

**Developing a Framework for improving Business Continuity
Management success (BCM) in UAE Construction Industry**

**وضع إطار عمل لتحسين نجاح إدارة ديمومة الأعمال في قطاع الإنشاءات في دولة
الإمارات العربية المتحدة**

by

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of the requirements for the degree of
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ABSTRACT

Purpose of the study

The main purpose of carrying out this study was to explore the concept of Business Continuity Management (BCM). Research even determines ways for Business Continuity Management (BCM). The study identifies alternative for BCM in UAE Construction industry. At the end, research recommends Frame work for the effective implementation of BCM in UAE that can be used by UAE's construction industry to ensure BCM.

Research methodology

The researcher has emphasized on implementing deductive method which aids to study and examine the theories regarding construction and business continuity management. Study has undergone mixed method because of its intuitive and logical appeal. It helps the investigator to fill the gap between qualitative and quantitative research. The exploratory design is most convenient which gives better help to deal quantitative study. Mainly, it has been implemented to achieve better and valid outcomes. For collection of primary data survey and interviews are considered from among different methods for this study. The different ways for collection of secondary data has been selected such as books, journals as well as online articles. Convenience sampling is explained as sampling in which sample is taken on the basic ease of researcher. For saving time and cost to complete research, information has been taken from 50 officials who were working with Construction industry of UAE. The primary data collected using questionnaire has been analyzed using SPSS software tool was used for proper validation of data analysis and information. Different kind of techniques such as frequency distribution, cross tabulation, One Way ANOVA, descriptive and pie charts as well as bar graphs

Conclusion and recommendation

Study concludes that labor work permit and Rain & flooding have highest mean. Larger spread value of sand storms and labor work permit factors explore that more spread out the observations are. In addition, change in the policies & regulations and governmental approval are other major parameters which highly influence working of organisations and performance of an individual one. Study even identified that employee's performance was decreased and new challenges come in workplace. For that various factors were responsible such that enforce new

technology, insufficient labour training, inadequate early construction planning, high complexity in construction and inadequate early construction planning etc.

ملخص

الهدف من الدراسة

إن الهدف الرئيس من هذه الدراسة هو الوقوف على مفهوم إدارة ديمومة الأعمال (BCM)، فالبحوث تُحدد المدارس المختلفة التي يسلكها هذا المفهوم، ويعرف المسارات البديلة له في قطاع الإنشاءات في دولة الإمارات العربية المتحدة. وفي الختام تُوصي الدراسة بإطار عمل للوصول إلى التطبيق الفعال له في الدولة والذي يمكن لقطاع الإنشاءات استخدامه لضمان ديمومة الأعمال.

منهجية البحث

سلّط الباحث الضوء على تبني طريقة اقتطاعية تساعد على دراسة واختبار النظريات الخاصة بإدارة ديمومة الأعمال والإنشاءات. وقد سلكت الدراسة طرائق مختلطة في طرحها البديهي والمنطقي لتساعد الباحث على سد الثغرة بين البحث الكمي والنوعي. التصميم الاستكشافي للبحث هو الأكثر مناسبة لتقديم مساعدة أفضل للتعامل مع الدراسة الكمية، وقد طبقت بشكل رئيسي للحصول على مخرجات أصح وأفضل.

أما عملية جمع المعلومات من خلال الاستبيانات والمقابلات فقد دُرست من خلال طرائق مختلفة في هذه الدراسة، أما الطرق المختلفة لجمع البيانات الثانوية فقد اختيرت من بين مصادر مثل الكتب والمجلات والمقالات المنشورة على شبكة الإنترنت. أما النمذجة (عملية أخذ العينات) المناسبة فقد تمّ القيام بها بحيث أخذت العينة كأساس للبحث، وفي السعي لتوفير الوقت والمال لاستكمال هذا البحث، تمّ جمع المعلومات من 50 مسؤولاً يعملون في قطاع الإنشاءات في دولة الإمارات العربية المتحدة، وكان جمع المعلومات الرئيسية الأساسية باستخدام الاستبيانات التي تمّ تحليل نتائجها عن طريق تطبيق SPSS والذي كان وسيلة للتحقق المناسب من تحليل البيانات والمعلومات على الوجه الأنسب إلى جانب أنواع مختلفة من التقنيات الأخرى مثل التوزيع المتكرر والجدولة المتقاطعة وANOVA ذات الطريق الواحد والمخططات الوصفية والرسومومية بالإضافة المخططات.

الخلاصة والتوصيات

خلصت الدراسة إلى أن تصريح العمل والأمطار والتسريب هي العامل الأعلى، كما إن قيمة عالية موزعة ذهبت إلى العواصف الرملية وعوامل منح تصاريح العمل بينت أن أثرها أكبر من الذي أعطته المراقبة والمشاهدة. كما إن التغييرات في السياسات والتشريعات والموافقات الحكومية شكلت عوامل رئيسية أخرى أثرت على العمل في المؤسسات وأداء الأفراد. كما عرّفت الدراسة أن أداء الموظف انخفض وظهرت تحديات جديدة في مكان العمل. هذه العوامل المتعددة المسؤولة عن التحديات التي يواجهها القطاع ويندرج ضمنها تطبيق التقنيات الجديدة والنقص في تدريب العمالة وغياب التخطيط الإنشائي المبكر والتعقيد العالي في الإنشاءات وغيرها.

Table of Contents

CHAPTER 1: INTRODUCTION	1
1.1 Overview and background of the study	1
1.2 Importance of Construction Industry in UAE.....	1
1.3 History and Evolution of Business Continuity Management Concept	2
1.4 Importance of Business Continuity Management for companies	4
1.5 Lack of BCM plans	4
1.6 Aim and Objectives.....	5
1.7 Research Questions	5
CHAPTER 2: LITERATURE REVIEW	6
2.1 Introduction.....	6
2.2 History of BCM	6
2.3 Need for BCM.....	8
2.3.1 Growing competition and greater demands of consumers	9
2.3.2 Mounting threats.....	9
2.3.3 Rising regulatory requirements	9
2.3.4 Rising demand and supply chain integration.....	9
2.3.5 Introduction of process based approaches	10
2.3.6 Greater reliance on multifarious information systems	10
2.4 Defining BCM	10
2.5 Elements of Business Continuity Management (BCM).....	11
2.6 Need for BCM in Construction Industry	13
2.7 The concept of maturity models	13
2.8 Maturity models	15
2.9 Further research	15
2.10 Alternative Business continuity model	16

CHAPTER 3: RESEARCH METHODOLOGY	27
3.1 Introduction.....	27
3.2 Research approach	27
3.3 Research type	27
3.4 Research design	28
3.5 Data collection	28
3.6 Sampling method	30
3.7 Data analysis	31
3.8 Reliability and validity of the report.....	31
3.9 Ethical considerations	32
3.10 Limitation of the study.....	32
CHAPTER 4- DATA ANALYSIS AND INTERPRETATIONS	34
4.1 Introduction.....	34
4.2 Quantitative analysis	34
4.3 Acceptance or rejection Hypothesis.....	38
4.4 Thematic data analysis	43
CHAPTER 5- CONCLUSION AND RECOMMENDATIONS	48
REFERENCES	51
APPENDIX 1: QUESTIONNAIRE (CONTRACTOR).....	54

LIST OF TABLES

Table 1: Demographic profile of construction industry employees.....	34
Table 2: Designation and experience level of respondents.....	35
Table 3: Relationship between experience and satisfaction level of employees	36
Table 4:	37
Table 5: Descriptive statistics	37
Table 6: One way ANOVA table 1.....	39
Table 7: One Way ANOVA table 2.....	40
Table 8: One Way ANOVA table 3.....	41
Table 9: Causes of time and cost overruns related issues	44
Table 10: Material handling related factors responsible for creating risks.....	45

LIST OF FIGURES

Figure 1: <i>Evolution of BCM</i>	6
Figure 2: Business continuity model 2012	16
Figure 3: Business continuity model 2015	20
Figure 4: View of respondents about risk occurrence	37
Figure 5: View of employees about present risk management strategy	46

CHAPTER 1: INTRODUCTION

1.1 Overview and background of the study

Business entities are separate from their owners and the management team. Business Continuity Management (BCM) is a key concept for companies regardless of the industry that they may be operating in (Herbane, 2010). Non effective management of this phenomenon can prove to be very dangerous for the concerned organization and in many cases even put its very existence in a state of jeopardy. Therefore authorities of any enterprise need to ensure that a proper model and approach for BCM is used to ensure that the firm sustains in the market for a longer period and maintain its image in the market. This concept is equally applicable to the construction industry in the UAE. Since this location is known as the hub for all activities related to construction, many companies operate in this sector (Kondabagil, 2007). Therefore BCM is of critical importance for these organizations to sustain in the market and fulfill their goals and objectives to a great extent.

1.2 Importance of Construction Industry in UAE

UAE is world's one of the leading countries in terms of construction industry. The field of construction is a major contributor to national income and growth in UAE. In last several years the country has gained significant popularity in the world of construction because of the number and sheer scale of mega projects that are being constructed currently and the ones which would be made in the future (Watters, 2014). Thus it is clear that the construction industry is of prime importance for UAE; and thus it is critical for the authorities that they develop and manage it in the most effective of ways. Importance of the industry can be supported through fact that in coming years, i.e. in the future, it is expected that Middle East nations would have depleted majority of their oil and thus they would a portion from which a major chunk of money comes to the countries. For the nation, investing into and developing infrastructure projects could be very useful in the future. Currently, rulers of these developing countries like Dubai, are turning their respective realms into major tourism destinations (Herbane, 2010). Example of Dubai is very prominent, as it is one of the fastest developing Middle Eastern countries. Its rulers have constructed world's tallest building; additionally they have other sites such as 'World Island', 'Palm Island', etc. which are some of the wonders of construction industry.

Facts such as the estimated value of project planned or in pipeline was US\$ 727 billion in 2014 (Sahebjamnia, Torabi and Mansouri, 2015). This shows that projects worth a fortune are either in process or are slated for the future, indicating the strong preference and inclination of UAE government to promote and invest in this sector. Furthermore, UAE nation Dubai also won the right to host World Expo 2020, which means that even more construction projects would be started in the region. In this sense it may not be wrong to say that it would provide even more growth to the country and help it to grow at a healthy pace (Kondabagil, 2007). Studies by different global market research companies have shown that construction industry is of paramount importance for authorities of GCC countries.

Essentially the concept of BCM is related to identification of all the resources and processes that may be necessary for the organization to survive in the market and to ensure that minimum level of business activities are carried to cover the cost(s) incurred by the enterprise (Watters, 2014). Thus it can be said that BCM enables companies to resume their operations at the earliest keeping delays to a minimum. Over the years it has been observed that construction companies have not paid much attention towards this phenomenon, due to which they are not able to function in an efficient and effective manner. On many occasions their very existence has been put into a state of jeopardy due to it (Hiles, 2008). This has happened primarily because level of competition in the UAE construction industry has increased by great levels. Today there are many companies that operate in this vertical, meaning that firms are constantly fighting against one another for share in the market. Through the concept of BCM, companies can easily achieve their goals and objectives with ease along with surviving in the market place for an extended period (Elliott, Swartz and Herbane, 2010).

1.3 History and Evolution of Business Continuity Management Concept

The concept of BCM was developed to facilitate business managers to protect sensitive information about operations of the company. But over the years it has evolved significantly, as it now focuses on different business activities and ensures that functions are carried out even in adverse situations (Wong, 2009). Many authors and experts on the subject matter consider it the best way to manage operations of a business organization and to ensure it sustains and survives in the market for a longer duration of time. Since the modern business environment is considered highly volatile and unpredictable in nature, it is crucial for managers and other such authorities to pay attention to making the firm sustain the competition and adverse situations of the market.

Planning is an integral part of functioning of business enterprises, and preparing for making the entity sustain, thus is a critical component. Increasing competition and disintegrating markets due to increasing financial instability and changes in customer preferences (Tammineedi, 2010). These collectively have forced business managers to become more aware of their surroundings and plan business operations in such a manner that they help the firm to sustain along with beating the competition.

Essentially the roots of BCM lie in the concept of Disaster Management (DM). It was developed from war gaming and scenario planning, where in plans were developed to face adverse situations and survive through them (Low, Liu and Sio, 2010). Business Management experts saw the potential in this phenomenon and started developing and modifying it to suit needs of a business organization. Many state that BCM is based on the book 'Art of War' written by Sun Tzu (Kondabagil, 2007).

The concept of business continuity management thus focuses on enabling the firm to sustain and survive in the market, while ensuring that its working or operations are preserved. According to Kondabagil (2007) BCM initially started when companies started storing and backing up their data in either paper or electric form. This clearly signifies the mindset of management of such organizations. They wanted their respective organizations to not just function effectively in the market, but also sustain in it. Over the years there has been significant development in BCM (Elliott, Swartz and Herbane, 2010). Initially BCM focused only on backing up data of the company through different technological tools. But at that time the technology failed significantly, which made the concerned experts to look at wider internal factors as well. This gave birth to 'Auditing Mindset'. Here, though technology was still used extensively, but there were certain rules, regulations and parameters that companies had to comply with in order to effectively implement and use the concept of BCM. But then this approach also failed (Tammineedi, 2010). By the 90's experts started developing 'Value Mindset' philosophy, which converted BCM into BCP (Business Continuity Planning). In this mindset, authorities assess operations of the whole company and monitor them very closely on a regular basis, in order to determine which ones would be beneficial for the future. Thus the focus is on business function and technology (Garrett and David, 2012).

1.4 Importance of Business Continuity Management for companies

Business environments have become highly volatile and unpredictable. This coupled with fact that competition is increasing at a rapid pace, concept of BCM holds critical importance for companies, regardless of the market they may be a part of. Today business continuity management is crucial for companies, mainly because it helps managers to manage operations of the firm in a much better and effective manner (Hiles, 2008). The modern business environment is characterized as extremely unpredictable, as it is very difficult to identify patterns and predict them for the future. Due to this reason, companies are failing and finding it very difficult to function in such an environment. Therefore the role of BCM is crucial. On many occasions it has been observed that companies face some or the other kind of disasters or issues, from which they are not able to recover. This further clarifies the importance of BCM for organizations (Tammineedi, 2010).

BCM provides assurance to both internal and external stakeholders that management of the company has developed different contingency plans to face adversities in a better manner. Thus it is an indication of firm's preparedness to face 'worst situations' and its ability to recover from them.

1.5 Lack of BCM plans

Although there have been numerous discussions over the topic of BCM, but still there are only a few organizations around the world and in UAE that use it to its full potential (Sahebjamnia, Torabi and Mansouri, 2015). This has created precarious situations for these organizations, as they are fighting for survival and name in the market. In a very recent study it was observed that firms are not doing enough to save them from the dangers of the market and to extend their survival in the industry. They either have not developed the BCM approach, or are not using it in a proper manner. 73% of firms around the world are not using the system and thus they face serious risks which could harm them in significantly (Wong, 2009). Same is the case with companies in UAE as well. There are very few firm that are using it; and even those who are, have not implemented the system properly, so they are not able to get the best results from it.

1.6 Aim and Objectives

Aim of the present investigation is “*To Develop a Framework for ensuring Business Continuity Management (BCM) in UAE Construction Industry*”. The existing literary works on the subject have not taken this into consideration and this would be visible in the Literature Review section of the report. In this study the researcher explores the concept of business continuity management and develops a system or approach through which it can be used effectively in UAE’s construction industry. In order to achieve this aim, following objectives would be useful:

- To explore the concept of Business Continuity Management (BCM).
- To determine ways for Business Continuity Management (BCM).
- To identify alternative for BCM in UAE Construction industry.
- To study the difference between demographic profile of respondents towards issues faced under construction industry in UAE.
- To recommend Frame work for the effective implementation of BCM in UAE that can be used by UAE’s construction industry to ensure BCM.

1.7 Research Questions

Answering the following research questions is useful in attaining aim and objectives of the research study:

- What is the meaning of Business Continuity Management (BCM)?
- What are the various ways to ensure BCM in business organizations?
- What alternatives can be used by the UAE construction industry to ensure BCM?

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The present section will introduce the concept of BCM. Firstly the noteworthy definitions for BCM by different authors will be presented followed by the need of BCM in general and in the construction industry in particular. Subsequent to that the exact scope BCM considers will be amplified plus the position it has regarding associated notions.

2.2 History of BCM

The roots of BCM can be unearthed in Disaster Recovery (DR) which emerged from scenario planning and war gaming. In early manifestations of war gaming, the capability to turn unfavorable situations to one's benefit was perceived to be the reward of good planning. Herbane (2010) refers to the fact that organizations started storing backup copies of the important data, electronic or paper, at different locations. Disaster Recovery chiefly originated from the desire of US banks to better safeguard their corporate data centers. The main objective of DR was to safeguard the technical systems rather than proffering a business side safety. From DR Scenario planning the concept of having recovery sites or backup emerged. Initially such offsite storage was done only periodically, however, it these procedures became more regular and frequent by the end of 1970s (Nollau, 2009). During this time, third party storage facilities were also developed to create what would become the alternate location, or the "hot site".

Over the years, DR has progressed into Business Continuity Planning and then to BCM. This development is best explained by a series of mind-sets put forward by Elliott, Swartz and Herbane (2010).

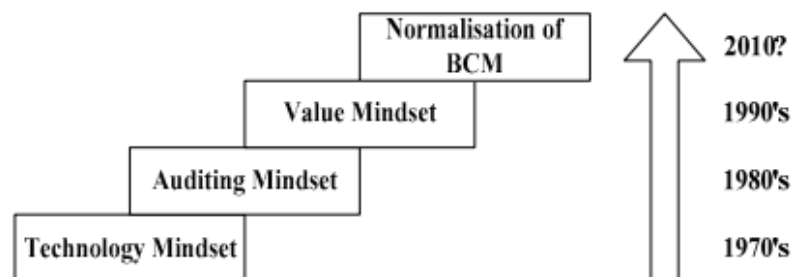


Figure 1: *Evolution of BCM*

(Source: Garrett, 2012)

Technology Mindset – The fundamental DR approach purely focused on the technical aspects of recuperating from disasters and presumed that disasters were caused due to technology failure and was not broadened beyond this to take a view at the wider business reasons of disasters. During the late 1970s and 80s, Disaster recovery was widened to entail a broader base, formulating the BCP approach which took a look at much wider internal aspects that had a bearing on disasters in a company. The reason of such expansion was that the nature of IT systems altered from a mainframe centered data processing approach to a rather End User Computing approach (Elliott, Swartz and Herbane, 2010).

Auditing Mind-set – The transformation from pure DR to a BCP approach is referred as the “Auditing Mind-set” by Elliott, Swartz and Herbane (2010). This mind-set, whilst still concentrating on technology, extended its focus to entail the safety of business activities and was primarily triggered by external regulation. However, the auditing mindset did not consider the effect of human contribution to crisis situations or of the human influence on the effect of the BCP approach. The main focal point of the auditing mindset was concerned with how to avoid and sustain through any crisis and on how to persuade compliance.

Further, moving into the late 1980s and the early 1990s, the domain of Business Continuity Planning was expanded to consider the external aspects by harvesting cues from Crisis Management (CM). The CM approach to BCP varies from the preliminary, preventative and internally focused DR and BCP approaches and addresses both prevention as well as recovery. Mitroff (2001) observed that the sources of crises are embedded in all societies and organizations and every complex system and while crises cannot be completely stopped from occurring, it is possible to manage them with practice. The CM approach also recognized that there is an intricate interaction of system elements which needs to be acknowledged, that DR approaches did not prepare to avoid threats and that crisis entailed both external and internal elements. The CM approach is integrated in the Value Based mindset as presented by Elliott, Swartz and Herbane (2010), which focused more on the prospect of expanding BCP to bring more value to the company on the whole and to widen its focus to entail all stakeholders of the company. Such new extended focus developed the BCM approach. The BCM approach with its higher company-wide and external considerations provided improved forecasting and safety from disasters and disruptions that befell the companies.

None of the outlined approaches ensure 100% effective recovery when a disaster takes place. Irrespective of the approach followed, there is still a possibility that a pattern of events will occur which will lead to a disaster situation. However, by adoption of BCM approach, the capability of a company to be flexible, recover and continue operating after the disruption is augmented.

The value based mindset moved toward BCM from BCP and was concerned less with technological failure, regulations and compliance than with the company itself. In this mindset the BCP scope widened to encompass the entire company, entailing the employees who Elliott, Swartz and Herbane (2010) recognize as the biggest challenge in implementation and management of the BCM process. Company stakeholders were also seen as a crucial driver for change and thus, for introducing and developing BCM. The perils of focusing BCM on too precise a technical domain is still in the initial stages in academic literature. Myers (2006) indicated the risk of the security of systems becoming the goal of BCM instead of a holistic approach being adopted. A steadiness between the business and technical focus is relevant in present times also as organizations are becoming even more dependent on technology.

2.3 Need for BCM

A depiction of the need for BCM is enfolded in the term itself. Companies engage themselves with business continuity management to ensure stability of their business. Though the requirement for continuity of business persists for as long as the business exists, BCM is a comparatively novel concept in relation to majority of the other business disciplines. BCM has branched out of its predecessor disaster recovery, which mushroomed in the 1960s, coupled with growing computerization and contingency planning.

According to Smit (2005), interest in BCM emerged in the 1990s, but it achieved true momentum only in the past some years. The reason behind this is twofold: on one hand, a growing pressure is imposed on companies to give affirmation for the stability and continuance of their business processes. This is mainly caused due to two transformations in the business environment, i.e. increasing competition, greater demands of consumers, and growing regulatory mandates. On the other hand, the assurance of such stability becomes highly complex for companies. Three changes causing this are identified by Smit (2005) to be mounting threats, rising demand and supply chain integration and growing reliance of business functions on intricate information systems.

Apart from the aforementioned five changes, there is another change that has controlled the introduction of BCM. Though the arrival of process oriented approaches cannot be directly attributed to leading to the emergence of BCM, they did cause a transition in management thinking which facilitated the process focus of BCM. All the six changes have been discussed below.

2.3.1 Growing competition and greater demands of consumers

Increasing competition as well as mounting demands of the consumers, e.g. expecting 24/7 availability of digitalized services render it important for companies to give extra consideration to their continuity assurance. Any disturbance in business can spell dire consequences like loss of goodwill, financial loss etc. Consumers are also demanding assurance with respect to the stability of their suppliers and that such continuity is assured to a great extent (Smit, 2005).

2.3.2 Mounting threats

There are increasing numbers of threats such as natural disasters, terrorism, commercial espionage and fraud which threaten the continuity of a business. In addition to the growth in threats themselves, there is also a growth in the visibility of such threats and their implications. This is principally because of widespread media coverage and attention (Smit, 2005). Such superfluous visibility highlights the impact that the threats have on the industry/company.

2.3.3 Rising regulatory requirements

The growing number of laws and regulations pertaining to continuity can be viewed as other crucial driver for giving importance to BCM. Legal mandates compel companies to be more attentive about the continuity of their business (Smit, 2005).

2.3.4 Rising demand and supply chain integration

Companies prefer focusing more on their core processes whilst outsourcing non-core areas. This can be attributed to the increasing competition, which makes cost efficiency a pre-requisite. Such extension of the demand and supply chains coupled with growing expectations of price, quality and delivery time necessitates the channel partners to cooperate more effectively. As the channel partners integrate their activities with one another, the implications of

discontinuity also expand (Smit, 2005). The impact of discontinuity is not confined to one party but can also have repercussions for the complete chain. Hence this needs to be considered when planning for continuity.

2.3.5 Introduction of process based approaches

The necessity of more continuity had an instrumental role to play in the development of BCM. Apart from that, a crucial change in corporate thinking has also been mentioned by Smit (2005). In contrast to concepts like information security and disaster recovery, BCM concentrates on vital processes rather than business functions. Such process focus has been facilitated by the introduction of the process centric approaches such as Business Process Improvement, Business Process Re-engineering etc. and resulted in a critical transition in corporate thinking. Companies began understanding that they must concentrate not just on business activities, but also, and indeed primarily on business process because they help in value creation.

2.3.6 Greater reliance on multifarious information systems

Companies have become highly dependent on their information systems and the underpinning infrastructure. Such growing reliance on IT and other technologies are turning company more susceptible to disturbances in these technologies. An evident example of this dependence is visible in the Y2K threat that resulted in huge disruption within several companies and was ensued by a considerable increase in BCM frameworks (Smit, 2005).

2.4 Defining BCM

For the purpose of studying business continuity management in the present research, it is important to gain a clear understanding of what this term entails. The term BCM was first coined in the later part of the 1990s. Nonetheless, it has only recently begun to garner considerable momentum within companies. The evolution of business continuity management from Disaster Recovery has led to various distinct definitions being offered over time.

As per the Business Continuity Institute (BCI) (2005), BCM is the act of predicting incidents that are likely to impact goal-critical processes and functions for the company and ascertaining that it reacts to any such incident in a rehearsed and planned manner. It is a crucial

management process by which success is attributable to the collaborative efforts of each individual within the organization with the emphasis on the senior cadre personnel.

Venclova, Urbancova and Vydrova (2013) assert that BCM is centered on management of risks to make sure that a company can continue operating at all times to, at least, a premeditated minimum level.

Elliott, Swartz and Herbane (2010) apply the following definition: Business continuity management is a holistic management approach to identify potential incidents that intimidate the sustenance of a company and developing plans to respond to these occurrences. It entails a wide range of business and managerial disciplines, including crisis management, disaster recovery and risk management.

Lastly, the definition used by Smit (2005) is: BCM includes the management process that intends to prevent serious disruptions in the business processes and to safeguard crucial processes against the repercussions of disasters or disruptions.

Though there is no universally accepted definition of BCM, but some features of BCM are identified here that can be seen in all the above definitions and their associated explanations.

- BCM is aimed at ensuring the continuity of a business at a particular level;
- All the initiatives must be directed toward the most important business functions;
- It includes both the avoidance of disruptions or disasters and restricting the damage to the company in case of a disruption or disaster, hence it has repressive, corrective and preventive features; and
- It is a constant managerial process, and not limited to a single project.

2.5 Elements of Business Continuity Management (BCM)

BCM is a never ending process of the organization which comprises of different elements which are necessary to discuss. According to Herbane (2010), these are significant elements are highly required for ensuring long term business survival with safe working and operations. These are detailed as follows:

Risk Mitigation Plan: Organizations which are part of construction industry are adopting measures to deal with the risk aspect with an objective to maintain the continuity of their business. This helped them to gain the operational insurance and resiliency level so that appropriate designing, planning and executing of different risk management strategies can be

worked upon. Companies believe in planning viable business continuity plan which is inclusive of engrossing plan regarding risk identification, prioritization, monitoring, and mitigation (Venclova, Urbancov and Vydrova, 2013). The formulated plan is composed of supportive subsidiaries and team who work on the basis of gained feedback so that actual and standard potential risks could be planned and worked out in highly organized manner.

Business Continuity Plan: Business Continuity plan is not a simple formula beside this is inclusive of entire structure that enlist the project which is a complete BCP procedure based on size and ample of aspects. The main objective why this BCP is undertaken is to provide customers service, reducing disruptions and mitigate with the adverse situations that arises as a part of regular business activities and actions.

Pandemic Plan: BCP is a strict formulated project but is not limited to any kind of restrictions and challenging actions. Process of BCP may create adverse impact because of pandemic and thereby have harmful impact of manpower which is valuable asset to the organization. They play major role of enabling those planned behavior in BCP into actions which are majorly responsible for undertaking functions that support business to gain continuity.

Contingency Plan: In alignment with next element, contingency plan as a part of BCP is a significant way to formulate strategies and ways to deal with the expected issues, sudden emergency and events which are catastrophic in nature. If such events are not managed and deal properly, then may hamper the entire business and can also face business into critical and challenging situations.

Business Recovery: The main aspect behind BCP is to provide supportive background to undertake favorable business operations. Recovery is the vital stage as every risk pertaining to business activities can be necessarily handled (Low, Liu and Sio, 2010). However, the extent may vary to the stage of recovery where through the business recovery element of BCP, situation can be effectively handled to some extent. These are exercised through various strategies of BCP which are inclusive of manual processing, recovery and operation on an alternate system, or relocation and recovery at an alternate site.

Audits: Scanning of business operations is very crucial function of the organization. For prolonging business continuity, it is mandatory to review the documents plans with reliability and accuracy so that proper risk analysis of BCP could support in leading effective and suitable outcomes. Auditing is a medium which is a complete package of process comprising of planning,

scheduling, implementation and management (Jordan, Zellenrath and Verzuu, 2015). This is conducted through the implementation of audit software and program in the organization.

2.6 Need for BCM in Construction Industry

As with other industries, an effectual BCM is vital for organizations in the construction industry. Being a part of an industry that is continuously prone to external and internal pressures, construction firms are likely to make expensive mistakes if they are unprepared when a disaster or crisis occurs. An example of such a situation was the unannounced and sudden ban on the export of sand into Singapore in February 2007 by the Indonesian government. This ban led to a deficiency of sand supply in the country, resulting in a steep increase in the price of ready-mix concrete (Low, Liu and Sio, 2010). Organizations in the middle of their projects encountered the likelihood of further increase to their original project cost estimations; as such organization without sufficient monetary resources were left in a calamitous state and the progress of their project slowed down and even stopped completely. This situation illustrates the competitiveness of the sector as organizations tendered at minimal profit or cost price or even at a loss. This reflects that for the construction firms to sustain and grow in a volatile environment, a sound BCM is imperative (Low, Liu and Sio, 2010).

2.7 The concept of maturity models

According to Jiang, concept of maturity model is being proposed to manage and measure as well control the process in lifecycle. This is analogue to the lifecycle which occurs is the development stage to gain the maturity. Moreover, the concept also implies growth in the areas of process capabilities, consistency and fortune across the whole organization. By using the maturity model the maturity can be identified assuming the progress towards the achievement of goals. The maturity model follows is a process that an organization could use to sustain the improvement and getting the better performance (Jiang. et.al. 2014). It has come through smart work by analyzing the existing process. The maturity model is being used for determining the right direction of process to achieve the objectives.

The scope of maturity has significant influence over the design of model. In order to formulate the standard of maturity these models have been used that helps to concentrate over features. The major aim of these models is to gain the highest level of maturity that improves the

performance of the organization. Myers has suggested that maturity model is a staged structure which defines the specific process that involves effectiveness and controlling of the tasks and support organization to develop and adopt new process and practices. Additionally, maturity model aid organization to optimize and move on to next level according to desired standard. Business continuity management (BCM) is a holistic management approach to identify potential incidents that intimidate the sustenance of a company and developing plans to respond to these occurrences (Myers, K. 2006). By mapping of objectives and applying the right concept of maturity model the management of organization could satisfy the needs and achieve the greater efficiency. It entails a wide range of business and managerial disciplines, including crisis management, disaster recovery and risk management.

The concept of business continuity management is provide focus and guideline for decision and actions that required for organization to prevent, mitigate, prepare for respond to resume, recover and restore the transaction from the crisis events. According to Johnson & Peppas, business continuity planning involve developing a collection of processing the various organization units that will ensure the progress of the critical business. Moreover the model of BCM enables organization to respond to the changes effectively and efficiently (Johnson & Peppas, 2013). The information security measures are also been undertaken for critical business process that prevents organizational activity log. Information security has border scopes that integrate the IT related measures that are part of BCM and has critical significance to achieving the objectives.

The model of BCM enables to do action-based recommendations that required for developing the best practices and logical steps that give visibility. However, by adoption of BCM approach, the capability of a company to be flexible, recover and continue operating after the disruption is augmented. The major concept of BCM model is focus on the process of practices to achieve the goals and objectives. Moreover, it enables senior management to anticipate the requirements that could support the enterprise to improve the position as well overcome the gaps by analyzing the realistic targets. According to Jordan, Zellenrath and Verzuu,, BCM model provides a basis for peer-groups comparison and establishment of industry standard. None of the outlined approaches ensure 100% effective recovery when a disaster takes place (Jordan, et.al. 2015). Irrespective of the approach followed, there is still a possibility that a pattern of events will occur which will lead to a disaster situation.

2.8 Maturity models

There are various types of models for BCM has been proposed that could be used for managing the continuity in the actions of organization to achieve the greater efficiency in business. According to Kenny, business models like CMM and BPO are most preferred models of business development and managing the continuity in the practices. CMM and BPO models are simple and have only one hierarchy of level that gives the maturity of process that has been followed by the organization (Kenny, 2006). CMM model of business continuity assign a maturity level to the whole software development process that involve all processing areas that have major contribution in the organizational process of development. This kind of process helps to maintain the maturity and process according to required standard of organization as well helps to configure the services system.

On the other hand BPO model is being used for managing the organizational soft issues, process and people using the technology and facilities that improves the quality of work as well gives in-depth monitoring. Additionally, BPO model for business continuity encourage the service delivery, development and maintenances and strategy to meet the desired level of efficiency. However in practical management scenario it is difficult to have one single hierarchy for maturity level that gives feasibility in the each level of management.

2.9 Further research

According to the past research it is been considered that, the CM approach also recognized that there is an intricate interaction of system elements which needs to be acknowledged, that DR approaches did not prepare to avoid threats and that crisis entailed both external and internal elements. By adoption of CM approach, the capability of a company to be flexible, recover and continue operating after the disruption is augmented. The CM approach is integrated in the Value Based mindset, which focused more on the prospect of expanding BCP to bring more value to the company on the whole and to widen its focus to entail all stakeholders of the company. moreover it is been also identified that extension of the demand and supply chains coupled with growing expectations of price, quality and delivery time necessitates the channel partners to cooperate more effectively (Garrett, 2012). As the channel partners integrate their activities with one another, the implications of discontinuity also expand such new extended focus developed the BCM approach. The BCM approach with its higher company-wide and

external considerations provided improved forecasting and safety from disasters and disruptions that befell the companies.

2.10 Alternative Business continuity model

Business continuity model 2012

BC program development

There is a need for developing BC program as per the requirements given in the standard. It must have a commitment of top management and ongoing test, exercise, review and development. In a case when an organisation is having BCM planning prior to the issuance of such a standard. Under that situation this standard will be used as a scale for ensuring these requirements are meet or even exceeded at the federal, local or entity level both in the public and private sector, so that BCM could be established, maintained and sustained in an appropriate manner.

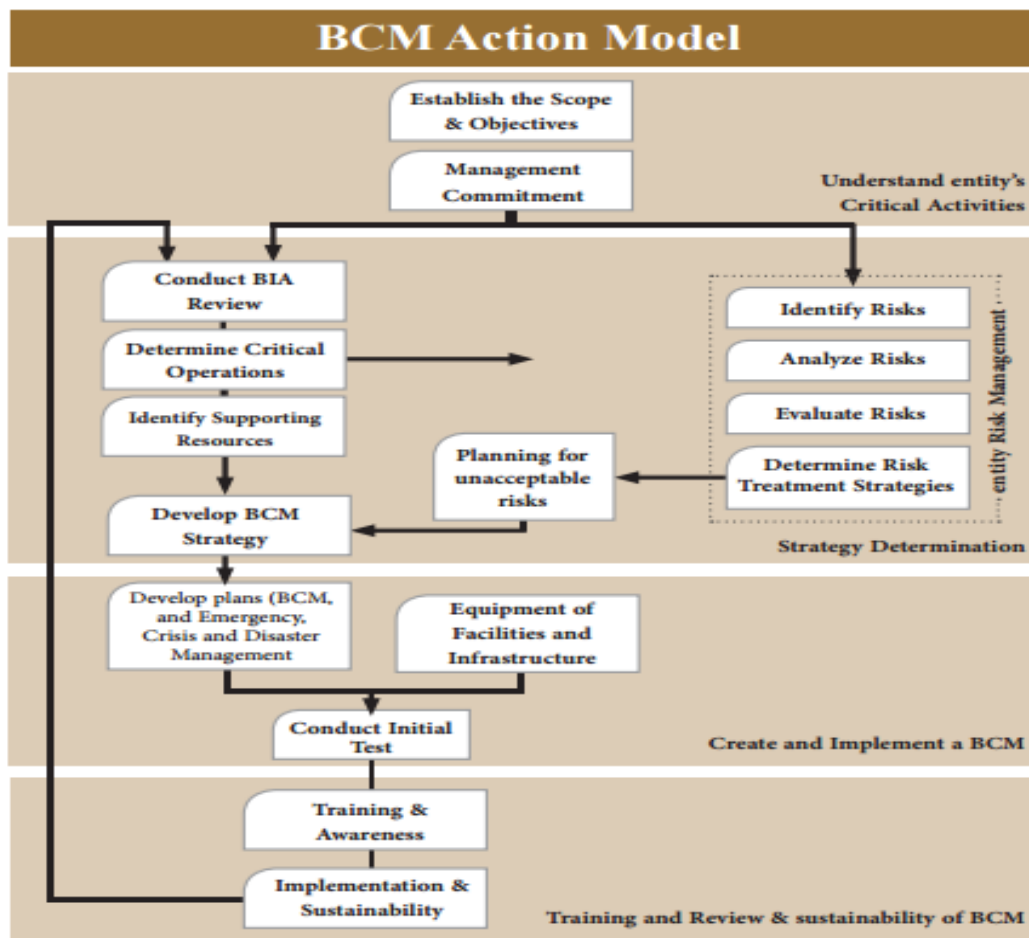


Figure 2: Business continuity model 2012

(Source: Business Continuity Management Standard and Guide. 2012)

Top management commitment

For the top management it is important to ensure that their entity BCM concept and objectives are identified. Business must provide with appropriate resources in order to maintain and implement BCM program for ensuring allocation of resources that is required for achieving continuity within their crucial activities.

Business impact analysis (BIA)

In this respect it is important for the organisation to define and document a method, so that company is able to identify the impact of disruptions concerning their main, essential services and activities.

BIA documentation

<i>Particular</i>	<i>Documentation</i>
<i>Identifying</i>	• Essential functions, activities and services • Actions for supporting essential functions, activities and services • Disruption impact over the performance of activities and services • Maximum tolerable period of disruption concerning every activity • Internal and external bodies for continuity in the essential functions, activities and services • Requirement of indispensable resources concerning essential functions and services including service providers and suppliers
<i>Classifying</i>	• The essential activities and services are classified as per the recoverability priority as per BIA.
<i>Reviewing</i>	• Current emergency plan of the business, so that they are able to provide services on a continuity basis
<i>Establishing</i>	• There is a need for laying down recovery time objective for regaining ability in order to regain their main activities with their Maximum Tolerable Period of Disruption.

Risk assessment

For the organisation it is crucial for carrying out risk assessment so that they are able to identify, analyse and evaluate the business continuity risk that they are undergoing (*Business Continuity Management Standard and Guide*. 2012). In order to carry out the risk assessment process there is a need for carrying out well defined and approved method, so that risk assessment could be updated on regular intervals.

Risk management strategy

In this respect it is important for the business for undergoing implementation and to document risk management, so that they are able to handle risk concerning their essential functions, activities and services based on the acceptable level. There is a need for identifying appropriate risk handling strategies and tailor them in order to reduce, shorten and mitigate the impact of a disruption. Business must represent their risk handling recommendation to the top level management for the purpose of review and approval.

Business continuity management strategy

The business top management must undergo the development and approval of BCM strategies, so that they are able to undergo continuous performance of their essential functions, activities and services with the company disruption. These are those risks that cannot be mitigated or removed at the acceptable levels.

Business continuity management plan

The organisation must prepare their BCM plan as per their strategies. In this regard business shall have their documented plan that will be detailing about the business disruption response, crisis management and emergency. It is carried out by business for being sustainable in respect to their essential activities and services following a business disruption.

Awareness and training

It is important for the business to ensure appropriate training and awareness programme to be developed and implemented effectively within the organization in order to support the objectives of BCM. In this respect business must undergo appropriate staff training programmes by ensuring BCM integration in their day to day business processes. For company it is important

to ensure that training initiated against the personnel and team must match roles and responsibilities in a significant manner (*Business Continuity Management Standard and Guide*. 2012). Further, organisation must carry out proper documentation and maintenance of BCM training records. At the end, there is a need for spreading BCM awareness among external stakeholders.

Test and exercises

The organisation must undergo appropriate tests and exercises, so that they are able to ensure BC plans of business remains fit for the purpose and effective. It must also undergo rolling one year test and exercise plan.

BCM continual improvement

- *Requirements:* The business need to ensure that objectives of BCM are met through periodic review. In this regard there is a need for carrying out self assessment and continual improvement regarding its plan, performance and documentation.
- *Methodology:* Business must undertake regular review of changes within the organisation and risks that have the potential of affecting business operations. It is even important to study the impact of such disruption. Further, management must carry out review and examine the risk treatment and business continuity strategies. Then there is a need for approving communication, response, incident management and recovery plan for achieving the objectives of BCM.
- *Results:* The results of the review process must be carried out by Business continuity officer and then it must be reported to the top level management of the business.
- *Inconsistency:* Under this organisation need to address BC capability as per this model standard by undergoing appropriate preventive and corrective actions.
- *Preventive and Corrective actions:* In this respect actions must be carried out on the basis of business continuity policy and BCM objectives that are at the acceptable level of risk determined by top level management of the organisation.

Conformity and certification

For the business it is important to stick to this standard for ascertaining their conformity and certification. It can be done through self assessment or third party certification.

Compliance and internal audit

Finally, organisation need to carry out appropriate planning, development, implementation and maintenance programme for carrying out the process of auditing its BCM (*Business Continuity Management Standard and Guide*. 2012). In this regard it is essential for the company to carry out annual internal audit, internal audit program, internal audit procedures and internal audit report.

Business continuity model 2015

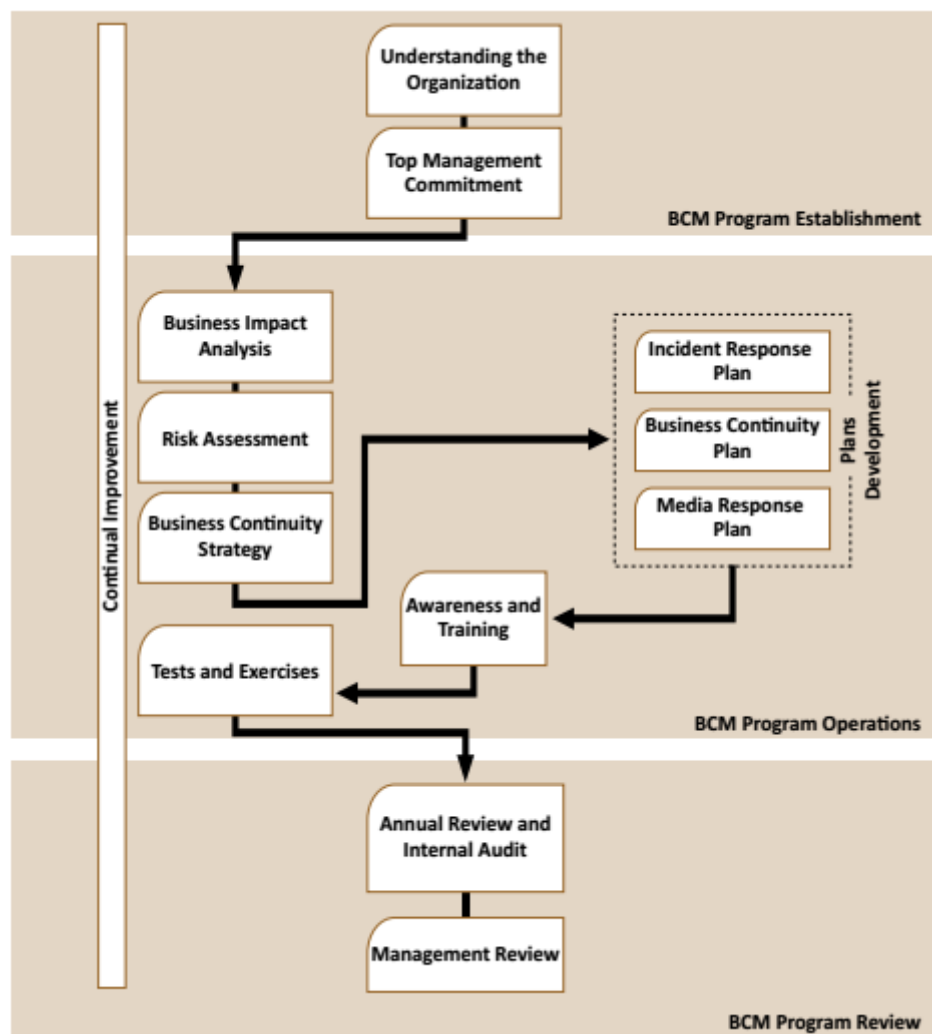


Figure 3: Business continuity model 2015

(Source: Business Continuity Management Standard and Guide. 2015)

<i>Factor</i>	<i>Components</i>
<i>Business Continuity Management Program establishment</i>	• Understanding the organisation • Top management commitment
<i>Business continuity capability</i>	-
<i>BCM programs documentation and records</i>	• Required documents • Controlling BCM Documentation and Records
<i>Business Continuity Management Program Operations</i>	• Business Impact Analysis • Risk Assessment • Business Continuity Strategy • Incident Response plan • Business Continuity Plan • Media Response Plan • Awareness and Training • Tests and Exercises
<i>Business Continuity Program Review</i>	• Annual BCM Review • Review of Suppliers and Service Providers • Compliance and Internal Audit
<i>Management Review</i>	• Management Review of BCM Program • Documentation of the management review • Points of input during management review • Management Review outcome
<i>BCM Program Continual Improvement</i>	• Non Conformities • Corrective Actions

2.11 Hypothesis framed for the study

After undergoing extensive review of literature it has been observed that there are varied studies which focus upon the Risk assessment, Risk management strategy, Business continuity management strategy, Business continuity management plan, Awareness and training in the construction industry. There were studies which tried to study the relationship between these variables and other trying to study the cause and effect. However, none of the study tried to research the demographic difference towards role of BCM to overcome technical risk occurs in UAE construction industry. In this regard appropriate hypothesis has been framed these are as follows:

H01: There is no significance difference between experience of employees and the role of BCM to overcome technical risk occurs in UAE construction industry.

H02: There is no significance difference between experience of employees and the role of BCM to handle engineering and design change related issues in construction industry.

H03: There is no significant difference between satisfaction level of employees and use of BCM to handle construction related factors in UAE construction industry.

2.12 Summary of critical success factors for Business continuity management success

Critical success factors	Source
Feasibility of construction methods	Elliott.et.al., (2010) Ivanovic & Majstorovic, (2006)
Inadequate training of labour	Kenny, (2006) <i>Business Continuity Management Standard and Guide</i> , (2015)
Poor planning of site layout	Myers, (2006) Ivanovic & Majstorovic, (2006)
Appropriateness of materials	Smit, (2005) Hardcastle.et.al., (2013)
Inappropriate project feasibility study	Johnson & Peppas, (2013) Elliott.et.al., (2010)

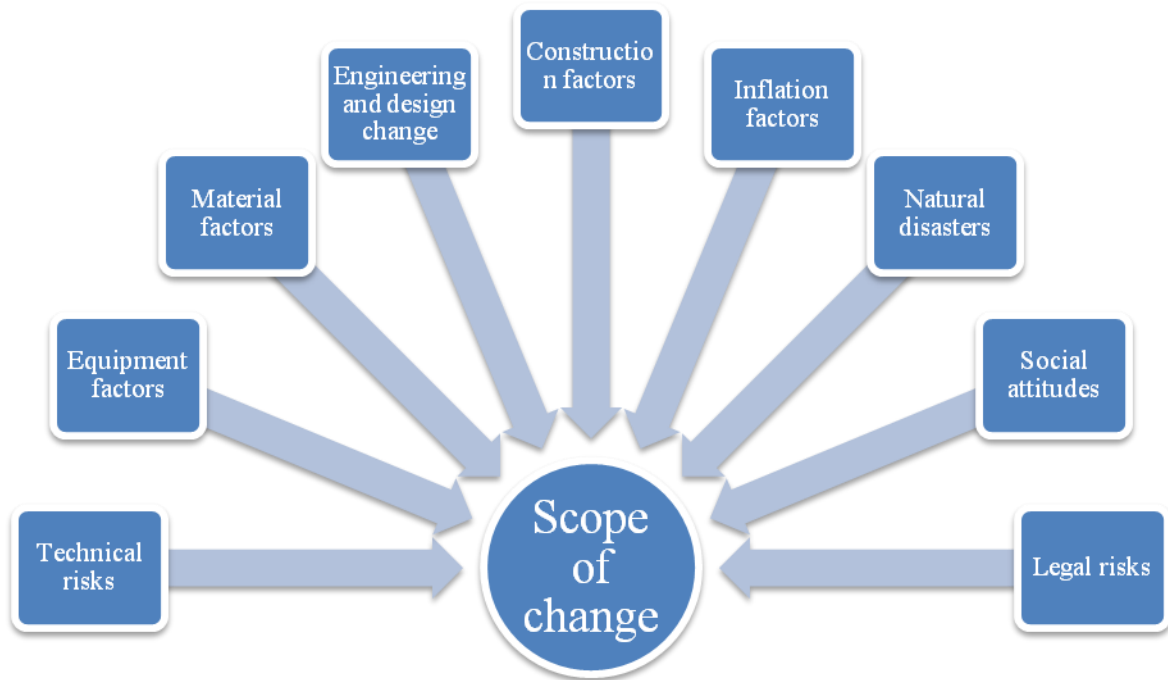
Planning of project is insignificant	Jiang.et.al., (2014) Low.et.al., (2010)
Midstream change within the scope and volume of work	Nollau, (2009) Johnson & Peppas, (2013)
Inadequate project formulation, technical specifications and investigations	Garrett, (2012) Herbane, (2010)
Shortage in equipments	Myers, (2006) Venclova.et.al., (2013)
Maintenance of equipment is slow	Low.et.al., (2010) Ivanovic & Majstorovic, (2006)
Failure in equipment	Hardcastle.et.al., (2013) Jiang.et.al., (2014)
Unskilled operator	Herbane, (2010) Ivanovic & Majstorovic, (2006)
Usage of defective materials	<i>Business Continuity Management Standard and Guide</i> , (2012) Garrett, (2012)
Price fluctuation of materials	Ivanovic & Majstorovic, (2006) Herbane, (2010)
Delivery of materials is slow	Myers, (2006) <i>Business Continuity Management Standard and Guide</i> , (2015)
Embargo	<i>Business Continuity Management Standard and Guide</i> , (2015) Low.et.al., (2010)
Complexity of design	Hardcastle.et.al., (2013) Smit, (2005)
Delay in the work of design process	Mitroff, (2001) Venclova.et.al., (2013)
Omissions and errors in the design	Jordan.et.al., (2015) Ivanovic & Majstorovic, (2006)
Design scope of project is incomplete	Jiang.et.al., (2014) Myers, (2006)
Tender price	Elliott.et.al., (2010) Herbane, (2010)

Price fluctuation	<i>Business Continuity Management Standard and Guide</i> , (2015) Garrett, (2012)
Inflation	Myers, (2006) Venclova.et.al., (2013)
Increase in the transportation costs	Smit, (2005) Kenny, (2006)
Weather change on construction activities	Johnson & Peppas, (2013) Garrett, (2012)
Effect of rain on the construction activities	Jiang.et.al., (2014) Herbane, (2010)
Storms and heavy-dusty wind	Nollau, (2009) Johnson & Peppas, (2013)
Ideological beliefs	Garrett, (2012) Low.et.al., (2010)
Education	Myers, (2006) Nollau, (2009)
Culture	Low.et.al., (2010) Herbane, (2010)
Delay and approval by custom department	Venclova.et.al., (2013) Hardcastle.et.al., (2013)
Change in the policies and regulations by sovereigns	Herbane, (2010) Nollau, (2009)
Delay in the receipt of the government clearance	<i>Business Continuity Management Standard and Guide</i> , (2012) Venclova.et.al., (2013)
Permission with respect to foreign labour	Ivanovic & Majstorovic, (2006)
Changes in the regulations on periodic basis	Myers, (2006) Venclova.et.al., (2013)
New technology or new construction methods	Low.et.al., (2010) Herbane, (2010)
Inadequacy in the labour training	Hardcastle.et.al., (2013) Garrett, (2012)
Poor site layout planning	Mitroff, (2001) Majstorovic, (2006)
New technology or new construction methods	Elliott.et.al., 2010 <i>Business Continuity Management Standard and Guide</i> , (2015)

Unrealistic contract period	Nollau, (2009) Johnson & Peppas, (2013)
Adopting old construction methods	Jordan.et.al., (2015) Ivanovic & Majstorovic, (2006)
Feasibility of construction methods	<i>Business Continuity Management Standard and Guide</i> , (2015) Nollau, (2009)
Inadequate of early construction planning	Myers, (2006) Kenny, (2006)
Improper control over site resource allocation	Garrett, (2012) Ivanovic & Majstorovic, (2006)
Complexity	Hardcastle.et.al., (2013) Nollau, (2009)
Type of structures (steel, concrete, brick, timber, masonry)	Mitroff, (2001) Smit, (2005)
Material changes in types and specifications during construction	Hardcastle.et.al., (2013) Venclova.et.al., (2013)
Complexity of building services	Myers, (2006) <i>Business Continuity Management Standard and Guide</i> , (2015)

2.13 Conceptual framework

The different factors that have been identified on the basis of which conceptual framework has been designed also indicates about its impact over the construction scope of change as follows:



CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Research Methodology is one of the most important chapters of this report, as it is through this section that the researcher has got an idea as to how the study has to be conducted and what all factors have to be kept in mind. It helps in reducing main issues of researcher during the examination of information. It gives proper guidelines to investigator for completing the research in a proper way (Mackey and Gass, 2013). Further, it includes the selection of research approaches, collection of data and analysis method that has been adopted for the effective development of better report. This has been done for effective and accurate conclusions that have been drawn as per the objectives of research.

3.2 Research approach

Research approach is beneficial for improving the thought procedure of the investigator to carry out research ahead. There are two kind of approach that researchers adopt while carrying out the study are inductive and deductive. The major objective of former approach is to develop new theories by considering some observation. On the other side, the main aim of deductive method is to consider pre existing theory for data collection and analysis (Noor, 2008). According to the current scenario, researcher has emphasized on implementing deductive method which aids to study and examine the theories regarding construction and business continuity management. Then after that, investigator has accumulated the primary data to analyze and compares the findings with secondary information which has helped in achieving appropriate outcomes.

3.3 Research type

It examines the important section of any research as it dictates about the nature of study. This has been classified on the basis of two kind of study and that are qualitative and quantitative research. Further, qualitative research aids in achieving core subjective and complete information regarding construction and business continuity management areas (Thorne, 2008). On the other side, quantitative research plays important role for investigator to acquire numerical, statistical and other calculative information in an appropriate manner. Apart from these, there is also another method which combines qualitative and quantitative approaches and is said to be mixed

method to draw out better conclusion for the present study. The main reason behind the selection of mixed method is because of its intuitive and logical appeal. It helps the investigator to fill the gap between qualitative and quantitative research. In addition to this, findings of both information helps to complement each other by following both methods. Qualitative approach help in removing out complex statistics and qualitative research aids in deriving quantitative information effectively. This process provides reliability to achieve better results by putting proper information in the report.

3.4 Research design

There are different kinds of research design that a researcher can adopt which includes descriptive, exploratory and casual designs. Descriptive design can suit for quantitative research type which provides flexibility to manage its activities. On the other note, exploratory design is most convenient which gives better help to deal quantitative study (Gomm, 2008). Mainly, it has been implemented to achieve better and valid outcomes which also enable researcher to develop a framework for ensuring Business Continuity Management (BCM) in UAE Construction Industry. Hence, to ensure the complete analysis, investigator can consider exploratory research design.

3.5 Data collection

The method of data gathering can be defined as a technique in which researcher collects the information and data. It aids him to analyze and extract new knowledge regarding construction management business. Investigator can collect two types of information like primary and secondary. Primary data collection technique provides new data as per the required situation of environment. For this, researcher's uses questionnaire, interview questions, survey, sampling as well as observation techniques which contribute effectively to find out new information. On the other side, secondary data sources have higher level of relevancy with completed researches on the same subjects (Gast and Ledford, 2009). Further, main sources of secondary data collection techniques are certified journals, author books, online articles and magazines which aid in extracting out relevant information regarding construction management. They have been collected and achieve from emerald sights, science direct, IEEE as well as Google scholars websites where researchers can procure better secondary information.

3.5.1 Primary data collection

For collection of primary data survey and interviews are considered from among different methods for this study. In this process, survey was utilized to collect quantitative and statistical data by making online questionnaires. Mainly researcher cannot reach in other countries and areas due to higher expenditure and other reasons. In this condition, online survey can be better option to extract quantitative data and it also reduces cost of survey as compared with offline survey. For this, structured questionnaire were designed which were easy for respondents to understand the all questions (Alvesson and Sköldbberg, 2009). It helped the researcher to get better and valid output in different areas of UAE. On the other side, investigator also used interviews method for some respondents which contributed effectively to achieve qualitative information regarding construction business management. Hence, this process of research helps the investigator to find out and analyze better information in an appropriate manner.

Survey was initiated to achieve qualitative information from different respondents. Generally, many face to face interactions are not possible due to lack of time of interviewees. In order to sort out this issue, researcher uses survey as per convenience of respondents in the UAE. In addition to this, another reason for selection of this method is that it is cost effective which reduces expenses of researcher (Denzin and Lincoln, 2008). Further, it saves time of respondents and investigator. Thus, this method aids the researcher to complete study on construction management in a shorter time period.

3.5.2 Secondary data collection

There are many ways for collection of secondary data like books, journals as well as online articles. The main keywords that have been used for searching appropriate qualitative information were construction in UAE, advantage and disadvantages of construction development, effect on economy and construction business (Cooper.et.al., 2009). The researcher has also followed Google books by entering different keywords to find out other relevant information regarding this subject.

Investigator also personally went to college library for assessing bibliographies to some selected important books in order to extract data on construction management. Journals on same subject were also considered from Google scholar and emerald sight to collect secondary data. For this, researcher read the abstract of different journals to find out relevancy regarding

construction and business continuity management. In addition to this, best online articles were searched by using Google search which contributed effectively to find out better information.

3.6 Sampling method

Sampling can be defined as a process for choosing set of respondents who represents rest of population. It plays important role for researcher to carry out research further which aids in understanding different kind of information effectively. There are held two kind of sampling methods which are represented as Non probability and probability approaches to achieve the proper information (Silverman, 2011). In the Non probability sampling, investigator has no appropriate details regarding entire population, so sample is considered according to a judgment, decision and convenience. Further, in the probability sampling, researcher has better knowledge about population. Due to this reason, sample consideration among population provides flexibility to carry out a research.

For completing the present study survey and interviews are considered by using convenience sampling in order to collect data from the respondents. For this, non probability sampling is used due to inappropriate knowledge regarding entire population. Research has adopted convenience as it has helped research to collect data based on their ease. This approach has proved very beneficial which helps in reducing cost and time of both investigator and respondents.

Mainly, sample was taken on associated people of construction industry of UAE. For saving time and cost to complete research, information has been taken from 50 officials who were working with Construction industry of UAE. For this activity, investigator sent e-mail to all respondents for conducting enquiry purpose and taking proper permission to participate in research (Flick, 2015). Then after this, as per response from mails, final sample was decided by researcher. For the information gathering, employees at all levels were included in survey for collecting data from senior officials of construction industry. This process contributed effectively for researcher to extract out further information regarding construction management. In addition to this, researcher had better relations with these all respondents which provided better flexibility to get appointment easily.

Further, selected sample is also justified which gives sufficient information to examine data through SPSS as well as forming themes for present research. The main reason behind the selection of small sample is to reduce complexities in research procedure.

3.7 Data analysis

As per current scenario, qualitative data is collected by utilizing telephonic interviews which helps in analyzing thematic method. Further, thematic analysis can be considered as technique has been used for carrying out data analysis for the present research (Rosenthal.et.al., 2009). It is effective for researcher and enables him to consider multiple theories, concepts as well as increase range of research by associating previous researches and studies.

A part from that, investigator represented certain themes on the basis of research objectives and aims in the report. After that, interview transcripts were examined for data analysis. Information related to theme was considered, sorted and compared in order to increase proper understanding of researcher regarding construction management.

In order to examine the primary data collected using questionnaire SPSS software tool was used for proper validation of data analysis and information. Generally, this tool is utilized because it is very user friendly for analyzing quantitative data properly. In addition to this, huge information set can be stored and easily examined by using SPSS (Green.et.al., 2012). For completing primary data analysis, appropriate process is considered by researcher which is given below in the points.

- In this process, whatever data is gathered from respondents are coded in the excel sheet.
- After that, Coded excel sheet is imported to SPSS tool for evaluating information in a appropriate manner.
- Researcher also uses different kind of techniques such as frequency distribution, cross tabulation, One Way ANOVA, descriptive and pie charts as well as bar graphs for analyzing information and data in order to get better outcomes.

From the above mentioned approach, it is found that data statistical analysis plays important role for investigator to represent better results in form of charts, graphs as well as tables.

3.8 Reliability and validity of the report

The main important aspect to ensure the reliability and validity of the report is based on the data collection and analysis methods. It is necessary for investigator to analyze that whether research is going in a right direction or not. This helps researcher to develop better report by prioritizing the components of reliability and validation of information in an appropriate manner. Further, researcher has emphasized higher concentration for analyzing the information which

contributed effectively to ensure the flexibility and validation of the report (Krishnaswamy.et.al., 2009). A part from that, collection of data is considered into proper consideration which aids in maintaining reliability of study.

In addition to this, secondary sources have helped investigator to analyze journals, books, online articles as well as other sources in a proper manner. They played important role for researcher to get proper information which helped in achieving analyzing data for validation and reliability of report effectively.

3.9 Ethical considerations

The consideration of ethical issues is necessary for researcher because they help him to assure reliability along with validity of report. According to the current scenario, investigator has given better efforts regarding references of previous researchers who contribute effectively to increase knowledge in construction management. Further, investigator emphasized on avoidance of plagiarism content in the present report. It is found that in case of maintaining higher level of validity of report data as well as information are represented in a proper format for better understanding (Mahoney, 2010). Further, permission of respondents was also taken before carrying out survey process on construction management and business continuity management. Moreover, proper tools as well as techniques such as SPSS and excel sheet were used to analyze and evaluate data and information in a appropriate manner.

3.10 Limitation of the study

As per the current report, researcher has faced many issues and limitation during the research completion. Investigator has suffered lack of experience in the present subject and time management issues. Further, major problems are experienced regarding relevance of secondary information which creates issue for researcher. They also oblige investigator to search and read lot of books, journals as well as online articles properly for achieving proper content. In addition to this, inappropriate research knowledge produces many complexities which are faced by investigator (Jonker and Pennink, 2010). Researcher suffers with proper usage of tools and techniques due to lack of knowledge regarding them which consume so much time of him during report completion. Investigator also faces many issues to take consent of different respondents due to lack of time availability which increases his time for report preparation. Researcher

realizes difficulties to follow best suggestion which are given by friends along with mentors for report completion.

CHAPTER 4- DATA ANALYSIS AND INTERPRETATIONS

4.1 Introduction

Data analysis is an important part of dissertation that help researcher to generalize findings and conclusions. In addition, frequency distribution and percentage method were used to present view of respondents participated in survey. In order to analyze the qualitative or theoretical nature data, thematic analysis was applied. Besides that, SPSS tool was used to analysis mathematical data and test hypothesis made for understanding perceptions of construction industry employees.

4.2 Quantitative analysis

Demographic details

Table 1: Demographic profile of construction industry employees

		Frequency	Percent
Gender	Male	37	74.0
	Female	13	26.0
Age	20-25 years	6	12.0
	26-30 years	25	50.0
	31-35 years	12	24.0
	35 years and above	7	14.0
Education level	Less than high school	3	6.0
	High school certificate	9	18.0
	College degree	14	28.0
	Graduate degree	11	22.0
	High diploma	6	12.0

	Master or above	7	14.0
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Interpretation: Frequency distribution table indicate the statistics of respondents who participated in survey and their demographic details. From the result, it is found that most of the candidates were male (74%) and they were belonging to 26-30 years age category (50%). From the above table, it is clear that most of candidates who were shared their views about various challenges facing by UAE construction industry have college degree (28%) and graduation degree (22%).

Table 2: Designation and experience level of respondents

		Frequency	Percent
Designation	Board/Managing Director	6	12.0
	Technical Director	10	20.0
	Senior Engineer/Planner/Architect	13	26.0
	Engineer/Planner/Architect	21	42.0
Experience in construction industry	1-2 years	17	34.0
	3-4 years	25	50.0
	5 years and above	8	16.0

Interpretation: In order to better understand the role of BCM and collect action-based recommendations that required for developing the best practices and logical steps in construction industry, researcher was collected data from officials who were working with Construction industry of UAE. For the information gathering, employees at all levels including board/managing director, Technical Director, senior and junior engineer/planner/architect as per their knowledge and experience wise targeted to determine ways for Business Continuity Management in relevant sector. From the numerical value provide in above table, it is clear that most of the respondents participated in survey to share their view about alternative for BCM in UAE Construction industry have 3-4 years experience (50%).

Cross tabulation: In order to identify relationship between two variables, it is calculated. In the present case, to understand the correlation between work experience and satisfaction level of employees towards present risk management strategy used in construction industry, cross tabulation was done.

Table 3: Relationship between experience and satisfaction level of employees

		Satisfaction level towards present risk management strategy				
		Highly dissatisfied	Dissatisfied	Neutral	Satisfied	Highly satisfied
Experience in construction industry	1-2 years	1	8	1	3	4
	3-4 years	5	9	3	5	3
	5 years and above	1	2	3	2	0

Interpretation: From the result of cross tabulation between two factors, it can be said that most of the employees belong to different levels such that Board/Managing Director, Senior Engineer/Planner/Architect and Engineer/Planner/Architect etc. were not highly satisfied with performance of construction industry presently. Candidates having more than 3-4 years experience in same industry (9) not satisfied with present risk management strategy implemented in UAE construction industry. On the other side, some employees show their neutral responses about the role of BCM use and its advantages for entire sector from long term perspectives.

Bar chart

From the below chart, it is clear that most of the individuals who have been participated in survey are accepted that they often faced (30) time and cost overrun related issues during construction process. In addition, other candidates are strongly agree with the fact that organizations in UAE were facing variety of challenges during executing their business operations. In addition, 6 candidates were not given any respond about time and cost related issues raised in industry.

Table 4:

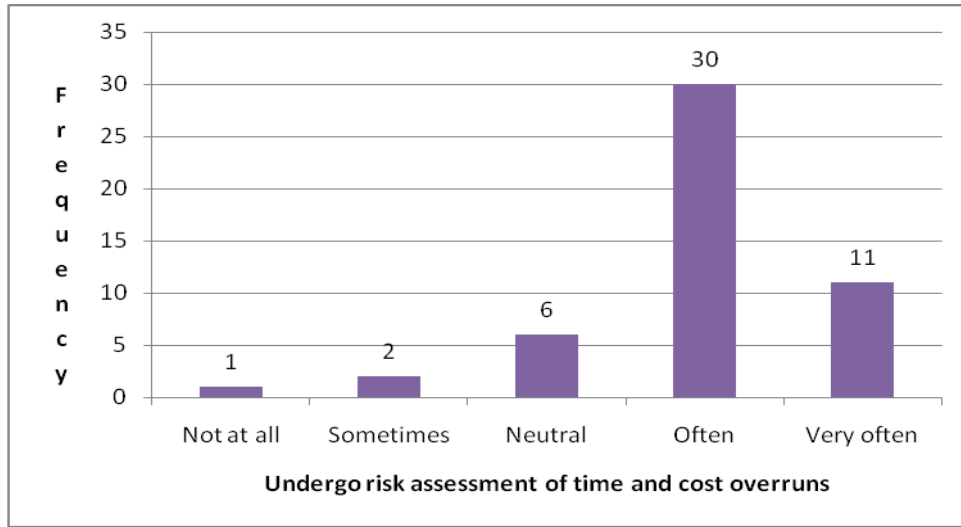


Figure 4: View of respondents about risk occurrence

Descriptive statistics: In the context of describing the basic features of the natural conditions and social attitudes related data, statistics have been taken. On the basis of characteristics of data, researcher tries to explore the concept of Business Continuity Management and its implementation in construction industry. In order to measure the dispersion or variation in data, standard deviation is calculated.

Table 5: Descriptive statistics

Natural conditions and Social attitudes	N	Minimum	Maximum	Mean	Std. Deviation
Sand storms	50	1	5	2.34	1.042
Extreme heat temperature	50	1	5	2.30	.974
Rain & flooding	50	1	5	2.40	.926
Ideological beliefs	50	1	5	2.24	.894
Education background	50	1	5	2.30	.995
Culture differences	50	1	5	2.32	.978

Life style requirements.	50	1	5	2.26	.899
Change in the policies and regulations	50	1	5	2.30	.974
Governmental approval	50	1	5	2.20	.833
Labour work permit	50	1	5	2.42	1.090

Interpretation: The above table summarizes details about natural conditions related factors affect construction industry including sand storms, extreme heat temperature, extreme heat temperature and Rain & flooding. N (50) value shows the number of valid observations for natural condition variable. Minimum and maximum values are 1 and 5. From the statistics, it is clear that labor work permit and Rain & flooding have highest mean. Larger spread value of sand storms and labor work permit factors explore that more spread out the observations are. In addition, change in the policies & regulations and governmental approval are other major parameters which highly influence working of organisations and performance of an individual one.

4.3 Acceptance or rejection Hypothesis

H01: There is no significance difference between experience of employees and the role of BCM to overcome technical risk occurs in UAE construction industry.

Ha1: There is a significance difference between experience of employees and the role of BCM to overcome technical risk occurs in UAE construction industry.

Table 6: One way ANOVA table 1

Technical risks		Sum of Squares	df	Mean Square	F	Sig.
Feasibility of construction methods	Between Groups	4.315	2	2.158	1.980	.149
	Within Groups	51.205	47	1.089		
	Total	55.520	49			
Inadequate training of labour	Between Groups	3.300	2	1.650	1.716	.191
	Within Groups	45.200	47	.962		
	Total	48.500	49			
Poor planning of site layout	Between Groups	3.200	2	1.600	1.895	.162
	Within Groups	39.680	47	.844		
	Total	42.880	49			
Inappropriateness of materials	Between Groups	2.734	2	1.367	1.502	.233
	Within Groups	42.786	47	.910		
	Total	45.520	49			

Interpretation: From the result of one way ANOVA table, it is clear that all factors have significant values greater than 0.05. It means null hypothesis is rejected and alternative is accepted. It can be interpreted that poor planning of site layout, inadequate training of labour, lack of feasibility of construction methods and inappropriateness of materials are the major technical risks. These factors are responsible for creating precarious situations for enterprises in cut throat competitive market. In this case Tammineedi (2010) and researcher findings are same. Both emphasized on effective use of BCM for organizations to handle technical issues occur in

construction industry. Hence, it can be said that there is no deviation between views of other scholars and researcher view about need of BCM in UAE Construction industry. It can be said that by using this method, management could be able to ensure stability of their business and continuance of their business processes.

H02: There is no significance difference between experience of employees and the role of BCM to handle engineering and design change related issues in construction industry.

Ha2: There is a significance difference between experience of employees and the role of BCM to handle engineering and design change related issues in construction industry.

Table 7: One Way ANOVA table 2

Engineering and design change		Sum of Squares	df	Mean Square	F	Sig.
Complexity of design	Between Groups	3.869	2	1.935	2.532	.090
	Within Groups	35.911	47	.764		
	Total	39.780	49			
Lengthily design process	Between Groups	2.974	2	1.487	1.592	.214
	Within Groups	43.906	47	.934		
	Total	46.880	49			
Design revision	Between Groups	3.704	2	1.852	1.961	.152
	Within Groups	44.376	47	.944		
	Total	48.080	49			
Incomplete design of project	Between Groups	3.300	2	1.650	1.716	.191
	Within Groups	45.200	47	.962		

	Total	48.500	49			
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Interpretation: On the basis of higher significant values generated by one way ANOVA, it can be said that null hypothesis is rejected in all cases. From the experience of construction employees in UAE, it is clear that engineering and design change related factors highly influenced the performance of companies. Hence, it can be said that complexity of design, incomplete design of project and design revision are the major issues faced by them during working in industry. Apart from that, respondents were facing other engineering and change related problems such that lengthily design process and design revision at their workplace. From the outcome of present study and findings of Watters (2014), it is clear that BCM could be helpful for construction enterprises in order to ensure proper execution of minimum level of business activities in an effective and efficient manner.

H03: There is no significant difference between satisfaction level of employees and use of BCM to handle construction related factors in UAE construction industry.

Ha3: There is a significant difference between satisfaction level of employees and use of BCM to handle construction related factors in UAE construction industry.

Table 8: One Way ANOVA table 3

Construction factors		Sum of Squares	df	Mean Square	F	Sig.
Enforce New technology	Between Groups	7.040	4	1.760	1.910	.125
	Within Groups	41.460	45	.921		
	Total	48.500	49			
Insufficient labour training	Between Groups	1.828	4	.457	.440	.779
	Within Groups	46.752	45	1.039		
	Total	48.580	49			
Poor site layout	Between Groups	6.620	4	1.655	1.714	.164

planning	Within Groups	43.460	45	.966		
	Total	50.080	49			
Unrealistic contract period	Between Groups	2.935	4	.734	.998	.419
	Within Groups	33.085	45	.735		
	Total	36.020	49			
Adopting old construction methods	Between Groups	7.040	4	1.760	1.910	.125
	Within Groups	41.460	45	.921		
	Total	48.500	49			
Feasibility of construction methods	Between Groups	3.820	4	.955	1.089	.373
	Within Groups	39.460	45	.877		
	Total	43.280	49			
Inadequate early construction planning	Between Groups	7.720	4	1.930	1.405	.248
	Within Groups	61.800	45	1.373		
	Total	69.520	49			
Improper resource management system	Between Groups	10.383	4	2.596	5.206	.002
	Within Groups	22.437	45	.499		
	Total	32.820	49			
High complexity	Between Groups	6.645	4	1.661	1.794	.147

in construction.	Within Groups	41.675	45	.926		
	Total	48.320	49			
Type of structures	Between Groups	7.040	4	1.760	2.007	.110
	Within Groups	39.460	45	.877		
	Total	46.500	49			

Interpretation: On the basis of views of UAE construction industry employees who have participated in survey, it can be said that construction related factors were high influenced performance of organizations in competitive world. Null hypothesis is rejected in the present case due to significant values of all variables greater than threshold value (0.05). By collecting the feedback from employees, researcher was able to know that most of the respondents were agreed with the fact that their performance was decreased and new challenges come in workplace. For that various factors were responsible such that enforce new technology, insufficient labour training, inadequate early construction planning, high complexity in construction and inadequate early construction planning etc. Besides these issues, some other factors including unrealistic contract period, lack of feasibility of construction methods and adopting old construction methods were responsible for decreased their motivation level at workplace. Respondents said that in case of improper resource management system companies would be unable to grasp business opportunity and better compete with their competitors in construction sector. From the scholar own point of view and previous researchers Elliott, Swartz and Herbane, (2010) findings, it is identified that for surviving in the market place and resume their operations at the earliest keeping delays to a minimum, BCM could be beneficial for organizations in UAE and other countries around the world.

4.4 Thematic data analysis

In order to better deal with qualitative nature data and identified patterns across data sets, different themes were prepared. With help of analysis, researcher could be able to better understand the perception of construction industry employees about various situations in which they were faced during process.

Theme 1: Perception of construction industry employees about often risk assessment of time and cost overruns related issues faced during entire processes.

Table 9: Causes of time and cost overruns related issues

	Very low	Low	Medium	High	Very high
Inappropriate project feasibility study	6	31	7	4	2
Inadequate planning project	9	32	7	2	0
Midstream change within the scope and volume of work	6	30	7	5	2
Inadequate project formulation, technical specifications and investigations	5	32	6	5	2
Unavailability of the equipment	8	28	7	5	2
Delay of equipment	12	20	11	5	2
Failure in equipment	8	28	7	5	2
Operator competency	4	33	6	5	2

Interpretation: By collecting data from respondents belong to different experience level and designation in UAE construction industry; it is clear that they have almost similar views about risk assessment process. Most of candidates participated in survey were agree with the fact that due to several reasons inappropriate project feasibility study, inadequate project formulation, technical specifications and investigations and midstream change within the scope were major issues they were faced. Due to these challenges, several times they were failing to manage cost and time of project. Apart from this, numerous time, construction project was delay due to equipment failure related problems such that operator competency, failure in equipment and unavailability of the equipment etc. In most of the cases, low value indicates that equipment failure and inappropriate project planning were responsible for time and cost overruns. From the analysis, it can be said that organisations and management in construction industry were facing problems regarding to successful utilization of their resources in the absence of proper equipments and proper planning.

Theme 2: View of respondents about material handling related factors that are responsible for risk assessment of time and cost overruns

Table 10: Material handling related factors responsible for creating risks

	Very low	Low	Medium	High	Very high
Operator competency	4	33	6	5	2
Usage of defective materials	4	36	6	2	2
Price fluctuation of materials	6	35	7	1	1
Delivery of materials	8	28	7	5	2
Preference of using certain materials	4	35	4	6	1

Interpretation: From the view of candidates participated in survey, it is clear that most of them were faced material handling related during their working process. Respondents replied that ineffective use of defective materials and fluctuation come in prices of products were major issues they were faced while working in construction industry. Apart from these issues, inappropriate delivery of materials and preference of using certain materials were also creating challenges for organizations in UAE and other area around the world. On the basis of responses provided by participants, it is clear that employees and enterprises working in industry were facing material related issues. From the analysis of result, it can be said that in order to overcome material related challenges, BCM approach could be beneficial for organizations in cut throat competitive market. From employee's responses, it is identified that BCM could be helpful for companies to ensure that firms sustains in the market for a longer period and maintain image in canvas of mind of customers. Participants having more than 3-4 years experience and belong to senior position were agreed with the importance of BCM in construction industry.

Theme 4: Satisfaction level of employees towards present risk management strategy to handle challenges in construction industry.



Figure 5: View of employees about present risk management strategy

Interpretation: On the basis of above figure, it is clear that most of candidates participated in study were satisfied (24%) with the fact that improvement is required in present risk management strategy. Most of employees have more than 3-4 years experience and belong to senior designations in construction organizations in UAE were highly satisfied with the changes need in risk management strategies and ways enterprises use to better deal with these kinds of challenges in modern arena. However, some respondents were given neutral answers to question related to requirement of change in risk management strategy in construction industry. From comparison between researcher own perception and views of respondents involved in survey, it is clear that both have same thought about change in present risk management and handling techniques. They recommended that without changing in current processes and implementing BCM approach, UAE based companies would be unable to better perform and enhance motivation level of their employees in competitive arena. Hence, it can be said that for identification of all the resources and processes that may be necessary for the organization, BCM could be helpful for companies in UAE. In order to protect sensitive information about operations and increased financial instability and better respond to change in customer preferences, this concept can be beneficial for companies.

Theme 5: Recommendations provided by respondents regarding to the effective implementation of BCM in UAE that can be used by UAE's construction industry to ensure BCM.

Interpretation: When researcher was asked question from respondents who were participated in study about review risk management strategies used in UAE construction companies, then they replied that changes are required within current processes. From their own experience, Board/Managing Director and Senior Engineer/Planner/Architect replied that business continuity management could be beneficial for companies to better perform organization functions effectively in the market. In order to improve forecasting and safety from disasters, BCM can be beneficial for construction companies in UAE. Candidates recommended that through focusing more on their core processes and maintain balance between expectations of price, quality and delivery time necessitates, enterprises can grasp business benefits in an effective and efficient manner. On the basis of respondent's awareness and usage of BCM in construction sector, it can be said that most of employees have more experience and higher positions in companies were aware about weakness of risk management processes. In addition, they were also focused on need of business continuity management to overcome current challenges in modern arena. However, without conducting Business Impact Analysis and preparing Business Continuity Plan, management of enterprises would be unable to take benefits of BCM at workplace. By reviewing Business Continuity Program and review of suppliers and service providers, construction companies could be able to improve in their risk management strategies and overcome challenges occur in industry.

CHAPTER 5- CONCLUSION AND RECOMMENDATIONS

From the study it has been found that employees having 3-4 years experience in same industry are not satisfied with present risk management strategy implemented in UAE construction industry. Research indicated that employees often faced time and cost overrun related issues during construction process. In addition, other staff believes that organizations in UAE were facing variety of challenges during executing their business operations. Study concludes that labor work permit and Rain & flooding have highest mean. Larger spread value of sand storms and labor work permit factors explore that more spread out the observations are. In addition, change in the policies & regulations and governmental approval are other major parameters which highly influence working of organisations and performance of an individual one. Further, research shows that poor planning of site layout, inadequate training of labour, lack of feasibility of construction methods and inappropriateness of materials are the major technical risks. These factors are responsible for creating precarious situations for enterprises in cut throat competitive market. In this case Tammineedi (2010) and researcher findings are same. Both emphasized on effective use of BCM for organizations to handle technical issues occur in construction industry. Hence, it can be said that there is no deviation between views of other scholars and researcher view about need of BCM in UAE Construction industry. It can be said that by using this method, management could be able to ensure stability of their business and continuance of their business processes.

Additionally, research observes that experience of construction employees in UAE clearly shows that engineering and design change related factors highly influenced the performance of companies. Hence, it can be said that complexity of design, incomplete design of project and design revision are the major issues faced by them during working in industry. Apart from that, respondents were facing other engineering and change related problems such that lengthily design process and design revision at their workplace. From the outcome of present study and findings of Watters (2014), it is clear that BCM could be helpful for construction enterprises in order to ensure proper execution of minimum level of business activities in an effective and efficient manner.

Study even identified that employee's performance was decreased and new challenges come in workplace. For that various factors were responsible such that enforce new technology, insufficient labour training, inadequate early construction planning, high complexity in

construction and inadequate early construction planning etc. Besides these issues, some other factors including unrealistic contract period, lack of feasibility of construction methods and adopting old construction methods were responsible for decreased their motivation level at workplace. Respondents said that in case of improper resource management system companies would be unable to grasp business opportunity and better compete with their competitors in construction sector. From the scholar own point of view and previous researchers Elliott, Swartz and Herbane, (2010) findings, it is identified that for surviving in the market place and resume their operations at the earliest keeping delays to a minimum, BCM could be beneficial for organizations in UAE and other countries around the world.

Research showed that several reasons that are inappropriate project feasibility study, inadequate project formulation, technical specifications and investigations and midstream change within the scope were major issues they were faced. Due to these challenges, several times they were failing to manage cost and time of project. Apart from this, numerous time, construction project was delay due to equipment failure related problems such that operator competency, failure in equipment and unavailability of the equipment etc. In most of the cases, low value indicates that equipment failure and inappropriate project planning were responsible for time and cost overruns. From the analysis, it can be said that organisations and management in construction industry were facing problems regarding to successful utilization of their resources in the absence of proper equipments and proper planning.

Study found that ineffective use of defective materials and fluctuation come in prices of products were major issues they were faced while working in construction industry. Apart from these issues, inappropriate delivery of materials and preference of using certain materials were also creating challenges for organizations in UAE and other area around the world. On the basis of responses provided by participants, it is clear that employees and enterprises working in industry were facing material related issues. From the analysis of result, it can be said that in order to overcome material related challenges, BCM approach could be beneficial for organizations in cut throat competitive market. From employee's responses, it is identified that BCM could be helpful for companies to ensure that firms sustains in the market for a longer period and maintain image in canvas of mind of customers. Participants having more than 3-4 years experience and belong to senior position were agreed with the importance of BCM in construction industry.

Research recommends that without changing in current processes and implementing BCM approach, UAE based companies would be unable to better perform and enhance motivation level of their employees in competitive arena. Hence, it can be said that for identification of all the resources and processes that may be necessary for the organization, BCM could be helpful for companies in UAE. In order to protect sensitive information about operations and increased financial instability and better respond to change in customer preferences, this concept can be beneficial for companies.

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APPENDIX 1: QUESTIONNAIRE (CONTRACTOR)

The main aim of this survey is to develop a Framework for improving Business Continuity Management success (BCM) in UAE Construction Industry

1. Gender

- Male ☐
- Female ☐

2. Age

- 20-25 years ☐
- 26-30 years ☐
- 31-35 years ☐
- 35 years and above ☐

3. Experience in construction industry

- 1-2 years ☐
- 3-4 years ☐
- 5 years and above ☐

4. What is your satisfaction level towards present risk management strategy?

- Highly dissatisfied ☐
- Dissatisfied ☐
- Neutral ☐
- Satisfied ☐
- Highly satisfied ☐

5. Does your project team undergo sufficient interaction among expert risk management team and non-expert employees?

- No interaction at all ☐
- Some interaction ☐
- Neutral ☐
- Strong interaction ☐
- Very strong interaction ☐

6. In your project how often do you undergo risk assessment of time and cost overruns?

- Not at all ☐
- Sometimes ☐
- Neutral ☐
- Often ☐
- Very often ☐

7. Technical risks

On the basis of your expectation and experience please give your opinion on technical risk Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-20%	>20%	1%	1-5%	5-10%	10-20%	>20%
Feasibility of construction methods															
Inadequate training of labour															
Poor planning of site layout															
Appropriateness of materials															

8. Scope of change

On the basis of your expectation and experience please give your opinion on scope of change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-30%	>20%	1%	1-5%	5-10%	10-30%	>20%
Inappropriate project feasibility study															
Planning of project is insignificant															
Midstream change within the scope and volume of work															
Inadequate project formulation, technical specifications and investigations															

9. Equipment factors

On the basis of your expectation and experience please give your opinion on equipment factors Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate.

Factors	Likelihood of occurrence	Severity on cost and time overrun per project as % from the original estimate
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	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-30%	>20%	1%	1-5%	5-10%	10-30%	>20%
Shortage in equipments															
Maintenance of equipment is slow															
Failure in equipment															
Unskilled operator															

10. Material factors

On the basis of your expectation and experience please give your opinion on material factors Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-30%	>20%	1%	1-5%	5-10%	10-30%	>20%
Usage of defective materials															

Price fluctuation of materials							
Delivery of materials is slow							
Embargo							

11. Engineering and design change

On the basis of your expectation and experience please give your opinion on engineering and design change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-20%	>20%	1%	1-5%	5-10%	10-20%	>20%
Complexity of design															
Delay in the work of design process															
Omissions and errors in the design															
Design scope of project is incomplete															

12. Construction factors

On the basis of your expectation and experience please give your opinion on construction factors change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-30%	>20%	1%	1-5%	5-10%	10-30%	>20%
The period of contract is unrealistic															
New technology or new construction methods															
Inadequacy in the labour training															
Poor site layout planning															
Unrealistic contract period															
Adopting old construction methods															
Feasibility of construction methods															

Inadequate of early construction planning							
Improper control over site resource allocation							
Complexity							
Type of structures (steel, concrete, brick, timber, masonry)							
Material changes in types and specifications during construction							
Complexity of building services							

13. Inflation factors

On the basis of your expectation and experience please give your opinion on inflation factors change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low	very unlikely to occur	Medium likely to	High very likely to	Very high expected	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high

						1%	1-5%	5-10%	10-20%	>20%	1%	1-5%	5-10%	10-20%	>20%
Tender price															
Price fluctuation															
Inflation															
Increase in the transportation costs															

14. Natural disasters

On the basis of your expectation and experience please give your opinion on natural disasters change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-20%	>20%	1%	1-5%	5-10%	10-20%	>20%
Weather change on construction activities															
Effect of rain on the construction activities															
Storms and heavy-dusty wind															

15. Social attitudes

On the basis of your expectation and experience please give your opinion on social attitudes change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of occurrence					Severity on cost and time overrun per project as % from the original estimate									
	Very low very unlikely to occur	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-20%	>20%	1%	1-5%	5-10%	10-20%	>20%
Ideological beliefs															
Education															
Culture															
Delay and approval by custom department															

16. Legal risks

On the basis of your expectation and experience please give your opinion on legal risks change Likelihood of occurrence and its Severity on cost and time overrun per project as % from the original estimate

Factors	Likelihood of	Severity on cost and time overrun per project as
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	occurrence					% from the original estimate									
	Very low very unlikely to	Low unlikely to occur	Medium likely to occur	High very likely to occur	Very high expected to occur	Time					Cost				
						Very low	Low	Medium	High	Very high	Very low	Low	Medium	High	Very high
						1%	1-5%	5-10%	10-20%	>20%	1%	1-5%	5-10%	10-20%	>20%
Change in the policies and regulations by sovereigns															
Delay in the receipt of the government clearance															
Permission with respect to foreign labour															
Changes in the regulations on periodic basis															