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ISTANBUL GEDİK UNIVERSITY
INSTITUTE OF GRADUATE STUDIES

TOWARDS ENHANCEMENT OF CONSTRUCTION INNOVATION IN IRAQ

MASTER'S THESIS

Yasser Mohannad Tawfeeq ALKHABATAH

Engineering Managemnt Master in English Program

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Thesis Advisor: Assist. Prof. Dr. Redvan GHASEMLOUNIA

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DECLARATION

I, Yasser ALKHABATAH, do hereby declare that this thesis titled as “Towards Enhancement of Construction Innovation in Iraq” is original work done by me for the award of the masters degree in the faculty of Engineering Management. I also declare that this thesis or any part of it has not been submitted and presented for any other degree or research paper in any other university or institution. (14/06/2021)

Yasser Mohannad Tawfeeq ALKHABATAH

PREFACE

I dedicate the results of this research to every company or organization interested in developing its internal environment to improve the outputs of its projects, develop construction innovation, and obtain economic value, and I wish them success.

I would like to thank all the doctors who taught me at Gedik University, and especially my supervisor Dr. Redvan. I thank Dr. Aysam Akses and Dr. Jumaa for their help. I thank all of my classmates, you have been friendly, positive and helpful.

Thank you mom, thank you tutu, thank you my family.

I hope this research is useful in practice and academically.

In the end, I dedicate this work to every human being who carries the meaning of humanity who lives on this earth. You deserve the best. and I promise you to provide the best in the future as I can.

June 2021 Yasser Mohannad Tawfeeq ALKHABATAH

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ABBREVIATIONS

ANOVA : Analysis of Variance
H_o : Null Hypothesis
IQD : Iraqi Dinar
ISIS : The Islamic State in Iraq and Syria
LC : Lean Construction
PM : Project Management
P-Value : Probability Value
QM : Quality Management
R : Rank
RM : Risk Management
R&D : Research and Development
RI : Relative Important
RII : Relative Important Index
SPSS : Statistical Package for Social Sciences
TFL : Transformational Leadership
UK : United Kingdom

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TOWARDS ENHANCEMENT OF CONSTRUCTION INNOVATION IN IRAQ

ABSTRACT

Due to the great importance of construction innovation, many scientists believed that construction innovation would become the fourth dimension of future performance in addition to the traditional cost, quality, and time dimensions. In this regard, construction organizations need to innovate to benefit from market economic changes, develop long-term relations with customers, increase organizational motivation, and improve systems and processes. On the other hand, efficient construction project management supports construction organizations by increasing the likelihood of successful completion of the project – on schedule, within the budget, and without financial or legal problems. Consequently, considering the importance of innovation and project management in the construction sector, to increase project management efficiency and improve construction innovation at the same time, this research presented innovative best practices and demonstrated the possibility of integrating them with project management practices. In addition to investigating the most important factors that limit or increase creativity because creativity is a key ingredient in every innovation process. In short, this research covers two topics and combines them, namely "innovation" and " project management".

The main objective of this research is to improve the efficiency of project management and improve construction innovation by investigating the most important factors and practices that exist in construction organizations and companies in Iraq that would limit or enable creativity, as well as by searching for the best practices that lead to innovation and presenting them for Integrate it with project management. In the end, the results are linked to a framework to help construction companies in Iraq complete more successful projects, and develop construction innovation.

to achieve these objectives, the study relied on the exploratory research inquiry of structured questionnaires with interviews.

A survey of the questionnaire was submitted to 121 engineers with various engineering specializations and positions working in consulting construction organizations, contracting organizations, or governmental organizations residing in Iraq. Among the engineers, the SPSS program was used for data analysis. The data was part descriptive and the other part was hypotheses, the metadata included the first section of the questionnaire, which includes the most important factors and practices present in construction organizations in Iraq that limit or enable creativity among workers in these organizations, as the results showed that the most important factor that limits creativity within construction organizations It is "The organization uses outdated policies and unnecessary red tape." Among the factors and practices that enable creativity the least practice used by construction organizations in Iraq was

"Practicing creative thinking techniques in the organization, like the brainstorming method".

As for the hypotheses, the results of their testing showed that there is a significant relationship at the level of ($\alpha<0.05$) among practices of (lean construction, transformational leadership, quality management, risk management, and project management)

The researcher provided a framework based on the results obtained from the research, it is supposed to assist construction organizations and companies in developing the level of project management and construction innovation. Also, this framework helps organizations pay attention to the factors and practices present within organizations that limit or enable creativity, thus create an environment better within these organizations lead to enhancing creativity and increasing employee efficiency.

For future studies, the research results and information are expected to help and inspire researchers in the same field of this research to investigate new methods and establish new frameworks for innovative project management.

In Iraq, the construction sector is one of the key sectors of the economy that has faced significant problems in terms of time, cost, and quality. To overcome these problems and to increase project management efficiency and improve construction innovation at the same time, this research presented innovative best practices and demonstrated the possibility of integrating them with project management practices. In addition to investigating the most important factors that limit or increase creativity because creativity is a key ingredient in every innovation process. In a nutshell, this study blends two topics: "innovation" and "project management."

Keywords: *Construction Innovation, Transformational Leadership, Lean Construction, Project Management, Iraq*

IRAK'TA İNŞAAT YENİLİKLERİNİN İYİLEŞTİRİLMESİNE DOĞRU

ÖZET

İnşaat inovasyonunun büyük önemi nedeniyle, birçok bilim insanı, inşaat inovasyonunun geleneksel maliyet, kalite ve zaman boyutlarına ek olarak gelecekteki performansın dördüncü boyutu olacağına inanıyordu. Bu bağlamda, inşaat organizasyonlarının piyasa ekonomik değişikliklerinden faydalanmak, müşterilerle uzun vadeli ilişkiler geliştirmek, organizasyonel motivasyonu artırmak ve sistem ve süreçleri iyileştirmek için inovasyon yapması gerekmektedir. Öte yandan, verimli inşaat proje yönetimi, projenin başarılı bir şekilde tamamlanma olasılığını artırarak - zamanında, bütçe dahilinde ve mali veya yasal sorunlar olmadan inşaat organizasyonlarını destekler. Sonuç olarak, inşaat sektöründe inovasyon ve proje yönetiminin önemi göz önünde bulundurulur. Proje yönetimi verimliliğini artırmak ve aynı zamanda inşaat inovasyonunu geliştirmek için, bu araştırma yenilikçi en iyi uygulamaları sundu ve bunları proje yönetimi uygulamalarıyla entegre etme olasılığını gösterdi. Yaratıcılığı sınırlandıran veya artıran en önemli faktörleri araştırmanın yanı sıra, yaratıcılık her inovasyon sürecinin temel bileşenidir. Kısaca, bu araştırma iki konuyu kapsamakta ve bunları birleştirmektedir, yani "inovasyon" ve "proje yönetimi".

Bu araştırmanın temel amacı, Irak'taki inşaat organizasyonları ve şirketlerinde var olan, yaratıcılığı sınırlandıran veya mümkün kılan en önemli faktör ve uygulamaları araştırarak ve en iyiyi arayarak proje yönetiminin verimliliğini artırmak ve inşaat inovasyonunu iyileştirmektir İnovasyona yol açan ve bunları proje yönetimi ile entegre eden uygulamalar. Sonunda, sonuçlar Irak'taki inşaat şirketlerinin daha başarılı projeleri tamamlamalarına ve inşaat yeniliklerini geliştirmelerine yardımcı olacak bir çerçeveyle bağlantılı.

Bu hedeflere ulaşmak için çalışma, görüşmelerle yapılandırılmış anketlerin keşif amaçlı araştırma sorgulamasına dayanıyordu.

Irak'ta ikamet eden inşaat organizasyonlarında, müteahhitlik organizasyonlarında veya devlet kurumlarında danışmanlık yapan çeşitli mühendislik uzmanlıklarına ve pozisyonlarına sahip 121 mühendise anketle ilgili bir anket sunuldu. Mühendisler arasında veri analizi için SPSS programı kullanıldı. Veriler kısmen açıklayıcı, diğer kısmı hipotezlerdi, üst veriler anketin Irak'taki inşaat organizasyonlarında mevcut olan ve bu kuruluşlardaki işçiler arasında yaratıcılığı sınırlandıran veya yaratıcılığı mümkün kılan en önemli faktörleri ve uygulamaları içeren ilk bölümünü içeriyordu. İnşaat organizasyonlarında yaratıcılığı sınırlandıran en önemli faktör olduğunu gösterdi "Organizasyon modası geçmiş politikalar ve gereksiz bürokrasi kullanıyor." Irak'taki inşaat organizasyonlarının yaratıcılığı mümkün kılan etkenler ve uygulamalar arasında en az kullandıkları uygulama "Beyin fırtınası yöntemi gibi organizasyonda yaratıcı düşünme tekniklerinin uygulanması" idi.

Hipotezlere gelince, testlerinin sonuçları, (yalın inşaat, dönüşümsel liderlik, kalite yönetimi, risk yönetimi ve proje yönetimi) uygulamaları arasında ($\alpha \geq 0.05$) düzeyinde önemli bir ilişki olduğunu göstermiştir.

Araştırmacı, araştırmadan elde edilen sonuçlara dayalı bir çerçeve sunmuştur. İnşaat organizasyonlarına ve şirketlere proje yönetimi ve inşaat inovasyon düzeyini geliştirmede yardımcı olması beklenir, ayrıca bu çerçeve organizasyonların yaratıcılığı sınırlandıran veya mümkün kılan faktörlere ve uygulamalara dikkat etmesine ve böylece bu organizasyonlarda daha iyi bir ortam yaratmasına yardımcı olur. yaratıcılığı geliştirmeye ve çalışan verimliliğini artırmaya yol açar.

Gelecekteki çalışmalar için, araştırma sonuçlarının ve bilgilerinin, bu araştırmanın aynı alanındaki araştırmacılara yeni yöntemleri araştırmaları ve yenilikçi proje yönetimi için yeni çerçeveler oluşturmaları için yardımcı olması ve ilham vermesi beklenmektedir.

Irak'ta inşaat sektörü, ekonominin zaman, maliyet ve kalite açısından önemli sorunlarla karşılaşan kilit sektörlerinden biridir. Bu sorunların üstesinden gelmek ve aynı zamanda proje yönetimi verimliliğini artırmak ve inşaat inovasyonunu iyileştirmek için, bu araştırma yenilikçi en iyi uygulamaları sundu ve bunları proje yönetimi uygulamaları ile entegre etme olasılığını gösterdi. Yaratıcılığı sınırlandıran veya artıran en önemli faktörleri araştırmanın yanı sıra, yaratıcılık her inovasyon sürecinin temel bileşenidir. Özetle, bu çalışma iki konuyu harmanlamaktadır: "yenilik" ve "proje yönetimi".

Anahtar Kelimele: *İnşaat İnovasyonu, Dönüşümcü liderlik, Yalın Yapı, Proje Yönetimi, Irak*

1. INTRODUCTION

1.1 Background

The importance of the construction sector in all life areas is no secret to anybody. If we look around in any city, we will see that all built buildings, roads, and even infrastructure are part of the construction sector. On the other hand, in improving any country's economy the construction industry has a significant role, as it provides an appropriate environment for people to practice their activities and professions. Besides, it provides many job opportunities. According to Barbosa et al. (2017), the building industry employs nearly 7% of the world's working people and it's one of the largest industries in the world economy with $10 trillion per year for building products and services. The construction industry of any country is therefore considered to be essential. Besides the importance of building for countries' economic growth, innovation also plays an important role, since many critical problems are resolved by innovations. Innovation is needed more than ever in developing countries. Besides, Innovation, in addition to growing revenues, it provides a competitive advantage for construction firms and organizations. Anyway, **c**onstruction is usually characterized as an industry that does not innovate compared to other industries (Alinaitwe et al. 2005). The reluctance of the construction industry to learn from other industries was one of the obstacles to achieving the required improvement in productivity and performance in the construction sector of the UK, thus resulted in time lags between the development of new technologies and management techniques and their implementation in the construction sector (Ferng & Price, 2005). This situation was not unique to the United Kingdom. Rather, this situation applied to all countries of the world. In general, Winch (2003) mentioned that the construction industry's efficiency was poor in terms of production, quality, and product functionality compared to other industries. The construction industry needs to improve in developing countries because of its vital role in national economies and long-term socio-economic growth (Ofori, 2005). According to Ghaben et al. (2015), construction Organizations are called upon to challenge

conventional construction project management applications and to look at modern applications to improve their skills in response to development and change in the construction environment. Also, Ghaben et al. (2015) stated that Construction Organizations have to integrate project management with innovation, as innovation practices have become the engine through which methods, relationships, and processes of project management can be enhanced to increase project success and competitive advantage.

As for Iraq, Iraq's building industry consider the largest sector which plays an important role in economic growth (Al-karawi,2018). Unfortunately, given the circumstances of Iraq over decades, it is suffering a housing crisis and a shortage of infrastructure and road transport networks, which means that a significant urban recovery is required. But, the construction industry is experiencing major problems. According to Al-karawi (2018), this sector has struggled, with all this significance in the building sector, to entrust the Iraqi economy, as the sector has not been entitled to growth or competition within the same sector in the world or even neighboring countries for many years (from 2003 to 2011).

1.2 Aim and Objective of the Research

The main goal of this research is: To make the projects that are implemented more successful and to enhance construction innovation in Iraq. It has been supposed that this goal can be achieved by focusing on the factors and practices present in Iraqi construction organizations that would limit creativity, as well as practices that would enable creativity among workers in construction organizations in Iraq, and by providing innovative practices that contribute to enhancing innovation and project management efficiency if it was integrated with project management.

To achieve the main goal, the researcher needed to achieve two objectives:

The first objective is: To investigate the factors and practices that exist within construction organizations in Iraq that limit or enable creativity among workers and staff in these organizations so that organizations can pay attention to the most important of these factors and take the necessary measures to improve the conditions that enhance creativity.

The second objective is: To provide best practices that can be integrated with project management to increase project management efficiency and promote construction innovation.

1.3 The Research Problem

The construction sector is considered one of the vital and important sectors in Iraq. However, this sector suffers from problems in project implementation, delays in delivery, problems with work quality, and a lack of innovation. Therefore, in order for these Iraqi companies and organizations to develop to have an innovative culture with long-term sustainability instead of survival strategies, these companies need to investigate the factors that led to the weakness of creativity and innovation and address these factors, and these organizations also need to develop innovative practices that are integrated with project management. Thus, the company has a competitive value that increases its profits in addition to developing the reality of the construction sector in Iraq in general and developing construction innovation.

1.4 The Research Project

The research project consists of two parts, as the first part is about the research questions and the second part is about the research hypotheses.

1.4.1 Research questions

The questions of this research were designed to achieve the first goal, and the questions were as follows:

- What are the factors and practices present in Iraqi organizations that enables creativity?
- What are the factors and practices, which present in Iraqi organizations that limits creativity?

1.4.2 Research hypotheses

To achieve the second objective of this research and through the literature review, ten hypotheses were identified and formulated, the purpose of which is to ensure that the practices under investigation correlate positively with each other in general and correlate positively with project management in particular. Thus, their application

contributes to the implementation of more successful projects and gives a competitive advantage to construction companies and organizations, in addition to enhancing construction innovation. These hypotheses are as follows:

H1: There is a positive relationship between lean construction and transformational leadership

H2: There is a positive relationship between lean construction and Quality Management

H3: There is a positive relationship between lean construction and Risk Management

H4: There is a positive relationship between lean construction and Project Management

H5: There is a positive relationship between Transformational Leadership and Project Management

H6: There is a positive relationship between Transformational Leadership and Quality Management

H7: There is a positive relationship between Transformational Leadership and Risk Management

H8: There is a positive relationship between Quality Management and Risk Management

H9: There is a positive relationship between Quality Management and Project Management

H10: There is a positive relationship between Risk Management and Project Management

Based on the hypothesis above the main hypothesis of the research is:

“Best practices for innovation correlate positively with project management practices and its ten knowledge areas”.

2. LITERATURE REVIEW

2.1 Chapter Overview

This chapter will discuss some of the previous studies in the field of construction project management, creativity and innovation in construction industry, and best practices in construction innovation.

2.2 Previous Studies in Construction Innovation

Compared to other industries, the construction sector is regarded as of low innovation. A number of research studies have been conducted in the field of construction innovation. Tatum (1984) was one of the early researchers in construction innovation, the title of his research was "What prompts construction innovation", the study aimed to provide guidelines for industry professionals and researchers to support engineering and construction innovation, and to identify factors promoting construction innovation. his method was a case study of a power plant project. the result of his study Provided seven different types of construction innovation.

Veshosky (1998) investigated the way in which project managers achieve information about innovations in large US construction companies. His research title was "Managing innovation information in engineering and construction firms". His method was conducting Interviews and a questionnaire with managers of 50 firms. He concluded that managers should have an encouraging and motivating attitude towards innovation in order to improve the construction industry in the United States.

"Innovation in project-based, service enhanced firms: the construction of complex products and systems" was the research's title of Gann and Salter (2000). in their conclusion, they recommended the need for a conceptual framework to understand new management practices to connect project and business processes to enhance project performance. They aimed to study management and innovation in project-based firms in engineering and construction.

Manley (2006) provided guidelines for organizations to boost their innovation efficiency by concentrating on partnering and training programs to develop management and social skills to address innovation barriers. Their aim was to examine the drivers and barriers to construction innovation in the Australian construction industry. For that purpose, they conducted 400 questionnaire surveys and 12 case studies.

The "House of Innovation" model was developed by (Kearney, 2006). This model shows the most important building blocks of successful innovation management. It tests innovation practices in four dimensions: (1) an innovation strategy that is aligned with the business strategy; (2) an organization that drives innovation through its structure and culture; (3) a product-life-cycle process that continuously develops ideas generation capabilities; and (4) Enabling factors for innovation management.

Ghaben et al. (2015) Conducted a questionnaire for more than 300 respondents and interviews with seven experts. The aim of their studies was to present a clear picture of the relative importance of key drivers, barriers, and impacts of innovation along the value chain of construction innovation, and to explore the best innovative practices that need to be integrated with project management practices in order to enhance project management skills. The main results of their research were that they produced a conceptual framework containing 26 innovative practices that were designed to enable companies to learn about innovation project management best practices. The title of their research was "Assessing Innovation Practices in Project Management: The case of Palestinian Construction Projects".

2.3 Construction Industry

2.3.1 Construction and construction industry definition

Construction word comes from Latin constructio (from com- "together" and struere "to pile up") and Old French construction (Online Etomology Dectionary). construction is a general term meaning the science and art to form systems, objects, or organizations (Oxford English dictionary 2009). In General, construction is Clearing, excavating, dredging, and grading of land and other activity associated with structures, buildings, or other types of real property such as roads, bridges, dams (construction Business Dictionary, 2020).

The construction industry is a manufacturing and commercial branch based on the construction, maintenance and repair of structures. This includes drilling and exploration of solid minerals (United Nations, 2004). Traditionally, the building field is classified into three subsectors, They are: (1) construction of buildings; (2) construction of bridges, roads, and utilities, and (3) specialty trades. It includes all the enterprises that build houses, offices, roads, and bridges as well as those which perform the specialist work of electricians, plumbers, and masons usually involved in the construction of all types of structures (Sharon Szymanski 2006).

2.3.2 Nature of construction industry in Iraq

The construction industry is one of Iraq's most important industries. As there is a continuous population increase as is the case in developing countries. The growing population requires facilities of construction such as homes, infrastructure, hospitals, etc (Al-Sabah 1997). The housing crisis in Iraq has been one of the most critical issues affecting urban construction. According to (Iraq National Housing Plan, 2016) The analysis of the realities of the housing sector can indicate the following main facts:

- The housing deficit continues to reach 5.2 million housing units at the end of 2016, 50% of which are concentrated in the governorates of Baghdad and Nineveh.
- A continuous increase in the rate of residential occupancy at the level of the housing unit and at the level of one room

World Bank Group (2018) stated that due to the war with ISIS, a total IQD 53.3 trillion (US$45.7 billion) of houses, roads, and other infrastructure in the country was damaged. Of the total, IQD19 trillion (US$16 billion)-worth of houses and IQD8.3 trillion (US$7 billion) of power plants were damaged during the war with ISIS until 2018.

In Iraq, there are a large number of construction companies, according to (Iraq Ministry of Planning website, 2020) there are more than 36,000 contractors and contracting companies in Iraq, which are classified with the Ministry and distributed between classification grades from the first to tenth.

The construction industry in Iraq faces many problems like the other developing countries because there is a lack of experience in project management and its

knowledge areas, lack in innovation practices, outdated technology, and Oil prices fluctuating, which poses a great risk to construction. besides, Most mega-projects in developing countries are designed, prepared, and financed by public sector organizations. the staffs in such organizations are critically unfamiliar with the methods, strategies, and methodologies of modern project management systems (Ahmed, 2020).

2.4 Construction Innovation

2.4.1 Innovation, innovation practices, and construction innovation definitions

The term innovation came from the Latin word "innovative", which means creating something new(Fagerberg 2005; Marte 2017). Innovation is the process that creates a market that no one could have imagined before (Druker 1985). Innovation has been defined by Plessis(2007) as the development of new products, ideas, and processes that make organizational outcomes possible. It is a new idea, method, device, or the introduction of something new (Merriam-webster 2016). İt is the process of translating an idea or invention into a good or service that creates value (Business dictionary 2016).

Innovation does not only depend on ingenuity but rather occurs as a result of interaction. Lundvall (1992) has defined Innovation as a “network-based”, and it is an interactive learning process. Marte (2017) stated that the interaction between actors in innovation networks depends on the method of innovation as well as the nature and integrity of the partners involved.

Innovation practices are defined as the ability of the company to search within an organization for new and better ways of identifying, acquiring, and implementing ideas and tasks (i.e. management and administrative systems, internal cultures, procedures, products and services, distribution channels, and marketing methods - segments) (North & Smallbone 2000; Calantone, Cavusgil & Zhao 2002 Blumentritt & Danis 2006; Brem & Voigt 2009; Al-Ansari 2014).

With regards to construction innovation definition, Murphy et al. (2011) stated that the attempts to define construction innovation are scant and insubstantial. anyway, Many researchers have defined construction innovation. Pedersen (1996) has defined construction innovation as The first use of technology within a construction

company, whether in the product or the process. Innovation can be seen as the successful exploitation of new ideas and that create economic value. In construction, new ideas can be in the form of technologies, processes, products, and markets (Egbu et al. 1998). It appears that by implementing a large and new set of ideas, the company's competitive position is being strengthened (Manseau and Seaden 2001). It is defined by Dulaimi (2005) as generating, developing, and implementing ideas that are new to an organization and have practical or commercial advantages.

2.4.2 Nature of the innovation of construction

The buildings are large, expensive, non-mobile, and last very long compared to the products of most other industries. As a result, off-site construction is difficult, and not particularly sensitive to some high-performance innovations (for example, those that reduce weight), risky for innovation, and represent substantial fixed assets to owners, respectively (NRC, 1997).

The researchers differed in determining the nature of construction innovation, there are literary studies that consider that innovation in the industry is more advanced than the construction sector, while there are literary studies that confirm that the construction industries are innovative in itself. Nam and Tatum (1997) considered that construction lags behind the innovativeness of the services manufacturing sectors. On the other side, Slaughter, E.S. (1993) revealed that the mindset of innovation in the construction business is very conservative. In manufacturing, buyers' role in the innovation process is generally negative: they provide "market demand" or "potential needs" that innovators actively respond to. In construction, however, it is well known that the owner is not just a buyer of the finished product: the owner is one of the main players before and during the implementation of the project (Nan and Tatum, 1997). on the other hand (Pries and Janszen, 1995) considered that construction projects are inherently innovative. Regardless of whether the construction industry is innovative or not; There are concerns that innovation will not spread systematically through industry. The Business Roundtable (1982, mentioned in (Nan and Tatum, 1997) is attributed to a lack of innovation to a lack of a concerted effort to link market needs and innovation capacity in spite of withdrawing sufficient demand and also promising technologies, such as Computers, advanced materials and robots that are ready for use by a coordinated system.

(Kulatunga & Amaratunga& Haigh 2006)mentioned that fewer firms are involved in product and/or process innovation in the construction sector. Moreover, construction companies have been shown to be less open to the external environment and tend to develop research and development weakly, with a low capacity to absorb ideas from abroad due to the lack of focus on innovation in external sources.

Innovation in the construction industry is very important to have a competitive advantage for the firms, there for the R&D is very important in this sector. Satoshi (1992) concluded that due to the lack of commitment to research and development in the US construction sector, it is losing its market share in the international construction market, as well as its domestic market, and it's losing the technological leadership to European and Japanese companies, which has led to American companies being slower to transfer research results to practice. Therefore, innovation has become very important for competing construction companies. Construction companies define innovation as a way to compete in international markets (Nam and Tatum, 1997). One of the top 10 strategies mentioned in The CEO Challenge (2015) for becoming or remaining a high-performance organization is to support a culture of innovation and entrepreneurship that learns from failure mentioned. From other side, Tangkar A. et al. (2000) mentioned that Building innovation is occurring increasingly over many years, and as a result, it is often invisible. the construction industry is innovating and adopting technological change, slowly despite its conservative reputation. Ayda Abadi (2014) stated that Innovation is not seen in a positive and beneficial way. besides, Aouad et al.(2010) recognized that innovation remains at the forefront of policymakers and practitioners alike, whether at the level of international, national, or regional analysis, a company or a project. Our perception of creativity, though, is far from complete.

İn general, Current common theories of innovation and about the supposed objective nature of innovation are not based on the views of practitioners. Ideas do not simply spread as was commonly envisioned in the literature on innovation.

2.4.3 Barriers and drivers of construction innovation

There is a lot of literature discussed several reasons that cause a barrier to innovation. Pries and Janzen (1995) stated that the main barrier to innovation is the fragmented nature of the construction process. (Blayse and Manley, 2004) added another reason

as a barrier to innovation which is the special longevity of building products because instead of being radically innovative it forces the customer to stick to known methods. He explained that the nature of the project-based construction industry is a major impediment to innovation

Barret and Sexton (2006) explained that there is a significant barrier to innovation, which is the nature of the project-based construction industry.

One of the barriers to innovation in the construction industry is the risks associated with innovation, as humans are inherently resistant to risks. Many of scholars mentioned different kind of risks may involve in construction projects, Ozorhon et al. (2010) mentioned that risks of commercializing innovations that pose a barrier to construction innovation, while Gambatese and Hallowell (2011) mentioned that the barriers of innovation are the Risk of failure, Lack of technical capabilities, Lack of recognition of the value of the innovation and Long payback period.

Ghaben and Jaaron (2015) illustrated that the main barriers to innovation is the lack of effective management, followed by limited budget, time pressure, lack of interest in innovation, poor coordination, fear of the unknown, low salaries and job insecurity, inappropriate planning, overwork or underweight, balance problems between work and life, Accidents during construction, and lack of cooperation due to competition. The absence of a coordinated effort to link market needs and innovative capacity was a barrier to construction innovation from point of view of (Kulatunga & Amaratunga& Haigh 2006).

A large number of studies have been carried out to find drivers for innovation, Ghaben and Jaaron (2015) noted that decreasing costs and time, competition, responding to customer needs, improving efficiency/productivity, rapid technology development, and improving quality are the drivers of construction innovation. Ozorhon et al. (2010) discussed Technology and technological improvement and their effect on construction innovation as a driver of innovation.

The increasing need for a sustainable built environment in the construction industry is an important driver of innovation. Building regulations have been reported as the major drivers of innovation in the construction industry (Brandon and Lu 2008), the explanation behind that is the development of demand to minimize the environmental effects of buildings on the construction industry. Also, Ozorhon (2013) noted that the

client's first action was to set an agenda throughout its operations to reduce carbon emissions from its buildings by at least 50 percent by 2020. Not the first attempt by the customer, this environmental store has tested new building designs, technologies, and materials to save energy and reduce carbon emissions.

From another point of view, the client's requirement can drive the innovative designs and creative ideas that are necessary to deliver some project (Nam and Tatum, 1997). Ozorhon et al. (2010) stated that Technology-push, Competitive advantage and Competition is the main driver of construction innovation. Beliz and Kutluhan (2016) have identified the importance of innovation policy, project complexity, and environmental sustainability as drivers of construction innovation.

2.5 Creativity

2.5.1 The definition and the importance of creativity

The literal definition of creativity is the ability to produce or use original and unusual ideas, or to make something new or imaginative (Cambridge Dictionary, 2021).“The abilities that are most characteristic of creative people”, it was from the earliest definition of creativity written by Guilford (1950). creativity is an engagement process in creative acts regardless of whether the outcomes are novel, creative and useful, or unuseful (Drazin et al. 1999). There is a lot of recent definition of creativity, Dewett (2007) suggests a definition of creativity as “the production of novel and useful ideas, products or processes by a group or a person. Al-Ababneh (2020) defined creativity as producing useful new ideas or solutions to solve problems. Individuals may possess high creativity if they have personal traits of creators and thus creativity has been viewed in various ways as a mental, practical, and human behavior.

Creativity is so important, it helps one to see things differently and better deal with uncertainty. Besides, trying to do things the same way they have always been done in the past can lead to difficulties in a rapidly changing cultural, economic, or technological business environment. Alex Gray (2016) mentioned that creativity will become a third place in 2020 after it was in tenth place in 2016 for the most important work-related skill. Besids, Alex Gray (2016) had forecasted that Creativity will become one of the three best skills that workers need. With so many new products, new ways to work, and new technologies, workers will have to

become more creative to take advantage of these changes. Change is an ever-present phenomenon that forces corporations of all kinds to respond to them if they want to have the best chance of survival and prosperity. Proctor (2005), mentioned that trying to do things the same way as in the past can lead to difficulties in a rapidly changing economic, cultural, or technological business environment, as change is important and forces companies of all kinds to respond to them, if they want to stay and thrive. (Van Gundy, 1987) stated that Survival and growth can directly relate to an organization's ability to produce and implement new products, processes, or services. Barron, (1988) mentioned that Creativity is an important human resource found in all organizations. of all human activities, creativity comes closest to providing the fulfillment we all hope to get in our lives (Csikszentmihalyi M. (1996). Realizing the importance of innovation, Csikszentmihalyi M. (1996) also argued that creativity needs to be cultivated not only in traditionally creative fields like sciences and arts but also in business, government and education.

Generally, creativity is so important because it predicts a longer life, develops confidence, and solves problems.

2.5.2 Characteristic and common behaviour of creative people

There are some characteristics of creative people, Dai et al. (2004) mentioned that creative people are motivated about solving problems in a creative way. creative people have a creative attitude toward life (Sternberg, 2000). also, creative people like to come up with new ideas (Sternberg, 1997). Csikszentmihalyi M. (1996) mentioned many characteristic for creative people, that are:

- Creative People Are Energetic, but Focused
- Creative People Are Playful, Yet Disciplined
- Creative People Are Smart, but Also Naive
- Creative People Are Realistic Dreamers
- Creative People Are Extroverted and Introverted
- Creative People Are Not Weighed Down by Rigid Gender Roles
- Creative People Are Proud, Yet Modest
- Creative People Are Conservative, Yet Rebellious
- Creative People Are Sensitive and Open to Experience, but Happy and Joyful
- Creative People Are Passionate, but Objective About Their Work

In general, people are creative within particular domains of endeavor (Solaiman. 2005).

2.5.3 Creative thinking techniques

Ideas are the lifeblood of any organization, without which it will not develop and improve its operations, products, and services. Anne Craig (2020) mentioned that theQueen's University researchers discover that the person has more than 6,000 thoughts each day. This means that the person has a great ability to generate ideas. Therefore, to stimulate creative thinking, there are many techniques exist. The most popular one is the 'Brainstorm' technique. David Burkus (2013) stated that every major creative process involves some idea generation stage like brainstorming, but also stages that evaluate, prototype, and implement ideas. brainstorming is originated in 1953 by Osborn (1963) in his book " Applied Imagination", he proposed that groups could double their creative output with brainstorming. Gogus (2012) defined Brainstorming as one of the techniques to promote group creativity through which ideas are exchanged between members to find solutions to practical problems. Osborn (2009) points out the main rules for this technique, the first of them is to ignore criticism. The second rule is that wild ideas are very welcome, then answers and ideas are incorporated and improved by using them as an inspiration for further action. After that, a group of participants writes all the answers to this "fundamental" question that comes to their mind. An amendment was introduced to this technique which is a "problem reversing" technique. According to Thompson (2007), starting "brainstorming" with an inverse question may lead to more creative and appropriate results. The effectiveness of brainstorming has been described by Johnson (1972) as (1) group thinking more productive than individual thinking and (2) avoiding criticism improves the production of ideas. in the construction industry, Kumar et all, (1998) stated that Brainstorming sessions are now very common in design practice, "free-thinking" (i.e. generating ideas in a situation where one feels bad about wrong) is not limited to formal meetings. İn project management, specifically in the risk management knowledge area, Royer (2000) said a brainstorming session could identify multiple risk mitigation or contingency plans. İn general, brainstorming is considered an important technique, Kristen (2020) mentioned three of the benefit of brainstorming (1) Collects Different Viewpoints (2) Encourages Critical Thinking (3) Get the one out of his head.

2.5.4 The relationship between creativity and innovation

Innovation and creativity are not similar; the distinction between them is clear and important. But it is easy to confuse creativity with innovation. To be creative, an individual or a company must be able to invent new ideas. But they must work on these ideas to be innovative (Smartstorming, 2018). Woodman et al. (1993) stated that innovation through creativity is an important factor in the success and competitive advantage of the company. (NAKANO& WECHSLER 2018; Giglio, Wechsler, & Bragotto, 2009) stated that Most studies involving the relationship between innovation and creativity are still much more exploratory than effectively supported by theoretical models. (NAKANO& WECHSLER 2018; Primi & Wechsler 2018) noted that both innovation and creativity have historically been complex phenomena, subject to social influences and innumerable contextual.

Generally, The individual should have creativity to be innovative. Many organizations sometimes have the capacity and talents that can bring innovation to the right place but fail because of poor integration. So one must try to take the necessary steps and make it possible for employees to be creative at their best (Mehta & Neeraja 2014). So, the relationship between creativity and innovation is very critical, because if creativity is stifled or ignored, it is difficult to create a truly innovative organization. Likewise, creativity has no commercial value at all without successful procedures for turning creative ideas into realistic, value-added implementation (Smartstorming, 2018).

To more understanding the relationship between creativity and innovation, Amabile (1998), defined creativity as the production of novel and useful ideas, and defined innovation as the successful implementation of creative ideas within an organization. According to (Woodman et al., 1993), Innovation through creativity is one of the important factors for organizations to achieve success and competitive advantage. The fact that creativity pushes innovation is one of the reasons for fostering creativity. Creative people and processes can come together to solve develop innovative solutions that meet the changing requirements of consumers and customers (Puccio Gerard (n.d)).

2.6 Construction Management & Construction Project Managemet

According to Sears et al. (2015), construction management is applied to providing professional management services to the construction project owner in order to achieve high quality at the lowest cost. Construction project management is defined by Emily (2017) as the act of planning, organizing, and supervising the different tasks involved in a construction project, and the goal is to ensure that the project is constructed as planned. Construction management is the planning, coordination, and control of the project from conception to completion of the project on behalf of the client (walker, 2007).

2.7 Project Management

According to A K Munns (1996), project management can be defined as the process of controlling the achievement of the project objectives. Project management is considered to be one of the main tools used to maximize the chance of a successful project (Ghaben et al. 2015). The function of project management for construction specification of project is objective and plans, maximization of efficient resource utilization, implementation of various operations, and development of effective communications and mechanism to resolving conflict among the various participant (Hendrickson, 1998). The knowledge area of project management and its purpose According to Hendrickson (1998) is Project integration management to ensure the effective co-ordination of the different project elements, Project scope management to ensure that all necessary work is included (and only required work), Project quality management to ensure compliance with the functional requirements, project communications management to ensure that efficient internal and external communications, cost Project management to identify and maintain budget controls on budgetary issues and resources, Human resource management of projects to establish and recruit project workers effectively, risk management projects for risk analysis and risk mitigation, and project procurement Management to obtain the resources required from external sources. Project management is required to organize, execute and manage projects, efficiently lead teams and produce outcomes, thus materializing creative ideas (Jennifer, 2018).

2.8 Research Concepual Framework

2.8.1 The best practices of innovation in construction project management

Construction is an important sector that contributes to economic growth in all countries. The needs and requirements of customers will not remain stagnant, and therefore the construction industry must be dynamic to keep pace with the response to the urgent economic, social, and technological challenges affecting all industries today (Aouad et al. 2010). Haner (2002) developed an innovation quality framework focused on three distinct domains: the product/service domain, the method domain, and the organization domain, each of which contains a collection of steps. The logic of innovation in construction was examined by Bygballe et al. (2014) by answering four questions: What is being renovated in construction? How is it going to be done? Who's involved? And why are the firms innovating or not?.

From a construction perspective, Tangkar et al. (2000) Developed a proposed model that demonstrates how the innovation process can flow through a periodic mechanism that includes six stages of need, creativity, invention, innovation, publishing, and adoption. This new paradigm represents the whole phenomenon as a shift in the need for adoption. Ghaben et al. (2015) In order to improve project management expertise, they developed a conceptual framework to explore the best innovation practices that need to be incorporated with project management applications, which are: (1) Strategic Management, (2) Internal Creative Work Environment, (3) External Innovative Work Environment and (4) Stakeholder Management.

To consider the first objective of this thesis, many factors that may influence innovation in construction have been identified. Within four major groups shown in the next section with enough information about that practices. The four groups are: (1) Risk Management (2) Quality Management (3) Lean Construction (4) Transformational Leadership. To provide best practices that can be integrated with project management, It is believed that similar strategies should be considered by organizations and firms seeking to increase project management efficiencies and improve their innovation performance.

2.8.2 Risk management in construction project

Risk management is an important area of knowledge and it is an important part of any effective project management. Khatleli (2019), stated that it is important for risk management to be fully integrated into other areas of project management. Risk in a construction project is a deviation from the expected, wanted, or hoped result of the construction project (Raftery, 2003). According to (Tetteh, 2014) Risk in construction projects is the possibility of damage, loss, or negative consequences in the ongoing construction project.

According to al-Mukahal et al.(2020) Building and construction projects are considered to be of a special nature, Risk management in this kind of project is responsible for planning, directing, organizing, and controlling risks to control and mitigate the negative impacts resulting from them. The result of The research of Khatleli, (2019) revealed that infrastructure projects are more demanding than other projects in terms of risk management. Building projects contain many risks that relate to various factors, such as legal, regulatory, technical, political, and other factors, due to the length of time in those projects. It is possible that the circumstances may change as there are many stages of the construction project life cycle, starting from the beginning of the project and ending with the Closing stage. Therefore, the negative impact on the expected and hoped-for outcome stems from these risks (al-Mukahalet et al. 2020).

2.8.2.1 Risk management best practices of innovation in construction project management

According to the extensive literature review, the best practices in risk management are:

- Strong risk culture creation.
- Build awareness of risks by interacting with the entire organization.
- Defining the roles and duties clearly.
- Clear policies and procedures to be defined.
- Defining mitigation of any or all hazards identified.
- Creating clear processes for monitoring.
- Fitting the risk appetite.
- Updating consistently how staffs view innovation-related risks.

- Developing new skills. learning new skills widely.

2.8.3 Quality management

Simply, The definition of quality is meeting the customer's expectations, For the user, quality is only a satisfaction with the appearance of performance, the reliability of the project, and within certain price limits (Rauzana et al. (2018).

(ISO 1994; Rumane, 2018) defines quality as the totality of characteristics of an entity that bears on its ability to satisfy stated or implied needs. Researchers have been inspired by the relevance of innovation and quality management to recognize different driving forces for innovation and to explore new ways of generating it through quality management practices. Rumane (2018) Stated that Quality in construction projects is the comprehensive management approach to completing the facility, not just the quality of the product and equipment used in building the facility. Besides, according to D.Ashokkumar (2014), Quality is one of the decisive factors in the success of construction projects, as the development of the construction industry depends on the quality of construction projects. Besides, (Kanji & Wong, 1998) mentioned that Quality management has been adopted by the companies of construction as an initiative to meet the needs of the end customer and solve quality problems.

There are many factors that affect quality management Patil et al.(2015) concluded that the construction project checklists are used as a tool for quality, measure quality control as quality in workmanship, and the due importance that must be given to clients satisfaction. According to Rauzana et al. (2018) the Factors with positive contributions to achieving the required quality level in the construction projects are the competence of the project manager, Support and efficiency of senior management, Interaction between project participants, The efficiency of the owners, Monitoring and support from project participants, while the factors that negatively affect the quality of project performance are conflict between project participants; violent competition in the bidding stage, hostile social, economic and climatic conditions; Ignorance and lack of knowledge.

According to Juneja Prachi (n.d.), Quality Management is so important because it ensures superior quality products and services, is essential for customer satisfaction which eventually leads to customer loyalty, ensures increased revenues and higher

productivity for the organization, and It enables employees to work closely with suppliers and incorporate. Curkovic et al. (2000) mentioned that Several conceptual and case studies assume that when applying quality practices within the new model of sustainability practices, significant benefits can arise. On the other hand, D.Ashokkumar, (2014) stated that the factors that affect the quality of construction are the limitation of Finance, Limitation of Communication, Limitation of Labour and Wage, Limitation of Weather, Limitation of Building Plan and Construction Detail, Limitation of Time, Limitation of Rule or Regulation, Limitation of Construction Methodology, and Training Policies.

2.8.3.1 Quality management best practices of innovation in construction project management

According to the extensive literature review, the best practices in quality management are:

- Change how the firm views innovation – from seeing innovation as simply ‘technology’ to seeing innovation as a means to achieve quality and profitability.
- Work to alter the company culture such that it is more amenable to risk, forward-thinking, and proactive.
- Learn about best practices from firms within and beyond a firm’s industry sector.
- Proactively focus on customers, ensure a company takes the initiative to identify, communicate, and respond to the needs of current as well as potential customers.

2.8.4 Transformational leadership

Transformational leadership is a leadership style used in politics, education, finance, technology, entertainment, and other sectors across the spectrum (Ashley, 2019). According to Nam and Tatum (1997), leadership is a key factor for facilitating construction innovation. (Yukl, 1998) has defined transformational leadership as transforming priorities and values of followers, and motivate the followers to perform beyond their expectations According to (García-Morales et al., 2012) Transformational leadership has been recognized as one of the most important

factors that influencing innovation. Han Jh et. al (2001) has defined Transformational leadership as the process of searching for the general things of change through the reciprocal partnership between the leader and the followers, and the ability that affects the values, attitudes, beliefs, and behaviors of others to motivate followers to achieve great desires of self-realization and achieve ideal goals beyond interacting with followers, and to achieve the mission and goals of the organization. Lale et al. (2007) stated that transformational leadership is positively associated with the creativity of followers. Besides, climate innovation plays an intermediary role between transformational leadership and innovative behavior (Zhang et al. 2018). the classification of transformational leadership has been done by Bass et al (1987) into four components, the idealized influence or charisma of leaders, inspirational motivation, individualized consideration, and intellectual stimulation. Han et al. (2015) concluded that the behaviors of Transformational leaders are closely related to job site creativity, and individual creativity can be enhanced by offering support, empowerment, encouragement, and recognition of proposed visions or innovation, Despite that, none of the sub-factors had a major impact on individual creativity Except charisma.

Li and Shi (2005) and Chen et al. (2012) adapted some measurement items to rate the transformational leadership of the project leaders or managers, the item was: (By working zeal, the leader or boss encourages the employees to strive for the same goal; The leader or administrator focuses on giving each person consideration; In order to improve the team attitude and spirit amongst project participants, the leader or manager positively emphasizes the importance of the project objective and value.; In the building phase, the leader or manager acts and shares with us; The manager asks questions that inspire others to think.).These procedures have demonstrated a satisfactory level of reliability of the internal consistency of the elements. Furthermore, Zhang et al. (2018) used the same measuring elements for the same reason, the outcome of their research indicates that transformational leaders among project participants build the environment of innovation. Besides, creativity is motivated and encouraged by transformative leadership among followers, the various needs and ideas of individual followers are facilitated, and any tools needed for them to seek innovation are facilitated. A creative environment is thus generated in construction firms, thus improving organizational creativity (Chan et al). (2014).

2.8.4.1 Transformational leadership best practices of innovation in construction project management

According to the extensive literature review, the best practices in Transformational Leadership that may affect innovation are:

- Intellectual stimulation.
- Comfortably with Experimentation.
- Always Looking for an Opportunity to Improve, give creativity and innovation loyalty, not to old ideas that may no longer have a purpose.
- Inspiring others to do the best work they can for the good of themselves and the company.
- Building shared respect; getting beyond self-interest.
- Developing the skills of the workers; helping to get what the individual needs.
- The leader has no trouble discarding an old plan that is not realistic and no longer serves a reason. Encourage staff to be imaginative and inventive in their approach to challenges and strategies.

2.8.5 Lean construction

Lean construction is a way of designing production systems in building environments to decrease time, effort, waste of materials, maximizing value, and minimizing costs, and increases the productivity of the construction industry (Riddel, 2017). (Koskela et al., 2002) produce a clear definition of the lean construction concept, they stated that the lean construction is a way to design a production system that minimizes material waste, time, and effort. In 1992, work was initiated with theories and methods of lean construction, which was introduced as a new approach to management in the construction industry to improve productivity. Lean Construction has been implemented by several construction companies in the United States. According to Kim et al. (2006), the majority of construction companies in the U.S. who are beginning to adopt lean construction are aiming for better outcomes from their current lean construction projects than from previous projects that incorporate classical project management. Besides, They noted that many companies that did not

adopt Lean Construction would like to exchange knowledge from other companies, to learn more about this application and thus develop their lean implementation. the key differences that The Lean Construction Institute (2004) identifies (as cited in Ferng, et al, 2005, P.170) between Lean Construction and traditional forms of construction project management were as follows.

- Product and delivery processes simultaneously designed to identify, support, and enhance customer pull.
- Value-driven performance, as defined throughout the project's entire life by stakeholders and clients.
- A total project approach to maximizing performance and reducing waste that acknowledges that there does not always have to be a trade-off between time, cost, and quality.
- A more proactive approach to continuously improving planning and control systems.
- Decentralizing decision-making by increasing transparency and empowerment.

In addition to, Lean construction maximizes value and eliminates waste, and incorporates specific methods in a creative approach to project execution, including supply chain management and Just-In-Time techniques, as well as transparent exchange of knowledge with all parties involved in the production process (Ferng, et al, 2005).

2.8.5.1 Best practices for lean construction in project management

According to the extensive literature review, the best practices in lean construction that may affect innovation are: Striving to do everything correctly from the first time so that there is no re-work again, and thus wasting effort, time and cost.

- Working not to overproduce, including not allowing a pre-task to be completed before the specified date or before the next task in the process begins.
- Striving not to make the workers wait, and that waiting is usually due to the non-delivery of the materials necessary to complete the work, or the required pre-task is not completed.

- Seeking to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted.
- Striving not to add features or activities that have no value to the customer.
- Work on identifying the labor, information, equipment, and materials needed for each activity. And remove any steps or resources that do not add value.
- Providing advice and assistance in forming expectations throughout the project period by the project team, and the work is not limited to providing what the client wants only.
- Working to ensure a predictable and continuous flow of work processes so that there is no waste of waiting and other problems.
- Ensuring that the participants, including subcontractors, communicate and work closely with each other to determine the schedule of assignments.
- Working on continuous improvement by identifying opportunities for improvement and acting on them during the project and applying them to future projects.

3. METHODOLGY OF THE RESEARCH

3.1 Introduction

In this chapter, a description and clarification of the methods used to test the hypothesize and address the questions. Consequently, to achieve the purpose of this study. This chapter describes the study design, the research steps, the research approach, the population and sample size of the survey, the design of the questionnaire, the collection of data, and the analysis carried out. An explanation for testing reliability and validity is also included in this chapter.

3.2 Research Design

Research design helps researchers to concentrate on acceptable research methods for the subject and to perform successful studies. According to the description of Parahoo (1997), Research design is a plan describing how data are collected, when and where, and analyzed.

According to Robson (2002), Research projects can be divided into three groups (exploratory, descriptive, and explanatory) based on the purpose of the research area as each design serves a different end purpose.

- **Exploratory research** is used to explore a problem that is not clearly defined and leads to a better understanding of the existing problem, but it does not yield final results ("Exploratory Research", 2020). According to Sandress (2000), exploratory research could be performed through conducting structured or semi-structured interviews on focus groups. In other words, Exploratory research is not intended to address the research questions with definitive final answers but simply explores the topic with different depths (Boru, 2016).
- **Descriptive research** according to Robson (2002), descriptive research is used to obtain information on the current status of a certain phenomenon, and to study the relationships between variables. Boru (2016) stated that

alternative research designs, such as the explanatory or exploratory method, are advisable when abundant descriptive information is accessible.

- **Explanatory research** according to Boru (2016), Explanatory research sets out to explain and account for the descriptive information, and it's conducted to discover and report some relationships among different aspects of the phenomenon under study.

As defined in the previous section, the main objective of this study is to develop a framework that helps organizations and companies to enhance construction innovation and increase the efficiency of project management by introducing the best innovative practices in the construction industry and integrating them with project management. To identify and analyze best practices for innovation, the researcher needed to conduct structured and semi-structured interviews with focus groups. Therefore, the pertinent research design for this study is exploratory type.

3.3 Phases of the Research

This research consists of nine phases, these phases are the methodology of this research. The diagram in Figure (3.1) shows the research methodology stages. The stages are:

- The first phase is the formulation of a title that fits with the objectives for which the research was conducted.
- The second phase is the formation of a proposal in which the objectives and the methodologies used are explained, in addition to the time needed and the place where this study will be conducted.
- The third phase is the literature review, which includes previous studies that dealt with innovation, and creativity in the field of the construction industry, in addition to the status of the construction industry in Iraq.
- The fourth phase includes designing the questionnaire and preparing the questions. The questionnaire design includes conducting questionnaire validity, and questionnaire reliability.
- The fifth phase includes conducting structured interviews pre-study, Where the questions are tested by experts so that the questions are relevant, understandable, not boring for the respondents, and serve the purposes of the research.

- The sixth phase is the stage of distributing the questionnaire to engineers, company managers, and experts. In addition to conducting interviews with experts (semi-structured interviews: post-study) to conduct interviews with experts to collect the data required.
- The seventh phase is the stage of analyzing the data, which have been analyzed by the statistical program (SPSS).
- The eighth phase is the development of a framework and a model that helps enhance construction innovation, and increase project management competency
- The last phase (ninth) includes research findings and conclusions, in addition to recommendations, and suggestions for future studies.

3.4 Research Approach

According to (Creswell, 2003), there are three approaches to conducting research: qualitative approach, quantitative approach, and mixed approach. The three methods are explained as follows below.

3.4.1 Mixed approach

A mixed approach that combines qualitative and quantitative approaches has been used in this research. Creswell (2003) has described this approach as one in which the researcher attempts to base knowledge statements on pragmatic grounds, for example: consequence-oriented, problem-centered, and pluralistic. Interest in the mixed approach has increased by researchers since the eighties, so that a journal dealing with this type of approach has appeared, called (Journal of Mixed Methods Research). In order to answer "pragmatic knowledge claims," a qualitative and quantitative approach is combined for this purpose according to (Creswell, 2003) definition, which is called a mixed approach. According to Boru (2016), the mixed approach allows the researchers to address questions that cannot only be addressed through qualitative or qualitative approaches. İn addition, he stated that by noting trends and generalizations as well as in-depth knowledge of the perspectives of participants, a mixed approach provides a more complete picture.

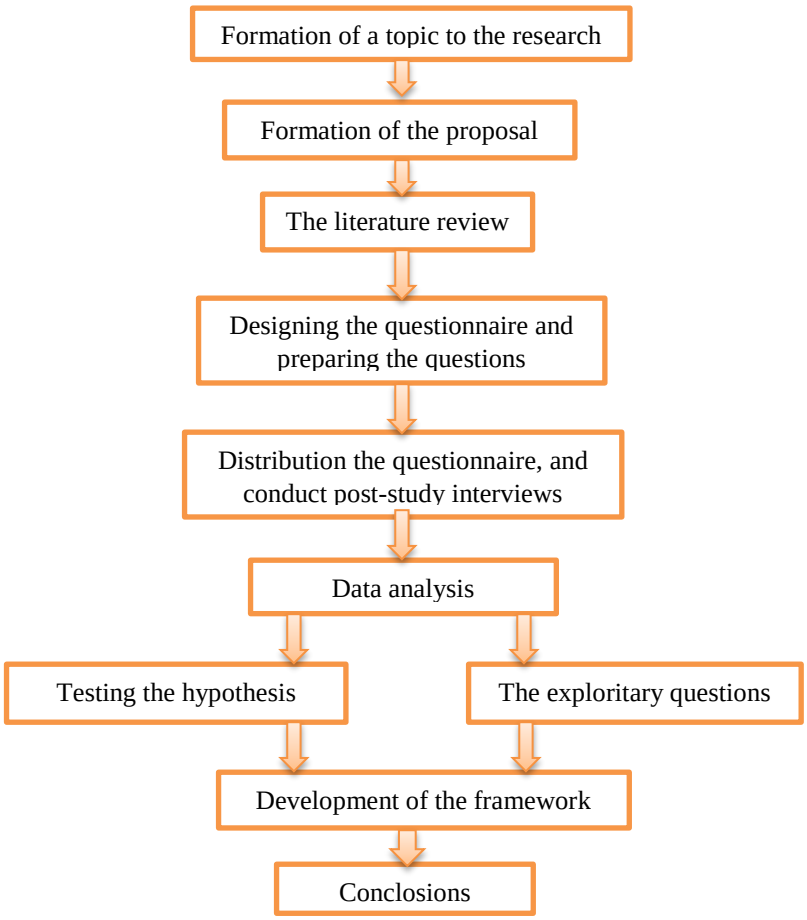

Figure 3.1: Flowchart for Research Methodology

One of the advantages of using the Mixed method is that the analysis uses all methods to achieve a research finding that is more stable than either method. Overall, mixed quantitative and qualitative approaches make it possible to investigate more nuanced facets of the individual and social world and relationships (Malina et al. 2010). Also, they mentioned that An significant benefit of a mixed-method study design is that a researcher can reread qualitative data and quotes within the context of the larger paper during the project. On the other side, The key problems posed in an analysis using mixed methods are the weight distribution of the qualitative and quantitative findings and the time control of the studies to be carried out (Guedes et al. 2017). some of the advantages and disadvantages of using the mixed method Approach are shown below in Table (3.1).

Table 3.1: Advantages and Disadvantages of a Mixed Research Method

Disadvantages	Advantages
Increases the difficulty of evaluations.	The quantitative and qualitative data were compared.
It relies on a multidisciplinary research team.	It gathers rich, detailed information.
More resources is required.	Promoting the engagement between scholars of quantitative, qualitative, and mixed approaches.

Source: (Jennifer &John, 2013)

3.4.2 Qualitative approach

The qualitative approach is implemented by the researcher by collecting data that were recorded during interviews, video recordings, in addition to audio recordings, interviews, and through documents that the researcher extracted or already available. . According to (Alasuutari, 2010) a greater proportion of the papers published in academic journals are qualitative research. Creswell (2003) stated that the qualitative approach is based on individual experiences or collaborative, political, or change-oriented. According to (Jaaron, 2018) The goal of qualitative research is to give the research a detailed description and understanding of the subject of the study, so it is considered exploratory research, and because of the small sample sizes, the result of this type of research cannot be generalized, but its usefulness is only to obtain a preliminary understanding. A comparison between mixed, quantitative, and qualitative approaches was made as shown in Table (3.2).

3.4.3 Quantitative approach

Given et al. (2008) has defined Quantitative research as the systematic experimental investigation of the phenomena that can be observed through statistical, mathematical, or computational techniques. This definition includes the natural and social sciences, and possibly in other fields. According to (Creswell, 2003) in the quantitative method, the data be in the form of numbers. Alasuutari (2010) stated that the reason for the growing demand for quantitative research is particularly due to the fact that advanced market economies have experienced a climate of increasing accountability in public spending and a requirement that research should serve policy objectives. According to (Hunter. et. all, 2008) the two largest American sociology journals found that nearly two-thirds of the journals published between 1935 and 2005 used the quantitative method.

Table 3.2: A Comparison Between Mixed, Quantitative, and Qualitative Approaches

Qualitative Approach	Quantitative Approach	Mixed Approach
Constructivist knowledge claims,	Participatory knowledge claims,	Pragmatic knowledge claims,
Ethnographic design, and observation of behavior	Narrative design, and open-ended interviewing.	Collection of both quantitative and qualitative data sequentially
The researcher seeks to establish the meaning of a phenomenon from the view of participants	The researcher seeks to examine an issue related to oppression of individuals	The researcher bases his investigation on the assumption that the combination provides the various types of data as best as possible when understanding the research problem.
An essential component of data collection is monitoring the participants' behaviors by participating in their activities.	Individuals are interviewed at length to personally determine how they were subjected to repression.	The study begins with a broad survey to generalize the results to the population, then focuses, in the second phase, on detailed, open qualitative interviews to collect detailed opinions from the participants.

Source: (Creswell,2003)

In this research, a mixed-methods approach was used to answer the research questions because this study includes collecting and analyzing qualitative and quantitative data**.**

3.5 The location of the research

The research was conducted in Iraq, as Iraq contains 18 governorates, which are Baghdad, Al-Anbar, Basra, Karbala, Najaf, Qadisiyah, Maysan, Amara, Muthanna, Erbil, Salah al-Din, Sulaymaniyah, Dohuk, Nineveh, Kirkuk, Babylon, Diwaniyah, and Diyala.

3.6 The design of the questionnaire

To achieve the goals and objectives of the research, it was necessary to design a suitable questionnaire to achieve this purpose. important information was collected to form a suitable questionnaire Through previous studies, literature reviews, articles,

books, and websites, where a temporary version of the questionnaire was created to develop it later. After that, the questionnaire was presented to a group of experts to evaluate the questionnaire and add comments and amendments, Then it was approved by the research supervisor. The questionnaire consists of three sections, the first part relates to information about the respondents, such as gender, engineering specialization, years of experience, type of organization or company in which the respondent works. The second section consists of 18 questions. These questions relate to the factors and practices present in construction organizations in Iraq that limit or enable creativity. The five-point Likert scale was used for this purpose, starting from No. 1 (it does not exist at all) to No. 5 (it is present in a very high percentage). As for the third section, it consists of 21 practices that should enhance the innovation of construction and increase the efficiency of project management. These practices concern lean construction, transformational leadership, quality management, risk management, in addition to the ten areas of project management. The five Likert scale was used from No. 1 (not at all) to No. 5 (to a very great extent).

3.7 Pilot Study

It is always preferable, before collecting the final data of the questionnaire from the entire sample, to conduct a pilot study to verify the feasibility and validity of the questionnaire. According to Ghaben et al. (2015), the pilot study is an opportunity to refine the questionnaire, fill in the gaps, and determine the time required to complete the questionnaire. For this reason, the questionnaire was tested by several experts specialized in the field of this research to make the necessary adjustments to the questionnaire and to test how easy the questions are for the respondents, easy to understand, and whether the questions are long and boring, or are they suitable. besides, to focus on the questions that make the questionnaire interesting and enjoyable.

3.8 Pupoulation and Sample Size of the Survey

The number of respondents on the questionnaire was 121 that consider good for statistical tests according to Roscoe (1975), he proposed that Sample sizes larger than 30 and less than 500 are appropriate for most research. Also, according to Hair et all.

(1995), he stated that the minimum sample size for having any confidence in statistical tests is 50. the least number of subsamples of gender and types of organization was 30 which consider an acceptable sample size according to the proposition of Roscoe (1975), he proposed that if samples consist of subsamples a minimum sample size should be 30. The targeted sample included engineers from different specializations, managers or owners of companies, project managers, and those working in government construction establishments and companies, contracting firms, engineering consulting firms, and organizations. All organizations operate in Iraq. Because of the difficulty of accessing construction companies in Iraq and knowing the total number of workers inside these companies, due to the presence of a large number of these companies, as there are more than 36 thousand contractors and contracting companies in Iraq classified by the ministry and distributed among the grades of classification from the first to the tenth according to (Ministry of Planning website, 2020). The questionnaire was designed using Google form. The sample is distributed by converting the questionnaire into an electronic link and then publishing it through the WhatsApp application in a random method that included engineers from various specialties. They work in various Iraqi construction organizations and companies. 121 answers were collected, all of them were valid. The importance of choosing this sample lies in the fact that the target sample is the main group responsible for carrying out construction works in various fields in Iraq.

3.9 Data Collection

The data in this research were collected in three ways:

1- A structured questionnaire consisting of the five Likert scale
2- structured interviews (Post-study) with expert engineers with at least 15 years of experience in the construction industry in Iraq
3- Literature research. The primary concern throughout the review phase was to define some of the broader criteria potentially relevant to the construction innovation practices and what factors enable or limit creativity. where the literature review was written from a variety of sources such as books, international magazines, articles, research papers, and websites.

3.10 Calculations and Analysis of Data

The researcher used SPSS (Statistical Package for the social sciences) program V.25 to analyze data and presenting the results. The SPSS program is an important statistical program and is widely used to conduct statistical analyzes in scientific research, where the information obtained is usually a lot and needs long and complex mathematical procedures. This program conducts all the necessary statistical checks and information through simple steps, in addition to that, the program allows to show a graphic representation of the results and data, making it easier for the user to read and understand them.

The filled data was collected by the respondents automatically through Google's questionnaire form, this data was copied and sent to the SPSS database. Descriptive analyzes of the data were performed by this program. besides, inferential analysis was conducted by using One Way Anova tests. Where the null hypotheses were tested whether there is great importance in the answers of workers in different organizations, and if there is great importance in this regard, then another post hook is used to determine which of the organizations had an answer that formed a difference of great importance for the different research questions. For the structured interviews, questions were presented to the experts, then the researcher wrote down their notes and answers about the questions, the most important identical results were drawn, and then the conclusion was written.

3.11 Validity and Reliability of the Questionnaire

The significance of assessing the accuracy and consistency of research instruments is known as validity and reliability in particular as questionnaires (Bolarinwa 2016). For any questionnaire to be considered useful, it must be both a reliable and a valid measure of the variable it is designed to assess. İn other words, reliability is not sufficient unless combined with validity (Taherdoost, 2016).

3.11.1 Reliability of the questionnaire

Boru (2016), defined reliability as the extent to which studies can be replicated. According to Carmines and Zeller (1979), reliability involves the degree to which the calculation of a phenomenon produces a stable and accurate outcome. Huck (2007) clarified that the reliability check is critical as it relates to the accuracy of the parts of

the measuring instrument. There are several different scales for measuring reliability. If the researcher uses a Likert scale, it is recommended that he use the Cronbach Alpha scale. It is known to be the most appropriate indicator of reliability when using Likert scales (Robinson, 2009).It is proposed that reliability should be equal to or greater than 0.60 for an exploratory or pilot study (Straub et al., 2004).

3.11.2 Validity of the questionnaire

Validity is the degree to which a measure's scores reflect the variable they are intended for. In other words, it reflects the extent to which a measurement measures what it is intended to measure (Bolarinwa 2016). The most correlations that are used to test validity in the research's questionnaire are spearman and Pearson correlations. Pearson's correlation assesses linear relationships, Spearman's correlation assesses monotonic relationships (whether linear or not). In this research, spearman's correlation has conducted to test the validity of the questionnaire with two phases, internal, and structure validity.

The researcher used internal validity of the questionnaire as a first phase, It refers to how accurately the measurements obtained from the study actually quantified what they were intended to measure. internal validity was conducted by calculating the correlation confidence between each item in one variable and the whole method and tools of data collection variable.

Two-tailed method conducted for statistical significance test. Hayes (2020) explained about the two-tailed method as follows:

- A two-tailed test is a process of statistics in which the critical region of a distribution is two-sided and measures whether a sample is greater than or less than a range of values.
- It is used for statistical significance in null-hypothesis testing.
- The alternative hypothesis is accepted instead of the null hypothesis if the sample being tested falls into one of the critical areas,

as shown in Table (3.3) the correlation coefficient of the variable are significant at the 0.01 level, so it proves that the items of the variable "Factors and practices that limit creativity in Iraqi organizations" are valid and usable to reach the research objectives.

Table 3.3: Factors and Practices That Limit Creativity Present in Iraqi Construction Organizations

No.	Scale Item	Spearman's Correlation	Sig. Two Tailed
1	The lack of projects implemented by the organization	0.528**	0.000
2	The organization is led by people who are not competent, have no experience	0.727**	0.000
3	Employee has (self- imposed barriers), i.e.: markers that people set up so that certain barriers will not be crossed, for example: I will never try CAD. Someone told me that computers make errors and design by hand is safer.	0.526**	0.000
4	Fear (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks)	0.552**	0.000
5	Administrators are evaluating new ideas very quickly	0.644**	0.000
6	Employee is not given time or encouragement to be creative and innovative.	0.779**	0.000
7	The organization uses outdated policies and unnecessary red tape	0.639**	0.000
8	The organization exerts pressure on employees to achieve results very quickly	0.751**	0.000
9	The presence of personal biases in the organization: that is, beliefs, attitudes, and values that may amount to sabotaging the efforts of co-workers and slandering their reputation.	0.690**	0.000

** Correlation is significant at the 0.01 level (2-tailed)

Table (3.4) show that the correlation coefficient for the variables is significant at $\alpha = 0.01$. Therefore, it can be concluded that the items of the variable "Factors and practices present in Iraq organizations that enable creativity" are consistent and valid to measure what they were set for.

Table 3.4: Correlation Coefficient of Each Item of The Variable "Factors and Practices Present in Iraqi Organizations That Enables Creativity"

No.	Scale Item	Spearman's Correlation	Sig. Two Tailed
1	The organization gives an appropriate reward to those who deserve it	0.817**	0.000
2	The leadership of the institution rejects sectarianism and tribalism and does not care about party affiliations among employees and treats everyone equally	0.750**	0.000
3	The organization implements unconventional and takes risks	0.681**	0.000
4	The existence of open communication and exchange of information (between individuals and management	0.770**	0.000
5	Practicing creative thinking techniques in the organization, like the brainstorming method	0.848**	0.000
6	Existence of space and resources to pursue ideas (for example: works of art, 3ing,creative things and designs within the organization	0.792**	0.000
7	The company or organization seeks to transform the latest technologies and methods of work used in the field of construction in the world	0.863**	0.000
8	The organization or firm organizes training courses continuously on the latest methods of work and programs	0.759**	0.000
9	The organization is interested in appointing smart people and who show behaviors of creative people	0.833**	0.000

**Correlation is significant at the 0.01 level (2-tailed)

As for the variables related to innovation practices, the items of the variable " Best practices for innovation in Risk Management" were valid and consistent to be measured as the P-value was less than 0.01. The results are shown in Table (3.5).

Table 3.5: Correlation Coefficient of Each Item of the Variable " Best Practices for Innovation in Risk Management"

No.	Scale Item	Spearman's Correlation	Sig. Two Tailed
1	The organization practices forecasting methods to be aware of risks before it occurs	0.773**	0.000
2	The organization provide frequent and detailed training to employees to enhance understanding of the various risks the organization is exposed to	0.910**	0.000
3	The organization works to create awareness of risks by communicating with members of the entire organization	0.801**	0.000
4	The organization is constantly developing new competencies and learning new skills to be able to face potential risks	0.737**	0.000

**. Correlation is significant at the 0.01 level (2-tailed)

Likewise, the items of the variable " Best practices for innovation in quality Management " were valid to be measured and as shown in Table (3.6).

Table 3.6: Correlation Coefficient of Each Item of the Variable "Best Practices for Innovation in Quality Management"

No.	Scale Item	Spearman's Correlation	Sig two tailed
1	The organization sees innovation as a means of achieving quality and profitability and does not view it as merely a new development	0.751**	0.000
2	Customer is the main focus of the company. voice of customer (feedback from sales, marketing, customer satisfaction in quality of implementation and production, customer services etc.) are top-level interested	0.764**	0.000
3	The company adheres to the standard specifications in implementation	0.694**	0.000
4	The organization has a properly followed quality management system	0.819**	0.000
5	The deviations that may occur are analyzed during implementation and then corrective actions are taken	0.668**	0.000
6	The company is seeking to obtain the International Organization for Standardization (ISO 9001) certification.	0.617**	0.000

** Correlation is significant at the 0.01 level (2-tailed).

All the items of the variable "Best practices for innovation in transformational leadership" are valid and usable to be measure too, because the P-value is less than 0.01 as shown in Table (3.7).

Table 3.7: Correlation Coefficient of Each Item of the Variable " Best Practices for Innovation in Transformational Leadership "

No.	Scale Item	Spearman's Correlation	Sig. two tailed
1	If a specific problem arises during implementation, the leader takes personal responsibility and intervenes to solve the problem rather than simply blaming individuals	0.722**	0.000
2	Leadership encourages employees to be innovative and creative in how they deal with problems that arise during the implementation of a project and provide appropriate solutions.	0.824**	0.000
3	The leadership of the organization gives loyalty to creativity and innovation, not to old ideas that have no longer had a purpose	0.850**	0.000
4	In every project, the leadership of the organization inspires and encourage individuals and the stakeholders to do the best possible work for them and for the organization	0.808**	0.000
5	Organizational leadership builds mutual respect among individuals; leadership transcends self-interest and focuses on the public interest.	0.654**	0.000

**Correlation is significant at the 0.01 level (2-tailed)

The results of Spearman's correlation for items of the variable "Best practices for innovation in lean construction" were not different from the rest of the variables as shown in Table (3.8), the P-value was less than 0.01, this means that the elements of this variable are valid to be measured**.**

Table 3.8: Correlation Coefficient of Each Item of The Variable " Best Practices for Innovation in Lean Construction "

No.	Scale Item	Spearman's Correlation	Sig. Two Tailed
1	The organization makes sure to do everything correctly and according to standard and technical specifications from the first time so that there is no re-work again, thus wasting effort, time, and cost.	0.753**	0.000
2	The organization works to not overproduce beyond planned, And also stick to the schedule including by not allowing the pre-task to be completed before the specified date.	0.647**	0.000

Table 3.8: Continue

No.	Scale Item	Spearman's Correlation	Sig. Two Tailed
3	The organization seeks to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted.	0.848**	0.000
4	The company seeks to ensure the continuous and predictable flow of the stages of workflow so that there is no delaying and 6 problem	0.712**	0.000
5	The company seeks continuous improvement by identifying opportunities for improvement and working on them during the project and applying them to future projects..	0.707**	0.000

** Correlation is significant at the 0.01 level (2-tailed)

The second phase of questionnaire validity testing is" structured validity", which is used by calculating the correlation coefficient between each variable and the total of all the variables of the questionnaire. Table (3.9) shows the Spearman correlation coefficient for each item of barriers and enablers of creativity that present in Iraqi organizations and the total of that items. Since the correlation coefficient are less than 0.01, and the correlation coefficient is significant at 0.01, then it means that the variables of barriers and enablers to creativity are consistent and valid to be measured.

Table 3.9: Correlation Coefficient of Each Field of the First Part of The Questionnaire i.e. " Barriers, and Enablers of Creativity That Present in Iraqi Organizations

No.	Scale Item	Spearman's Correlation	Sig. Two Tailed
10	Barriers of Creativity in Iraqi Organization	0.570**	0.000
11	Enablers of Creativity in Iraqi Organization	0.773**	0.000

** Correlation is significant at the 0.01 level (2-tailed)

Finally, as shown in the table (3.10) below, the variables are all valid and consistent to be measured because the values of the Spearman's correlation for each item of the best practices for innovation in the construction industry sector and the total of those items (risk management, quality management, transformational leadership, lean construction, and project management) are all less than 0.01.

Table 3.10: Correlation Coefficient of Each Field of the Second Part of the Questionnaire i.e. " Best Practices for Innovation"

No.	Scale Item	Spearman's Correlation	Sig.
10	Risk Management	0.840**	0.000
11	Quality Management	0.881**	0.000
	Transformational Leadership	0.944**	0.000
12	Lean Construction	0.917**	0.000
13	Project Management Areas	0.702**	0.000

** Correlation is significant at the 0.01 level (2-tailed)

3.12 Reliability Test of the Questionnaire

Reliability is how well a test measures what it should (Stephanie Glen, 2014). In other words, Shrout et all (2020) defined reliability as the reproducibility of measurement and this is a degree to which is measures produce the same values when applied repeatedly to a person or process that has not changed. to test reliability In this research, the Cronbach Alpha test was used, it is the most famous and commonly used among reliability coefficients. Cronbach's alpha tests to see if multiple-question Likert scale surveys are reliable. The equation by which to calculate the Cronbach's alpha as advanced by Goforth (2015) is as shown in (3.1).

$$\alpha = \frac{k*c}{v+(k-1)c} \quad \textbf{(3.1)}$$

where:

- k refers to the number of scale items
- c refers to the average of all covariances between items
- v refers to the average variance of each item

Cortina, J. M. (1993) stated that many sources said if the score of Cronbach's alpha test was above 0.70 that's mean is acceptable. 0.80 or greater is preferred. Higher is better. Table (3.11) illustrates the rule of thumb for interpreting alpha for Likert scale questions.

Table 3.11: Cronbach's Alpha Ranges for Internal Consistency

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source: (Stephanie Glen, 2014)

As shown in Table (3.12) the result of the Cronbach test was between 0.814 and 0.932, Which means that it ranges between good and excellent consistency. The total reliability of all items is 0.939.

Table 3.12: Cronbach's Alpha Test

Item	Number of paragraphs	Cronbach's Alpha	Internal consistency
Barriers of creativity	9	0.857	Good
Enablers of Creativity	9	0.932	Excellent
Risk Management	4	0.883	Good
Quality Management	6	0.814	Good
Transformational Leadership	5	0.892	Good
Lean Construction	5	0.849	Good
Total	39	0.939	Excellent

Taking into consideration, the value of the factor (best practices of innovation in PM) was not tested alone because it consists of one paragraph, but the paragraph has been entered in the test of the total number of paragraphs.

3.13 Normality Test

The normality test is a statistical process used to determine if a sample or any group of data fits a standard normal distribution (NORMALITY TEST, n.d.). In this research, not all data were distributed normally, so, an assessment of the normality of data is a prerequisite before data analysis began. Table (3.13) demonstrates the differences between parametric and non-parametric tests.

Table 3.13: Differences, Advantages, and Disadvantages Between Parametric and Non-Parametric Tests

Tests	Non-Parametric	Parametric
Correlation test	Spearman	Pearson
Independent measures, 2 groups	Mann-Whitney test	Independent-measures t-test
Independent measures, >2 groups	Kruskal-Wallis test	One-way, independent-measures ANOVA
Repeated measures, 2 conditions	Wilcoxon test	Matched-pair t-test
Repeated measures, >2 conditions	Friedman's test	One-way, repeated measures ANOVA
Assumed distribution	Any	Normal
Assumed variance	Any	Homogeneous
Typical data	Ordinal or Nominal	Ratio or Interval
Data set relationships	Any	Independent
Usual central measure	Median	Mean
Benefits	Simplicity; Less affected by outliers	Can draw more conclusions

Source: Changing Minds. (2012)

The table illustrates the difference between parametric and nonparametric in choosing the suitable tests. For that, the Kolmogorov-Smirnov test and Shapiro-Wilk test was used to test normality. The Kolmogorov-Smirnov is a non-parametric test commonly used as a test for normality to check the data if it is normally distributed, compares data with a known distribution, check if it has the same distribution, and used to check the assumption of normality in Analysis of Variance (Stephanie, 2016). It is a statistical test applied for best fit for both, one- and multi-dimensional data (Lapidot, 2020). The Shapiro-Wilk test was also used to test normality. According to the results of Ricci et al. (2019), the Shapiro-Wilk test confirmed its superiority in the identification of non-normally distributed but symmetrical variables, as in the case of uniform distribution. But it is appropriate for sample sizes less than 50 (Hughes. 2019). Table (3.14) show the results of these tests, all the significant values are less than 0.05, that means all the data is not normally distributed, so that, the analysis of the data should be nonparametric statistics.

Table 3.14: The Result of Kolmogorov-Smirnova and Shapiro-Wilk Tests

Elements	Kolmogorov-Smirnova	Sig.	Shapiro-Wilk	Sig.
Barriers of creativity	0.082	0.044	0.961	0.001
Enablers of Creativity	0.106	0.002	0.976	0.027
Risk Management	0.200	0.000	0.894	0.000
Quality Management	0.129	0.000	0.975	0.022
Transformational Leadership	0.190	0.000	0.897	0.000
Lean Construction	0.161	0.000	0.926	0.000
PM	0.276	0.000	0.856	0.000

4. DATA RESULTS

This chapter aims to describe and analyze the data obtained from the questionnaire and structured interviews. The results were processed by the SPSS program. This chapter is divided into several main branches, the first section deals with analyzing the characteristics of the study population, the second section analyzes the rank of the relative relationship of factors and practices present within Iraqi construction organizations and companies that impede or enable creativity, the third section compares the relationship between some specific variables and a section of the characteristics of the study population In order to find some beneficial relationships.

4.1 Introduction

This chapter aims to describe and analyze the data obtained from the questionnaire and structured interviews. The results were processed by the SPSS program. This chapter is divided into several main branches, the first section deals with analyzing the characteristics of the study population, the second section analyzes the rank of the relative relationship of factors and practices present within Iraqi construction organizations and companies that impede or enable creativity, the third section compares the relationship between some specific variables and a section of the characteristics of the study population In order to find some beneficial relationships.

4.2 Population Study

In this research, the researcher collected statistics information on the first part of the questionnaire, which included information on gender, type of organization, years of experience, and engineering specialization. Frequencies were used in the SPSS program to compute this information.

4.3 Gender

The number of men who responded to the questionnaire was 91, while the number of women was 30. Figure (4.1) shows the percentage of respondents, where it was about 75 percent of men and 25 percent of females.

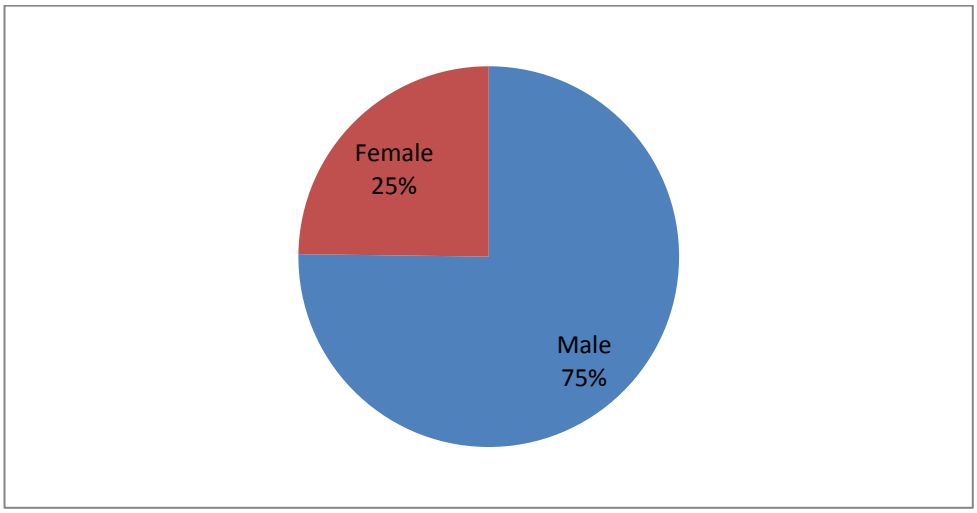

Figure 4.1: The Gender Ratio of The Respondent to The Questionnaire

4.4 Position of The Respondents

It can be seen from the Figure (4.2) that 16.5 % of the respondents, were firm manager/owner, 11.6 % of them were project managers, and the percentage of the engineers who responded were 71.9. This gives the basis that the result of the questionnaire mostly presents the point of view of the engineers who work in the targeted organizations in this research.

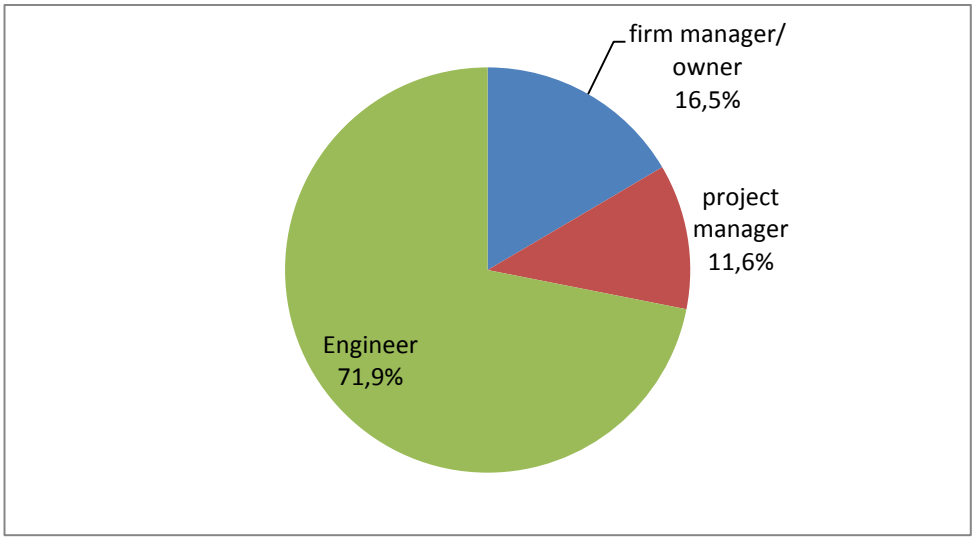

Figure 4.2: Position of Respondents

4.5 Years of Experience of The Respondents

Figure (4.3) clarifies the distribution of the sample respondents by experience as follows: Respondents with 0 to 5 years of experience constitute 17 percent of the total, : Respondents with 5 to 10 years of experience constitute 32 percent of the total, : Respondents with 10 to 15 years of experience constitute 12 percent of the total, and 39 percent of respondents have more than 15 years years of experience. This means that more than a third of the respondents have a great experience, which makes the research results more important and valuable.

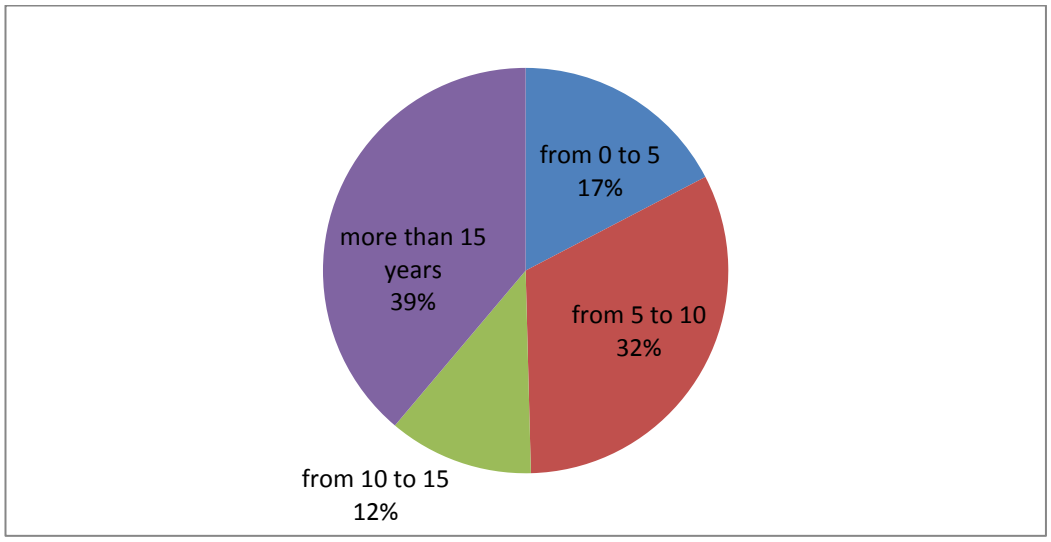

Figure 4.3: The Experience of the Participants

4.6 Engineering Branches for Respondents

As shown in Figure (4.4), 10% of respondents were Architectures, 12% were Mechanical Engineers, 11% were Electrical Engineers, 6% were Computer Engineers, While 45% of the Respondents were Civil Engineers. On the other hand, The percentage of respondents from other branches reached 16 percent.

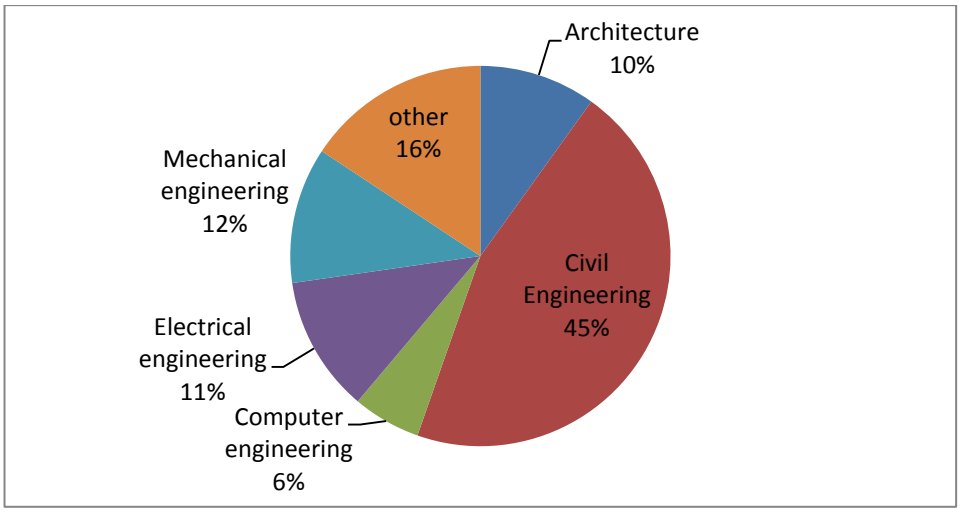

Figure 4.4: Engineering Branches for Respondents

4.7 Type of Organizations for Respondents

As shown in Figure (4.5), The largest percentage of respondents worked in governmental organizations, reaching 45% of the number of respondents. While the percentage of participants who work in constructing organizations reached 30% of the total number of respondents. On the other hand, the percentage of participants who work in consulting/ engineering organizations reached 25%.

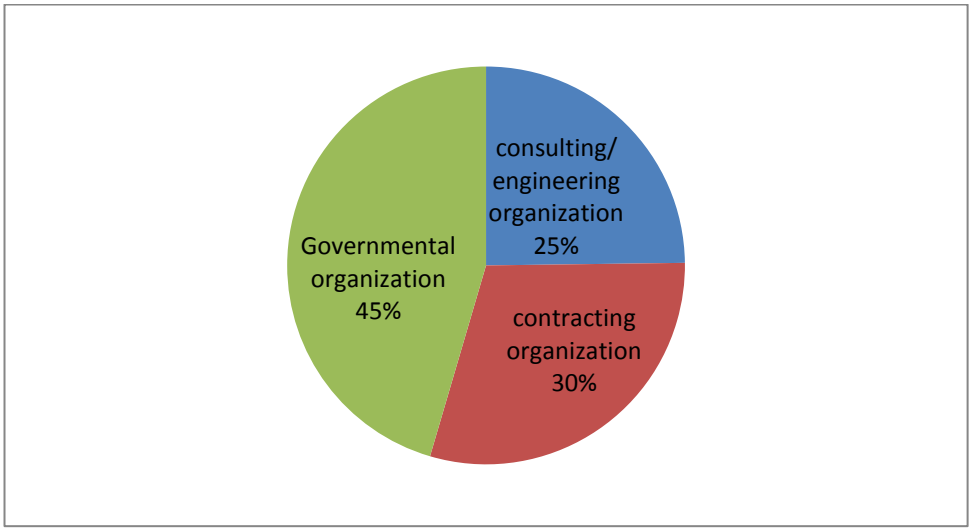

Figure 4.5: Types of Organizations

4.8 Kruskal-Wallis H Test, and Relative Importance Index

To find out if there is a big difference in views among the staff of construction organizations in Iraq, which included governmental organizations, consulting organizations, and contracting organizations. For this purpose, the null hypothesis

and the alternative hypothesis were imposed. The null hypothesis states that there is no significant difference in views between the staff of construction organizations in Iraq, and the alternative hypothesis states that there is a significant difference in views within Iraqi construction organizations. If the maximum value is less than $\alpha = 0$, the null hypothesis is rejected and the alternative hypothesis accepted.

To do that between three variables Kruskal-Wallis test was conducted. The Kruskal-Wallis H test is a rank-based nonparametric test that can be used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable (Laeard, 2018). Relative important index RII values used to conduct Kruskal-Wallis test, it is a mean score for an item, using with Likert scale as follow:

RII= Mean*20/100 for three-point Likert scale. RII = Mean*33/100 for the five-point Likert scale, RII = Mean*20/100. If the Likert scale was seven points, then, RII= Mean*14/100. Since the researcher used the five-point Likert scale, he used five levels of importance as shown in Table (4.1) that are transformed from RI values according to Akadiri (2011).

Table 4.1: Domain of Levels of RII and its Degree of Importance

Domain of Levels of RI	Degree of Importance
$0.8 \leq RI \leq 1$	High (H)
$0.6 \leq RI \leq 0.8$	High-medium (H–M)
$0.4 \leq RI \leq 0.6$	Medium (M)
$0.2 \leq RI \leq 0.4$	Medium-low (M-L)
$0 \leq RI \leq 0.2$	Low (L)

Source: Akadiri (2011)

4.9 Factors and Practices That Limit Creativity Present in Iraqi Organizations

The results of the survey of creativity's limits are shown in Table (4.2). It's ranking in ascending order according to their effect and presence in Iraqi construction organizations from the lower factor or practices to the highest one. with RII= 0.58 " Administrators are evaluating new ideas very quickly" was ranked first as the lower factor that exists in Iraqi organizations. "The presence of personal biases in the organization: that is, beliefs, attitudes, and values that may amount to sabotaging the efforts of co-workers and slandering their reputation" ranked as the second lower factor that exists in Iraqi organizations with RII= 0.59. "Employee has (self-imposed barriers)" was ranked by the overall respondents as the third lower factor with RII=

0.6. "The organization exerts pressure on employees to achieve results very quickly" take the rank 4 with RII= 0.63.

Table 4.2: Factors and Practices that Limit Creativity Ranked in Ascending Order

Factors and Practices Prescent in Iraqi Organizations That Limit Creativity	For All Respondents		Consulting Organizations Respondents		Contracting Organizations Respondents		Governmental Organizations Respondents	
	RII	Rank	RII	Rank	RII	Rank	RII	Rank
Administrators are evaluating new ideas very quickly	0.58	1.000	0.61	4.000	0.64	3.000	0.52	1.000
The presence of personal biases in the organization: that is, beliefs, attitudes, and values that may amount to sabotaging the efforts of co-workers and slandering their reputation.	0.59	2.000	0.55	1.500	0.57	1.000	0.63	5.500
Employee has (self-imposed barriers), i.e.: markers that people set up so that certain barriers will not be crossed, for example: I will never try CAD. Someone told me that computers make errors and design by hand is safer.	0.60	3.000	0.56	3.000	0.69	7.000	0.55	2.000
The organization exerts pressure on employees to achieve results very quickly	0.63	4.000	0.63	5.000	0.63	2.000	0.64	7.000
The organization is led by people who are not competent, have no experience	0.64	5.000	0.69	7.500	0.66	5.000	0.59	4.000
Employee is not given time or encouragement to be creative and innovative.	0.64	6.000	0.55	1.500	0.68	6.000	0.66	8.000
The lack of projects implemented by the organization	0.66	7.000	0.71	9.000	0.75	8.500	0.58	3.000
Fear (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks)	0.68	8.000	0.69	7.500	0.75	8.500	0.63	5.500
The organization uses outdated policies and unnecessary red tape	0.70	9.000	0.66	6.000	0.66	4.000	0.76	9.000

"The organization is led by people who are not competent, have no experience", and "Employee is not given time or encouragement to be creative and innovative" take the rank 5, and 6 respectively with (Medium-High) degree of importance according to Relative important Index. The last three factors were the most important factors

exist in Iraqi organizations that limit creativity were "the lack of projects implemented by the organization" as the seven rank with RII=0.66. "Fear (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks)" was ranked as the eighth rank from all the respondents with RII= 0.68. According to Gurteen, David. (1998), one of the factors that limit creativity is fear in different types. He stated that in Western culture fear is paralyzed enough; on the other hand, fear is far worse in other cultures. Some type of fear(s) is the predominant barrier of creativity (Groth, et al. 1999). According to participants respondents, The factor most present within construction organizations in Iraq that limit creativity was "The organization uses outdated policies and unnecessary red tape", it takes the ninth rank with RII= 0.7. Many researchers mentioned the problems that present because of red tape, (Feeney & DeHart-Davis, 2009; Gore, 1993) stated that Creativity, innovation, and flexibility are reduced due to the presence of red-tape, and this discourages increases in performance by limiting the possibility of solving novel problems.

A Kruskal-Wallis H test was conducted to make comparisons between the three different types of organizations in their staff's views. For that, the researcher assumes a null hypothesis, The null hypothesis is there is no statistically significant difference at α =0.05 in staff's view between all types of organizations and the variables that enables creativity in Iraqi organizations. The null hypothesis is rejected if α <0.05.

Table 4.3: Kruksal-Wallis H Tests for Practices and Factors That Limit Creativity in Iraqi Organizations

No.	Practices and Factors That Enables Creativity	Kruskal-Wallis H Statistics	Sig.	Null Hypothesis Results	
				Rejected	Accepted
1	The lack of projects implemented by the organization	14.304	0.001	×	
2	The organization is led by people who are not competent, have no experience	3.814	0.149		✓
3	Employee has (self- imposed barriers), i.e.: markers that people set up so that certain barriers will not be crossed, for example: I will never try CAD. Someone told me that computers make errors and design by hand is safer..	9.724	0.008	×	
4	Fear (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks)	5.913	0.052		✓
5	Administrators are evaluating new ideas very quickly	7.605	0.022	×	
6	Employee is not given time or encouragement to be creative and innovative..	4.739	0.094		✓

Table 4.3: Continue

No.	Practices and Factors That Enables Creativity	Kruskal-Wallis H Statistics	Sig.	Null Hypothesis Results	
				Rejected	Accepted
7	The organization uses outdated policies and unnecessary red tape	5.360	0.069		✓
8	The organization exerts pressure on employees to achieve results very quickly	0.168	0.919		✓
9	The presence of personal biases in the organization: that is, beliefs, attitudes, and values that may amount to sabotaging the efforts of co-workers and slandering their reputation.	2.449	0.294		✓

As shown in Table (4.3) there are no statistically significant differences in point of view between Iraqi construction Organizations in part of creativity barriers except three variables: The lack of projects implemented by the organization, Employee has (self-imposed barriers), and Administrators are evaluating new ideas very quickly. In order to specify which one of the three types of organizations has the statistically significant differences in point of view, since data are nonparametric- independent samples, Kruskal-Wallis one-way ANOVA (k-samples) conducted for that purpose, Table (4.4) shows P-values of the different organizations.

Table 4.4: Kruskal-Wallis One-Way ANOVA (k-samples) Between The Three Types of Construction Organizations for (Barriers to Creativity), Factor 1.

Item (Factor)	Organizational Type	Sig.	Null Hypothesis	
			Rejected	Accepted
The lack of projects implemented by the organization	Governmental organization-	0.091		✓
	Consulting/ engineering organization			
	Governmental organization-	0.001	×	
	Contracting organization			
	Consulting/ engineering organization-	0.680		✓
	Contracting organization			

The null hypothesis is there is no statistically significant difference at $\alpha = 0.05$ in staffs' views between each two types of the organizations' types and the variables that limit creativity in Iraqi organizations. The null hypothesis is rejected if $\alpha < 0.05$.

Table 4.5: Kruskal-Wallis One-Way ANOVA (k-samples) Between the Three Types of Construction Organizations for (Barriers to Creativity), Factor 3.

Item (Factor)	Organizational Type	Sig.	Null Hypothesis	
			Rejected	Accepted
Employee has (self-imposed barriers), i.e.: markers that people set up so that certain barriers will not be crossed, for example: I will never try CAD. Someone told me that computers make errors and design by hand is safer	Governmental organization	1.000		✓
	consulting/ engineering organization			
	Governmental organization	0.009	×	
	contracting organization			
	consulting/ engineering organization-	0.053		✓
	contracting organization			

As shown in Table (4.5) there is a significant statistics deference in the staff's view of governmental organizations and contracting organization about the presence of factor" Employee has (self-imposed barriers)" in Iraqi organizations, contracts organizations got the seven rank from nine and RII=0.69 in ascending order. While, the governmental organizations staff's view got the rank 2 with RII=0.55. That means Iraqi contract organizations need persons who have a spirit to take risks and have less self-imposed to be more creative, thus, be more innovative.

Table 4.6: Kruskal-Wallis One-Way ANOVA (k-samples) Between the Three Types of Construction Organizations for Factor 5 in (Barriers to Creativity).

Item (Factor)	Organizational Type	Sig.	Null Hypothesis	
			Accepted	Rejected
Administrators are evaluating new ideas very quickly	Governmental organization	0.202		×
	Consulting/ engineering organization			
	Governmental organization	0.028	✓	
	contracting organization			
	Consulting/ engineering organization-	1.000		×
	Contracting organization			

As shown in Table (4.6), There is significant statistical deference in the staff's view of governmental organizations and contracting organizations about the factor "Administrators are evaluating new ideas very quickly". Contracts organizations got the third rank from nine in ascending order with RII=0.64. While, the governmental organizations staff's view got the rank 1 with RII=0.52.

4.10 Factors and Practices Present in Iraqi Organizations That Enables Creativity

Table (4.7) shows the results of all respondents about the factors and practices that enable creativity, the nine factors were placed in ascending order according to the value of the relative important index got by each factor. the practice "Practicing creative thinking techniques in the organization, like the brainstorming method" got the first rank as a lower factor that present in Iraqi organizations with RII=0.46 according to the overall respondents. This result may be justified. The lack of knowledge in creative thinking techniques to the managers of Iraqi construction institutions may be the cause. "Existence of space and resources to pursue ideas (for example: works of art, creative things and designs within the organization". Guibé (2019) stated that the existence of art in the workplace enhances employee creativity as well as company values. Art helps to think outside the box and see from another person's perspective. Besides, it gives employees an opportunity to visualize problems from a new angle and find innovative solutions. The overall respondents ranked "The organization or firm organizes training courses continuously on the latest methods of works and programs" As the third least factor found within institutions and organizations of construction in Iraq with RII=0.49. The factor "The organization implements unconventional and takes risks" got 4th rank with RII=0.5. according to Tan (1998) creativity is hindered when management discourages risk-taking and experimentation and inhibits feedbacks from the ground. "The company or organization seeks to transfer the latest technologies and methods of work used in the field of construction in the world" got the 5th rank according to overall respondents with RII=0.53. " the organization is concerned with employing persons who are smart and who exhibit the behaviors of creative persons" got the 6th rank with RII=0.57. While "The organization gives an appropriate reward to those who deserve it and evaluated fairly" take the seventh rank as a factor that presence more in Iraqi construction organizations with RII=0.58. Byron and Khazanchi (2012)

found that creativity-contingent rewards can foster creativity.in addition; Saether (2020) concluded in his research that Creativity-contingent rewards can increase creativity if they positively impact intrinsic motivation in case when rewards were evaluated fairly. Consequently "The existence of open communication and exchange of information (between individuals and management)" ranked 8th with RII=0.62. one of the steps mentioned by Klijn et al (2010) to promote creativity stimulating climate was to promote open communication that management of organizations should do. the last factor that got the biggest value of relative important index was "The leadership of the organization rejects sectarianism and tribalism and does not care about party affiliations among employees and treats everyone equally" ranked as 9th with RII=0.7 which makes it biggest factor that presence in Iraqi construction organizations which its presence should enable creativity. Hon (2011) mentioned in her research that norms and values that emphasize things such as tradition, adherence to laws, compliance with authority, and stability are thought to inhibit creativity in organizational management, while those that emphasize modernity, equality of members, openness, and flexibility to move are thought to foster creativity. The equality between employees has more advantages. Equality among employees has many benefits that are not limited to just enhancing creativity, Dutta (n.d.) mentioned some benefits of equality like: Attract and Retain Competent Talent, Boosts Collaboration, Enhance Company Brand Reputation, and Increased Employee Engagement.

Table 4.7: Factors and Practices That Enables Creativity Ranked in Ascending Order

Factors and practices that enables creativity in Iraqi organizations	**For all respondents**		**Consulting organizations respondents**		**Contracting organizations respondents**		**Governmental organizations respondents**	
	RII	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**
Practicing creative thinking techniques in the organization, like the brainstorming method	0.46	1.000	.47	1.000	.52	5.000	.42	1.000
Existence of space and resources to pursue ideas (for example : works of art, creative things and designs within the organization.	.47	2.000	.54	4.000	.44	1.000	.45	3.000
The organization or firm organizes training courses continuously on the latest methods of works and programs	.49	3.000	.49	2.000	.46	2.000	.52	6.500

Table 4.7: Continue

Factors and practices that enables creativity in Iraqi organizations	For all respondents		Consulting organizations respondents		Contracting organizations respondents		Governmental organizations respondents	
The organization implements unconventional projects and takes risks	.50	4.000	.53	3.000	.47	3.000	.51	5.000
The company or organization seeks to transfer the latest technologies and methods of work used in the field of construction in the world	.53	5.000	.59	6.000	.49	4.000	.52	6.500
The organization is concerned with employing persons who are smart and who exhibit the behaviors of creative persons	.57	6.000	.65	8.000	.69	8.000	.45	2.000
The organization gives an appropriate reward to those who deserve it and evaluated fairly	0.58	7.000	.59	5.000	.67	7.000	.51	4.000
The existence of open communication and exchange of information (between individuals and management)	.62	8.000	.62	7.000	.66	6.000	.59	8.000
The leadership of the organization rejects sectarianism and tribalism and does not care about party affiliations among employees and treats everyone equally	.70	9.000	.69	9.000	.77	9.000	.65	9.000

A Kruskal-Wallis H test was conducted to make comparisons between the three different types of organizations in their staffs views. For that, the researcher assumes a null hypothesis, The null hypothesis is there is no statistically significant difference at $\alpha = 0.05$ in staff view between all types of organizations and the variables that enables creativity in Iraqi organizations. The null hypothesis is rejected if $\alpha < 0.05$.

The results are shown in Table (4.8) revealed that all the respondents were homogeneous with their views accepts two factors, these factors were: "The organization is interested in appointing smart people and who show behaviors of creative people", and "The organization gives an appropriate reward to those who deserve it and evaluated fairly ".

Table 4.8: Kruksal-Wallis H Tests for Practices and Factors That Enables Creativity in Iraqi Organizations

No.	Practices and factors that enables creativity	Kruskal-Wallis H statistics	Sig.	Null hypothesis	
				Rejected	Accepted
1	The organization gives an appropriate reward to those who deserve it and evaluated fairly	9.220	0.010	×	
2	The leadership of the institution rejects sectarianism and tribalism and does not care about party affiliations among employees and treats everyone equally	4.424	0.110		✓
3	The organization implements unconventional and takes risks	3.262	0.196		✓
4	The existence of open communication and exchange of information (between individuals and management)	3.052	0.217		✓
5	Practicing creative thinking techniques in the organization, like the brainstorming method	5.539	0.063		✓
6	Existence of space and resources to pursue ideas (for example :works of art, creative things and designs within the organization.	2.983	0.225		✓
7	The company or organization seeks to transform the latest technologies and methods of work used in the field of construction in the world	3.370	0.185		✓
8	The organization or firm organizes training courses continuously on the latest methods of work and programs	1.815	0.403		✓
9	The organization is interested in appointing smart people and who show behaviors of creative people	20.826	0.000	×	

In order to specify which one of the three types of organizations has the statistically significant differences in point of view, and since data are nonparametric-independent samples. Kruskal-Wallis One-Way ANOVA (k-samples) conducted for that purpose, Table (4.9) shows significant P-value of organizations. The researcher assumes a null hypothesis, The null hypothesis is:

H^{o} = there is no statistically significant difference at $\alpha = 0.05$ in organizations staffs views between each two types of organizations and the variables that enable creativity in Iraqi organizations. The null hypothesis is rejected if $\alpha < 0.05$.

Table 4.9: Kruskal-Wallis One-Way ANOVA (k-samples) Between the Three Types of Construction Organizations (For Factor 1) in (Enablers to Creativity).

Factor (Item) 1	Organizational type	Sig. P-value	Null hypothesis	
			Rejected	Accepted
The organization gives an appropriate reward to those who deserve it and evaluated fairly	Governmental organization	0.395		✓
	consulting/ engineering organization			
	Governmental organization	0.008	×	
	contracting organization			
	consulting/ engineering organization	0.662		✓
	contracting organizations			

As shown in Table (4.9) there is a significant statistics deference in staff's view of governmental organizations and contracting organization about the presence of factor "The organization gives an appropriate reward to those who deserve it and evaluated fairly". The viewpoint of respondents who represent government organizations is that the application of this factor is little (rank 4 from 9 with RII=0.51) compared to the viewpoint of respondents who represent contracting organizations (rank 7 from 9 with RII=0.67) Keeping in mind that the ranking is in ascending order. This result may be justified, The reason may be that the management of contracting organizations is more interested in creating a competitive environment and encouraging employees to work more efficiently than the administration of government organizations is concerned with that, because the nature of the work of most government organizations is funding projects by the government and salaries are almost constant, unlike what happens with contracting organizations and companies where It needs to compete with other companies to succeed.

Table 4.10: Kruskal-Wallis One-Way ANOVA (k-samples) Between the Three Types of Construction Organizations for (The Factor 9) in (Enablers to Creativity)

Factor (Item) 9	Organizational type	Sig.	Null hypothesis	
			Rejected	Accepted
The organization is interested in employing smart people and who show behaviors of creative people	Governmental organization	0.003	×	
	consulting/ engineering organization			
	Governmental organization	0.000	×	
	contracting organization			
	consulting/ engineering organization	1.000		✓
	contracting organization			

As shown in Table (4.10) there is a significant statistics deference in staff's view. There is a very big difference between the responses of workers in governmental organizations on the one hand and consulting organizations and contracting organizations on the other hand about the presence of the factor "The organization is concerned with employing persons who are smart and who exhibit the behaviors of creative persons" in their organizations. The viewpoint of respondents who represent government organizations is that the presence of this factor is low (rank 2 from 9 with RII=0.45) compared to the viewpoint of respondents who represent contracting organizations (rank 8 from 9 with RII=0.69) and consulting organizations (rank 8 from9 with RII=0.65), keeping in mind that the ranking is in ascending order. This big difference of results may be justified, contracting and consulting organizations seek to implement projects and designs in a good way and gain a good reputation for the organization in the market by attracting smart minds and thus making profits, unlike government organizations that seem to be not required to make a profit in most cases.

4.11 Results of Structured Interviews

To identify the most important factors that prevent or enable creativity directly within construction organizations and companies in Iraq, structured interviews were

conducted with some experts in this field as part of the qualitative analyzes of this research. The respondents' detailed answers and information about them are found in Appendix (B). Summary of results were as follows:

About barriers to creativity, Most of the answers talked about a lack of expertise, whether from contractors or engineers, and even manpower, in addition to the spread of corruption, financial and administrative embezzlement and bribery, the deterioration of the security situation in Iraq and the fluctuation of the Iraqi currency rates that led to the failure to implement construction projects at a high level, and the absence of foreign construction companies Known sobriety operating inside Iraq.

About enablers to creativity, most of the answers talked about the desire of many companies and organizations to keep pace with the development and transfer of modern technologies in construction, in addition to emphasizing the material factor and the good profits that come from referring business to good companies and not just referring them based on the lowest bidding. An expert stated, with a negative outlook, that there are currently no factors or practices within construction organizations in Iraq that would enhance creativity in this area.

5. FRAMEWORK DEVELOPMENT

5.1 Introduction & Overview

A vision of transformation for innovation to reassess the construction industry is important for the growth of a culture of self-sustaining progress and mutual recognition in the long term in Iraq and developing countries. Besides, and Because of its critical position in national economies and long-term socio-economic growth, developing countries must boost the construction industry. According to Yitmen (2007), the performance of construction industries in developing countries has been unsatisfactory from the point of view of customers, users, and even governments. from other perspectives, mentioned that It is important for the construction industry to keep pace with the rapid changes in the technology and economic model that the world is moving towards. The construction industry is known to be poor in innovation compared to other industries. relative to 11 other sectors, construction was the lowest-performing sector in terms of innovation according to a survey conducted in 2004 by The Third UK community Innovation (Aboot, 2006). For that reason, The researcher investigated the best innovation practices that can be correlated with project management for the growth and enhancement of the construction industry. The researcher assumed that companies wishing to improve their project management performance and enhance innovation in the construction industry could use these practices. A simplified framework has been developed for this purpose and is presented at the end of this chapter.

5.2 Testing the Hypothesis of the Research

To achieve one of the research objectives, which involves the testing of ten hypotheses listed in Chapter One, the researcher used the SPSS software for this purpose. To explore the relationship between the four parts of innovation best practices on one side and the relationship between those parts and the project management knowledge areas on the other side, the spearman's correlation

coefficient test was conducted for that purpose. The researcher assumes a null hypothesis, the

null hypothesis is: there is no significant relationship between the parts of (best practices for innovation. the null hypothesis is rejected if significance is less than $\alpha = 0.05$, and the alternative hypothesis is accepted, the alternative hypothesis is: there is a significant relationship between the parts of (best practices for innovation). The results were shown in Table (5.1). The result shows that the significant values between the parts of (best practices for innovation) are less than 0.05, therefore, the null hypothesis was rejected and the alternative hypothesis was accepted, i.e.: there is a significant relationship between the parts of (best practices for innovation). The results in Table (5.1) show There is a great relationship between lean construction and transformational leadership with a correlation coefficient = 85.5%.

Table 5.1: Spearman's Correlation Between Each Part of (Best Practices for Innovation)

Practices for innovation		**Risk Management**	**Quality Management**	**Transformational Leadership**	**Lean Construction**	**Project management (PM)**
Risk Management	Correlation Coefficient	1.000**	0.621**	0.790**	0.656**	0.528**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000
Quality Management	Correlation Coefficient			0.793**	0.801**	0.586**
	Sig. (2-tailed)			0.000	0.000	0.000
Transformational Leadership	Correlation Coefficient				0.858**	0.687**
	Sig. (2-tailed)				0.000	0.000
Lean Construction	Correlation Coefficient					0.678**
	Sig. (2-tailed)					0.000
Project management(PM)	Correlation Coefficient					1.000**
	Sig. (2-tailed)					0.000

** Spearman's Correlation is significant at the 0.01 level

Kim et al. (2016) in their research concluded that there is a positive relationship between the level of transformational leadership and the effectiveness of lean implementation. As well, Kim et al. (2016) through a review of their literature, found that transformational leadership is relevant and essential in the organizational changes required in lean implementation at the project level. As well, The relationship between Lean construction and Quality management was high with a correlation coefficient= 0.801, This positive relationship between lean and quality in

the construction industry is very important and useful, where Ferng et al. (2005) confirmed that The construction industry must continue to review and improve its processes and deliverables in the light of every changing perceptions of quality and performance, This is due to low profits and relatively low levels of efficiency, also, there is a large waste of resources used in the completion of a specific project. Besides, lean construction got a significant correlation (0.678) with project management. Ansah (2016) has studied the correlation between lean construction and project management in the construction industry. Ansah (2016) stated that it was not possible for the employed or existing project management models and strategies to deliver projects on time and that waste was created as a result. He concluded that the implementation by project teams and industry practitioners of lean tools and techniques would minimize or eliminate waste, improve performance, and lead to significant cost savings for both industry and society. As a result, all the categories of the best practices for innovation (Quality management, risk management, lean construction, and transformational leadership) have significant correlations with each other, and each one of these groups has a significant correlation with project management. For that, and as shown in Table (5.2) we can declare that all the hypotheses of the research mentioned in (chapter one) are accepted. Thus, the main hypothesis of the research "Best practices for innovation correlate positively with project **management practices and its ten knowledge areas" is accepted.**

Table 5.2: Research Hypotheses and Results of These Hypotheses

NO.	Research Hypothesis	Correlation coefficient	Result of hypothesis
1	There is a positive relationship between lean construction and transformational leadership	0.858	accepted
2	There is a positive relationship between lean construction and Quality Management	0.801	accepted
3	There is a positive relationship between lean construction and Risk Management	0.656	accepted
4	There is a positive relationship between lean construction and Project Management	0.678	accepted
5	There is a positive relationship between Transformational Leadership and Project Management	0.687	accepted
6	There is a positive relationship between Transformational Leadership and Quality Management	0.793	accepted

Table 5.2: Continue

NO.	Research Hypothesis	Correlation coefficient	Result of hypothesis
7	There is a positive relationship between Transformational Leadership and Risk Management	0.79	accepted
8	There is a positive relationship between Quality Management and Risk Management	0.621	accepted
9	There is a positive relationship between Quality Management and Project Management	0.586	accepted
10	There is a positive relationship between Risk Management and Project Management	0.528	accepted

5.3 Best Practices for Innovation

A questionnaire was performed for multiple respondents, all of them had worked in the building industry; there were 121 respondents, a Likert five-factor scale; and statistical data evaluated and the mean collected for each practical application were obtained from the SPSS program. to test the level of practics that contributed to innovation in the construction industry. The mean was multiplied by 20 and divided by 100 to determine the relative value index of each practice, according to the following equation: RII = mean * 20/100. According to Table (4.1) shown in the previous chapter, the degree of importance for each practice was calculated. The Kruskal-Wallis (K-samples) test was performed to verify if there is a substantial difference in opinion between government agency workers, contracting organizations, and consulting organizations. Table (5.3) indicates the outcomes. The researcher assumes a null hypothesis, the null hypothesis is there is no significant difference at level α =0.05 in view between the organizational types about the best practices for innovation. The null hypothesis is rejected if P-value is less than 0.05 and the alternative hypothesis is accepted. The alternative hypothesis is there is a significant difference at level α =0.05 in view between the organizational types about the best practices for innovation.

Table 5.3: Best Practices For Innovation Rank In Descending Order

No.	The Practices	RII	Degree of Importance	Sig.
1	The deviations that may occur are analyzed during implementation and then corrective actions are taken	0.577	M	0.549
2	The organization works to not overproduce beyond planned, And also stick to the schedule including by not allowing the pre-task to be completed before the specified date.	0.590	M	0.335
3	The organization works to create awareness of risks by communicating with members of the entire organization	0.605	M-H	0.270
4	the organization provide frequent and detailed training to employees to enhance understanding of the various risks the organization is exposed to	0.626	M-H	0.103
5	The company adheres to the standard specifications in implementation	0.645	M-H	0.304
6	The company seeks to ensure the continuous and predictable flow of the stages of workflow so that there is no delaying problems	0.651	M-H	.134
7	The organization practices forecasting methods to be aware of risks before it occurs	0.671	M-H	0.002
8	The organization has a properly followed quality management system	0.679	M-H	0.203
9	In every project, the leadership of the organization inspires and encourage individuals and the stakeholders to do the best possible work for them and for the organization	0.693	M-H	0.000
10	The organization makes sure to do everything correctly and according to standard and technical specifications from the first time so that there is no re-work again, thus wasting effort, time, and cost.	0.698	M-H	0.004
11	The organization sees innovation as a means of achieving quality and profitability and does not view it as merely a new development	0.699	M-H	0.000
12	Leadership encourages employees to be innovative and creative in how they deal with problems that arise during the implementation of a project and provide appropriate solutions.	0.721	M-H	0.006
13	The company is seeking to obtain the International Organization for Standardization (ISO 9001) certification.	0.722	M-H	0.002

Table 5.3: Continue

No.	The Practices	RII	Degree of Importance	Sig.
14	If a specific problem arises during implementation, the leader takes personal responsibility and intervenes to solve the problem rather than simply blaming individuals	0.722	M-H	0.092
15	The leadership of the organization gives loyalty to creativity and innovation, not to old ideas that have no longer had a purpose	0.729	M-H	0.002
16	The customer is the main focus of the company. Voice of customers (feedback from sales and marketing, customer satisfaction in quality of implementation, production, customer services, etc.) is receiving great attention.	0.737	M-H	0.000
17	The organization is constantly developing new competencies and learning new skills to be able to face potential risks	0.750	M-H	0.168
18	project management knowledge areas(project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communication management, project risk management, project procurement management, And managing project stakeholders)	0.764	M-H	0.237
19	The company seeks continuous improvement by identifying opportunities for improvement and working on them during the project and applying them to future projects.	0.775	M-H	0.018
20	Organizational leadership builds mutual respect among individuals; leadership transcends self-interest and focuses on the public interest.	0.800	M-H	0.015
21	The organization seeks to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted.	0.805	H	0.002

After conducting the Kruskal-Wallis H test, the results showed there are no significant differences in the three organizations' staffs views accept eight variables (practices), Table (5.3) showed that results. Anyway, to specify which one of the three types of organizations has the statistically significant differences in point of view, since data are nonparametric, and independent samples, Kruskal-Wallis One-

Way ANOVA (k-samples) conducted for that purpose, Table (5.4) shows P-value between each two organizations. most of the significant differences in views were between governmental and contracting organizations. These differences, anyway, the levels of importance according to RII values were all between High and (medium to high) which does not mean that there is a contradiction in visions. So, these differences may be justified, The pursuit of contracting organizations to achieve economic value and competition to survive and collect greater profits drives them to pay more attention to applications that enhance innovation, unlike government organizations that seek to provide public services and do not pay great attention to profits. The rest of the results of differences in significance were between consulting and contracting. Also, between consulting and governmental organizations. Anyway, all the relative importance index of these differences got (medium to high) levels at the levels of importance according to RII values.

Based on the above, there is sufficient information and explanations about the differences in views. So, we can declare the acceptance of the null hypothesis, which states that there is no significant difference in the points of view between the staff (project managers, engineers, and firm managers/owner) in the three (contracting, consulting, and governmental) organizations.

The findings reveal that the most three important practice for innovation in the construction industry were:

1. (The organization seeks to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted). It got RII=80.5% for all respondents.
2. (Organizational leadership builds mutual respect among individuals; leadership transcends self-interest and focuses on the public interest). It got RII=80% for all respondents.
3. (The company seeks continuous improvement by identifying opportunities for improvement and working on them during the project and applying them to future projects). It got RII=77.5% for all respondents.

On the other side, the following three practices got the least relative important index for all respondents in the survey of this research:

1. (The deviations that may occur are analyzed during implementation and then corrective actions are taken). It got RII=57.7% for all respondents.
2. (The organization works to not overproduce beyond planned, And also stick to the schedule including by not allowing the pre-task to be completed before the specified date). It got RII=59% for all respondents
3. (The organization works to create awareness of risks by communicating with members of the entire organization). It got RII=60.5% for all respondents.

Unsurprising, project management and its knowledge areas got just 76% of the relative importance index from all respondents in terms of best practices of innovation. As (Kavanagh et al, 2009) stated that the very high levels of project management are correlated with decreasing level of innovation performance.

5.4 Interviews Analysis

Depending on (Post-Study) structured interviews were conducted to clarify and check the findings with three professionals working in the field of construction industry and project management. The following were the most important issues:

- The interviewees agreed that good management has a major role in improving innovation processes, as they agreed that transformational leadership practices in general have the greatest impact on that among the rest of the practices mentioned in this research.
- The interviewees argued that putting the right employee in the right place that he loves and feels excel in has a great impact on developing innovation.
- The interviewees have emphasized the importance of focusing on the customer and his needs, in addition to training the staff on the latest technologies that have a significant impact on the development of innovation.
- Interviewees agreed that if we were able to create an innovative environment within the organization, weaknesses in construction project management could be decreased.

Table 5.4: Kruskal-Wallis One-Way ANOVA (k-samples) Between the Three Types of Construction Organizations for (The Best Practices of Innovation)

	Governmental organization-			consulting/ engineering organization			contracting organization		Governmental organization	contracting organization
	RII	rank	Sig.	RII	Rank	Sig.	RII	Rank	Sig.	
The customer is the main focus of the company. Voice of Customer (Feedback from Sales and Marketing, customer satisfaction in the quality of implementation and Production, and Customer services etc.) are top level interested	0.67	M-H	0.087 Accepted	0.75	M-H	0.405	0.83	H	0.000 Rejected the null hypothesis	
The leadership of the organization gives loyalty to creativity and innovation, not to old ideas that have no longer had a purpose	0.68	M-H	1.000	0.75	M-H	0.035	0.83	H	0.002	
The company is seeking to obtain the International Organization for Standardization (ISO 9001) certification	0.72	M-H	0.106	0.63	M-H	0.001	0.8	H	0.213	
Leadership encourages employees to be innovative and creative in how they deal with problems that arise during the implementation of a project and provide appropriate solutions..	0.67	M-H	1.000	0.69	M-H	0.099	0.82	H	0.005	
The organization sees innovation as a means of achieving quality and profitability and does not view it as merely a new development	0.62	M-H	0.140	0.71	M-H	0.075	0.81	H	0.000	
The organization makes sure to do everything correctly and according to standard and technical specifications from the first time so that there is no re-work again, thus wasting effort, time, and cost .	0.67	M-H	1.000	0.66	M-H	0.003	0.78	M-H	0.005	
In every project, the leadership of the organization inspires and encourage individuals and the stakeholders to do the best possible work for them and for the organization	0.64	M-H	1.000	0.67	M-H	0.005	0.79	M-H	0.000	
The organization practices forecasting methods to be aware of risks before it occurs	0.61	M-H	0.015	0.74	M-H	1.000	0.71	M-H	0.007	

5.5 Framework Development

Formal project management approaches may facilitate the exploitation of existing knowledge and perhaps hinder exploration in search of new knowledge (Kavanagh et al, 2009). So that, they stated that innovation is both the exploitation of existing knowledge and exploration in search of new knowledge.

The researcher invented a framework based on the results obtained through this research. According to Ghaben & Jaaron (2015), it is worth incorporating innovation methods into project management applications to optimize the performance of construction projects. So, This framework helps organizations and companies develop their practices in the field of construction project management to achieve better results and also to develop practices that enhance construction innovation. Table (5.5) shows the results in descending order. Organizations and companies can use this table as a framework for achieving construction innovation. This framework consists of five levels arranged in ascending order of relative importance, both for each level and for each practice. The first level is transformational leadership, the second one is Lean construction, the last three levels are Project management, quality management, and risk management respectively.

Table 5.5: RII of Practices That Lead to Innovation in The Construction Industry, Ranked in Descending Order.

No.	Transformational Leadership	RII
1	Organizational leadership builds mutual respect among individuals; leadership transcends self-interest and focuses on the public interest.	0.800
2	The leadership of the organization gives loyalty to creativity and innovation, not to old ideas that have no longer had a purpose	0.730
3	If a specific problem arises during implementation, the leader takes personal responsibility and intervenes to solve the problem rather than simply blaming individuals	0.720
4	Leadership encourages employees to be innovative and creative in how they deal with problems that arise during the implementation of a project and provide appropriate solutions.	0.720
5	In every project, the leadership of the organization inspires and encourage individuals and the stakeholders to do the best possible work for them and for the organization	0.690
	mean	0.732

Table 5.5: Continue

No.	Transformational Leadership	RII
	Lean Construction	**RII**
1	The organization seeks to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted.	0.800
2	The company seeks continuous improvement by identifying opportunities for improvement and working on them during the project and applying them to future projects.	0.780
3	The organization makes sure to do everything correctly and according to standard and technical specifications from the first time so that there is no re-work again, thus wasting effort, time, and cost.	0.700
4	The company seeks to ensure the continuous and predictable flow of the stages of workflow so that there is no delaying and 6 problem	0.650
5	The organization works to not overproduce beyond planned, And also stick to the schedule including by not allowing the pre-task to be completed before the specified date.	0.590
	Total mean of RII	0.704
	Project Management	**RII**
1	project management knowledge areas(project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communication management, project risk management, project procurement management, And managing project stakeholders	0.76
	Quality Management	**RII**
1	The customer is the main focus of the company. voice of customers (feedback from sales, marketing, customer satisfaction in quality of implementation and production, customer services, etc.) are top leveled interested	0.740
2	The company is seeking to obtain the International Organization for Standardization (ISO 9001) certification	0.720
3	The organization sees innovation as a means of achieving quality and profitability and does not view it as merely a new development	0.700
4	The organization has a properly followed quality management system	0.680
5	The company adheres to the standard specifications in implementation	0.640
6	The deviations that may occur are analyzed during implementation and then corrective actions are taken	0.580
	mean	0.676

Table 5.5: Continue

No	Transformational Leadership	RII
	Risk Management	**RII**
1	The organization is constantly developing new competencies and learning new skills to be able to face potential risks	0.750
2	The organization practices forecasting methods to be aware of risks before it occurs	0.670
3	the organization provide frequent and detailed training to employees to enhance understanding of the various risks the organization is exposed to	0.630
4	The organization works to create awareness of risks by communicating with members of the entire organization	0.600
	mean	0.662

According to the results of this research, these practices are combined with project management practices to improve performance in projects and to create an environment, favorable conditions, and on this basis, innovation in the construction industry is improved.

5.5.1 Part one of the framework: transformational leadership

Every organization, regardless of its specialization, needs successful leadership for its projects to succeed. Slevin & Pinto, (2004) mentioned it has been shown that effective project managers use a great deal of flexibility in their use of leadership styles. On the other side, Zang, et al (2018) founded that transformational leaders positively develop an innovation climate. For that, and To obtain successful projects and improve construction innovation, the leader of any organization should build mutual respect among individuals, gives loyalty to creativity and innovation, be positive in dealing with problems that may arise during work, encourages employees to be innovative and creative in how they deal with problems that arise during the implementation of a project and provide appropriate solutions. Besides that, practicing inspiration to individuals and the stakeholders to do the best possible work for them and the organization is very important. Prabhakar (2006) found that the project managers who practice the transformational leadership behavior of inspirational motivation enjoy the project success.

5.5.2 Part two of the framework: lean construction

Lean processes are structured to minimize variation and create a continuous workflow that will lead to a substantial change in predictability and strongly promote respect for all stakeholders. There are many benefits of lean construction, including Higher Quality of Output and Operations, Enhanced Safety and Reduced Risks, Greater Cost Control, Improved Planning and Scheduling, and Higher Customer and Employee Satisfaction. So that, and after applying the part one of the framework, and to reach these goals and to enhance construction innovation, the organizations should do the following:

- Harnessing talent by placing the right employee or worker in the right place in which he excels or in his field of specialization.
- Working on continuous improvement by identifying opportunities for improvement and working on them during the project and applying them to future projects.
- Making sure that everything is done correctly the first time and according to the standard and technical specifications.
- Seek to ensure a predictable and continuous flow of workflow stages
- Not to overproduce beyond the planned, as well as adhere to the schedule including not allowing the pre-task to be completed before the specified date.

5.5.3 Part three of the framework : quality management

As long as the construction industries aim to create stability among cost, time and quality, so that, quality management is very important in construction industries, where quality management is a major indicator of the reliability and durability of the project that has been created. . Besides, Quality management practices are an important approach to organizational performance enhancement (Khalfan et al. 2020). in addition, Quality management practices do support the management of strategically important innovation practices (Bart, 2002).

According to this research results, organizations should focus on the following practices of quality management to be more innovative and achieve success in projects:

- The client should be the main focus of the company.

- Obtaining the International Organization for Standardization (ISO 9001) certification.
- The organization's vision for innovation should be a way to achieve quality and profitability.
- The organization has a properly followed quality management system.
- The company must adhere to the standard specifications in implementing the project.
- The company must take care to analyze the deviations that may occur during implementation and then take corrective actions.

5.5.4 Part four of the framework: risk management

Construction projects are often subject to risks as they are often fragmented temporary and complex. Therefore, risk management is essential to the success of construction projects. but, Although risk management appears to be a mature discipline, it is still in the process of evolution and there is some way to go before its full potential is realized (Hillson, 2016). So that, and to ensure project success and enhance innovation in construction it is recommended for any construction organization to constantly developing new competencies and learning new skills. Besides, Practice forecasting techniques such as the Delphi method to be aware of risks before they happen. Moreover, Providing frequent and detailed training to employees to enhance understanding of the various risks to which the organization is exposed, and may motivate them to find solutions and new ideas. In addition, organizations must create awareness of risks through communication with members of the entire organization.

5.6 Simplified Conceptual Framework

For the framework to be more usable by construction organizations and companies, the researcher developed a simplified framework as shown in Figure (5.1) that combines four parts (transformational leadership, lean construction, quality management, and risk management). Each part combines practices that obtained RII≥70% of all respondents. This framework will be easier to use and focus on the most important practices.

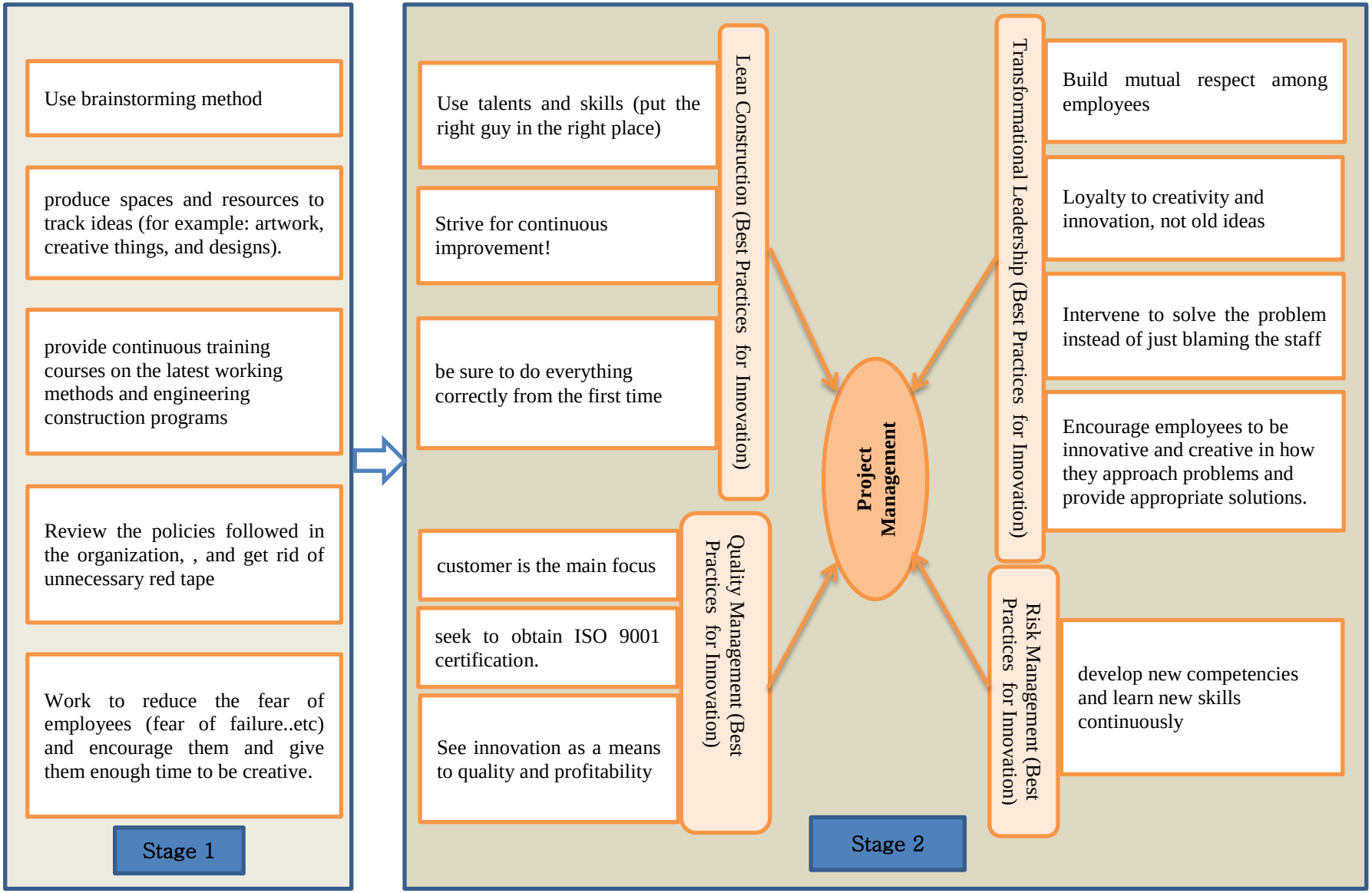

Figure 5.1: The Simplified Conceptual Framework of the Research

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

This research consists of a main goal and two objectives. main goal was "To make the projects that are implemented more successful, and to enhance construction innovation in Iraq". The achievement of the main goal relates to the merging of the results of the first objective and the second objective of the research.

The first objective was "investigate about Factors and Practices Present in Iraqi Organizations That Enables Creativity, and investigate about Factors and Practices Present in Iraqi Organizations that limit creativity" was achieved through quantitative analysis of the variables collected through a literature review related to the topic of innovation in the construction industry. The issue of creativity was investigated in the form of factors that limit creativity, factors that enable creativity, nine variables for the enablers, and nine variables for the limitation were collected. A questionnaire was conducted for 121 engineers of various specializations and positions working in construction organizations and companies. The results were analyzed using the SPSS program, and the results were as follows:

As for the practices that enable creativity, the least practice that has been practiced in construction organizations in Iraq is "Practicing creative thinking techniques in the organization, like the brainstorming method". Then it comes next " Existence of space and resources to pursue ideas (for example: works of art, creative things and designs within the organization)". Then it comes next" "The organization or firm organizes training courses continuously on the latest methods of works and programs". Then comes the rest of the factors and practices, as shown in Table (4.7).

As for the factors and practices found within the construction organizations that limit creativity, the highest practices found in construction organizations in Iraq are "The organization uses outdated policies and unnecessary red tape", followed by" Fear (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks)",

followed by" The lack of projects implemented by the organization", Then comes the rest of the factors and practices, as shown in Table (4.2).

The second objective: "provide best practices that promote innovation and enhance project management competencies and that can be integrated with project management" Twenty practices were collected to integrate them with project management. These practices were collected through a literature review within the areas of transformational leadership, lean construction, risk management, quality management, and in addition to the ten areas of project management, these practices were ranked according to relative importance in their impact on Improving innovation and increasing project management efficiency through the answers collected during the questionnaire from 121 engineers working in different construction organizations. The most important practice in transformational leadership was "Organizational leadership builds mutual respect among individuals; leadership transcends self-interest and focuses on the public interest ". Followed by the rest of the practices. In Lean Construction, the best practice was "The organization seeks to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted." In the field of quality management the best practice was "The customer is the main focus of the company. Voice of customers (feedback from sales, marketing, customer satisfaction in quality of implementation and production," customer services, etc.) are top leveled interested. . As for risk management, the results showed that the best practice is the organization is constantly developing new competencies and learning new skills to be able to face potential risks. All practices are mentioned in Table (5.5) according to their relative importance.

Through the results obtained from the questionnaire, the research hypotheses were examined. The results of the ten hypotheses indicated that there is a significant relationship at a level of significance ($\alpha<0.05$) between all five components (transformational leadership, lean construction, risk management, quality management, and project management).

6.2 The Contribution of the Study

The study contributed to proving the possibility of integrating the best practices of lean construction and transformational leadership with project management to improve the efficiency of project management, thus opening the way for researchers to develop project management by studying other practices related to innovation and integrating them with project management, thus increasing the success of projects that will be implemented in the future and enhancing construction innovation.

Bisides,This study contributes to improving the reality of the construction industry in Iraq by investigating the factors that lead to improving or restricting creativity, as companies can focus on the most important of these factors and work to address them to improve the reality of creativity among workers in construction organizations and companies in Iraq. Besides, this study presented a framework that includes the most important practices that would enhance innovation and improve project management. The framework includes the most important factors that limit or enable creativity. If these organizations use this framework, it is assumed that construction innovation will be promoted. in addition to that, Increasing the efficiency of project management, thus implementing more successful projects and adding a competitive advantage to these organizations or companies. On this basis, costs will be reduced, the time required for implementation will be reduced, and profits will be increased.

6.3 Recommendations

Based on what was stated in this study, and in order to promote the construction industry in Iraq, the most important recommendations reached by this study were put forward as follows:

1. It is recommended that organizations look at their old policies, use more modern ones, as well as reduce unnecessary red tape.
2. The management of organizations should work to reduce the fear barrier among employees (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks), encourage them, and give them sufficient time to be creative.

3. It is recommended that ineffective project managers and management of organizations be replaced by managers who have experience and proven competence
4. The management of organizations is recommended to practice creative thinking techniques in the organization, such as the method of brainstorming, to find the required solutions and increase the creativity of employees in addition to creating a good environment that strengthens friendly relations between employees
5. It is recommended that organizations or companies organize training courses for engineers on an ongoing basis on the latest work methods and programs in the construction industry
6. Organizations recommend providing spaces and resources within the organization for employees to pursue ideas (for example: artwork, objects, and creative designs).
7. It is recommended that companies and organizations apply innovation practices and integrate them with project management to improve the efficiency of project management and improve construction innovation and thus achieve successful and more profitable projects. The framework that was presented is useful to achieve this purpose.

6.4 Study limitations and Future Researches

Because of the Coronavirus and the quarantine policy in Iraq, in addition to the drop in oil prices at the time of the study, most construction and infrastructure projects were stopped. As a result, it was difficult to conduct more interviews with construction companies and their staffs, and it was difficult to access and see the real situation of the companies directly.

The subject of integrating new practices for innovation with project management considers new in the construction industry, as there is a lack of research on this subject. Therefore, this allows researchers to search for new innovative practices that can be combined with project management in order to improve project management efficiency

and develop construction innovation. Besides, researchers can evaluate the extent of application of these innovative practices within Iraqi construction organizations. Also, Researchers can evaluate the factors that lead to creativity and the factors that restrict creativity among employees and workers within construction organizations in other developing countries.

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APPENDICES

Appendix A: the Questionaire

'Survey on assesing enablers and barriers to creativity in Iraqi construction organizations, and practices and factors that enhance construction innovation.'

My name is Yasser Mohannad Alkabatah, a graduate student at the Institute of Science and Technology –Istanbul Gedik University. I am seeking for MSc degree in Engineering Management program under the supervision of Dr. /Redvan Ghasemlounia. The title of my thesis is "Towards Enhancement of Construction Innovation In Iraq". This study aims to investigate the best practices that can be applied in project management to enhance construction innovation in Iraq. It is expected that the findings will provide a useful framework for companies, and will include practices that help to enhance construction innovation in Iraq. This questionnaire aims to collect and rate practices and factors that affect construction innovation. I would like to express my gratitude for your valuable support by completing this questionnaire with your experience.

The questionnaire is divided into 7 parts, namely the biographical details, Barriers to Creativity in Iraqi Organizations, factors that enable creativity in Iraqi Organizations, best practices in lean construction, project management, transformational leadership, quality management, and risk management that enhance construction innovation.

Part one of the Questionaire:

personal information and general questions

Gender: Male ☐ Famle ☐

Your position is:

firm manager/ owner ☐

Project manager ☐

Engineer ☐

Your experience in construction sector in years:

0-5 ☐ 5-10 ☐ 10-15 ☐ more than 15 years ☐

Type of engineering specialization:

Archituctural ☐ civil engineering ☐ mechanical enginnering ☐

Computer engineering ☐ electrical engineering ☐ other ☐

type of organization you are working in:

govermantal organization ☐ consulting/engineering organization ☐

contracting orgnization ☐

Part two of the questionaire:

The First stage:

To investigate the factors and practices present in construction organizations in Iraq that impede creativity or enable it, for each item choose the rank from (1-5) that must accuratly describe your organization (To what extent thies factors precent in your organization). (1) not at all. (2) to a slight degree (3) to a moderate extent. (4) to a great extent. (5) to a very great extent.

	Barriers to Creativity To what extent thies factors precent in your organization? الى اي مدى توجد هذه الممارسات والعوامل داخل المنظمة التي تعمل بها؟	**Rank**				
		1	2	3	4	5
1	The lack of projects implemented by the organization قلة المشاريع التي تنفذها المنظمة					
2	The organization is led by people who are not competent, have no experience قيادة المؤسسة من قبل اشخاص ليسوا ذوي اختصاص او ليس لديهم خبرة					
3	Employee has (self- imposed barriers), ie: markers that people set up so that certain barriers will not be crossed, for example: I will never try CAD. Someone told me that computers make errors and design by hand is safer. الموظفين لديهم حالة الحواجز التي يفرضها الشخص ذاتيا على نفسه (حواجز يضعها الأشخاص على انفسهم بحيث لا يتم تجاوز ذلك الحاجز). على سبيل المثال: لن اجرب استخدام برنامج الاوتوكاد أبدًا. أخبرني أحدهم أن أجهزة الكمبيوتر ترتكب أخطاء وأن التصميم اليدوي أكثر أمانًا.					
4	Fear (Fear of failure. Fear of decision-making. Fear of making mistakes. Fear of taking risks) وجود الخوف لدى الافراد (الخوف من الفشل. الخوف من اتخاذ القرار. الخوف من ارتكاب الأخطاء. الخوف من المخاطرة.)					
5	Administrators are evaluating new ideas very quickly قيام المسؤولين بتقييم الأفكار الجديدة بسرعة كبيرة					
6	Employee is not given time or encouragement to be creative					

	and innovative. لا يُمنح الموظف الوقت أو التشجيع ليكون مبدعًا ومبتكرًا.					
7	The organization uses outdated policies and unnecessary red tape تستخدم المؤسسة سياسات قديمة وروتين غير ضروري					
8	The organization exerts pressure on employees to achieve results very quickly تمارس المؤسسة الضغط على الموظفين لتحقيق نتائج بسرعة كبيرة					
9	The presence of personal biases in the organization: that is, beliefs, attitudes, and values that may amount to sabotaging the efforts of co-workers and slandering their reputation. وجودالتحيزات الشخصية في المؤسسة: اي المعتقدات والمواقف والقيم التي قد تصل إلى حد تخريب جهود زملاء العمل والافتراء على سمعتهم					
	Enablers of creativity To what extent thies factors precent in your organization? الى اي مدى توجد هذه الممارسات والعوامل داخل المنظمة التي تعمل بها؟	1	2	3	4	5
1	The organization gives an appropriate reward to those who deserve it تقوم المؤسسة باعطاء مكافأة مناسبة لمن يستحقها					
2	The leadership of the institution rejects sectarianism and tribalism and does not care about party affiliations among employees and treats everyone equally قيادة المؤسسة تنبذ الطائفية والعشائرية والانتمائات الحزبية بين الموظفين وتعامل الجميع بالتساوي					
3	The organization implements unconventional and takes risks تقوم المنظمة بتنفيذ مشاريع غير تقليدية ولديها روح المجازفة					
4	The existence of open communication and exchange of information (between individuals and management) وجود تواصل مفتوح وتبادل للمعلومات (بين الأفراد والإدارة					
5	Practicing creative thinking techniques in the organization, like the brainstorming method ممارسة تقنيات التفكير الابداعي في المؤسسة مثل طريقة العصف الذهني					
6	وجود مساحة وموارد لمتابعة الأفكار (مثلا: أعمال فنية وهندسية وتصاميم وأشياء ابداعية داخل المؤسسة) Existence of space and resources to .					

	pursue ideas (for example :works of art,creative things and designs within the organization,(					
7	The company or organization seeks to transform the latest technologies and methods of work used in the field of construction in the world تسعى الشركة لنقل أحدث التقنيات وأساليب العمل المستخدمة في مجال البناء في العالم					
8	The organization or firm organizes training courses continuously on the latest methods of work and programs تقوم المنظمة او الشركة بتنظيم دورات تدريبية باستمرارعلى الطرق الاحدث في العمل					
9	The organization is interested in appointing smart people and who show behaviors of creative people تهتم المنظمة بتعيين الأشخاص الاذكياء والذين تظهر عليهم سلوكيات وتصرفات الأشخاص المبدعين					

The Second Stage:

To asses the best practices that should inhance construction innovation

At the (Rank) column: to identify for each item to what extent these practices affect to enhance construction innovation (1) affect with little degree. (2) Affect something. (3) affects with everage degree. (4) affect with large degree. (5) affect with very large degree

Best Practices For Innovation to what extent these practices affect to enhance construction innovation الى اي مدى تؤثر هذه الممارسات في تحسين الابتكار الانشائي		**Rank**				
		1	2	3	4	5
Best practices for Risk Management						
1	The organization practices forecasting methods to be aware of risks before it occurs ممارسة المؤسسة طرق التنبؤ لكي تكون على دراية بالمخاطرقبل حدوثها					
2	the organization provide frequent and detailed training to employees to enhance understanding of the various risks the organization is exposed to توفير تدريب متكرر ومفصل من قبل المنظمة					

	للموظفين لتعزيز فهم المخاطر المختلفة التي تتعرض لها المنظمة					
3	The organization works to create awareness of risks by communicating with members of the entire organization عمل المنظمة على خلق وعي بالمخاطر من خلال التواصل مع أعضاء المنظمة بأكملها					
4	The organization is constantly developing new competencies and learning new skills to be able to face potential risks عمل المنظمة باستمرار على تطوير كفاءات جديدة وتعلم مهارات جديدة لتكون قادرة على مواجهة المخاطر المحتملة					
Best practices for Quality management						
1	The organization sees innovation as a means of achieving quality and profitability and does not view it as merely a new development رؤية المنظمة للابتكار كوسيلة لتحقيق الجودة والربحية ولا تنظر إليه على أنه مجرد تطور جديد					
2	The customer is the main focus of the company. Customer voice (feedback from sales and marketing, customer satisfaction in quality of implementation, production, customer services, etc.) is receiving great attention. العميل هو محور التركيز الرئيسي للشركة. تحظى أصوات العملاء (ردود الفعل من المبيعات والتسويق ورضى العملاء عن جودة التنفيذ او الانتاج وخدمات العملاء وما إلى ذلك) باهتمام كبير					
3	The company adheres to the standard specifications in implementation تلتزم الشركة بالمواصفات القياسية في التنفيذ					
4	The organization has a properly followed quality management system لدى المنظمة نظام إدارة جودة متبع بشكل صحيح					
5	The deviations that may occur are analyzed during implementation and then corrective actions are taken يتم تحليل الانحرافات التي قد تحدث اثناء التنفيذ ثم تتخذ الاجرائات التصحيحية					
6	The company is seeking to obtain the International Organization for Standardization (ISO 9001) certification.					

	(ISO 9001 سعي الشركة للحصول على شهادة الاعتماد العالمية)					
Best practices for transformational leadership						
1	If a specific problem arises during implementation, the leader takes personal responsibility and intervenes to solve the problem rather than simply blaming individuals إذا ظهرت مشكلة معينة أثناء التنفيذ ، يتحمل القائد المسؤولية الشخصية ويتدخل لحل المشكلة بدلاً من مجرد إلقاء اللوم على الأفراد					
2	Leadership encourages employees to be innovative and creative in how they deal with problems that arise during the implementation of a project and provide appropriate solutions. تشجيع القيادة للموظفين على أن يكونوا مبتكرين ومبدعين في كيفية تعاملهم مع المشكلات التي تظهر اثناء تفيذ مشروع ما وتقديم الحلول المناسبة.					
3	The leadership of the organization gives loyalty to creativity and innovation, not to old ideas that have no longer had a purpose منح قيادة المنظمة الولاء للإبداع والابتكار ، وليس للأفكار القديمة التي لم يعد لها قيمه تذكر					
4	In every project, the leadership of the organization inspires and encourage individuals and the stakeholders to do the best possible work for them and for the organization					
5	Organizational leadership builds mutual respect among individuals, leadership transcends self-interest and focuses on the public interest. بناء قيادة المنظمة الاحترام المتبادل بين الأفراد ، والقيادة تتجاوز المصلحة الذاتية وتركز على المصلحة العامة					
Best practices for Lean construction						
	The organization makes sure to do everything correctly and according to standard and technical specifications from the first time so that there is no re-work again, thus wasting effort, time, and cost. حرص المؤسسة على القيام بكل شيء بشكل صحيح ووفقًا للمواصفات القياسية والفنية من المرة الأولى حتى لا يكون هناك إعادة عمل مرة أخرى ، مما يضيع الجهد والوقت والتكلفة					

	The organization works to not overproduce beyond planned, And also stick to the schedule including by not allowing the pre-task to be completed before the specified date. سعي المنظمة على عدم زيادة الإنتاج (التنفيذ) عن المخطط، بما في ذلك عدم السماح بإكمال المهمة المسبقة قبل التاريخ المحدد					
	The organization seeks to use talents by placing the right employee or worker in the right place in which he excels or in his field of specialization so that his talent and skills are not wasted. سعي المنظمة إلى استخدام المواهب من خلال وضع الموظف المناسب أو العامل المناسب في المكان المناسب الذي يتفوق فيه أو في مجال تخصصه حتى لا تضيع موهبته ومهاراته.					
	The company seeks to ensure the continuous and predictable flow of the stages of workflow so that there is no delaying and 6 problem سعي الشركة الى ضمان التدفق المستمر والمتوقع لمراحل سير العمل حتى لا يكون هناك إهدار في الانتظار وغيرها من المشاكل					
	The company seeks continuous improvement by identifying opportunities for improvement and working on them during the project and applying them to future projects. سعي الشركة إلى التحسين المستمر من خلال تحديد فرص التحسين والعمل عليها أثناء المشروع وتطبيقها على المشاريع المستقبلية.					
Classical practices for Project management and its knowledge areas						
	project management knowledge areas(project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communication management, project risk management, project procurement management, And managing project stakeholders)(إدارة تكامل المشروع ، إدارة نطاق المشروع ، إدارة وقت المشروع ، إدارة تكلفة المشروع ، إدارة جودة المشروع ، إدارة الموارد البشرية للمشروع ، إدارة اتصالات المشروع ، إدارة مخاطر المشروع ، المشروع إدارة المشتريات ، وإدارة أصحاب المصلحة في المشروع)					

Appendix B: The Structured Interviews

Dear Sir:

First of all, I'd like to thank you for responding to our interview invitation. This interview will be conducted with a number of experts in Iraq as tool of thesis degree in engineering management, in order to identify the factors that presence in Iraqi construction organizations which cause barriers and enablers of creativity. The title of thesis is "Towards Enhancement of Construction Innovation In Iraq". I assure you that the information in this interview will only be used for academic research purposes and will be treated with total confidentiality.

Researcher name: Yasser Mohannad Al Khabatah

Supervisor: Dr. Redvan

University name: Istanbul Gedik University

Respondent name:

Experience in Construction:

Position:

The Questions are:

1- What are the factors and practices present in Iraq construction organizations and firms that limit creativity?

1- ما هي العوامل والممارسات الموجودة في مؤسسات وشركات البناء العراقية التي تحد من الإبداع؟

2- What are the factors and practices present in Iraq construction Organizations and firms that enable creativity?

2- ما هي العوامل والممارسات الموجودة في مؤسسات وشركات البناء العراقية التي تمكن وتساعد على الإبداع؟

Details of Structured Interviews for Question 1:

Information About Respondents	**The Factors and Practices Present in Iraq Construction Organizations and Firms That Limit Creativity**
<u>Respondent 1:</u> **Position**/ Senior engineer **Experience**/ 16 years Civil Engineer Project Manager	1_ Referral of work to companies based on the lowest bids according to the specifications and paragraphs of the bill of quantity (BOQ).
	2- The assignment of work to companies that do not have work similar to the nature of the assigned work, with a lack of experience in the method of implementation.
	3- The assignment of a resident engineer department that lacks experience in solving work problems.
	4- Mistakes in preparing the architectural and construction designs and correctly calculating the quantities.
	5- External pressures and interference like companies 'work.
	6- External factors and work impediments related to the nature of the land on which the project is based, the fact that the investigation and constructional laboratory tests have incorrect results and recommendations in dealing with the mechanical problems of the earth and the nature of its layers.
	7- Manipulating and circumventing the specifications and quantities of the tender paragraphs (bill of quantities) by the company when carrying out the work entrusted to it.
	8- The resident engineer's departments colluded with the implementing companies and changed the engineering specifications for the work items.
	9- Severe weather conditions and their impact on the completion of work paragraphs and lack of experience in overcoming them.
	10- Companies reluctance and failure to adhere to work progress schedule plans.

Information About Respondents	
<u>Respondent 2:</u> **Position**/ Senior engineer **Experience**/ 17 years Civil Engineer Project Manager	1. The absence of reputable and experienced international companies in Iraq due to the poor security conditions that were present in Iraq
	2. Failure to activate the standardization and quality control device on imported construction materials
	3. Lack of support for creators, technicians, and craftsmen, and no law to protect them or the existence of unions that support them
	4. The spread of bribes and administrative and financial corruption in Iraq
	5. Laws of project implementation contribute and assist the technical and engineering staff supervising the work to take bribes in a legalized manner
	6. Non-compliance with the engineering plans issued by the consulting offices
<u>Respondent 3:</u> **Position**/ Consultant Engineer **Experience**/ 25 years Civil Engineer Firm Manager	1- Weak technical personnel for Iraqi construction companies
	2. The limited possibilities of skilled workers (caliphs)
	3. Unavailability of modern building materials
	4- Failure of construction companies to keep pace with the great developments taking place in modern construction methods
	5- The construction companies lack advanced machinery and equipment
	6. Methods of referring work to construction companies, as it depends on the method of tender instead of standard documents and modern contracts that enter into many indicators aimed at choosing the best companies for the type of work and according to the material, administrative and scientific capabilities
	7. The security situation and the instability of the economy greatly limit creativity

Details of Structured Interviews for Question 2:

Informations About Respondents	**The Factors and Practices Present in Iraq Construction Organizations and Firms That Enables Creativity**
<u>Respondent 1:</u> **Position/** Senior engineer **Experience**/ 16 years Civil Engineer Project Manager	1- The assignment of work to companies that have experience in their field of work and have similar work and good implementation of similar works that they have previously carried out.
	2- The amount and cost of completing the work for all paragraphs that generate profits for the executing company.
	3- The assignment of a resident engineer department with expertise and problem solving during the execution of the work assigned to it by any company.
	4- Creating appropriate conditions and overcoming obstacles by government institutions in front of the implementing companies.
	5- Working on updating engineering designs according to work requirements during implementation.
	6- Maintaining the security and safety of the company and its staff by governmental institutions.
	7- The inclusion of corporate staff in the security system, social work and health insurance.
	8- Flexibility to disburse the company's financial dues and according to what has been accomplished from the items of the prepared statement and according to the outline of the work

	progress schedule in the event that the company demands payment of dues of what has actually been accomplished.
Respondent 2: **Position**/ Senior engineer **Experience**/ 17 years Civil Engineer Project Manager	"To my knowledge, there are no factors that helps to enable creativity within construction organizations in Iraq"
Respondent 3: **Position**/ Consultant Engineer **Experience**/ 25 years Civil Engineer Firm Manager	1- The desire of some construction companies and organizations to keep pace with the development, but it needs close follow-up and government sponsorship, as well as from the unions
	2. Patriotism and the desire to produce works referred to by Lebanon
	3- Some companies have good financial capacity if their course is properly directed

RESUME

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PROFESSIONAL EXPERIENCE AND REWARDS
PUBLICATIONS/PRESENTATIONS ON THE THESIS

- Yasser ALKHABATAH & Redvan GHASEMOLUNIA, International Journal of Engineering Technology Research & Management, Vol-05 Issues 04, April-2021, ASSESSING CREATIVITY PRACTICES IN IRAQI CONSTRUCTION ORGANIZATIONS. Publication URL: http://www.ijetrm.com/issues/files/Apr-2021-07-1617812998-A5.pdf