewick (2002)
Innovation enablers factors	Public and Private sectors Cooperation	Manley et al. (2009), Shieh 2010), Carlsson et al. (2002), Dulaimi et al. (2003)
	Private sector Early Engagement	Korczynski (1996),
	Management and leaders support	Ozorhon et al. (2015), Tatum (1989), Dulaimin et al. (2003)
	Innovation commitment	Al-Ghassani et al. (2004), Ozorhon (2014)
	Knowledge management	Ozorhon (2014)
	Reward schemes	Dulaimi et al. (2002)
	Innovation training policies	Cross (1983)
Innovation inputs factors	Capital	Teece (1996)
	Investment in R&D	Teece (1996), Audretsch and Feldman (1996)

Factors Category	Factors	Researchers
	Internal knowledge resource sharing	Ozorhon et al. (2013)
	External knowledge resource sharing	Salter and Gann (2003)
	External consultancy	Barlow et al. (2013)
	Innovation Teams	Sun and Pan (2011)
Innovation barriers factors	Shortage of financial resources	Slaughter (1993)
	Unsupportive organizational culture	Egan (1988), Aronson and Lechler (2009)
	Projects temporary nature	Sexton and Barrett (2003), Ozorhon et al. (2015)
	Lack of experienced and qualified staff	Aronson and Lechler (2009)
	Lack of clear goals and benefits (Outcomes)	Grossman and Helpman (1993),
	Time constraints	Davidson (2001)
Innovation Benefits (Outcomes)	Decrease in construction duration	Ozorhon et al. (2015), Gann and Salter (2000)
	Increase in productivity	Gann and Salter (2000)
	Increase in client satisfaction	Ling (2003)
	Gaining experience	Tatum (1989)
	Organization image improvement	Ozorhon et al. (2015)
	Technical and managerial capabilities improvement	Ozorhon et al. (2014)

Factors Category	Factors	Researchers
	Public and Private sectors long term profitability	Tatum (1989), Williams (2013)
	Future business collaboration	Ozorhon et al. (2014)

2.2 Public Private Partnership (PPP)

PPP can be defined in many ways depending on multiple factors such as number of stakeholders, complexity, institutionalization level, services, cost and time (Klijn, 2010). Generally, all types of collaboration between public and private sectors can be considered as partnership whether its service agreement or joint venture. As far as the construction sector is concerned, Public private partnership (PPP) is defined as the deployment of the private sector’s capital, skills, innovation and assets to aid the management and execution of the public sector services, development and infrastructure projects (Daube et al. 2008). PPP is typically organized as follows:

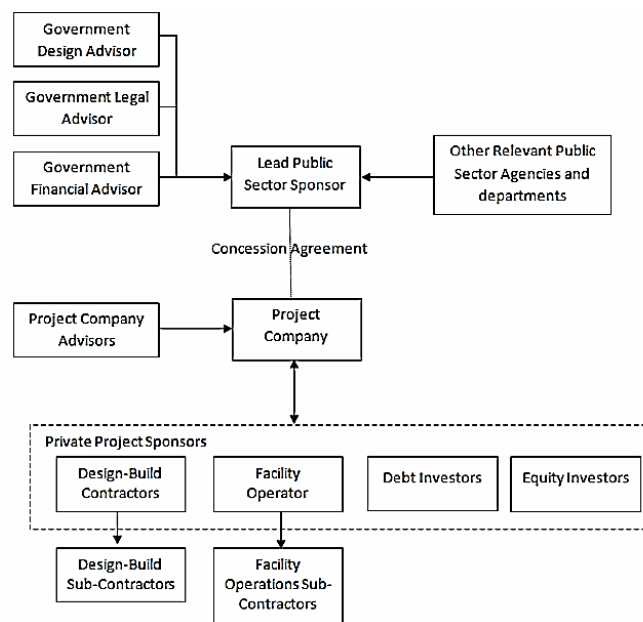


Figure 3: Typical PPP Concession Arrangement (Siemiatycki, 2012)

Several key factors indicate whether its efficient to consider PPP concept or to implement traditional procurement approaches. These factors which are available in mega projects in specific, include the value for the money to match public sector needs a combined by realistic breakdown of risks, quality, time, risks, the ability to produce additional income and an entire life cycle approach. Klijn and Teisman (2003) emphasized that such mega infrastructure projects demand the utilization of PPP as it provide the most affective mechanism to gain efficiency. On the other hand, Grimsey and Lewis (2002) stressed on the fairness on selecting the contractors, allocation of risk analysis and financial options precise evaluations to achieve the optimum value for money.

Moreover, in order to adopt with the ever changing in global interests including shifting toward green projects and sustainability, PPP contracts type has progressed throughout the previous few decades to accommodate such changes (Almarri & Blackwell,2014)., Therefore, the capability of the private industry to create sustainable investment is considered as an unavoidable opportunity for the public sector to guarantee secured incomes and higher facilities for the public and simultaneously protect the environment. , These stimulating factors are among the key advantages PPP role in wide diffusion green growth.

The PPP approach characteristics are summarized as follows:

- Private sector and public sector long term commitment.
- The services responsibility is shared.
- The public sector offers assets, skills, political power, access to publicity run services, , where on the other hand the private sector offers skills, innovation, capital, experience, commercial,.
- Risks and benefits are shared.
- Tasks are bundled.

Scholars have classified the following four types of PPPs in procurement based on the method of finance:

- (Build operate and transfer) - BOT

- (Build own operate) - BOO
- (Build own operate transfer) - BOOT
- (design build finance operate) - DBFO

In the light of how procurement varies between the conventional and the modern PPP approaches, several variances were compared by Fredriksen, (2012). Firstly, the public sector is the party who takes most of the risks in traditional contracts (Conventional procurement) while in the PPP procurement method, these risk are shared between both sectors. This is referred to the PPP concept which is based on mutual operational involvement and development management for a full package agreement, where the conventional procurement is a purchase process of a particular function.

Secondly, in the PPP contracts the private sector profits and benefits (Outcomes) is connected to the outcomes of the project or service, which is designed and implemented based on outcomes defined by the governmental sector rather than predefined specifications. , But, in conventional procurement, the private sector get profits and benefits (outcomes) against completion of a certain assignment specified in a set of pre-arranged requirements given by the public sector., Nevertheless, failure to fulfill both contract in both cases can lead to penalties on the private sector (Harris 2004), . Finally, in PPP the responsibility to deal with end users, financial market and taxpayers are laying on the private sector where in conventional procurement this role is managed by governments (Pinno, et al. 2007).

2.2.1 Public Private Partnership (PPP's) benefits (Outcomes)

First and foremost, PPP allocates lower cost on the Public sector; as concluded by Meidutė & Paliulis (2011), PPP offers the best solution to complete projects to the budget and as timely scheduled. Especially this fact, presents the most seen advantages of this type of contracts and value for money concept. For example, a paper published by the National Audit Office (UK) in 2013 and cited by Shaoul (2005) showed that only 22 % of the PFI projects (PPPs) were completed with time overrun , 24 % had cost overrun, In contrast, 73 % of projects done by implementing

traditional procurement completed over budget and 70 % of these projects suffered from time overrun.

Jakutyte (2012) suggested PPP contracts exhibit more risks and higher accountability and responsibility to the private sector resulting in accumulative responsibility to follow the cost constraints within a maximum efficiency., Furthermore, the long term nature of this partnership pushes both sectors to undergo a great deal of cooperation and synergistic developments to gain higher outcomes. On the other hand, public sector solely provides political, legislation and legal support while private sector provides utilization of the optimum skills combined with complex funding arrangements Jakutyte (2012)., This approach is found to lead to gaining additional value by mixing both parties leading characteristics (Harris 2004).

Certain factors need to be effectively implemented in order to win a successful PPP. These factors are listed by Almarri and Hijleh (2017) such as commitment from all parties, proper risk allocation, competent public entity, systematic procurement strategies, strong and stable private entity, fairly procurement process, political support, detailed feasibility studies, and proper governance.

In addition, Almarri and Blackwell (2014), highlighted two factors for PPP Risk sharing and investment appraisal;the first one was to change the contents of PPP agreements to have new structure that allows for different options with a very controlled renegotiation clause. The second one is to improve the risk simulation approach to expand the investment appraisal process and to create charters for cost and events for all completed projects.

2.2.2 Public Private Partnership (PPP's) and Innovation

In the modern definition of public private partnership (PPP) literatures, innovation is noted as an inherent characteristic of PPP (Ferrer 2010), In the same concept, meanwhile, it's difficult for any PPP policy approaches to proceed without highlighting the significance of innovation., As a result, expectations about the innovation capability of cross sectorial collaboration increase with policy specialists

and public organization like (Bel et al. 2013, Huxham & Vangen 2004)., However, the relationship between PPP and innovation has not yet been systematically conceptualized within the innovation framework. Furthermore, the presentation of PPP constraints or facilitates innovation in the governmental services projects delivery and in public and private sectors in general has not yet been yet addressed.

According to Hodge and Greve (2009), the PPP concept promote political achievement based on signifying innovation and stimulate attempts from the two sectors, where there is a lot of political investments put in supporting jurisdiction nowadays, the ideality of PPP has influence in the public spirit as well. Just what we intend by PPP success earns higher refined deliberation to the mind, PPP platform is mostly featured in term of design enhancement and productively gains (Shaoul (2005), Jakutyte (2012), Greve (2009), etc.), whereas other scholars take PPP as a shape of innovation in the public sector or organizations innovation by it self (Howell 2010), even though close in definite sets, the basic concept has though remained as well close and perhaps even deceptive, its generic to look at innovation practices as the key input of PPP performance advantages, whereas in contrast, empirical figures reflect that there is lower labor expenses of private organizations instead of leading to variations in service results (Greve 2009), lately there is a trend in the PPP researchers communal to refer to innovation practices as equal to several improvement or progressive transformation, on the other hand innovation can sometimes have bad impacts, most lectures in PPP do not distinguish between alterations that lead to huge radical alterations and minor alterations (Alterations to progression in society), however if any change can be measured as innovation then in the framework of PPPs, the concept of innovation can become a risk yet a trendy but fundamentally blank concept (Drechsler and Randma-Liiv 2014).

The expedition for understanding innovation in PPP is very complicated task, in which you have to keep into consideration the variances in the innovation process in relation to different sectorial senses as the collaboration positions at the perpendicular directions of both sectors, and accordingly there must be awareness

that innovation in the PPP contracts is and shall be seen in a different perspective than private sector innovation in its form (Osborne and Brown 2013), meanwhile, there is no clear platform exist which can explain and predict the process and meaning of the innovation in the PPP since the entire concept of public sector innovation is not yet fully conceptualized, it's today globally recognize innovation importance in the private sector platform, not only since it illuminates how the new cooperation come into life, but also how this mix of novel combination support us in order to discover the huge changes in societies in general and markets in specific (Nelson and Winter 2009), anyhow, in order to full understand the connections among innovation and PPP, a little academic distance has been up to now accomplished in terms of theoretically explaining both of these memorable concepts, thus, what we need is more focus view on the relationship between PPP and innovation, which project the specific characteristics of innovation in both the public and private sector rather than only reflecting the specific features of PPPs (Greve 2009).

2.2.3 Innovation in the private sector

The innovation term has been promoted within numerous social art disciplines, and all have described innovation in a different ways (Godin 2002), as industrial trend, innovation practices are known as a path dependent, endless and cumulative practice that represents the main characters for evolutionary conversions in the industry, in the latest economics convention the importance of innovation practices are understood in the exact way of how capitalism is featured (Lundvall 2010), In recent definition, adopting innovation is an essential and integral sensation; long term survival of organizations, and of local industries, mirror organization innovative ability and, furthermore, organizations have to get involved in activities, which target innovation in order to have place in the private sector, according to shumpeter (1939), innovation is about doing tasks and things in a different ways than the known practices, as innovation is the heart of businesses development and growth, since it create forth outstanding changes that extent all over the private sector and even beyond the

market, according to him the resources combination bring five main types of innovation; fresh products, a new method of production, new quality of product, new source of supply, new methods of organizing the economic process and new markets.

On the other hand, invention, new ideas or knowledge development which are considered as part of innovation process, differ from innovation which is something new that has been implemented in the marketplace and alone can be qualified to be sufficient with revolutionary outputs, the word; new, is defined as promoting a mix in a certain approach where it wasn't utilized before, accordingly, innovation is a cumulative process where single innovation will be results to a reflection and more innovation coming from other organizations, stimulated by add value prospects, which will ultimately alter the whole market, society and sectors, in addition innovation is basically a not stopping process instead of comprising of secrete stages (Fagerberg 2005).

Where in private sector, industrial and business gaining is the most affective trial if new practice is measured as innovation, in which acceptance of the new product, process etc. decide whether its innovation or not, and hence being new is not enough for being called innovation (shumpeter 1939), according to Nelson and winter (2013), innovation has different economical effect on different groups, meaning, it is the market and industry choosing criteria which decide the significance of innovation and or the way innovations impact economic, businesses and social transformation or not.

2.2.4 Innovation in the Public sector

Despite the fact that scholars have a growing interest in innovation in the public sector as a practice and concept, still there is significant misunderstanding of what innovation refer to in the public sector and how we can conceptualized the capability of the public sector to learn from the private sector innovation experience (Lynn 2013), recently, there is rising agreement that innovation practices in the governmental sector have to be considered as a drastic generated from old formulas,

and the new formulas must be adequately radical to bring about irreparable differences in main responsibilities (or routines) in the public sector entities linked to firms perception are another kind of innovations that is essential in the governmental sector framework and whether to enable or to decide essential changes in companies; new kind of public arrangement, authority mechanisms, public policies, regulations and social relationships(Osborne and Brown 2013).

The latest literature on public sector innovation concentrate on three, somehow overlapping shapes or themes of innovation; the first one is innovation activities that is related or connected to changes in organizations performance and Productivity, this include multiple efforts from policy to introduction of new processes and services, system level and conceptual innovations, the current innovation in public sector researches focusses on three innovation themes partially overlap with each other's, the first one is the innovation relevant to changes in organizational performance (Productivity) (Windrum 2008), this include various activities from introduction of new system-level and conceptual innovations, to creating new policies, services and processes (Windrum 2008), the second is a brand new facilities and modern methods of service that eventually change the link between government and citizens, in this type linked to physical products, the focus is the interaction as a principal feature of service (Coombs and Miles 2000), the third theme is public additional value development in its broadest logic, highlighting towards the necessity to concentrate on qualitatively diverse measures compared to industrial pertinent innovation, these practices processes in the public sector use diverse modalities (innovation through and within public sector), morphology from discontinuous to incremental changes, and agency where public sector take the lead to initiate changes or respond to environmental, technological changes (Moore 2005).

Despite the rising scholars that connect governmental sector innovation to certain public sector characters like accountability, public and society characters, transparency in addition to policy and political contexts, the fundamental sense of examining the innovation and its mechanisms in the public sector innovation

literature is still taken heavily from the private sector philosophy, but this creates theoretical challenges as it is not clear yet if private sector and public sector shall be investigated by using the same perspective, in addition the lack of profit prospects, duplications and industry assortment criteria makes it crucial to discharge the evolutionary character of innovation in the framework of governmental sector and how it varies from innovation in the private sector. (Suurna and Kattel 2010), a lot of attention was given to the smallest details for innovation in the public sector, for example, certain questions were highlighted like how public sectors organizations try to find out best methods to arrange their tasks, and how this alter firms daily routines and to what extent, incrementally or radically, in addition researchers have stressed on the role of persons as changing party and come up with conditions that limit or support changes, this all are still taken from the private sector literatures, however limited understanding is still exists on which mechanism explains the development of examination process in the public sector, what outcomes and capabilities are to be taken as successful and how the selection criteria of innovations works, accordingly, till date we don't have clear frameworks allow us to understand how the concept of fundamental transmission is different from the concept of routines or day to day changes in the governmental sector and also how it differs from the private sector innovation and this due to the fact that there is no clear mechanism for evaluating success of new combinations similar to industrial competition that govern the private sector market, hence the evaluation and understanding of innovation in public sector is still unclear and disputed (Suurna and Kattel 2010).

2.2.5 Innovation outcomes in PPP

When identifying innovation in the PPP context, researchers refer to it as an additional features from private sector involvement, this conclusion is generated from the idea that private partners provide their knowledge, resources, skills and new ideas, hence stimulate innovation by this involvement (Vangen and Huxham 2003). However, I will look at Innovation and PPP from another perspective, in which

innovation outcomes from this partnership will be investigated in private sector (Market) approach, Public sector approach and both combined in one approach.

Private sector (Market) Approach:

Talking form market position, PPPs are a fundamental tool for promoting innovation in the development companies, and have gain interests in R&D and innovation, PPP functions in regard to private sector (Market) innovation concept is therefore: offering an administrative context for creation and developing innovation practices and activities, by offering revolutionary platform and creating innovation policies (Christensen et al. 2004), in which, , PPP is a platform of promoting the creation of innovation practices by offering structural support for creating innovation and presenting new products, instrument of firms, process etc. to the industry and therefore changing the development of industries skill and capabilities, in PPP governments interferes in the market by choosing topics and partners and therefore in selection the winner complications, which match using ather tools of direct and focused policy interference, but in case the there is variance between social incomes of R&S and private sector is significant due to industry failure, then governments interfere in innovation policy and technology is totally justified in this case and will lead to very high outcomes (Stiglitz and Wallsten 1999).

According to Rothwell (1994), PPP play as diverse development instrument by involving different parties from different platforms in innovative environment, and thereby developing new opportunities for user communications and education. Therefore PPP subsidize to change the outputs of innovation process by enhancing the value of response connection in the market, in this case the demand of the users or the ways governments respond to the end users requirements is a main element affecting the business behavior, by creating new goods or by enabling the development of novel industrial features that exceed the state of art the society can performance as a measuring base for innovative products and inspire innovation by creating a lead environment for fresh knowledge, PPP oriented innovation shall influence industrial abilities beyond the ability to create additional products by enhancing the use of R&D procurement of backup industry distribution of and current

technologies, by implementing innovation friendly social procurement philosophies, PPP can contribute to the technology life cycle, stimulate innovation systems and clusters, and accordingly increase local, regional and national competitiveness (Stiglitz and Wallsten 1999), on the other hand, development of infrastructure is prime element for implementing PPP experiment in various sectors, and is also depends on innovation related infrastructure, and in specific the construction and daily management of strategies for the creation of innovative technologies by hand to hand collaboration between both sectors has long history and accordingly PPP supports systematic enhancement in the shape of innovation forms. Finally, PPP is approach of futuristic strategy and is utilized for innovation practices creation, innovation developments application, and as a requirement support strategy tool. Evolving and applying innovation sustainable plans and developments typically needs involvement of the private sector partner, public and private investigation organizations, and other partners of the governmental sector. In such framework PPP is essential to shape the innovation development, knowing that public sector mix numerous innovation strategies styles and purposely relation this innovation strategy mix with certain PPP projects (Stiglitz and Wallsten 1999).

Public sector Approach:

As mentioned earlier, it is still arguable how precisely the framework of novelty in PPP have to be assumed and advanced in the framework of the governmental sector. nevertheless taking the limitations in mind and according to the previous discussion we can identify three main governmental sector extents of innovation practices in the framework of PPP: the first one is PPP as a promoter for alteration in public sector legislative procedures; second, PPP as an approach of highlighting public challenges, and third, PPP as a tactical instrument to create legislation changes.

First, presenting PPP can considerably change the managerial habits of public establishments. Innovation impact appear when PPP undertakes modern skills and educational forms to be established to introduce and facilitate a project. Still, secondary kind of innovation impact can become as side effects of PPP developments incase, for instance, the public sector institutions 'efficiency enhanced as a result of

reforming of different teams and new industrial procedures (Dunleavy and Carrera, 2013).

Consequently, PPP act as a significant part in addressing public new arising challenges. Governments have important role in providing solutions to upcoming difficulties such as, the ageing and environment related challenges. However, the lack in acceptability might be still an issue combined with intelligence or shortage of resources to highlight these concerns. Usually, these challenges present huge difficulties for societies, so in order to reduce the affect and overwhelmed these difficulties, innovative resolutions might be unavoidable. Simultaneously, fundamental latest techniques usually required not only for technological revolutions, but also considering core deviations to take place, and public party is usually placed to enable these variations. PPPs are actively targeted by many governmental bodies to resolve difficulties. For example the transmission of sustainable sort of energy in public transport, the implementation of energy resourceful resources and products in building developments or health care facilities in existing hospitals.

Thirdly and finally, PPP propose significant alteration in authority and the term of public utilities when taken as an instrument for presenting industrial deregulation. At the same time, public monopolies in the energy sector, healthcare and transport offer public services, overview of PPPs transform this concept by attractive private market companies for the purpose of meeting public requirements. Fortunately, PPPs offer a wide room for the private sectors and for the normal person to be engaged in public strategy creation. Currently, new domination mechanisms like PPPs can be considered by authorities in emerging dynamic volumes of several communal and the industrial representatives (Jayasuriya, 2005) aiming to increasing the public acceptability. For this reason, PPP never only change the association, reliability and authority configurations among government and private sector, but also between government itself and the normal citizens.

Public and Private Sectors combined Approach:

It was debated that innovation in PPP framework has a broader meaning and capabilities impact compared to what has been highlighted in scholars literature till date.

Innovation theoretically have vital role for all phases that are usual for the PPP development value chain within the context of organization including design, development investment, construction, procurement and exchanges. Incident and governance of types of possible innovation in PPP differ within this concept. Taking a market oriented perception, PPP is an approach of expediting creation and misuse of innovation practices by providing a diversity formation and assortment criteria that is significant by all shapes (for example, new kind of product, efficient process, market, material and strategic design), nonetheless not in every single step. Other forms of creatibility taken for industrial based perception (PPP as a concept of offering bases, and practical innovation approach delivery) happen rarely as main character of novelty. Taking from governmental sector positioned perception sort of possible creativity differ crosswise different phases, as well. PPP can be a substance of modification in governmental and public sector mainly in the early phases; it can discuss modification in authority and perform as a (fresh) method of satisfying communal challenges in almost all phases.

Examples of possible activities theoretically leading to creation of innovations comprise leading multi stage procurement of contractors, scheming and constructing bases aiming to reducing expenses during the entire life-cycle of the project. Consequently, this attracts new foundations of sponsorship for infrastructure in addition to adopting new methods of user charge payback. Each single stage of that value chain is controlled by different groups of entities. These chains are listed as follows (Katte and Lember, 2010).:

- The public sector procurement representative
- The bidding process associations, the sponsors,
- The special purpose means, engineering process and
- Construction organizations, and the

- End users of developments delivered by PPP

Stakeholders are featured by diverse technical abilities, industrial and communication forms and sectorial innovation system (Malerba 2004), plus improvement performance and the possible innovation results in different PPP phases vary. Building type of service are contractor controlled, and these innovation activities concentrate on offering new processes instead of new products. Henceforth, technological development in those divisions to certain degree is identified by users' need. Innovation performance counts on that way such that public sector reflects user demands in PPP. The governmental sector is technically in several means is alike to suppliers controlled markets (Miozzo and Soete 2001).

Significant capabilities of PPP for facilitating innovation come from rising inter sectorial relationships and shared knowledge run amongst organizations with diverse technological capabilities and strategies. This would usually release external markets beyond the single PPP development. Especially, ICT service providers and engineering firms are amongst the most active and technological-enriched organizations under the (ICT) (Perez 2002; Castellacci, 2008). Needs for creativity in those businesses is identified by traditional PPP key actors including infrastructure companies and mega projects service organizations that usually transitional goods from information concentrated businesses as contribution to the market innovation actions. In this case, the public sector acts as a main expediter by specifying requirements and by designing PPP setups that empower the knowledge and experience sharing process between stakeholders. In order to achieve this, public sector needs to rearrange its own organizations and its organizational forms, this will result into alteration inside the public sector. The requirement to handle with fresh skills evolving from PPP can also activate this kind of changes.

3. Conceptual framework

A conceptual model is developed which links innovation implementation elements (innovation performance determinants) including Innovation drivers, enablers, and innovation barriers to the delivery of successful PPPs Projects and enhancement to the projects constraints which can be recognized by PPP innovation benefits (Outcomes).

Based on this model a set of questions will be prepared and a questionnaire will be distributed to get experts opinion from four organizations on the factors promoting innovation in PPP projects in the UAE.

The conceptual model will be used to develop four hypothesis that evaluate the influence and effect of innovation drivers, enablers, inputs and barriers on PPP projects Innovation benefits (Outcomes), data collected by the questionnaire will be analyzed using the correlation and regression tests to either accept or reject these hypothesis.

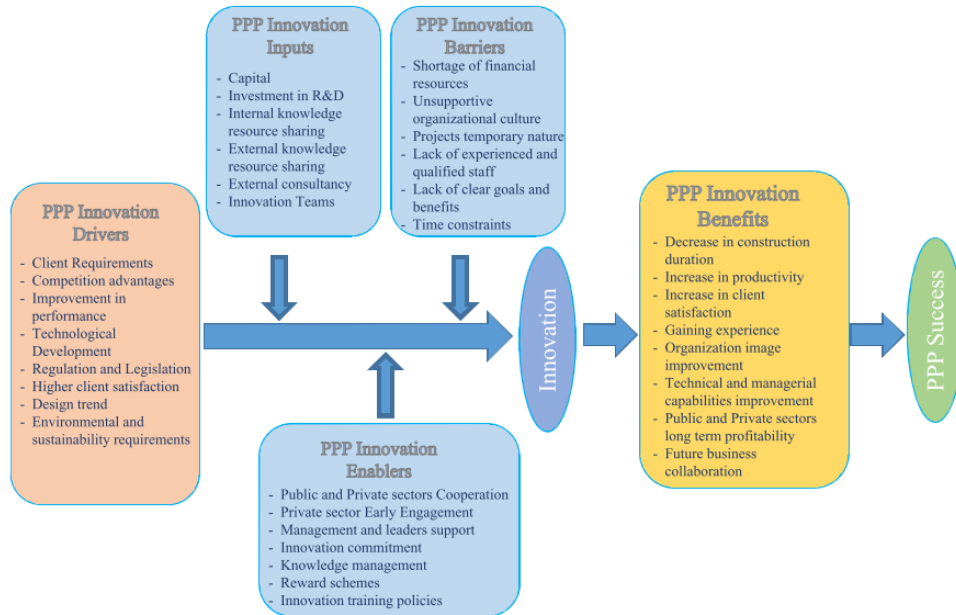


Figure 4: PPP innovation conceptual model

4. Hypothesis

Based on literature review for different components of innovation in PPP construction industry, we are developing these Hypotheses which will be tested in this this paper.

A set of independent and dependent factors will build our hypothesis,

The independent factors are:

- PPP Innovation Drivers
 - Client Requirements
 - Competition advantages
 - Improvement in performance
 - Technological Development
 - Regulation and Legislation
 - Higher client satisfaction
 - Design trend
 - Environmental and sustainability requirements

- PPP innovation Enablers
 - Public and Private sectors Cooperation
 - Private sector Early Engagement
 - Management and leaders support
 - Innovation commitment
 - Knowledge management
 - Reward schemes
 - Innovation training policies

- PPP innovation Inputs

- Capital
- Investment in R&D
- Internal knowledge resource sharing
- External knowledge resource sharing
- External consultancy
- Innovation Teams

PPP innovation Barriers:

- Shortage of financial resources
- Unsupportive organizational culture
- Projects temporary nature
- Lack of experienced and qualified staff
- Lack of clear goals and benefits (Outcomes)
- Time constraints

And the dependent factors are:

- PPP innovation benefits (Outcomes)
 - Decrease in construction duration
 - Increase in productivity
 - Increase in client satisfaction
 - Gaining experience
 - Organization image improvement
 - Technical and managerial capabilities improvement
 - Public and Private sectors long term profitability
 - Future business collaboration

Accordingly the following hypothesis will be tested in the quantitative part of this paper:

- Innovation Drivers have a positive influence on PPP innovation benefits (Outcomes).
- Innovation Barriers have a negative impact on PPP innovation benefits (Outcomes).
- Innovation Enablers have a positive influence on PPP innovation benefits (Outcomes).
- Innovation Inputs have a positive influence on PPP innovation benefits (Outcomes).

5. Research Methodology

So far we have conducted qualitative analysis of impact of processes, services and products innovations on the enhancement to the PPP construction constraints (time, cost and quality, etc.) in the UAE by a conceptual model that includes four performance elements (Innovation Drivers, enablers, inputs and barriers), which are developed to measure innovation Performance indicators (benefits (Outcomes)) in PPP projects, in addition, the model investigate the determinants of innovation performance interrelation, based on the framework proposed.

Quantitative methodology will be used to analyze the survey answers which will be discussed later to examine the statistical interrelation between Innovation performance elements and performance indicators according to experts opinion in the PPP Developments and Contraction industry in the UAE.

This section will assess to what degree these innovation performance elements are influencing and controlling the PPP innovation benefits (Outcomes).

The paper aim, objectives and the developed hypothesis will be validated as well, furthermore the quantitative section will include the theoretical background that relate innovation promoters and barriers (independent factors) to innovation benefits (Outcomes) (Dependent factors), moreover this section will contain the approach that has been considered for questionnaires sampling and data collection process, plus the data analysis process with discussing the findings and finally a conclusion for this study.

5.1 Theoretical background

The PPP innovation framework was created based on the literature review discussed in the qualitative section of this paper, this framework assumes a relation between the independent factors (Innovation drivers, inputs, enablers and barriers) and the dependent factors (Innovation benefits (Outcomes)).

In addition the research will investigate the degree of influence that innovation promoters have summarized by innovation drivers, enablers and inputs on

innovation benefits (Outcomes) (performance indicators) and the degree of impact that innovation barriers have on innovation benefits (Outcomes) (Performance indicators), and accordingly enhancement to the PPP construction constraints (time, cost and quality, Etc.) in the UAE.

Moreover this research will attempt to give more clarity for the paper statements of the problem which are:

- There are insufficient studies for innovation in the UAE construction environment and in particular for public private partnership based projects.
- Discuss innovation and public private partnership in the same platform.
- Innovation in PPPs is poorly understood and need more studies and understanding to decrease the void between innovation in PPP and its conceptual framework.

The interest on these two definition has come from the huge influence of the construction industry on the UAE economy.

In addition the hypothesis created earlier will be validated in this section.

5.2 Sample and Procedures

Questionnaire is designed and distributed to four entities including public (Governmental) and private sectors organizations in the UAE that are engaged in construction and PPP projects developments, the questionnaire was sent to 102 professionals conquering managerial, senior and junior positions in their firms, a total of 56 questionnaires were answered, which represent 55% response rate, the selected personnel were required to answer the questionnaire based on their experience and involvement in innovation activities in the construction industry and in PPP project development in the UAE.

Confirmation to conduct this survey was granted from each entity human resources department prior to distributing the questionnaires to the selected individuals.

The intention of this questionnaire was communicated to all participants in addition to appreciation sentence for their support to support the academic solely of this study. The statistical analysis will be done by using the SPSS software

5.3 Variables and measures

The survey consists of four main parts, the first one is general information about the respondents including their business designation, number of innovation expertise in their organizations, to what degree their organizations have in term of interaction between innovation experts and other employees, the measure of satisfaction of the participants regarding organizations innovation strategies, how often do they perform innovation practices related to processes, services and products innovation, how often do their organizations get engaged in PPP Contracts, in addition to participants experience in the management of construction and PPP projects.

Part two measures how the participants evaluate the influence of Drivers, Enablers and Inputs promoting PPP innovation in the UAE construction industry, the influence is ranged from 1 for no influence at all to 5 for exceptionally influential, part three measures the impact of innovation barriers on PPP innovation in the UAE construction industry and ranges between 1 for no impact and 5 for very high impact, part four requests participants to rate innovation Benefits (Outcomes) for PPP projects in the UAE construction industry, the benefits (Outcomes) evaluation is ranking between 1 for no impact and 5 for very high impact.

The result of this survey will be used to measure the influence of innovation promoters on innovation performance elements and accordingly conclude to what degree innovation enhance PPP development outcomes.

6. Data analysis, Finding and Discussion

In this section the Statistical package for social sciences (SPSS) software will be used to do analysis of the data collected from the participants, these reports will be used to verify the assumed hypothesis and then for discussion and final conclusion.

6.1 Variables and measures

In this section analysis of part one of the survey will be discussed, part one conclude participants general information comprising their business designation, number of innovation expertise in their organizations, to what degree their organizations have in term of interaction between innovation experts and other employees, the measure of satisfaction of the participants regarding organizations innovation strategies, how often do they perform innovation practices related to processes, services and products innovation, how often do their organizations get engaged in PPP Contracts, in addition to participants experience in the management of construction and PPP projects.

6.1.1 Designation

As per the survey results most of the participants were from engineering positions with a total percentage of 46.4%, the Senior position came next with a percentage of 26.8%, Other positions came third with 16.1 percent, then Manger positions 7.1% and finally the senior management position with only 3.6%, this represent a close percentage to normal distribution of positions in any organization.

6.1.2 Number of innovation experts in participants organizations

the survey shows that the highest percentage of respondents (66.1%) have only 0 to 5 innovation experts in their organizations, where 25% have 5 to 10 experts, 5.4% have 10 to 15 experts, 1.8% answered that they have 15 to 20 innovation experts and similarly 1.8% have more than 20 innovation experts.

6.1.3 Interaction between innovation experts and other employees

Most of the participants replied that their organizations have weak interaction between innovation teams and other employees with a percentage of 53.6%, whereas the least did choose strong interaction and very strong interaction with 1.8% each, no interaction at all was selected by 15 participants with a percentage of 26.8% and finally 16.1% have chosen moderate interaction, this represent in general lack of interaction between innovation experts and other employees.

6.1.4 Participants satisfaction regarding the organizations innovation strategies

The results of this question came as follows; 46.4% of the participants were not satisfied at all, 32.1% had low satisfaction, 14.3 were moderately satisfied, 5.4% were satisfied and one participant (1.8%) was very satisfied with the organization innovation strategies.

6.1.5 Participation in innovation practices

In this question participants have replied as follows; 19.6% do not participate in innovation practices, 66.1% have low participation in innovation, 10.7% moderately engage, 1.8% participate often and 1.8% participate very often.

6.1.6 Participants organizations engagement in PPP contracts

Based on the selected sample, the results came like this; 7.1% stated that their organizations doesn't get engaged in PPP contracts, the majority (83.9%) said that their organizations have low participation, 7.1% participate moderately, 1.8% participate often and none of them selected the very often option.

It was noted that 41.1% of participants have 0-5 years of experience, 30.4% have 5-10 years, 16.1% have 10-15 years, 8.9% have 15-20 years and 33.6% have more than 20 years of experience.

The following tables represent the data collected form part one of this survey:

Table 5: Questionnaire general information data analysis

Designation	Frequency	Percent
Senior Management	2	3.6%
Manager	4	7.1%
Senior	15	26.8%
Engineer	26	46.4%
Others	9	16.1%
Total	56	100.0%

How many expert innovation employees your organization has?	Frequency	Percent
0-5	37	66.1%
5-10	14	25.0%
10-15	3	5.4%
15-20	1	1.8%
More than 20	1	1.8%
Total	56	100.0%

In your organization, is there sufficient interaction between expert innovation team and other employees?	Frequency	Percent
No interaction at all	15	26.8%
Weak interaction	30	53.6%
Moderate Interaction	9	16.1%
Strong interaction	1	1.8%
Very Strong Interaction	1	1.8%
Total	56	100.0%

Are you satisfied with the prevailing innovation strategy of your company?	Frequency	Percent
Not Satisfied at all	26	46.4%
Low Satisfaction	18	32.1%
Moderately Satisfied	8	14.3%
Satisfied	3	5.4%
Very satisfied	1	1.8%
Total	56	100.0%

How often do you carry out innovation practices relating to processes, services and products innovations?	Frequency	Percent
Not at all	11	19.6%
Low	37	66.1%
Moderate	6	10.7%
Often	1	1.8%
Very Often	1	1.8%
Total	56	100.0%

How often do your company / Organization get engaged in PPP Contracts?	Frequency	Percent
Not at all	4	7.1%
Low	47	83.9%
Moderate	4	7.1%
Often	1	1.8%
Total	56	100.0%
Your personal experience in the management of construction and PPP projects (years):	Frequency	Percent
0-5	23	41.1

5-10	17	30.4
10-15	9	16.1
15-20	5	8.9
More than 20	2	3.6
Total	56	100.0

7. Results

In this part we will calculate innovation implementation elements and performance indicators survey data, this will include the mean, standard deviation and variances.

Table 6: Factors mean, variance and standard deviation

Main Factor	Sub Factor	Mean	Std. Deviation	Variance
Innovation Drivers	Client Requirements	3.6964	1.17426	1.379
	Improvement in projects performance	3.2143	1.15545	1.335
	Competition advantages for organizations	3.1786	1.17716	1.386
	Regulation and legislations by Authorities	2.9464	1.31315	1.724
	Technological development	2.9286	1.26286	1.595
	Organizations responsibility for higher client satisfaction and image improvement.	2.5000	1.37510	1.891
	Design trends	2.3571	1.06904	1.143
	Environmental and sustainability requirements	2.0179	.98148	.963
Innovation Enablers	Early engagement of Contractor (Private Sector)	4.0357	.76192	.581
	Internal and external	3.6607	.85868	.737

Main Factor	Sub Factor	Mean	Std. Deviation	Variance
	reward schemes			
	Cooperation between public and private sector	3.6429	.96160	.925
	Organizations Management and Leadership support	3.4107	.98676	.974
	Organizations commitment toward innovation	2.8393	1.21770	1.483
	Innovation training policies	2.6964	1.00760	1.015
	Knowledge Management	2.5179	1.14401	1.309
Innovation Inputs	Investment in research and development (R&D)	3.6607	.83724	.701
	Investing and putting more capitals in innovation practices	3.6250	1.01914	1.039
	Internal knowledge resources sharing	3.1786	.91666	.840
	External knowledge resources sharing	3.1071	1.39712	1.952
	Innovation teams	3.0714	1.21890	1.486
	External Consultancy	2.8929	1.18596	1.406
Innovation Barriers	Shortage of Financial resources	3.9464	.90292	.815
	The unavailability and	3.9286	1.05928	1.122

Main Factor	Sub Factor	Mean	Std. Deviation	Variance
	lack of materials			
	Lack of clear goals and benefits (Outcomes)	3.3571	1.18212	1.397
	Lack of experienced and qualified staff	3.3036	.91293	.833
	Unsupportive organizational culture	3.1071	1.05621	1.116
	The Temporary nature of Projects	2.2321	.83101	.691
	Time constraints	2.2321	.80884	.654
Innovation Benefits (Outcomes)	Decrease in project construction Duration	3.8036	.86170	.743
	Long term Profitability for public and private sectors	3.6607	.74533	.556
	Increase in productivity	3.3929	1.00324	1.006
	Increase in stakeholders satisfaction	3.2500	1.01354	1.027
	Improvement of technical and managerial capabilities	3.0536	1.24199	1.543
	Gaining experience for private and public sectors	2.5357	1.09485	1.199
	Future business collaboration	2.4821	.91435	.836
	Improvement of organizations image	2.3929	.86715	.752

7.1 Reliability test

According to (Hammerer et,al ,2013) Test reliability relate to the level to which a test is steady and consistence in measuring what it is anticipated to measure. Means, a test is reliable when it shows consistency within itself and across time, and hence a reliable and firm results and outcomes, to test reliability we will be using Cronbach alpha – inter consistency method, reliability will require to have values above 0.7.

Each main factors will be tested separately and then all factors will be tested for reliability in one measurements,

After conducting the test in SPSS the following results were found;

Table 7: Cronbach Alpha values

Main Factors	No. of Items	Cronbach Alpha	No. of Items after Deletion	Cronbach Alpha after deletion
Innovation Drivers	8	0.812	N/A	N/A
Innovation Enablers	7	0.709	N/A	N/A
Innovation Inputs	6	0.618	2	0.705
Innovation Barriers	7	0.71	N/A	N/A
Innovation Benefits (Outcomes)	8	0.673	2	0.718
All Factors	36	0.925	4	0.931

Table 3: Cronbach Alpha values

The table shows high reliability for the results of the survey, as the overall Cronbach Alpha value is 0.925 when considering the 36 factors, however when testing

reliability of each main (Category) factors separately it was noted that innovation drivers, enablers and barriers have Cronbach values greater than 0.7, which means high reliability, where it was 0.618 for the innovation inputs which required deletion of 2 factors (putting more capitals in innovation practices) and (Internal knowledge resources sharing) to get a value of 0.705.

Similarly Innovation benefits (Outcomes) Cronbach value was 0.673 before the deletion of two factors; (Decrease in project construction duration) and (Improvement of organizations image) the new value was 0.718.

7.2 Correlation test (Pearson's Product-Moment Correlation)

The Pearson correlation coefficient measures the strength and direction of linear relationship between pairs of continuous variables, in which it evaluate if there is statistical evidence for linear relationship among the same pairs of variables in a survey.

To prove the relationship between variables, the significance coefficient should range between (0.01 - 0.05), accordingly correlation is used to test the relationship between innovation implementation elements (innovation performance determinants) including drivers, enablers, inputs and barriers, and performance indicators (innovation benefits (Outcomes)) in the UAE construction industry and PPP projects developments.

The next table shows correlation test done on the correspondent's survey:

Table 8: Survey Correlation values

Correlations		Global Benefits (Outcomes)
Global Driver Factors	Pearson Correlation	.728**

Correlations		Global Benefits (Outcomes)
	Sig. (2-tailed)	.000
	N	56
Global Enablers Factors	Pearson Correlation	.772**
	Sig. (2-tailed)	.000
	N	56
Global Input Factors	Pearson Correlation	.699**
	Sig. (2-tailed)	.000
	N	56
Global Barriers Factors	Pearson Correlation	.509**
	Sig. (2-tailed)	.000
	N	56
**. Correlation is significant at the 0.01 level (2-tailed).		

The above table shows significant relationship between innovation drivers, enablers, inputs and barriers and innovation benefits (Outcomes), the same support the previously assumed hypothesis.

7.3 Regression test

Regression test is used when we want to predict the value of a dependent variable (Outcome Variable), in our case is the UAE construction and PPP development innovation benefits (Outcomes), from the perception of another independent variable (Innovation drivers, enablers, inputs and barriers).

Enter method will be used for regression test, according to the tables extracted from SPSS analysis shown below it is observed that the assumed hypothesis are

accepted as there is positive relationship between innovation implementation elements Drivers, enablers and inputs, and performance indicators (innovation benefits (Outcomes)) indicated by high value for F ratio and Negative relationship between innovation implementation element; Barriers, and performance indicators (innovation benefits (Outcomes)) as indicated by high value for F ratio.

It is noticed that the innovation enablers factors are the highest significance and the innovation barriers factors are the least in significance for innovation benefits (Outcomes).

7.3.1 Innovation drivers factors

The R Square and the adjusted R Square values were 0.530 and 0.521, this indicate a high degree of goodness of fit of the regression model, furthermore R Square and adjusted R Square values show that 52% of variance in the innovation benefits (Outcomes) criteria could be explained by the innovation drivers factors.

F Ratio for Innovation drivers factors is 60.92 which is significant at $P \leq 0.001$, this indicate that the regression model is predicting the innovation benefits (Outcomes) well for UAE construction and PPP developments, in addition the B value of .501 is positive, accordingly it supports the hypothesis assumed earlier which predict positive relationship between the innovation drivers and the innovation benefits (Outcomes).

Table 9: Innovation drivers Regression test analysis

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Innovation Driver Factors ^b		Enter
a. Dependent Variable: Innovation Benefits			

(Outcomes)
b. All requested variables entered.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.728 ^a	.530	.521	2.98750
a. Predictors: (Constant), Innovation Driver Factors				

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	543.757	1	543.757	60.924	.000 ^b
	Residual	481.957	54	8.925		
	Total	1025.714	55			
a. Dependent Variable: Innovation Benefits (Outcomes)						
b. Predictors: (Constant), Innovation Driver Factors						

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.127	1.520		8.638	.000
	Innovation Driver Factors	.501	.064	.728	7.805	.000
a. Dependent Variable: Innovation Benefits (Outcomes)						

7.3.2 Innovation Enablers factors

The R Square and the adjusted R Square values were 0.597 and 0.589, this indicate a high degree of goodness of fit of the regression model, furthermore R Square and adjusted R Square values show that 59% of variance in the innovation benefits (Outcomes) criteria could be explained by the innovation enablers factors.

F Ratio for Innovation enablers factors is 79.85 which is significant at $P \leq 0.001$, this indicate that the regression model is predicting the innovation benefits (Outcomes) well for UAE construction and PPP developments, in addition the B value of .788 is positive, accordingly it supports the hypothesis assumed earlier which predict positive relationship between the innovation Enablers and the innovation benefits (Outcomes).

Table 10: Innovation enablers Regression test analysis

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Innovation Enablers Factors ^b		Enter
a. Dependent Variable: Innovation Benefits (Outcomes)			
b. All requested variables entered.			

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.772 ^a	.597	.589	2.76827
a. Predictors: (Constant), Innovation Enablers Factors				

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	611.896	1	611.896	79.848	.000 ^b
	Residual	413.818	54	7.663		
	Total	1025.714	55			
a. Dependent Variable: Innovation Benefits (Outcomes)						
b. Predictors: (Constant), Innovation Enablers Factors						

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.597	2.045		3.225	.002
	Innovation Enablers Factors	.788	.088	.772	8.936	.000
a. Dependent Variable: Innovation Benefits (Outcomes)						

7.3.3 Innovation Inputs factors

The R Square and the adjusted R Square values were 0.489 and 0.480, this indicate a high degree of goodness of fit of the regression model, furthermore R Square and adjusted R Square values show that 48% of variance in the innovation benefits (Outcomes) criteria could be explained by the innovation inputs factors.

F Ratio for Innovation enablers factors is 51.68 which is significant at $P \leq 0.001$, this indicate that the regression model is predicting the innovation benefits (Outcomes) well for UAE construction and PPP developments, in addition the B value of .722 is positive, accordingly it supports the hypothesis assumed earlier which predict positive relationship between the innovation inputs and the innovation benefits (Outcomes).

Table 11: Innovation inputs Regression test analysis

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Innovation Input Factors ^b		Enter
a. Dependent Variable: Innovation Benefits (Outcomes)			
b. All requested variables entered.			

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.699 ^a	.489	.480	3.11541
a. Predictors: (Constant), Innovation Input Factors				

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	501.603	1	501.603	51.681	.000 ^b
	Residual	524.111	54	9.706		

Total	1025.714	55		
a. Dependent Variable: Innovation Benefits (Outcomes)				
b. Predictors: (Constant), Innovation Input Factors				

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.492	2.138		4.439	.000
	Innovation Input Factors	.772	.107	.699	7.189	.000
a. Dependent Variable: Innovation Benefits (Outcomes)						

7.3.4 Innovation Barriers factors

The R Square and the adjusted R Square values were 0.259 and 0.245, this indicate a high degree of goodness of fit of the regression model, furthermore R Square and adjusted R Square values show that 25% of variance in the innovation benefits (Outcomes) criteria could be explained by the innovation barriers factors.

F Ratio for Innovation enablers factors is 18.98 which is significant at $P \leq 0.001$ but the least of all factors, this indicate that the regression model is predicting the innovation benefits (Outcomes) well for UAE construction and PPP developments, in addition the B value of .722 is positive, accordingly it supports the hypothesis assumed earlier which predict negative relationship between the innovation barriers and the innovation benefits (Outcomes).

Table 12: Innovation barriers Regression test analysis

Variables Entered/Removed^a
--

Model	Variables Entered	Variables Removed	Method
1	Innovation Barriers Factors ^b		Enter
a. Dependent Variable: Innovation Benefits (Outcomes)			
b. All requested variables entered.			

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509 ^a	.259	.245	3.75127
a. Predictors: (Constant), Innovation Barriers Factors				

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	265.824	1	265.824	18.890	.000 ^b
	Residual	759.890	54	14.072		
	Total	1025.714	55			
a. Dependent Variable: Innovation Benefits (Outcomes)						
b. Predictors: (Constant), Innovation Barriers Factors						

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	12.761	2.763		4.618	.000
	Innovation					
	Barriers	.534	.123	.509	4.346	.000
	Factors					
a. Dependent Variable: Innovation Benefits (Outcomes)						

8. Discussion

The aim of this research is to identify the impact of innovation implementation elements on the delivery of successful PPPs Projects and enhancement to the projects constraints. To facilitate this a survey was conducted for experts in the UAE construction industry. The purpose of this chapter is to analyze results of the survey and accordingly be able to give conclusions and recommendation.

The survey comprises four central parts; the first constitutes the demographic data of the respondents including general information about their business' designation, the extent of interaction between innovation experts and other employees in their organisation, services and products' innovation, participants' experience in the management of construction, and PPP projects.

The second part highlights the extent of the participants' evaluation of the influence of drivers, enablers, and inputs factors promoting PPP innovation in the UAE construction industry, while the third part measures the impact of innovation barriers on PPP innovation in the UAE construction industry. Subsequently, the fourth part requests participants to rate Outcomes for PPP projects in the UAE construction industry, and accordingly, enhancement towards successful completion.

In the previous section, the relationship between factors of innovation and Outcomes for UAE construction and PPP development were measured and analysed utilising SPSS analysis testing methods.

The survey conducted with the nominated sample from four entities, including public and private sectors, involved in construction and PPP developments in the UAE. Most of the participants held engineering or senior engineering positions. However, the number of managers and senior managers was the least. This constitution represents a close percentage to normal distribution of positions in any organisation.

With regard to the number of innovation experts in the participant organisations, it was observed that the UAE construction industry expresses weak support for innovation teams, since more than 90% of the participants reported that their organisations possess less than 10 innovation experts. Similarly, the results exhibited inadequate or no interaction at all between innovation experts and other teams, with a total percentage of 75% for both selections. Further, more than 78% expressed low or no satisfaction regarding the organisations' innovation strategies, since almost 85% of the participants do not participate or have low levels of participation in innovation practices related to process, services, and production-related innovation.

On the other hand, it was observed that UAE construction industry displays a weak preference for PPP contracts compared to traditional procurement routes. This was made evident by the survey feedback, as more than 83% of the participants reported that their organisations have low participation or engagement in public private contracts.

The respondents experience ranged from 0 to more than 20 years, where the majority of the participants reported 0 to 10 years of experience in the field.

Furthermore, to establish the reliability of the data collected, a reliability test was conducted for the results that revealed a high level of reliability, as the overall Cronbach alpha value was 0.925, all factors considered. However, when the reliability of each central (category) factor was evaluated separately, it was observed that innovation drivers, enablers, and barriers displayed Cronbach values exceeding 0.7, projecting a high reliability of the results. The values stood as 0.618 for the innovation inputs that required the deletion of 2 factors (putting more capital in innovation practices) (internal knowledge resources sharing) to obtain a value of 0.705.

Similarly, Outcomes' Cronbach value was 0.673 before the deletion of the 2 factors; (decrease in project construction duration) and (improvement of organisations image), the new value was 0.718.

The correlation test was also conducted that demonstrated a significant relationship between innovation implementation elements (innovation performance determinants) including drivers, enablers, inputs and barriers, and performance indicators (Outcomes) in the UAE construction industry and PPP projects' development; the same supports the previously assumed hypothesis.

Regression analysis was also conducted to predict the value of a dependent variable (outcome variable), in this case, the UAE construction industry and PPP development Outcomes, and consequently, enhancement of the constraints of these developments, and eventually, the success criteria in terms of another independent variable (innovation drivers, enablers, inputs and barriers).

The results of this test support the hypothesis assumed earlier that predicts a positive relationship between the innovation drivers, enablers, and inputs with Outcomes, and a negative relationship between innovation barriers with Outcomes in the UAE construction industry and PPP development.

However, the innovation enablers display the highest significance and the innovation barriers demonstrate the least significance for Outcomes.

The following part will contain a discussion of the hypothesis tested earlier with scholars' reviews for the same.

8.1 Influence of innovation drivers

The objective of the data analysis was to determine the relationship between innovation drivers and Outcomes and the consequent enhancement of the developments constraints and the assurance of these developments' success; the same was proved with the regression test and the correlation test.

Responses from experts for the influence of Drivers:

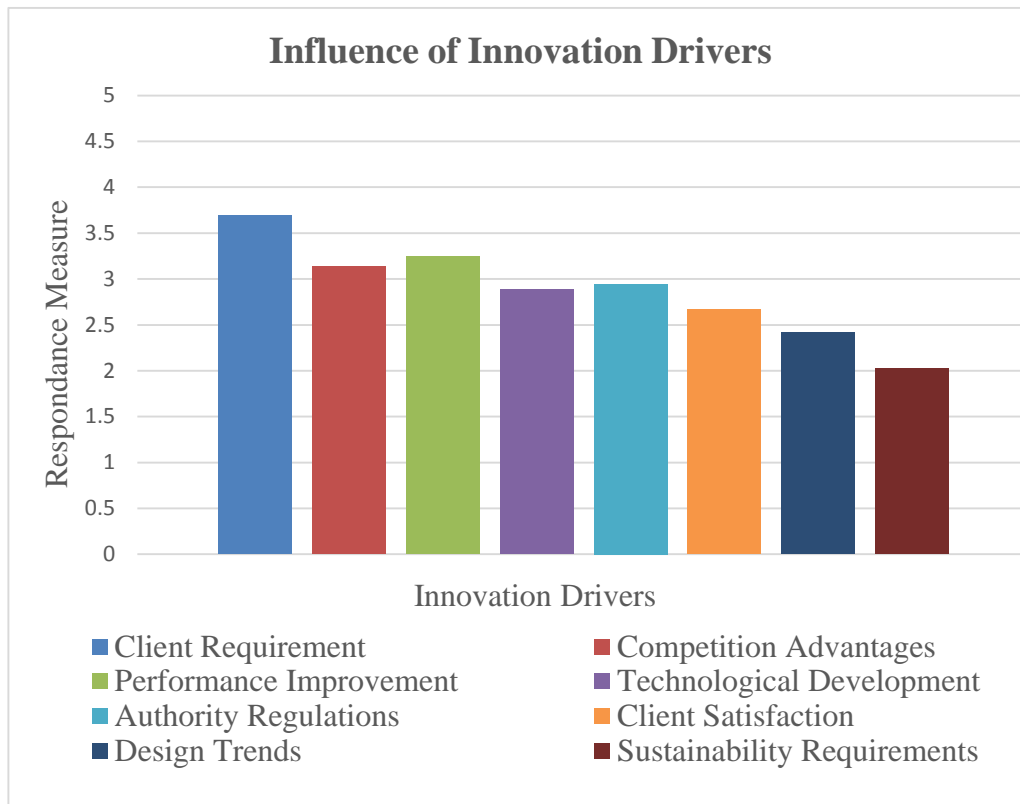


Figure 5: Drivers influence on Innovation benefits

The above figure shows the biggest influence coming from Client requirements and the lowest influence from sustainability requirements.

In this research paper, the hypothesis was formulated that assumes a positive influence of innovation drivers on PPP Outcomes. According to the results of our survey and SPSS analysis including the regression and correlation test, it is evident that innovation drivers have a positive relationship with Outcomes.

Previous researchers have highlighted the same relationship between innovation drivers and innovation enhancement and Outcomes.

According to Brandon and Lu (2009), client requirements are the most important and central factor for innovation in the construction industry it indeed encourages the project team to enhance its response, and to enhance the strategic

methods to mitigate the impacts of the unforeseen changes; the same benefits the project performance by reducing the impact of the risks (Gann & Salter 2000). Furthermore, the owners possess the ability to promote innovation by higher requirement for high-speed work, so they act as leaders to encourage new designs for a cooperative work atmosphere; hence, building an innovation team for more proactive efforts towards a controlled project constraints environment (Manley 2008). For example, it was highlighted by scholars that innovation provides significant advantages regarding the time constraint of projects, without jeopardizing the other constraints (Ozorhon et al. 2015).

Scholars have observed that the competitive environment in organisations drives innovation that has led to an increased interest in innovation due to the advantages that are derived from this environment, as firms aim to enhance their performance by increasing their innovation skills (Slaughter 2000). Consequently, construction companies came to believe that quality, time, and cost, in addition to other performance measurements, can be improved through innovative practices that will eventually lead to successful projects (Aouad et al. 2010). Apart from that, the increased use of new materials, communication, and information technologies has helped organisations to develop innovative solutions for typical construction issues by utilizing other technology outcomes (Nam & Tatum 1992).

According to Reichstein et al. (2008), new legislations and regulations, whether they came from governmental authorities or from the organisations, also play a considerable role in stimulating innovation by compelling companies to comply with these requirements by creating innovative solutions and processes that usually aim to achieve positive market changes. Conversely, the organisations' commitment to satisfy the clients and to improve their image in the market to maintain their sustainability and growth can be considered as one of the innovation outcomes that play a strong role in driving innovation (Borger & Kruglianskas 2006). The same view was highlighted by (Ozorhon et al. 2014), as stated successful innovation increases the clients' satisfaction that leads to higher opportunities for

future work collaborations and market share. Similarly, innovation provides opportunities for improvement of firms' image and position, as it is well known in the industry that a construction company's bad image can be enhanced by the advantages it provides in terms of productivity and safer designs, and it can earn a positive reputation for these companies in the market (Ozorhon et al. 2015).

Furthermore, Ozorhon et al. (2015) emphasised the ability of design trends to drive innovation, as it synchronises market needs, prospects, and methodological capabilities, and accordingly, it can be concluded that there is increased stress on creators to offer more competitive designs and to be more innovative. To accomplish this, designers must utilise integrated technology in advanced levels to create new ideas that display new insights in the construction industry.

Other factors of innovation include the tendency of the industrial companies to adapt and create new sustainable products to reduce a significant impact on the environment. These new strategies are governed by regulations or by self-motivation and involve the use of product delivery systems, procedures, products, and sustainable production equipment (Miozzo & Dewick 2002).

Therefore, as mentioned by researchers, several factors propel organisations and individuals to enhance innovation; this is based on a deep understanding of the benefits (Outcomes) hidden behind adopting this approach.

8.2 Influence of innovation enablers

The objective of the data analysis was to determine the relationship between innovation enablers and Outcomes; and the consequent enhancement of the developmental constraints and assurance of these developments' success; the same view was proved with the regression test and the correlation test.

Responses from experts for the influence of Enablers:

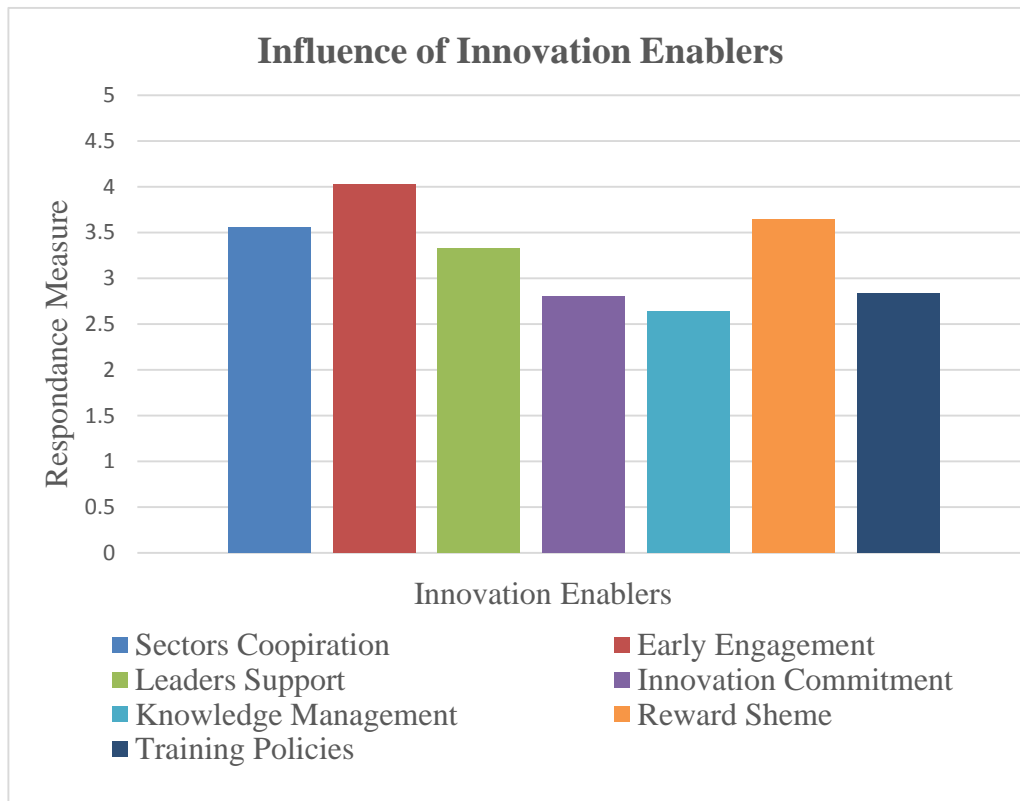


Figure 6: Enablers influence on Innovation benefits

The above figure shows the biggest influence coming from early engagement of the private sector and the weakest influence from knowledge management.

In this paper, a hypothesis was created that assumes that innovation enablers have a positive influence on PPP Outcomes. According to the results of our survey and SPSS analysis, including the regression and correlation test, it is evident that innovation enablers share a positive relationship with Outcomes and the related benefits stated previously.

Previous researchers have highlighted the same relationship between innovation enablers and innovation enhancement and innovation and its benefits (Outcomes).

According to Manley et al. (2009), effective innovation requires effective coordination, cooperation among projects stakeholders, including clients, consultants, contractors, subcontractors, designers, architects, and suppliers in the construction development. This collaboration and integration lead to a more cooperative environment that facilitates innovation as a part of development, and many studies reveal a lack of innovation accruing in isolated environments (Shieh 2010). In addition, researchers have emphasised the importance of building interactions for technological innovation, and such cooperation presents a powerful enabler for innovation in the construction industry (Carlsson et al. 2002). Dulaimi et al. (2003) highlighted that interoperation between the creator of the creative ideas and the associate firms, whose support is required to implement innovation, increase the contribution in innovation practices and eventually lead to innovation. Accordingly, innovation causes long-term profitability for firms, as innovation in the construction industry requires multiple demands form construction companies, and the alignment to these requirements is essential,, especially for enhancing performance in specific development. Success in an innovation project can create a competitive advantage for organisations by positively affecting the long term objective of the organisation and its business plans; the results usually affect companywide benefits (Outcomes) (Tatum 1989).

Scholars have emphasised the advantage of early involvement of contractors; therefore, early engagement between construction projects' parties play an important role in building trust among development stakeholders and is an enabler of innovation practices. Korczynski (1996) states that contractors' support in the early design phases award remarkable benefits (Outcomes) and enhancement through the way in which cooperative work environment is created. Additionally, early involvement of contractors might motivate staff members for the efficient formation and creation of value adding solutions.

Defined as one of the major enablers for innovation, leadership was highlighted by many scholars and researchers for its role in fostering innovation.

According to Ozorhon et al. (2015), leadership plays a critical role in shaping the spirit of the project, and the central players are the managers who motivate the team members and direct their attention to attract and foster creation and innovation. Conversely, the organisation's commitment towards innovation enables innovation from many aspects. This commitment includes the company policies and philosophy that influence construction-related innovation. Consequently, firms be tolerant towards taking risks, committing mistakes, and facing failure to promote innovation (Tatum 1989). Dulaimin et al. (2003) emphasised that alignment and high commitment to innovation between diverse stakeholders positively affects the creation of innovative ideas. Therefore, construction projects' parties must express commitment and engagement in innovation to guarantee a successful implementation. Consequently, innovation leads to the improvement of managerial and technical capabilities, as the use of new technologies forms a rich source of improvement. Through the adoption of new ideas, staff, and teams become more flexible towards the creation of methods for cooperation with other teams and colleagues; further, implementing innovation and problem-solving facilitate the improvement of supervisory abilities (Ozorhon et al. 2014).

Controlling knowledge is known as a tool through which enhanced business performance and innovation are attainable; consequently, managers and directors should create the tools and mechanisms that promote the exchange of knowledge among team members to facilitate innovation (Al-Ghassani et al. 2004). Effective knowledge sharing is crucial for supplying the correct ideas in the construction projects and for effective communication of these ideas to the entire project's stakeholders and for future projects (Ozorhon 2014). This knowledge sharing platform requires strategies for management, in addition to foster knowledge and knowledge workers' products in the innovation efforts.

Recognition of innovators serves as an enabler for successful innovation. Therefore, in order to facilitate innovation, a reward system and schemes for recognition require to be adopted in the form of innovation promotion, in which, staff

taking share in the application stage of innovation should be remunerated apart from the success of innovation with regard to the company and construction project's purposes. It is preferred to extend this recognition in the shape of basic rewards that deliver the challenges and pride to the personnel engaged in the innovation strategies (Dulaimi et al.2002). In addition, organisations must be able to accept fluctuating market conditions to survive and to maintain their competitive advantages To enhance that, organisations have to implement innovation training policies and the human resources departments must provide learning courses that allow the staff to be educated about innovation and utilise the innovation. These trainings have to be specialised for different innovation types and conducted in firms' offices and project site locations to disseminate the best knowledge (Cross 1983). Hence, organisations adopting and implementing innovation have advanced experience, in which a new knowledge is used on diverse kinds of projects, with a positive impact and promotion of additional benefits (Outcomes) in many presentations. It may be undertaken as standard exercises for the organisation. This needs awareness and recognition by the practical parties engaged in the developments, and the knowledge gained by innovation can be implemented in upcoming projects (Tatum 1989).

8.3 Influence of innovation Inputs

The aim of the data analysis is to govern the relationship between innovation input factors and Outcomes and the consequent enhancement of the developmental constraints and assurance of these developments' success. The same was proved through the regression test and the correlation test.

Responses from experts for the influence of Inputs:

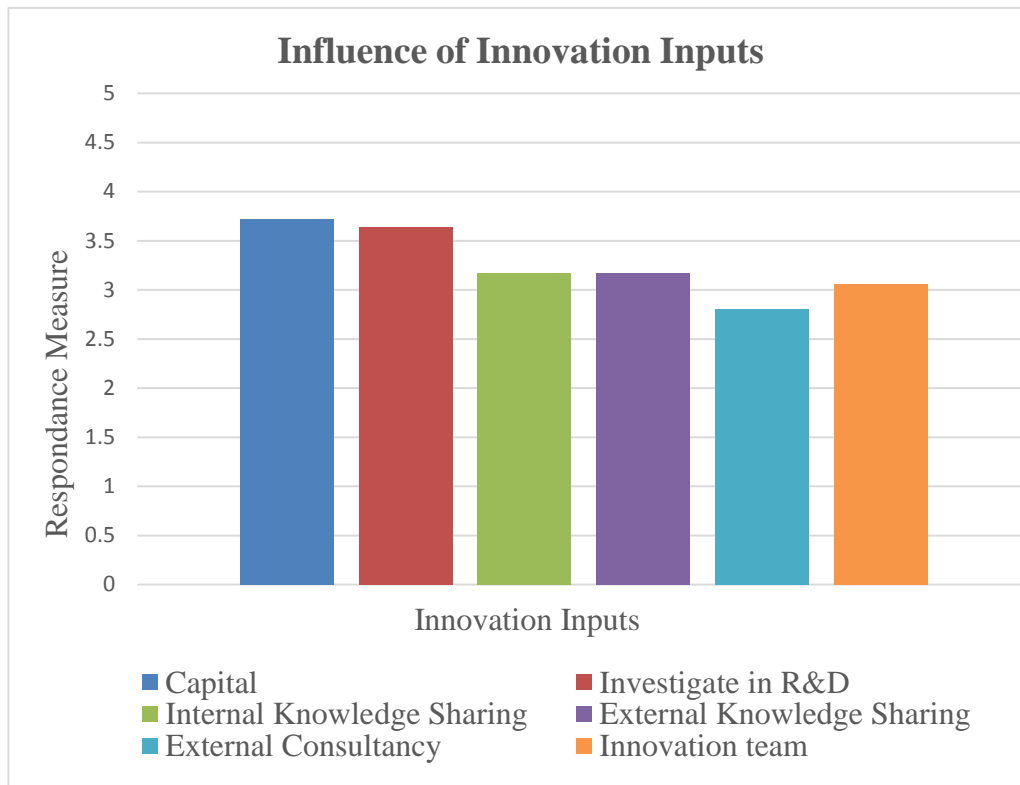


Figure 7: Inputs influence on Innovation benefits

The above figure shows the biggest influence coming from financial capital and the weakest influence from External consultancy.

In this paper, a hypothesis was formulated that assumes that innovation inputs have a positive influence on PPP Outcomes. According to the results of our survey and SPSS analysis including the regression and correlation test, it is evident that innovation inputs have a positive relationship with Outcome and the above mentioned benefits.

Previous researchers have highlighted the same relationship between innovation inputs and innovation enhancement and innovation and its corresponding benefits (Outcomes).

According to Teece (1996), innovation in construction requires inputs to ensure success. These include resources that are utilised to implement innovation such as financial, human, and organisational resources. An example of this is organisation capital. Construction firms' capabilities are extended and increased by investing in the adoption of research and development (R&D), organisational practices, and new knowledge.

Construction developments are complex in nature and need a tremendous amount of investments. Similarly, designing new products or specialised tools and equipment require huge financial resources. Another input is investment in R&D. Managers refer to R&D as a portion of project organisation practices. Nevertheless, R&D is not taken into consideration in developing innovation. This is due to the fact that construction is assumed as a low innovation sector that requires limited R&D expenditure. Consequently, investing in R&D is essential to facilitate innovation to facilitate the outcomes of innovation to guarantee projects' success (Audretsch & Feldman 1996).

As a return, innovation has a positive impact on the reduction of projects' cost, as the same present critical factors for the relationship between clients and service providers, including contractors. Accordingly, innovation has been proved to enhance projects' completion cost (Gann & Salter 2000)

Knowledge is an essential ingredient for innovation. This knowledge has two types; the first one is the internal knowledge resources; in this type, organisations learn from their own experiences and teams. Difficulties and problems arising during the construction activities might foster innovation; accordingly, project site personnel and project management team is critical for the innovation process. Furthermore, firms need to organise workshops on a periodical basis to come up with innovative solutions. Apart from that, managers have to stimulate innovation by coordinating and directing the team to generate creative ideas (Ozorhon et al. 2013).

The second type is comprised by the external knowledge resources; advantages can be gained by the multiple number of parties involved in construction projects, sharing knowledge of suppliers, engineers, designers, clients, constructors, and end users represent major inputs for innovation creation and implementation, highlighting that in the construction industry, most companies import new technologies from other industries and an example of this is information transfer between research universities/institutions and construction companies (Salter & Gann 2003).

Additionally, consultancies have a very crucial part in fostering innovation. By offering valuable information to clients, consultants develop business contacts with clients, cooperating with technology firms to collect new technologies, gather preceding understanding in knowledge management system, archives, or expertise directories, and formalise strategic management practices. Accordingly, it was noted that the hiring of external firms with different expertise bases is useful for innovation, as the collaborating organisations recognise the added value of information, and apply it strategically (Barlow et al. 2013). Finally, human resources is very important for the success of construction projects, and accordingly, for innovation, if the R&D teams are appropriately directed and supported (Sun & Pan 2011).

8.4 Impact of innovation Barriers

The objective of data analysis is to determine the relationship between innovation barriers factors and Outcomes. and the consequent negative impact on developments constraints and PPP developments failure The same was proved with the regression test and the correlation test.

Responses from experts for the impact of barriers:

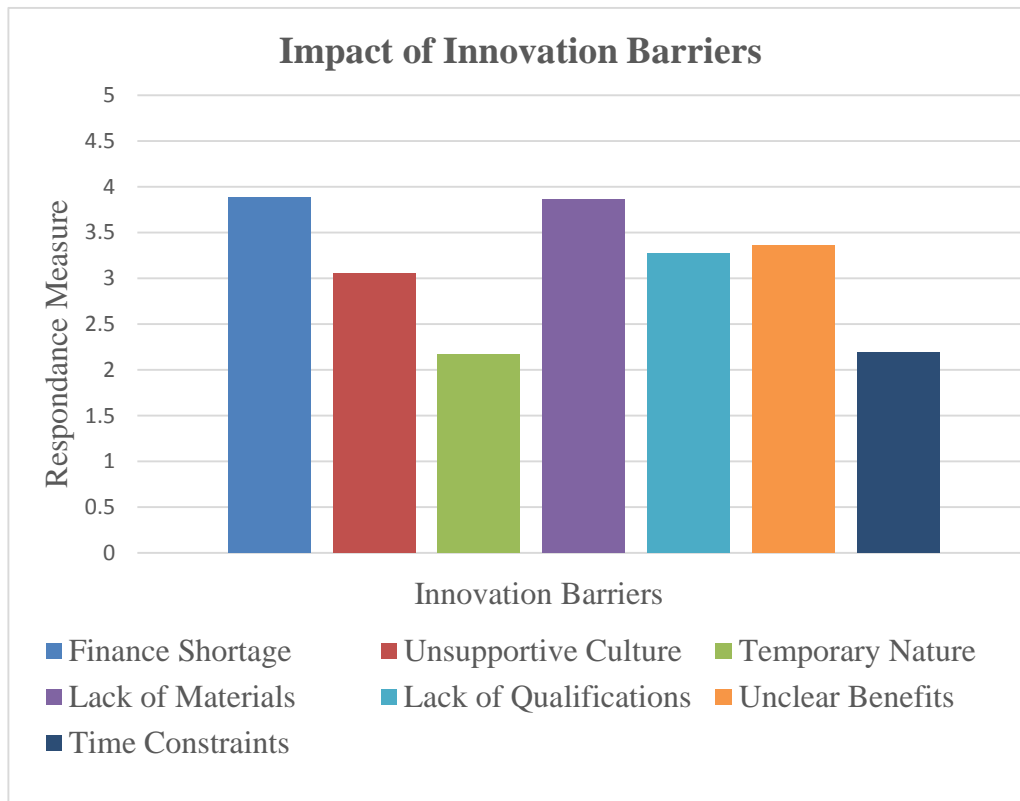


Figure 8: Barriers impact on Innovation benefits

The above figure shows the biggest impact coming from financial shortage and the weakest influence from the temporary nature of the project.

In this paper, a hypothesis was formulated that assumes that innovation barriers have a negative impact on PPP Outcomes. According to the results of this survey and SPSS analysis including the regression and correlation test, it is clear that innovation barriers have a negative relationship with Outcomes, and hence, a negative impact on developments' constraints and PPP developments' failure.

Previous researchers have highlighted the same relationship between innovation barriers and innovation failure.

Financial resources have a huge impact on innovation, and lack of these resources is considered as the major blocker for organisations to innovate and

negatively risk projects success. As innovation requires dedicated investment capitals, other scholars like Egan (1988) blamed the narrow cultural aspects of organisations for limiting innovation. According to him, some markets have an attitude of rejection for creating and accepting new methodologies and operations, where they widely criticise innovation and refuse to absorb new management process and technologies. This is noted in particular in the construction industry, where, on the other hand, Aronson and Lechler (2009) highlighted an organisation culture that is proactive, ready to take calculated risks, trusting, and adopts constructive attitude that enhances investigation and open interchange between the teams, and consequently, in such a philosophy, teams are open to conversion and innovation. So, unsupportive managerial culture and refusal to change is one of the major barriers for innovation and barriers for projects' enhancement.

It was also noted that the temporary nature of projects was considered as one of the barriers for innovation, as projects are usually operated on a short-term basis and carried out by diverse teams and this combination leads to challenges to deliver projects' outcomes. Similarly, this leads to limitations for innovation creation, which at the same time might provide solutions for time and productivity enhancement (Sexton & Barrett 2003). Furthermore, unavailability of materials has limited innovation in the construction industry. Several advantages were brought by standardisation of construction products. The construction industry's nature is resistant to modularisation of components, pre-assembly, and prefabrication. However, these urges for modularised and standardised buildings needs enhanced material and these materials are not always easy to supply. The unavailability of these material, and accordingly, in manufactured products, increases the difficulty to innovate Ozorhon et al. (2015).

Innovation requires highly skilled staff from all levels to create effectiveness in operation of construction companies. It is indicated that innovation might be fostered by teams that consider the newest technology and can take risks innovation usually starts from individuals on high positions who can take decisions, such as

directors, facilitators, and technology managers; in contrast, the lack of qualifications and lack of knowledge among the project's staff has a negative impact on creativity, and accordingly, leads to technical limitations in adopting new methods for innovation. Therefore, to foster innovation it is very important to have experienced managers who can be considered as innovation champions (Aronson and Lechler 2009).

The lack of clear benefits (Outcomes) have a huge impact as a tremendous barrier for innovation, since the margins of returns are considerably low in the construction market. Hence, incomes must be clearly calculated and wise decisions for investments should be made; since the new products might be used only in a single development, directors and decision makers usually experience complications in ensuring the return on investment (Grossman & Helpman 1993). Also, time limitations handicap innovation, as construction firms experience stress in the completion of the development within budgetary and time constraints. These constraints usually hinder the development of new products and ideas, and prevent analysing new systems and products. Davidson (2001) claims that the construction industry shows a lack of interest in innovation due to the time shortage of projects. This is clearly noticed in small construction organisations. Similarly, Hardie and Newell (2011) indicated that the needed time for technical innovation to be tested and developed present barriers for innovation in medium- and small-sized firms.

The influence of innovation benefit factors mentioned in scholars researches have been rated by respondents for PPP projects in the UAE Construction

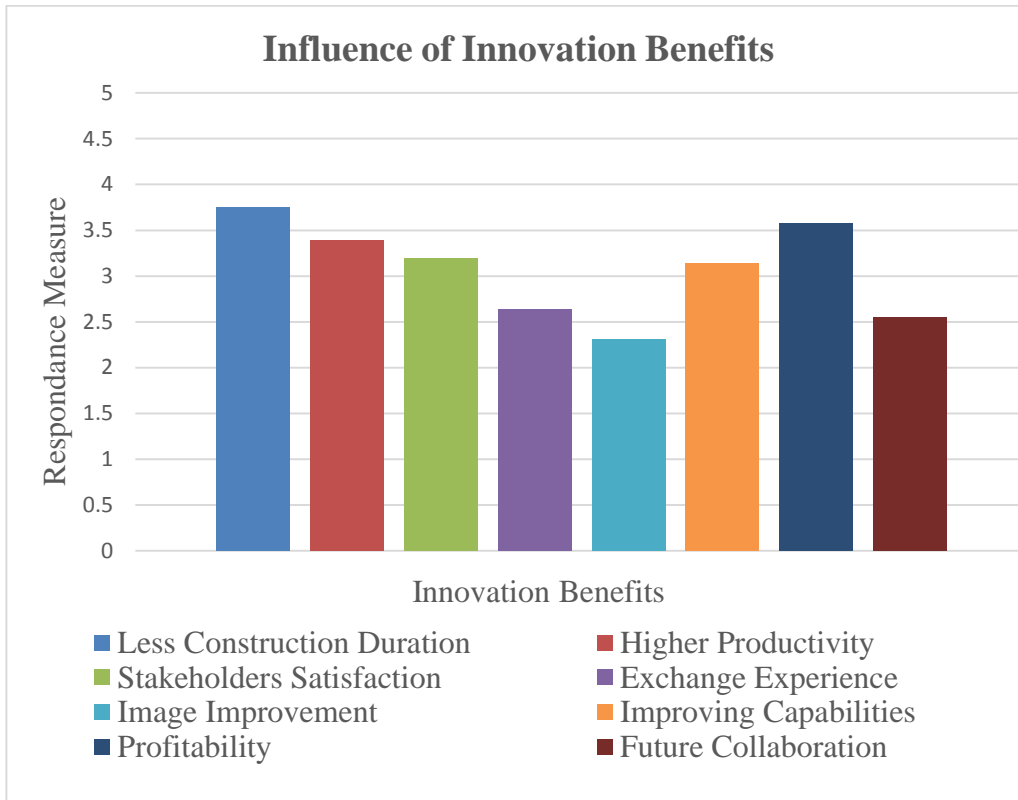


Figure 9: Innovation benefits influence on PPP projects success

The above figure shows the biggest impact coming from financial shortage and the weakest influence from the temporary nature of the project.

9. Conclusion

The main objective of this study is to identify the impact of innovation implementation elements (Innovation Drivers, enablers, inputs and barriers) on the delivery of successful PPPs Projects and enhancement to the projects constraints, and to set up a conceptual framework that links innovation implementation to the enhancement of the UAE construction industry and PPP developments' performance in the UAE.

A link between innovation implementation elements and Outcomes in PPP projects, (performance indicators) was tested, in addition to the investigation of the determinants of innovation performance interrelation, based on the proposed framework.

In order to answer these objectives, a survey was conducted for construction and PPP developments' experts from the UAE local market, where the influence and impact of innovation performance elements and performance indicators were evaluated, the results came as described below:

Due to research limitations, only eight driving factors have been considered in this study. These factors are client requirements, competition advantages, improvement in performance, technological development, regulation and legislation, higher client satisfaction, design trend and environmental and sustainability requirements. The influence of these factors on Outcomes were tested.

According to the results of the survey and SPSS analysis including the regression and correlation test, it is clear that innovation drivers have a positive relationship with Outcomes, and hence, enhance the developments' constraints and assure PPP developments' success. The same was highlighted by other researchers, and it is in line with the proposed hypothesis.

Innovation drivers have a significant effect on Outcomes, and accordingly, promoting these factors will stimulate Outcomes, and hence, enhancement to the developments' constraints and assurance of PPP developments' success.

Due to research limitations, only seven enablers factors have been considered in this study. These factors are public and private sectors cooperation, private sector early engagement, management and leaders' support, innovation commitment, knowledge management, reward schemes, and innovation training policies. The influence of these factors on Outcomes were tested.

According to the results of the survey and SPSS analysis including the regression and correlation test, it is clear that innovation enablers have positive relationship with Outcomes, and hence, enhancement of the developments' constraints and assurance of PPP developments' success. The same was highlighted by other researchers, and it is in line with the proposed hypothesis.

Innovation enablers have the highest effect on Outcomes; accordingly, promoting these factors will stimulate Outcomes, and hence, enhancement to the developments' constraints and assurance of PPP developments' success.

Due to research limitations, only seven inputs factors have been considered in this study. These factors are capital, investment in R&D, internal knowledge resource sharing, external knowledge resource sharing, external consultancy, and innovation teams. The influence of these factors on Outcomes were tested.

According to the results of the survey and SPSS analysis including the regression and correlation test, it is clear that innovation inputs have a positive relationship with Outcomes and the consequent enhancement of the developments' constraints and assurance of PPP developments' success. The same was highlighted by other researchers, and it is in line with the proposed hypothesis.

Innovation inputs have a significant effect on Outcomes; accordingly, promoting these factors will stimulate Outcomes and the consequent enhancement of the developments' constraints and assurance of PPP developments' success.

Due to research limitations, only seven influential factors have been considered in this study these factors are shortage of financial resources, unsupportive organisational culture, projects' temporary nature, lack of experienced and qualified staff, lack of clear goals and benefits (Outcomes), and time constraints. The impact of these factors on innovation benefits (Outcomes) were tested.

According to the results of the survey and SPSS analysis, including the regression and correlation test, it is clear that innovation barriers have a negative relationship with Outcomes and a negative impact on the developments' constraints and PPP developments' failure. The same was highlighted by other researchers, and it is in line with the proposed hypothesis.

Innovation barriers have the least significant effect on Outcomes; however, avoiding and reducing the effect of these factors will stimulate Outcomes, and hence, enhancement of the development constraints and assurance of PPP developments' success.

To promote enhancement of the developmental constraints and assurance of PPP developments' success, the advantages of innovation were studied in this paper from different perspectives. The influence and impact of different factors were linked to these Outcomes, eight benefits (Outcomes) were highlighted in this paper including decrease in construction duration, increase in productivity, increase in client satisfaction, gaining experience, organisational image improvement, technical and managerial capabilities improvement, public and private sectors' long-term profitability, future business collaboration, to highlight that these are the main benefits (Outcomes) of innovation.

The nominated sample of respondents has demonstrated that these benefits (Outcomes) as innovation outcomes enhance construction projects and PPP development's success criteria.

The findings of this paper are expected to facilitate both sectors adoption practices to stimulate innovation in UAE PPP developments, and accordingly, to effect the enhancement of projects constraints and assurance of their success, the same can be utilized by promoting innovation drivers, enablers and inputs factors and preventing innovation barriers factors.

Researchers can build on the results of this paper and do father study to investigate the factors promoting PPP developments success in the UAE construction industry and to highlight the most significant innovation practices that benefit these developments.

9.1 Recommendations

Based on this research, a set of recommendations and suggestions are arrived at to promote utilisation of Outcomes and the corresponding benefits. Each factors' group is considered separately to avoid confusion between these elements.

Being a significant innovation performance elements and promoter for innovation benefits (Outcomes), the following recommendation have to be considered:

- Client need to pursue higher degree of results by increasing their reasonable requirements limits.
- Promote competition instinct for its remarkable advantages
- Improvement in performance
- Organisations have to stay in line with technological development.
- Authorities can stimulate innovation by keeping up to date regulation and legislation for improved results.
- Higher client satisfaction is required for adopting innovative practices.
- Design trends improve organisation's reaction towards innovation.

- Organisations have to pay increased attention to environmental and sustainability requirements and to develop innovation methodologies to reduce the industrial impact.

Based on the aforementioned results, the following are recommendations for improved innovation driver:

- Increased collaboration between public and private sectors enhance innovation, and consequently, projects success.
- Promote private sector's early engagement in PPP developments.
- Managers and leaders have to act as fosters for innovation activities.
- Organisations have to commit to innovation enhancement.
- Internal and external knowledge management is essential for innovation.
- Reward schemes for innovation stimulate teams to go beyond normal standards.
- Organisations have to adopt innovation training policies.

Based on the aforementioned results, the following are recommendations for improved innovation inputs:

- Organisations have to put resources that are utilised to implement innovation such as financial, human, and organisational resources.
- Investing more in R&D promote innovation
- Companies need to have an internal knowledge resource sharing platform.
- Different entities have to practise knowledge resource sharing concepts.
- External consultancy adds value to innovation.
- Dedicate innovation teams for innovation activities.

Based on the aforementioned results, the following are recommendations for improved innovation barriers:

- Investors need to plan extensively to avoid a shortage of financial resources
- Eliminate any lack of support for innovation

- To promote a time limit for innovation and emphasise the temporary nature of project requirements to be considered while doing forecasts for projects
- Avoid shortage of experienced and qualified staff and provide the needful training to enhance their capabilities
- Organisations need to have clear goals and benefits' (Outcomes) strategies.

9.2 Limitations of the study

There are certain limitations of this paper, as the data used to confirm the proposed conceptual model were composed from a limited number of participants working in public and private entities from the UAE construction industry and PPP development only, and accordingly, reflect their experiences and projects. The findings might vary depending on diverse organisations' data, and therefore, may not be generalised that may require conducting this survey for a wider range of respondents. In addition, a limited number of factors and benefits (Outcomes) were studied. Therefore, it may be necessary to consider a broader range of elements.

9.3 Future researchers:

As stated earlier, it was noticed that there are insufficient studies for innovation in the UAE construction industry and in particular, PPP. In addition, innovation and PPP require to be discussed in the same platform Further, innovation in PPPs is poorly understood and requires more studies and understanding to narrow the gap between innovation in PPP and its conceptual framework.

Consequently, further research is required to limit the impact of these implications and to provide additional studies on innovation in UAE construction projects and PPP development.

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Appendices

Appendix 1 Questionnaire

Survey on “Innovation in PPP in the UAE Construction Industry“

Part I: Respondent’s General Information

<ul style="list-style-type: none">• Designation:<ul style="list-style-type: none"><input type="checkbox"/> Senior management <input type="checkbox"/> Manger / Senior resident engineer <input type="checkbox"/> Senior Engineer/Planner/Architect<input type="checkbox"/> Engineer/Planner/Architect <input type="checkbox"/> Other (kindly specify):
<ul style="list-style-type: none">• How many expert innovation employees your organization has?<ul style="list-style-type: none"><input type="checkbox"/> 0-5 <input type="checkbox"/> 6-10 <input type="checkbox"/> 11-15 <input type="checkbox"/> 16-20 <input type="checkbox"/> More than 20• In your organization, is there sufficient interaction between expert innovation team and other employees?<ul style="list-style-type: none"><input type="checkbox"/> No Interaction <input type="checkbox"/> Week <input type="checkbox"/> Moderate <input type="checkbox"/> Strong <input type="checkbox"/> Very strong Interaction• Are you satisfied with the prevailing innovation strategy of your company?<ul style="list-style-type: none"><input type="checkbox"/> Not satisfied at all <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> Satisfied <input type="checkbox"/> Very satisfied• How often do you carry out innovation practices relating to processes, services and products innovations?<ul style="list-style-type: none"><input type="checkbox"/> Not at all <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> Often <input type="checkbox"/> Very often• How often do your company / Organization get engaged in PPP Contracts?<ul style="list-style-type: none"><input type="checkbox"/> Not at all <input type="checkbox"/> Low <input type="checkbox"/> Moderate <input type="checkbox"/> Often <input type="checkbox"/> Very often• Your personal experience in the management of construction projects (years):<ul style="list-style-type: none"><input type="checkbox"/> 0 to 5 <input type="checkbox"/> 6 to 10 <input type="checkbox"/> 11 to 15 <input type="checkbox"/> 16 to 20 <input type="checkbox"/> more than 20
Please indicate whether you would like to receive a copy of the survey report: <input type="checkbox"/> Yes <input type="checkbox"/> No If you tick “Yes”, please write down your address or fax N0:
We are very grateful for your considerate cooperation

Part II: Influence of Innovation Drivers, Enablers, Inputs on PPP innovation in the UAE Construction Industry

The **Influence** of a response measure will enable UAE Public/Private sector to promote innovation by identifying the main drivers for innovation, what enable innovation and what inputs are needed for innovations. Please rate the influence of each factor by circling a suitable figure (1 = no influence at all to 5 = exceptionally influential)

Response Measures drivers promoting PPP innovation in the UAE Construction Industry		Influence
1	Client Requirements	1 2 3 4 5
2	Competition advantages for organizations	1 2 3 4 5
3	Improvement in projects performance	1 2 3 4 5
4	Technological development	1 2 3 4 5
5	Regulation and legislations by Authorities	1 2 3 4 5
6	Organizations responsibility for higher client satisfaction and image improvement.	1 2 3 4 5
7	Design trends	1 2 3 4 5
8	Environmental and sustainability requirements	1 2 3 4 5

Response Measures Enablers promoting PPP innovation in the UAE Construction Industry		Influence
1	Cooperation between public and private sector	1 2 3 4 5
2	Early engagement of Contractor (Private Sector)	1 2 3 4 5
3	Organizations Management and Leadership support	1 2 3 4 5
4	Organizations commitment toward innovation	1 2 3 4 5
5	Knowledge Management	1 2 3 4 5

6	Internal and external reward schemes	1 2 3 4 5
7	Innovation training policies	1 2 3 4 5

Response Measures inputs promoting PPP innovation in the UAE Construction Industry		Influence
1	Investing and putting more capitals in innovation practices	1 2 3 4 5
2	Investment in research and development (R&D)	1 2 3 4 5
3	Internal knowledge resources sharing	1 2 3 4 5
4	External knowledge resources sharing	1 2 3 4 5
5	External Consultancy	1 2 3 4 5
6	Innovation teams	1 2 3 4 5

Part III: Impact of Innovation Barriers on innovation in the UAE Construction Industry

The **Impact** of a response measure will enable UAE Public/Private sector to promote innovation by identifying the main barriers for innovation. Please rate each Barrier by circling a suitable figure (from 1 = No Impact to 5 = High impact)

Response Measures impact of innovation Barriers for PPP innovation in the UAE Construction Industry		Impact
1	Shortage of Financial resources	1 2 3 4 5
2	Unsupportive organizational culture	1 2 3 4 5
3	The Temporary nature of Projects	1 2 3 4 5
4	The unavailability and lack of materials	1 2 3 4 5
5	Lack of experienced and qualified staff	1 2 3 4 5
6	Lack of clear goals and benefits	1 2 3 4 5
7	Time constraints	1 2 3 4 5

**Part IV: Innovation benefits for PPP projects in the UAE
Construction Industry**

The **benefits** of a response measure will enable UAE Public/Private sector to promote innovation by identifying the main benefits (Positive Impact) of innovation. Please rate each impact by circling a suitable figure (from 1 = No benefit to 5 = High benefits)

Response Measures of Innovation benefits for PPP projects in the UAE Construction		Positive Impact
1	Decrease in project construction Duration	1 2 3 4 5
2	Increase in productivity	1 2 3 4 5
3	Increase in stakeholders satisfaction	1 2 3 4 5
4	Gaining experience from private and public sector	1 2 3 4 5
5	Improvement of organizations image	1 2 3 4 5
6	Improvement of technical and managerial capabilities	1 2 3 4 5
7	Long term Profitability for public and private sectors	1 2 3 4 5
8	Future business collaboration	1 2 3 4 5