Factors Affecting the Competitiveness and Innovation in Northern Iraq Construction Industry

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ABSTRACT

Innovation is the process of creating and implementing new ideas for the community, while competitiveness is the ability of a firm to provide the community standard quality services at competitive costs.

Creativity and innovation have always been recognized as the foundation of success of any organization, as is the case for the construction industry worldwide. However, without taking the competitiveness in consideration, the prosperity process would be difficult.

Over the past decade, the construction industry has been grown dramatically in Iraq, especially in northern region of the country. To keep the industry firms on the success path by way of making them innovative and competitive, examining factors affecting innovation and competitiveness is crucial. With this aim, this research is conducted so as to identify the factors influencing innovation and competitiveness of the firms.

Literature review about innovation and competitiveness was reviewed to identify the factors affecting the innovation and competitiveness of construction projects. Pilot study of the questionnaire was achieved by a scouting sample. A questionnaire survey was conducted and 43 factors were identified, categorized into 7 groups of dimensions: 1) input, 2) driver, 3) barriers, 4) enabler, 5) impact, 6) competitiveness, and 7) firm's need of innovation. 150 questionnaires were distributed to local construction firms. 85 questionnaires were received (57%).

Four hypotheses addressing the improvements of firm's project performance and their competitive advantages have been developed, a conceptual framework explaining the developed hypotheses are designed, ended up with recommendations to improve innovation, competitiveness and performance of construction projects in Northern Iraq.

Two theories are presented by the study: 1) project performance and competitive advantages of construction firms increase by activating inputs, drivers, enablers and impacts of the innovation; 2) the firms incapable of overcoming barriers, incapable of improving their project performance and competitiveness.

It is recommended for construction industry in the region to improve the factors that affect negatively on innovation and competitiveness through identifying a structured methodology and mechanism to: 1) improve Research and Development (R&D) expenditure and R&D projects; 2) consider the short and long term profitability; 3) increase the number of employees devoting innovation.

Keywords: Competitiveness, Construction firms, Innovation, Northern Iraq Construction Industry.

ÖZ

İnovasyon, toplum için yeni fikirler yaratma ve uygulama süreci iken rekabet, bir firmanın topluma rekabetçi maliyetlerle kaliteli standartlarda hizmet sağlama yeteneğidir.

Yaratıcılık ve inovasyon, her zaman dünya çapında inşaat sektörü için geçerli olduğu gibi, herhangi bir firmanın başarısının temeli olarak kabul edilmiştir. Ancak, rekabeti dikkate almadan, refah süreci zor olacaktır.

Geçtiğimiz on yıl içinde, inşaat sektörü özellikle Irak'ın kuzey bölgesinde, dramatik olarak büyümüştür. İnşaat firmalarının başarılarının devamını sağlamak için onları inovatif ve rekabetçi hale getirmek ve inovasyon ve rekabeti etkileyen faktörleri incelemek çok önemlidir. Bu amaçla, firmaların inovasyonunu ve rekabetini etkileyen faktörleri belirlemek için bu araştırma yapılmıştır.

İnovasyon ve rekabet ile ilgili yapılan önceki çalışmalar inşaat projelerinin rekabet gücünü etkileyen faktörleri belirlemek amacıyla gözden geçirilmiştir. Anketin pilot çalışması için örnek bir vaka elde edilmiştir. Bir anket çalışması yapılmıştır ve 43 faktör 7 grupta kategorize edilerek tanımlanmışrtır: 1) girdi, 2) itici güç, 3) engel, 4) etken, 5) etki, 6) rekabet ve 7) firmanın inovasyon ihtiyacı. 150 anket yerel inşaat firmalarına dağıtılmıştır. 85 doldurulmuş anket geri dönmüştür (% 57).

Firmanın proje performansı ve rekabet avantajlarının iyileştirilmisini işaret eden dört hipotez geliştirilmiş, geliştirilen hipotezleri açıklayan bir kavramsal çerçeve

tasarlanmış ve Kuzey Irak'taki inşaat projelerinin inovasyonunu, rekabet gücünü ve performansını artırmak için önerileri sunulmuştur.

Çalışmada iki teori sunulmuştur: 1) inşaat firmalarının proje performansı ve rekabet avantajları inovasyon girdileri, itici güçleri, etkenleri ve etkilerini aktive ederek artar; 2) engellerin üstesinden gelen firmalar, proje performansı ve rekabet gücünü artırır.

Bölgedeki inşaat sektörü için inovasyonu ve rekabeti olumsuz yönde etkileyen faktörlerin iyileştirilmesi yoluyla yapılandırılmış bir metodoloji ve mekanizmanın belirlenmesi tavsiye edilir: 1) Araştırma ve Geliştirme (Ar-Ge) harcamaları ve Ar-Ge projelerinin geliştirilmesi; 2) Kısa ve uzun vadeli karlılığın değerlendirilmesi; 3) kendini inovasyona adayan çalışanların sayısını artırılması.

Anahtar Kelimeler: Rekabet, İnşaat firmaları, İnovasyon, Kuzey Irak İnşaat Sektörü.

DEDICATION

I dedicate this thesis work to my husband, Karwan Jacksi, and to my daughter, Rupal.

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First of all, I would like to give special thanks to my supervisor Assoc. Prof. Dr. Ibrahim Yitmen for his patience, motivation and advices.

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LIST OF SYMBOLS/ABBREVIATIONS

BIM	Building Information Modelling
CEB	Central European and Baltics
CIFE	Centre for Integrated Facility Engineering
CMMI	Capability Maturity Model Integration
CoCoPS	Coordinating for Cohesion in the Public Sector
DEA	Develops a Network Data Envelopment Analysis
DfES	The Department for Education and Skills
DMO	Destination Marketing Organization
DTI	Department of Trade and Industry
EIS	European Innovation Scoreboard
FDI	Foreign Direct Investment
GDP	Grossed Domestic Product
GPS	Global Positioning Systems
IC	Intellectual Capital
IVC	Innovation Value Chain
KPI	Key Performance Indicator
MBNQA	Baldrige National Quality Award
MEP	Member of the European Parliament
NIS	National Innovation System
NZMEA	New Zealand Productions and Exporters Association
OECD	The Organization for Economic Cooperation and Development
PC	Political Connection
PV	Photovoltaic

R&D	Research and Development
RBV	Resource Build on View
RFID	Radio-frequency identification
RVC	The Russian Venture Company
SEE	South East European
SME	Small and Medium Enterprise
UCI	Urban Competitiveness Index
VDC	Virtual Design and Construction
WEF	World Economic Forum

Chapter 1

INTRODUCTION

1.1 Background of the Research

Innovation is a key way of reasonable advantage for construction companies. The focus is to make a company more innovative generally. The construction companies, which effectively innovate in a repeatable style, share one common thing which they're good at managing change (Kelley, 2010). The innovation in construction is progressively seen as a process that growths the competitive position of company by improving the extensive range of modern thoughts as stated in (Demir & Kocabaş, 2010).

According to a policy perspective, competitiveness is considered a multidimensional issue and a balanced multidisciplinary approach, which is necessary through practicing in the production system can increase quantitative methods (Davidson, Malard, & Ivanova, 2012). Competitiveness in construction is no longer regarded completely at national or international level, but nowadays is recognized as having a global dimension as well. The topic competitiveness is gradually becoming essential with the assistance of globalization (Akis, 2015). At the same time, companies are innovating for competitive advantage. Most of the studies show that the old-style dimensions such as price, quality, services, etc. do not have sufficient associations to get the competitive representation subjects for the existing competitive environment (Liu, 2013; Bierly & Daly, 2007).

By the vanishing of protective tendencies on world trade, there has been a growth in the exporting countries as well as the exported products and also the likeness of consumption forms along with globalization has also increased the world trade. Thus, as many countries have been producing and exporting the same products, the international competition has become indispensable. Inside this powerful competitive environment, the need to produce highly competitive products has initiated to create novel products or to develop the existing products, which is called the process of innovation (Akis, 2015).

The achievement of effective building practices can lead to positive competitive advantages such as: 1) costs saved from undesirable reduction plans, 2) improving human progress, 3) recovered labour performance by reducing the risks regularly related with unsafe construction places, and 4) increasing the income from developed models, developed market agreements and upsurge in duplication businesses (Mair et al, 2006). A questionnaire survey in the UK in some construction industries found that un-sustainability strategy and actual reportage to stakeholders can assist increase contractors' reputation and business competitiveness (Adetunji et al, 2003).

Innovation is introducing an origin idea, more effective solution for problems and devices or processes. Innovation can be observed as the request of a novel solution that encounter new and modern requirements of the process and firms, in expressed needs, and prevailing market needs. In addition, as the topic named competitiveness gradually becomes essential with the assistance of globalization, most of countries show tremendous efforts in order to rise their competitive powers for gaining more shares from the global market (Akis, 2015).

Innovation management is ultimately considered the management of innovation processes. It mentions to both of product and organizational innovation. Innovation management contains a set of tools that help managers and engineers to collaborate with an exact understanding of processes and to achieve the goals (Sun, 2011).

Management innovation includes the forefront of originality in an instituted organization, and it symbolizes a specific compose of organizational alteration (Hargrave, 2006). Additionally, commercial organization that emerges revenue basis and donate in selling belongings or facilities to consumers is called business firms. The management of a commercial firm will typically grow a set of organizational objects and devices for meeting those targets to help employees understand where the corporation is overseen (Quinn & Strategy, 2013).

1.2 Problem Statement

Project failures come from many reasons and factors but mostly from problems and failures in performance (Love, Raymond, & Edwards, 2005). After the Iraq war in 2003, construction industry has grown significantly in Iraq, particularly in the northern region, due to a high demand of construction needed for the region starting from the infrastructure to high buildings and very large residential complexes. However, many of the construction firms in the region fail in performance. Furthermore, failure measurement systems are not handy to identify the problems. In Northern Iraq, construction project issues appear in different ways: there are failures due to barriers such as lack of technology and experienced staffs, while others fail in time, performance, and others fail due to discouraging innovation and loss of competitiveness. Consequently, to identify these issues and suggest solutions, this

research is conducted so as to investigate the factors affecting innovation and competitiveness for construction firms in the region.

1.3 Research Questions and Objectives

The objective of this study is to investigate the factors affecting the competitiveness and innovation in construction industry in Northern Iraq so as to analyse and identify factors having negative effects on the project performance and firms' innovation and competitiveness. Furthermore, suggestions and recommendations will be presented by this research so as to support the construction firms overcome their problems and improve their innovation and competitiveness.

These are the research questions of this study:

1) What are the most important factors affecting the innovation and competitiveness in Northern Iraq construction companies?
2) How do the above factors affect the construction company's work in Northern Iraq?
3) What will be the benefits of these factors?

1.4 Research Methodology

The research begins by studying a large number of factors affecting innovation and competitiveness for the construction firms' word wide, then a collection of the most related factors affecting innovation and competitiveness to the region of Northern Iraq is selected. A questionnaire is created based on the selected factors, and sent to local construction firms in the form of hardcopies and online forms. The 150 firms have been surveyed, 70 from hardcopies and 80 from online forms, out of which 85 firms replied with the answers making the response rate 57%.

Data analysis is performed on the collected data by examining the specified factors. Followed by developing four hypotheses presenting the factors affecting project performance, innovation and competitiveness for the construction firms.

Statistical Package of Social Sciences (SPSS) and MS Excel software are used to analyse data, Relative Importance Index (RII) is utilized to rank the factors according to their importance to variables. Pearson correlation factors for each of the variables are determined to examine how factors are linearly correlate to each other and a conceptual framework for the developed hypotheses is presented. Finally, hypotheses testing is performed for the developed hypotheses so as to ensure the validity of the developed hypotheses.

1.5 Research Limitation

Although this research was carefully prepared, there were some of unavoidable limitations. First of all, due to time limitations, the research was conducted on a relatively small number of construction firms, since only 85 of the firms were replied with answers. To generalize the outcomes for a bigger number, the investigation should have involved more construction firms. Second, most of the construction firms in Northern Iraq do not give an accurate information or even a correct estimation about their annual turnover which makes it hard to categorize the firms according to their sizes. Third, to the best of our knowledge, there is no prior research studies on the same topic for the region, causing it more difficult to lay a foundation for understanding the research problem.

1.6 Research Outline

The thesis report consists of six chapters. The first chapter begins with an introduction to the topic of the thesis, chapter two gives a background to the innovation including

examples. Chapter three presents an overview on competitiveness in construction industry. The methodology of the thesis work is presented in chapter four. Chapter five presents data analysis, developed hypotheses, conceptual framework design and hypotheses testing. Finally, Chapter six presents the conclusion and recommendations for further study.

Chapter 2

INNOVATION

2.1 Introduction of Innovation

Innovation is well-defined as the development process, and when an organization does not innovate, a competitor may gain an advantage and customers might go elsewhere. This is the reason that it is important for organizations to have a means to manage innovation. Innovation is not a modern method. It is as old as human itself. It appears to be somewhat inherently "human" because of the tendency to think about modern and better ways of applying possessions and to try them out in practice. Innovation has newly been the heart of the knowledge-based economy (O'Leary, 2005).

Activities and properties of innovation depend widely on the reasons that innovation takes place (drivers) and who innovates also depend on the external circumstances that the innovation hold (Ozorhon et al, 2010).

The companies, which successfully innovate in a repeatable fashion, have one thing in common where they are good at managing change (Von Stamm, 2008). Innovation introduces new fundamentals into a communal service in the form of knowledge, a new management or procession skills. It represents discontinuity with the past (Zou, 2012).

Susman et al (2006) have discussed a traditional work which results in some guides that considered to improve the capability of Small and Medium Enterprise (SME) to plan effectively and manipulate modification. The concentration of the guide provided by authors is to help SME leadership accomplish all changes to result in innovation and growth with exacting emphasis on productively. These guides could be reused by MEP specialists looking for created information to assist their SME custom be able to have modifications and innovation, or it can be directly given to SME administrators.

A co-operative innovation and Research and Development (R&D) performance is observed in Argentina and Spanish firms. This is created on theoretical positions over the literature. They surveyed 540 samples in Argentina and Spanish firms so to have a combined analysis for technological innovation (Edwards et al, 2011),.

Richard (2015) have confirmed the significance of consumer leadership, yet the lowest price remains the overriding selection criterion in tenders. Many clients lack the insight and suckers to play a leadership role and are unwilling and unable to employ strategies to adoptive better performance and more innovation.

Crawford, Nahmias (2010) undertakes and discovers the differences in slant and exercise of projects, programs and change managers as a principal for determining the competencies compulsory to effectually manage change enterprises.

For the purpose of creating value and producing wealth and jobs, Lu, Kweh, Huang (2014) debates the global entrepreneurship and innovation with innovative standpoints and advanced knowledge. The paper underwrites to various outlooks of global entrepreneurship and innovation in different countries and industries.

Two goals by Davidson have been set by Davidson et al (2012). First, they explores how the development and management of the innovation strategy could be engineered to make the process more regular, repeatable, and unfailing. Second, they lay the ground work for the advance of an intelligent choice support system for technology firm directors.

2.2 Definition of Innovation

Department of Trade and Industry (DTI) in UK defines which the innovation as "the fruitful exploitation of new ideas" also it is the key of economic problem method to participate successfully in the increasing of competitive global environment (Edler and Georghiou, 2007). Innovation has lots of dimensions, such as the sort and rule of innovation that make the defining it very complex issue. Innovation is the application of important and new upgraded product (good or service), process, modern marketing process or a new organizational approach in business processes, workplace organization or external relationships. (Statistical Office of the European Communities, 2005).

There is no single and widespread definition of innovation, it is a complex phenomenon with a widespread input and output. In extensive term, it may be definite as the creation and adoption of new information to progress the assessment of product, process, and service. The other definition is innovation can be the mixture of invention, insight and entrepreneurship that provide development industries to make new value and produce great valuable jobs.

2.3 Role of Innovation in Economic Development

An innovative approach, concentrating on the role of innovation in social changes as well as economic changing. The development in the innovation branches had to be

seen as a system of developing the quality, determined by innovation, taking place in historical time. Motivated objectives are nowadays set in Russia for the development of the high-tech economic sector and growing the share of innovative goods in the country's Grossed Domestic Product (GDP) (Prianichnikov, 2013).

2.4 Innovation Management

Recently, regarding to sophisticate in technology and grow of globalization, the step of change has speeded greatly. Innovation and flexibility have been changed as a new set of key metrics for a business, more than traditional cost and structure-based metrics. Globalization has raised the stakes in the Small and Medium sized sector as competition can now happen in what would have been perceived previously as safe markets (Kaufmann and Tödtling, 2002). Organizational change is taking place and involve in the organization as a whole. A comprehensible and understandable system is wanted to manage the change process. The innovation system requirements have been increased to the level so large global companies expect innovation all the time and in all areas (Kanter, 1999).

In its largest sense, the innovation of management could be described as a conversion in the form, quality, or state with time of the management events in an organization, wherever the alteration is an original or unparalleled leaving from the past (Sun, 2011).

2.5 Current Problems of Innovation

The most available drawback in the innovation process is the limitation of resources. Firstly due to lack in the availability of the finances. Secondly because of the limitations of the manpower, and finally because of the lacks of time. These drawbacks can be overcome once organizations agree to innovate and encourage the resources obtainable. After resource problem, the following barrier which is specifically in a

high risk to innovation is the idea that innovation is not essential. These perceptual barriers are threatened speedily as a result of education and the need to strive in a universal environment. At the end, technology and qualified persons limitations are considered as final obstacles to innovation (Kaufmann and Tödtling, 2002).

2.6 Innovation Value Chain (IVC)

IVC splits the innovation method to three parts: knowledge collection, knowledge transformation and knowledge exploitation. All are dependable on innovation to gain good advantage. Recently, R&D and innovation growth in Ireland is more robust than that in Switzerland. They examine these variances over the lenses of the IVC. Important correspondences happen between some characteristics of firms in innovation comportment. Robust complementarities outcrop between exterior knowledge sources and also firms' local and exterior knowledge. To improve the innovation, managers may want to sight the procedure of converting thoughts into commercial outputs as a combined movement, such as Michael Porter's value sequence for converting raw materials into ended properties. The first stage of the three stages in the sequence is to create thoughts, across units in a business, or outside the firm. The second stage is to transfer ideas, or, more precisely, choose ideas for backing and developing them into goods or practices. The third stage is to diffuse the products. The activities have been examined with challenges associated with each activity (Hansen and Birkinshaw, 2007). For slight and open markets for instance, Ireland and Switzerland, excluding important natural source awards, innovation is a significance factor of persistent international competitiveness (Guellec, 2004).

2.6.1 Idea Generation

The primary link in the innovation sequence rate relays to firms' actions in finding the knowledge inputs for innovation (Frenz and Ietto-Gillies, 2009). On the other hand, it

is explained that the innovation procedure as probably “open”. Idea generation is the executive’s comprehension that innovation begins with worthy thoughts, however the question is: where do these thoughts arise from? Directors logically check firstly the entire of their individual, useful individuals or commercial components for inspired inspirations. They generally discover that they have a lot of worthy sense. The larger sparks are kindled when pieces of thoughts come together. Precisely, person’s brainstorm idea or when corporations knock external partners for ideas.

2.6.2 Idea Conversion

Idea transformation is generating lots of worthy ideas which is one part and how you handle the ideas once you have them is another matter (Hansen and Birkinshaw, 2007).

2.6.3 Idea Diffusion

In idea diffusion, thoughts that have been obtained, vetted, funded, and improved. Moreover, companies should get the related constituencies through the organization to support and spread the modern products, businesses, and practices through desirable geographic positions, channels, and customer teams (Hansen and Birkinshaw, 2007).

2.7 Types of Innovation

Hughes (2007) states that the innovation can have several types or forms such as product innovation where an organization prepossess, innovation in the process (variations in the approaches in which they are produced and sent), innovation in location (changes in the perspective where the products and/or services are announced), and standard innovation (variations in the essential conceptual prototypes which surround what the organization have done)

Innovation in marketing, such as the application of a modern marketing system containing important modifications in produced goods, cost, and promotion strategy.

On the other hand, technically or not technically, innovation is complicated, and there is no a particular or full definition or categorization of the innovation (Over et al, 2011).

Edquist et al (2001) have recommended in separating the class of process innovation into: technological innovation process and organizational innovation process. The former related to modern types of machinery and to modern approaches to establish work. Although, organizational innovations are not limited to new approaches to unify the production process with a given firm (Chandler, 1990).

2.7.1 Closed and Open Innovation

Chesbrough (2003) declares the open innovation pictures an innovation model transfer from a closed to an open paradigm. Open innovation has subscribed with a greater protuberance in dainty of the deliberation of the globalization and the probable of the R&D utility that one to turn out to be subcontracted. Figure 1 Figure 1: Closed innovationhas clearly shown that an illustration of the innovation process in the "closed innovation" ideal. At this point, research developments are threw from the firm's base of technology and science. They develop over the procedure, and few of the developments are stopped, whereas other developments are chosen for additional work. A subsection of the developments are selected to go over the business. This procedure is called a "closed" procedure because developments can just enter in a single way, at the establishment, and can only exit in a single way, by going into the business (Chesbrough, 2006).

The Open innovation model can be agreed as the contrary of the conventional vertical integration model where (R&D) interior study and development actions result in inside established products which are after that spread by the firm. Moreover, Open

innovation is the usage of beneficial influxes and outflows of facts to accelerate interior innovation, and enlarge the markets for exterior use of innovation, correspondingly (Chesbrough, 2006).

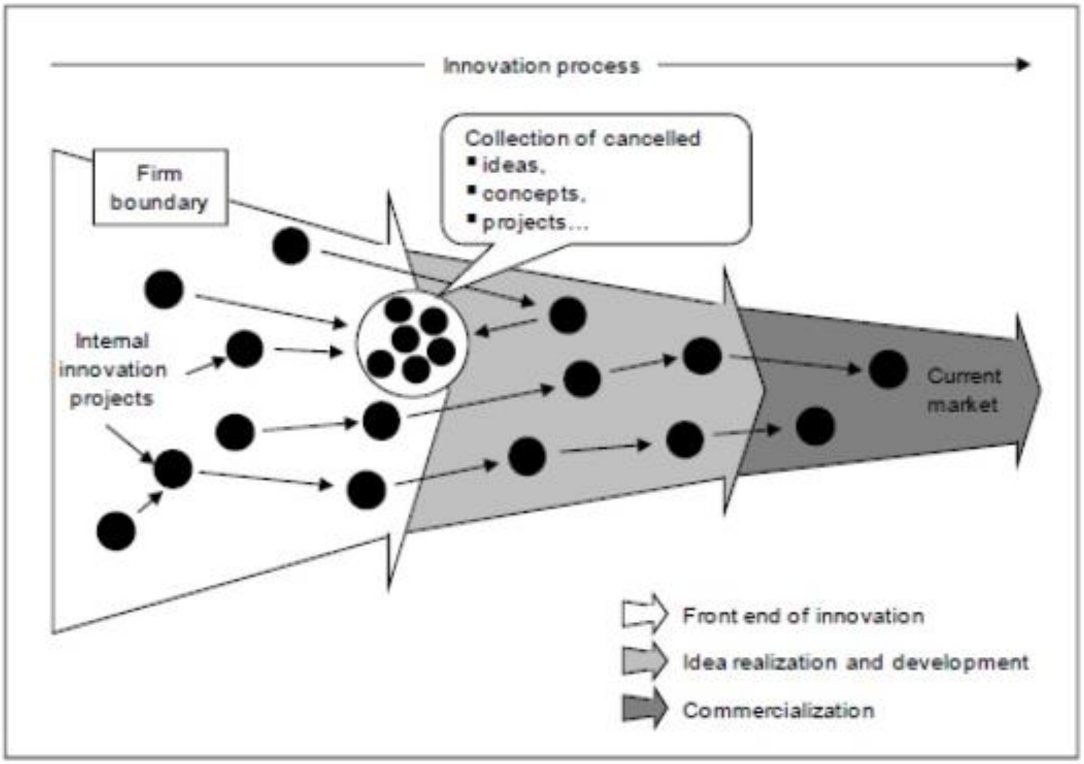


Figure 1: Closed innovation

Open innovation is a model which take up that firms should use exterior thoughts and interior thoughts, the interior and exterior pathways to the market, by means of they express to improve their technology. In addition, Open innovation developments associate both interior and exterior thoughts addicted to 16 constructions and systems. They develop business prototypes to define the necessities for these systems and architectures. Furthermore, the commercial paradigm uses both exterior and interior thoughts to generate value, meanwhile describing interior tools to claim some parts of that value.

Open innovation undertakes that interior thoughts can also be occupied to market over exterior channels, out of the present businesses in the firm, to produce additive value. The IVC adoption method and also a specific concentration place on various features of the innovation process (Chesbrough, 2006).

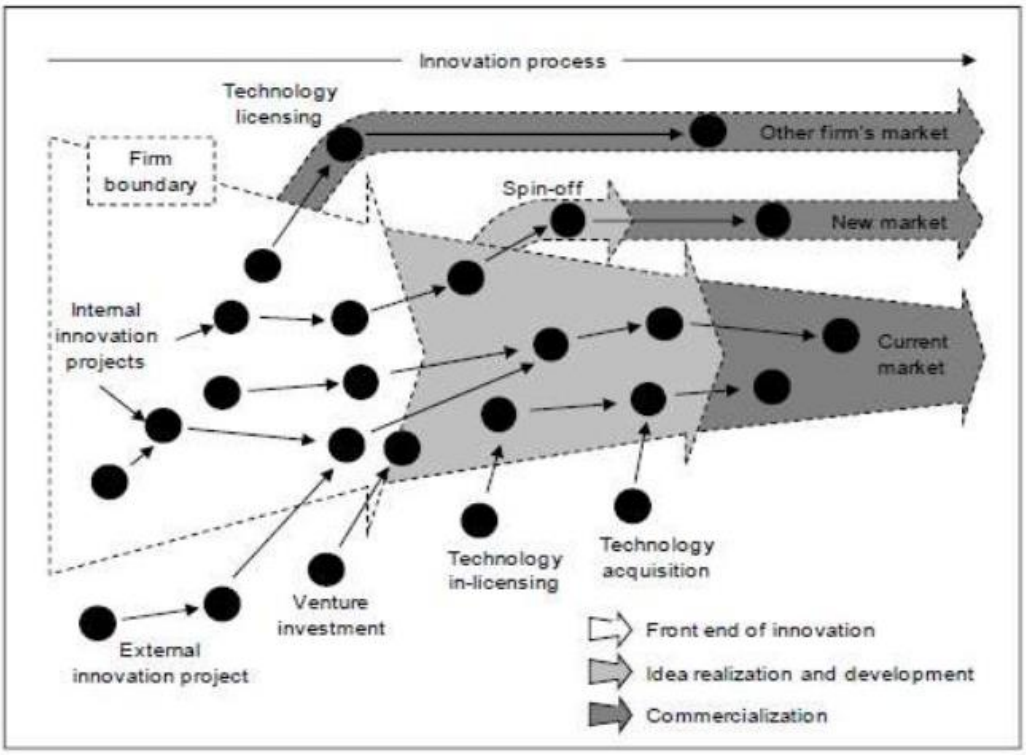


Figure 2: Open innovation

Figure 2 displays an illustration model of open innovation. Now, projects can be started from either interior or exterior technology bases, and a modern technology can enter in to the process at different stages. Furthermore, projects can enter the market in several approaches, such as during certifying or a derivative project company. Furthermore, going to market over the company's own marketing and sales channels. This paradigm is considered "open" due to the reason that there are countless approaches for thoughts to run into the procedure, also countless ways for it to run out into the market (Chesbrough, 2006).

2.7.2 Diffusion of Innovation

Distribution of an innovation is the quantity of period essential for a modern perception to be believed by a set of individuals (Rogers, 2003). Most researches on innovation distribution are based on distribution theory and main investigation of the distribution rate in different types of innovation inside a business. Moreover, five individual groups have been recognized to illustrate the dissimilar features to the distribution process: Innovators, Early Adaptors, Early Majority, Late Majority, and Laggards. Laggards can be defined as a training situation with participants of the individual group that acquire an innovation at a slowly rate. Furthermore, ten meetings were shown using contributors with at least those with a bachelor's degree and five years' experience with innovations and training. In addition, investigating in which way the sluggards interpret exercise and devising capability is to recognize stragglers initially in a preparation state that results in decreasing lost time and bound the volume of foundations used. It might also offer the apprentice with a developed self-efficiency and the wish to perform at a better exertion. The innovation definition is an impression or item that is stated as novel by a separate or extra element of implementation. Correspondingly, the meaning of diffusion is the system which a novelty is connected with sure stations over period between the followers of a social organization. Later, this system of a modern thought is to be recognized by a social group, which in many circumstances could be years (Rogers, 2003).

Somasundaram (2004) investigated the opinion where diffusion develops self-sustaining. On the other hand, the earlier this powerful point will be stretched, the earlier will longwinded more speedily. The outcome of an innovation when plotted out methods an S-shaped curve, representing the cumulative numbers of adopters for example, see Figure 3. Additionally, number of features of innovation have been

originate to impact diffusion containing proportional advantage; difficulty; experimental skill; and observability.

An innovation diffusion is a paradigm in its simple way concentrates on representing and explaining the embracing process as well as the innovation process diffusion in the aggregate level. The main meaning of innovation diffusion paradigms is to explain or foretell rates and shapes of innovation acceptance with time and/or space (Mahajan et al,1990).

Innovation diffusion paradigms based on well-established concepts in, psychology, sociology and communications. Moreover, they implement a very simple theoretical framework for understanding the diffusion of the innovation system.

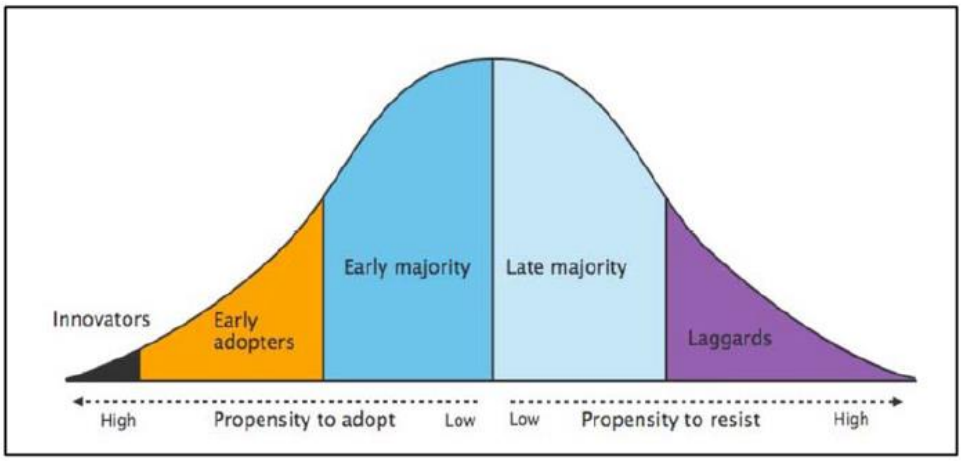


Figure 3: Diffusion of innovation

Diffusion research efforts to identify factors that increase the degree of acceptance of a novelty. In addition, the dispersal of a novelty is characteristically presented by a curve. Firstly, the degree of implementation is very low, and adoption is narrowed to supposed “pacesetters”. Subsequent to accept are the “primary adopters”, formerly the “late majority”, with the end curvature ends off as only the “stragglers” stay. Such

taxonomies are well by the usefulness of reflection, but adding slight leadership for coming designs of adoption. Figure 3: Diffusion of innovationFigure 3 shows dispersal of innovation, every group has it's their own personality. At least as its position to certain innovation energies. The best to think about the membership of each segment. Innovation diffusion promotes to encounter the requirements of succeeding segments (Tidd, 2006).

2.8 Novelty of Innovation

The detection of the novelty is the duty of categorizing the data of the test that vary in a lot of reverence from the data that are obtainable through training. In addition, this can be seen as "one-class institute", in which a paradigm is formed to explain the "normal" training data. Also, the novelty way is typically used when the quantity of available "abnormal" data is inadequate to make explicit models for un-normal classes. Furthermore, application contains implication in data sets from crucial systems, where the quantity of available normal data is very large, such that "familiarity" may be precisely demonstrated. Inventions may be occurred in anyplace, for instance: in colleges innovation ensue mostly in companies also may happen in many other types of organizations. In addition, in order to change the creation to an innovation, a company wants to gather many various kinds of information, services and accommodations, marketplace learning, a very good -operative spreading system, adequate monetary possessions, and so on. Moreover, it considers that the character of the modernizer, the responsible or the administrative unit who advocate himself for uniting the features may be more various from that of the inventor (Pimentel, 2014).

Forrester, Maute (2013) describes the environmental, process of innovation, and organizational connected are obstacles to innovation in tourist sector seem to be

carefully and commonly interrelated. Furthermore, most of acknowledged barriers emerge or tend to aggravate the borders between resident tourist business stakeholders.

Lisetchi, Brancu (2014) donates to clarify the relation between the two thoughts innovation and social innovation by determining the "socializing" trend related economic thoughts. Intervening time, by see-through the historic background and general definition of the social entrepreneurship thought are encouraging for the social innovation measurement of the social entrepreneurship concept. Furthermore, social economy organizations, illustrative the outputs of the social entrepreneurship process, are extensively innovating; both in terms of the organizational forms they developed and in the description of managerial activities. They are solving in modern and innovative approaches that demand the planning, organizing, leading, encouraging and controlling resources. People due to accomplish effectively and efficiently their purpose and objectives, basically connected to social needs. Invention and innovation have a significant dissimilarity factor. Firstly invention occurs a concept for every new processes and the products, meanwhile innovation is the next step to follow it out into practice.

In order to discover the difference in the procedure of innovation related to various stages of innovation. A different of experiential studies had revealed a novelty level of an invention powerfully impacts the features that form the presentation of innovation (Garcia and Calantone, 2002).

2.9 Systems of Innovations

Improving of both the innovativeness and technological concepts are outcomes of a very complicated data of relations amongst performers in the organization. According

to innovation system theory, which contains enterprises, universities and research institutes. Ren et al (2015) use experiential indication by means of panel data to test their paradigms. Although, they learn that the ability of research and development together with marketing ability are lowering the impact of internationalization on innovation performance. Moreover, since obstacles to international trade are worn by developments in technology and developments in means of transportation (Ripollés and Blesa, 2012).

Information among enterprises, institutions and people are keyways to the innovation process. It covers an interface among the performers which been requested to go a concept into a product and process. A concept of the systematic innovativeness compresses the producers of technology and service on the market. Knowledge and relationship movements with significant for all level of innovativeness with economic activity, comprising globally, intersect orally, spectrally, inter-firm, intra-firm, and interior-project (Manley, 2008a). The aim to both internally and between partners at local, nationwide and global levels (Swan *et al*, 2009).

2.10 National Innovation System (NIS)

Three decades ago, a development in (NIS) was extensively useful for academics and policy creators to clarify in what way connections among a group of distinctive, generally restricted associations ,supports, simplifies technical ,development and distribution of novel innovativeness. Watkins et al (2015) proposes a new research on mediators and might propose appreciated visions to different institution and the way of fixing.

Switzerland considers the most competitive country, as examined by the World Economic Forum. The paper published by Marxt & Brunner in 2013, the authors integrated and spread out a various concepts of stakeholders with (NIS) (Marxt and Brunner, 2013). Data are composed through a study of several stakeholders, containing academics and silicon wafer and solar cell firms (Lo et al, 2013).

Finally, a study describes a matrix to decision-making and produces proposals over a presentation development plan to assist administration and bosses develop the NIS presentation (Lu et al, 2014).

Morocco has presented in the late 90s a National Innovation System (NIS) to produce innovation as a driving force for economic development in a mainly competitive context. However, the anticipated dynamics of this system do not live up to expectations (Hamidi and Benabdeljalil, 2013). The notion of the NSI describes the significance of founding links among the numerous systems connected to novelty in growing the invention ability at the nationwide equal (Peace et al, 2010).

2.11 Innovation in Construction

Demir, Kocabaş (2010) describes there is sure trend and convergence in innovation in construction, it is progressively seen like a procedure which progresses the modest location of a company by recovering an extensive range to modern thoughts. Concerning management, is significant to theorize the process of innovation which cannot be divided to strategic and competitive context of a company because it lets aligning the operation method of the organization (Brookes and Clark, 2009).

Early research concentrates on innovation in construction which can be outlined back to seminal work by Bowley (1960). Although, innovation in construction established

incomplete care from researchers for many years after this, rarely being intentional with the same thoroughness as in sectors such as troposphere, communications and biotechnology.

The last decade of the research has step by step improved and grasped the point where a gathering of construction innovation books have been made containing (Gann and Salter, 2000).

A significance of the invention in construction been commonly sophisticated. Innovativeness may remain a keyway basis of modest benefit for building firms, proposing the means across a companies that may attain a customer's objects in a precise scheme (Slaughter, 2000). Innovation also allows corporation to positively contend with main changes happening in the industry. These variations include progressively modest and global markets, demand shifts, and client expectations for capital and operating costs to fall (Seaden and Manseau, 2001a).

A maturity model provides a systematic framework to carry out the comparative evaluation and improvement performance. These models lead the organization to strategically link it with continuous improvement of the current position of the organization in a defined desired future position. A research for other maturity models applied to different areas was carried out and two were found that resulted appropriated for the application under development. The first was the CMMI (Capability Maturity Model Integration) model largely appreciated due to its extensive adoption by different industries. Its purpose is to help organization to improve their processes for development and maintenance and allows approaching this improvement using two different representations: continuous and by stage .The second was a maturity model

related to risk management that resembles the kind of structure to be used for innovation management.

2.12 Examples of Innovation in Construction

2.12.1 Design Solutions

Gann, Salter (2000) and Kaner *et al* (2008) have detected obvious development in quality of manufacturing design, in expression of drawing of no-error, and a progressively increasing development in worker output by stratifying the BIM to four full studies. Eastman in 2011 stated that the potential usefulness of approving BIM is assessed in value of 2.3% to 4.2% of all cost for the specify project of precast concrete companies. The same author stated that BIM supports to achieve an upsurge of output extending from 15% to 41% prediction-in-place reinforced-concrete structures in the drawing phase (Eastman et al., 2011).

BIM cannot be very simple 3D model, but it is the system for developing a presentation over the all lifetime series of structures. Build on the identifications, BIM considered widespread variety of determinations, e.g., scheme and building mixing, job organization, with services administration. In addition, building info modelling is demanded to be a beneficial factor for dipping the building manufacturing's disintegration, developing its efficiency/effectiveness, and dropping the great prices of insufficient interoperability. Additionally, applications of life projects are considered practical environment factors in teaching and learning the students in colleges, e.g., architecture, engineering, construction (Lu et al., 2014).

2.12.2 Advanced Materials (Renewable, Improved and Innovative)

Nowadays the increasing overview of innovation constituents and technologies in the civil engineering arena is electrifying new predictions, tests, and chances. Innovation

of substantial resulted from the extension lead of materials to extensively been prepared in atmosphere and mechanical engineering, or of the increasing request for supportable answers such as reprocessing and desired construction materials. *In the* materials producing of the innovative materials are considered durable and compatible against environmental effects. Also, examination and plans are in need of re-thinking from basic main beliefs to improve new ideas and measures of security (Lorenzi et al, 2006).

2.12.3 Waste Management

The definition of construction waste is resulted from the comparison among values of materials delivered on-site and suitability in the using of the materials that are moved elsewhere due to harm. Ekanayake, Ofori (2000) made three groups of construction waste: material, labor and machinery and dividing the materials are more serious than of the construction waste, a high percentage of it arises of a non-renewable bases. It assessed around 40% of waste produced internationally arises activates related with constructing (Nitivattananon and Borongan, 2007).

Numerous writers have emphasized plans for waste minimization. Also, one of the strategies that often denoted to as 3Rs which indicates (reduce, reuse, recycle). Although, recycle and recycle 34 are the most economic possible advanced with very great effect. Investigators internationally have planned a form of eleven practices that help in the application of waste minimization. The performs are: calibration of plan, standard switch to reduce completed collation, green teaching to the labor force, adding the reprocessing and waste of the removal firms as portion of the source chain and on period/just in time provisions, fines to humble waste management, inducements (Hayat, 2012).

Waste management can produce numerous profits across the all growth of left-over of its proliferation till its last disposal (Henderson and Clark, 1990).

2.12.4 Off-site Manufacturing

Off-site Manufacturing is a production or construction performed not in the site place. The essential idea is to transfer some energy far away from the construction site to an extra controlled circumstances of the manufacturing ground. However, construction industry have come a long way with cranes, automation and laser directed precision construction; principally the concentrate of all these innovations is to move up the construction system, minimizing waste and inadequacies, maximizing quality, and developing health and safety (Arif et al, 2012).

Off-site construction, is explained in UK build on the Build offsite alliance as mainly exchangeable expressions which mention the portion of the construction procedure which prepared far of the construction site place (Gibb and Pendlebury, 2006). It produces additional agreeable of the operation concept to lean production as it needs advance level of replication and process control, and therefore has superior aim for providing the output, customer satisfaction and proceeds (Meiling et al, 2012; Osipova and Apleberger, 2007).

An extent of prefabrication series from the fabrication of separate basics of a construction to the remanufacturing of whole constructions can be joint into superior constituents, scheme expenses can be reduced due to the lesser dependence of expert labors and less resources requisite on work. Furthermore, when apparatuses' number is reduced, so it will result with less handling and production costs. Consequently, the full cost from manufacture to fitting may be deduct. Finally, (Khalili and Chua, 2013) projected Coordinating for Cohesion in the Public Sector (CoCoPS) structure for

organizing the gathering of building fundamentals in order to transfer outside of separate construction element way near advanced level prefabrication.

2.12.5 Information and Communication Technologies (ICT)

When, Evers (2015) investigated the possibility of the social innovation potential for ICT-enabling residence to upsurge participation in resident abundance risk management. In two causes study, the empirical findings of the research study highlighted the divergence of the citizens' role that authority convinced together with the citizens' role themselves in the practice. Technology forecasting is inevitable in modern society; however, few studies have assessed it under an innovation management framework. By employing the innovation readiness level, it has been assessed that the innovation performance of the 10 Emerging Future Technologies reported in 2009. The data-mining process, including a patent analysis and survey results, validates the following hypotheses. 1) Technological innovation activities involving the 10 Emerging Future Technologies have increased after their announcement. 2) A chasm exists in the commercialization process of the 10 Emerging Future Technologies. 3) Interaction between innovation practitioners is correlated with overcoming the chasm. 4) Government support is useful for groups having difficulties in overcoming the chasm. Those foundations stress the roles of technological forecasting when entrepreneur assumes the risk associated with uncertainty in commercializing emerging technologies ICT and innovation which mentions to the outline of ICT creativities to the organization.

2.12.6 On-site IT Applications (GIS, GPS, RFID)

Both Global Positioning Systems (GPS) and laser positioning sensors are very common in use nowadays. GPS can have many advantages to the automatic construction operation together with laser positioning technology. For instance, in the

case of installing positioning sensor to the excavators and for the construction manipulators. It will ultimately reduce the labor costs and progress engine performance and quality of the work, thus growing job efficiency in construction sites (Haas, 2002). Many technologies remained to use indoor location sensing such as GPS, inertial navigation systems, infrared-based solutions, and Ultra-wideband (UWB). Radio-frequency identification (RFID) which is the abbreviation of Radio frequency identification began to increase big impetus in the area of indoor location sensing (Razavi *et al*, 2012).

2.12.7 Robotic in Construction

The idea of construction automation is still in progressing and seeding phase but with continually developing and innovating the managing systems in construction sector, it can soon come in to the work. Additionally, the capability of robot system has been increased, in order to work in working environments (Bock, 2015).

Chapter 3

COMPETITIVENESS

3.1 Introduction on Competitiveness

The competition is the activate force of any market economies. Below modern contemporary circumstances, competition is influential for the business development. Furthermore, competitiveness is the most significant state for overall business prosperity. Competition, thus, is no longer regarded completely at national or international level, but, today is recognized as having a global dimension as well. Additionally, the European Union policies purpose to ensure not only a more favourable environment for SME start-ups but also further growth of the existing SME enterprises and achievement of competitive advantages to the European single market (Ahmedova, 2015).

Quality of products is considered as the best guarantee for long term competitiveness of firms and countries. Innovations are much more regionally concentrated than other economic activities and they are clustered within certain sectors and locations. The competitiveness factors change according to type of sectors or economic structures of the EU countries. Countries are innovating for economic prosperity. At the same time, companies are innovating for competitive advantage (Apak and Atay, 2015).

3.2 Concept of Competitiveness

According to a policy perspective, competitiveness is considered a multidimensional issue and a balanced multidisciplinary approach is necessary, and through practicing it precludes more quantitative methods (Davidson et al., 2012).

The strategic plans of the new 2014-2020 program design period be likely to concentrate on the European market economy for the 21st century and recognize the basic priorities headed for the accomplishment of smart, supportable and comprehensive growth. Furthermore, accomplishing these priorities will be thinkable through the support of competitive (SMEs), which measured the largest share between the enterprises establishing the national, regional and European economy. This consequences in increasing the interest is to investigate and reveal different features and encourages the search for novel managerial approaches to boost SME competitiveness. The research which is connected to the knowledge and construction process as the basic requirements to the green innovation activities and the international competitiveness (Ahmedova, 2015).

Both knowledge spillovers and innovation occur between novel identifiers of development and competitive circumstance in the world economy (Apak and Atay, 2015).

3.3 Competitiveness in Construction

Porter, Van der Linde (1995) suggested an association between sustainability and competitiveness. “Correct calculated standards can activate the innovativeness that reduced the cost of a product. In addition, novelties from raw materials for empowering the employment, therefore balancing the prices of refining environment

influencing and finishing the deadlock. Eventually, this improved resource productivity and creates corporations further competitive, not fewer. Conferring to (Mair et al, 2006) the accomplishment of workable building practices can lead to positive competitive advantages such as price saving from unwanted reduction plans, developed human improvement and recovered labor performs by plummeting the risks regularly related with dirty and unsafe construction places. Additionally, income increases from developed image, faithfulness, developed market admission and upsurge in duplication businesses. Adetunji et al (2003) supported out a questionnaire study in UK in some construction industries and found out that sustainability strategy and in effect reportage to stakeholders can assist increase contractors' reputation and business competitiveness.

Fergusson, Langford (2006) improved a framework discovering the relationships among conservational strategic development, competitive advantage and corporate performance improvement. On the other hand, improved environmental competencies add the chances for companies to profit competitive advantage that lead to developed commerce performance. Tan et al (2015) studied maintainable improvement in construction and suggested a framework to assist contactors progress in their competitiveness by realizing sustainable construction practices. In addition, the relationship between sustainability performance and contractors competitiveness had been verified and build on an experimental study.

Although, these profits decline after a highest point because of growing investment on sustainability. Since a longer term viewpoint, boundaries in supportable improvement would achieve much well than their participants. The aptitude of innovation and improving modern technologies and manufacture ways for sustainable improvement

would be more essential for nourishing competitiveness than old-fashioned competitive advantage issues (Porter and Van der Linde, 1995). Though, slight investigation been finished on inspecting a connection among sustainability enactment and business competitiveness. According to investigation of the World Bank there are several factors influencing the economy growth effectiveness and national competitiveness, containing organizations, substructure, market size, etc. Also, there are different bases, models, and analytical tools which are able to be used in reviewing the fundamental relationships among some main infrastructure issues and national competitiveness (Palei, 2015). The competitive location of an urban does not stay constant over time, it varies due to both internal and external issues such as the appearance of modern technologies, modern competitors and differences in the priority and desires of its goal groups. Furthermore, cities therefore want to appreciate the strengths and weaknesses that effect not just their own capability to participate but also that of their competitors. Urban competitiveness is a compound, multidimensional subject, so a rule of measurement has been formed build on an imitation index called the Urban Competitiveness Index (UCI), which encompasses various sub-indices representative its different dimensions. Moreover, cities therefore need to classify their competitors and calibrate where their competitive advantage lies if they are to accomplish development and economic/social viability (Sáez and Periáñez, 2015). The interrelated difficult elements that form construction segment attractiveness were positively exhibited to add a planned leader to support those concerned in agreement possession and carrying out. The model was worked out the information regarding to the powerful issues and sending them occasioned from manufacturing agents. It truly is an instrument for cogitation; one that notifies a company of conceivable (but uncertain) results. It go-slows in shrill distinguish to the traditional (static and cross-

sectional) numerical evaluation methods for competitiveness (Gilkinson and Dangerfield, 2013).

Innovation acts as an energetic role in nowadays fast altering business environment (Von, 2007). Today, most of the literatures provision that innovation means "redoing organizations for originality and development" (Balsano et al, 2008) and (McGovern and Hicks, 2006). One of the main causes for the declined level of help by manufacturing has been the incapability of the republic to build and retain competitiveness wanted to meet the global tests as well as to grow a larger domestic market during low cost production (Schwab, 2010).

Most of the works showed that the old-style dimensions such as price, quality, services, flexibility, etc, are not adequate related to get the competitive enactment subjects for nowadays competitive environment (Liu, 2013; Bierly and Daly, 2007). Today, the business environment is quickly varying because of increasing global inter-connectivity, rising request for innovation (Raymond et al, 2013). Additionally, technology modern product improvement in these studies (Bruch, 2014; Schrettle et al, 2014; Singh et al, 2008) are explained in details. Additionally, the future of globalization and industrial competitiveness is being determined by modern markets of new products. To withstand competitiveness in the global marketplaces an Indian manufacturing subdivision has a high pressure because of global competition and technologies altering (Mehrabi et al, 2000).

3.4 The Relation between Competitiveness and Innovation

During the last three decades, most of the works displayed that novelty is the key motorists to enhance the competitiveness of the manufacturing areas in India

(Burgelman et al, 1988). Therefore, in order to withstand the competitiveness in the global marketplace, they need to involve in a continuous development of technologies as well as innovation (Johnson et al, 2004). Firms of the Chinese catch the knowledge of technology from foreign companies, products imitation, do their advantage of low cost, and therefore producing of competitive products. On the other hand, this directed to Chinese firms' achievement in global competition as well as high manufacturing position in the international value chain. In addition, when laggard firms move from technology lag to frontier, as recommended by exploration on East Asian Tigers' practice in technology advancement, they create a planned shift from imitation to innovation (Sonobe, and Otsuka, 2005).

The Global index of innovation identifies that China is the considered the second investor among the highest R&D, only behind the US (Esty and Winston, 2009). However, there are very imperfect experimental research concentrating on the tool and operation process of copied innovation (Huang et al, 2010). In place of watching imitation and innovation as two conflicting excesses. Moreover, firms modify their position step by step by means of continual organizational learning and systematic development in R&D and technology competence. Imitative innovation is not only imitation. In other words, imitation just refers to replication and does not make novelty to the market, while imitative innovation makes novelty. It is the movement that firms improve new products or improve existing products on the principle of the innovation of other firms by addition of a new functionality, developing quality or dropping cost. In addition, imitative innovation is usually is an incremental innovation (Garcia and Calantone, 2002). Imitative innovation is defined as a process of 'learning by seeing and often engineering projects of engrossing new technology from overseas (Kim and Nelson, 2000). Furthermore, imitative innovators are often supporters of a new

technology/product in its late phase of the dispersal life cycle. Their derivative responses that will have the most effect on modifying the market and the rate of alteration and competitive dynamics in the market (Dickson, 1992). SMEs can meet various difficulties at various stage of the imitative innovation process and may need to belong various competence to implement the strategy positively as clear in the Figure 4.

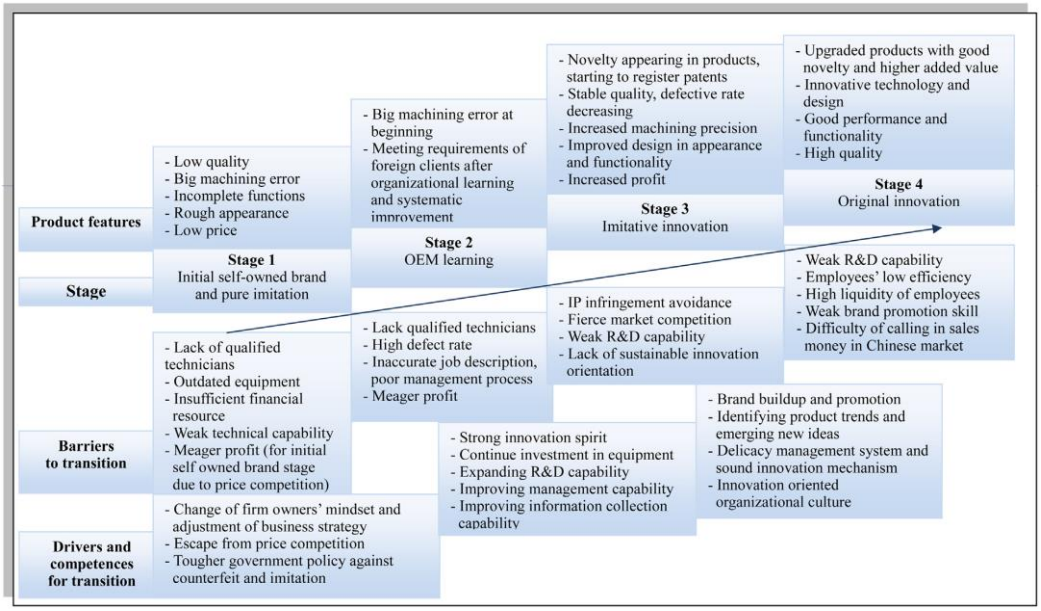


Figure 4: Product features, barriers and competences for transition from imitation to innovation

The firms' stimulation of innovativeness is basically impacted supplier and clients features. Precisely, they originate that in causes which customers and suppliers positions raise, companies are more probable to modernize. Additionally, if the income is made with insufficient companies, firms are fewer possible to produce innovation in product. Similarly, in the cause the companies have advanced amount of clients and suppliers, the innovation level of the companies become greater. Innovation and capability to innovate develop are vital for firms to sustain their competitive advantage. Customer location in innovation projects has a positive impact on modern

product improvement success and the degree of creation innovativeness rises in due course (Genis-Gruber, 2014).

The level of innovation of enterprises drive to competitive administrations, when the competitive marketplace is a leading power to innovativeness. In addition, as the company's marketplace possibility upsurges, the size of the competing firms will also rises. Consequently, firms have to create extra innovation as the competition develop severer. The discovery encourages the clue that the character of competition is considerable to the novelty actions of the companies if exterior features are measured (Genis-Gruber, 2014).

3.5 Enterprise Competitiveness and Factors for its Identification

The competitiveness theory has its basis in the 1980s and supplements the thoughts held by the establishing fathers of the classical economics Adam Smith, David Ricardo, Weber, Schumpeter, Sloan, Peter Drucker, Solow and others. According to the classical theory of finances, the concept of competitiveness touches its full progress in the 1990s to follow the publication of Michael Porter's works. In scientific publications connected to the matter of enterprise competitiveness there are marked differences of opinion this concept and yet there is a recent recognized definition of it. If the products are favored and purchased on an agreed market, then the enterprise that offered them shall be measured competitive. Yet there are others who trust that the pointers of the marketing level and enterprise management should be combined into products competitiveness (O'Farrell and Hitchens, 1988).

Enterprise competitiveness is believed to mention to competitiveness of product, efficiency of the product, financial position and effectiveness of organization in terms

of restructuring and sales and request stimulation. Competitive advantages emulate in higher productivity, and then in profitability. In addition, a company that has a capability to improve and support such opportunities that offer higher performance and sustainable profitability is measured as a competitive company. In other words, the level of achievement of a given industrial company is equal to its level of competitiveness. A wide-ranging repetition of the current works draws the researchers to the subsequent description of the concept of competitiveness: "Enterprise competitiveness is its capability over continuous renewal and development to make and maintain maintainable competitive advantages, leading to higher economic performance over long periods" (Singh et al., 2008). There is a group of writers who title that enterprise competitiveness is determined by its high resource productivity (Garcia and Calantone, 2002).

Using firm-level German data, Ab Rahman, Ramli (2014) conclude that the strong version of PH does not hold in general, the impact of regulation on competitiveness is heterogeneous depending on the type of environmental innovation. Liu in his research work in 2013, investigates both innovation and productivity responses to environmental regulation, provide by PACE, in Japan and Taiwan respectively (Liu, 2013).

3.6 The Competitive Index

A competitive index (CI) stablished to synthesize the impacts of numbers of issues to describe the multidimensional viewpoint of competitiveness in the constricting business. In addition, these involved cash-flow, postponements in finishing and beginning agreements, the sub-contracted employees with their provider relations. Figure 5 shows competitive index working details. It illustrates the (CI) for a company.

A typical example, there postponements are decreased claim which can be prevented, keeping an organization's status to go on and developing its Competitive Index. Additionally, the Competitive Index is efficiently an active fundamental performance explainer (KPI) for building competitiveness. Also (WI) symbolize the load allowed to the (CFI) in the building area or marketplace. They are detained immovable in any one path and will mirror the suitable allowances for an area.

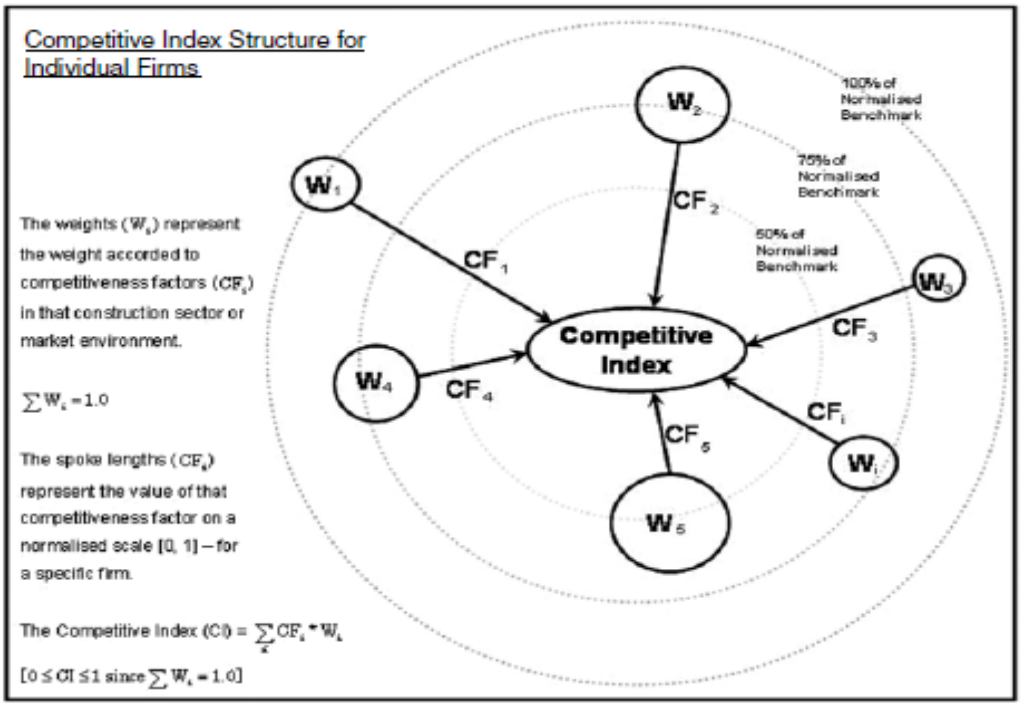


Figure 5: Competitive index working details

The masses need amount to 1.0. Furthermore, the shaft lengths (CFI) characterize the competitiveness magnitude issue for a normalized measure 0–1, for a precise company. Any resultant droplet in Competitive Index may stretch a very few share agreements of proposal in the marketplace. It recognized that a lot of exterior and interior contract subjects toward reflect for searching an approach to constant competitiveness (Gilkinson and Dangerfield, 2013).

For the company which do the contracting the chief exterior motorists for alteration are in request and subdivision of culture. However, the activities of challenging participants may impact the financial and monetary weather, for example, an established firm proposals wage increases to accomplished staffs. Such action can produce infection effects numerous interior effects. The capacity to create changes to suit the altering environment is what mention to dynamic competences: the grade to which the enterprise is satisfactory and flexible to change (Green et al,2008).

3.7 The Concept of Competitiveness for Cities

Begg (1999) stated that academic educations have paid more care to the conception of regional (provincial and urban) competitiveness. On the other hand, their attention has also extended the local and urban radical discourses. Moreover, numerous international organizations (European Union Commission, 2011; IMD, 2008; OECD, 2005) have distinct the term ‘‘competitiveness’’ in respect to lands. In political discourse, the impression that grounds, regions and towns. Additional room for maneuver through strategic movements to develop their competences and competitive edge is intensely rooted. Kitson, Martin, Tyler (2004) indicated that “law has competed forward of theoretical consideration with analysis of experience, and practices the term ‘‘institutionalized competition’’, build on the impression that government and public institutions which are mainly chiefly accountable for improving competitiveness in their regions and cities. Thus, in Europe, competitiveness has been recognized as a prime impartial in regional policy, and is measured as the most significant income of indorsing stable growth and regional cohesion (Enyedi, 2009; Hall, Smith, and Tsoukalis, 2001). The idea of city competitiveness was defined by Lever (1999) like a grade to towns may crop belongings and facilities which encounter the examination of broader local, nationwide and international marketplaces, whereas concurrently

growing actual returns, developing the managing of life for inhabitants with indorsing growth in a way which is supportable. In this description the writers take into excuse not just the economic profitability which a city need to be competitive, but also community profitability. This despicable that cities can also aid companies to be good or develop the main difficulty to their being so (Sáez and Periáñez, 2015).

As Begg (1999) embraces that competitiveness is a procedure of making and distributing competencies which rest not only on microeconomic features (businesses) but also on the capability of parts to suggestion features that ease economic activities. In other words, the impression is to generate a physical, technological, social, environmental and institutional situation which is helpful to attracting and increasing economic activities that can make wealth and jobs. The ideas of competition and competitiveness are related but not synonymous. It is the degree of competition that now exists between cities at domestic and international levels that services them to be competitive. Therefore, competitiveness develops a decisive issue for the economic growth of cities; when a city is talented of making a setting that is favorable to and appropriate for competitiveness it can be mentioned to as a competitive city.

The fact that towns participate with one another at national and/or international level does not mean that they cannot collaborate or even form partnerships to trial particular challenges. Although, such obliging arrangements are ultimately planned to make them more competitive (Borja, Belil, Castells, and Benner, 1997).So they collaborate in order to contend better. This is known as coopetition (Brandenburger & Nalebuff, 1996).

Makin, Ratnasiri (2015) in their work offer a new amount of competitiveness build on the ratio of non-tradable possessions and facility prices to tradable things and services values. Additionally, results founded on quarterly information from 1998 to 2013 propose that administration spending on non-tradable goods and services was the most important factor to deteriorate Australia's competitiveness. Accordingly, this proposals an alternative viewpoint on the effectiveness of fiscal rule to those formerly sophisticated in normal global macroeconomic replicas. Numerous issues impact an economy's competitiveness. Furthermore, from a macroeconomic perspective these contain financial and fiscal policy settings at home-based and overseas, as well as economy extensive salary growth. Factually, the real conversation rate has most often been examined with orientation to financial policy, value levels, interest rates, buying power and interest parity, rather than fiscal variables.

Although, competitiveness also theatres an important role in the classic Mundell (1963)–Fleming (1962) model for analyzing the efficiency of economic and financial rules in open economies. In Australia's circumstance, productivity presentation has been dominant to economic policy discussion, yet the macroeconomic part and effect of competiveness has mostly been ignored. The random decline in Australia's competitiveness from earlier of the century imitates inflation in the non-tradable sector (Makin and Ratnasiri, 2015).

A concept named the CI is used to design a bond sharing to a stylized market. Recreations explained permit the enterprises of contraction to mirror deliberately and an opinion for maintaining competitive of lengthier time horizon of from15 and 20 years (Gilkinson and Dangerfield, 2013).

3.8 Manufacturing Competitiveness

Porter in (1995) stated that the industrial strategy explaining was begun at the end of sixty's once Skinner marked that the manufacturing plan was a significant but missing theme. Afterward a related improvement by the Academia for more than three decades, is nowadays a commonly known description of the manufacturing-strategy (Skinner, 1996),

Yu et al (2015) reported that the "Industrial strategy is in effect usage of manufacturing powers as a powerful tool for the accomplishment of commercial and company goals". The research on industrial competitiveness taking place of the determining work on the competitiveness of countries by Porter (1995). He districted the local competitive work as a result of a state's capability to originally attain or preserve a beneficial position over other countries as well as improved quality and services. So that the product and services of the firms is standing in the global market (Newall, 1992).

Manufacturing competitiveness shows a tool role in the Indian economy and providing the Gross Domestic Product. It has been witnessed that there are numerous writers have been concentrated on defining the national competitiveness and other issues of competitiveness that can be affected to manufacturing industries to stabilize the global market. Over the past three decades, most of the investigators and practitioner defined manufacturing competitiveness like cost, quality, delivery, etc. In addition, it has been given less significance nowadays but want to be sufficiently decorated throughout the following decade of innovativeness (Raymond et al, 2014).

Chapter 4

RESEARCH METHODOLOGY

4.1 Introduction

The research is conducted by examining and selecting a collection of factors affecting innovation and competitiveness for the construction industry in Northern Iraq. Forty three factors have been selected and listed down into seven dimensions for both innovation and competitiveness based on the literature review.

4.2 Data Source

Concerning to the work of Brookes, Clark (2009), it is essential to give the kind of method would be used. A questionnaire examination is measured as the important source of data. Data is collected by the questionnaire delivered to large companies in Northern Iraq. Additionally, direct meetings with the contributors are coordinated. The form are intended to be precise, direct, guileless, clear and effortlessly understandable by all members.

4.3 Northern Iraq

Northern Iraq, officially known as the Kurdistan Region, is the only autonomous Iraq region. It has Iran from the east, Turkey from the north, Syria from the west and lengthways with the rest of Iraq from the south. The region is formally administered by the Kurdistan Regional Government (KRG). The capital of the area is Erbil or Hewler in Kurdish. The modern Iraqi constitution defines Iraqi Kurdistan as a federal region of Iraq. Moreover, the four governorates are Duhok, Hawler, Silemani and Halabja which include about 41,710 square kilometers (16,100 sq. mi) and have

an estimated of 5.2 million residents There is a big difference between Northern and the rest of Iraq. Northern Iraq is more developed. A lot of 5 star hotels, large residential complexes, big hospitals, luxury housing and infrastructure is built in Northern Iraq (Kurdistan Regional Government, 2014).

4.4 General Information about the Research

Northern Iraq construction companies produced an enormous demand for construction industry sector as in Figure 6. The real estate development, construction, and building material industries are all ready for investment. The huge number of construction projects in industrial sectors and infrastructure will require an advance innovation system in managing, designing, and construction execution .Additionally, opportunities are available across all areas and the already high request will continue to grow.

An in depth study about the factors affecting the competitiveness and innovation in Construction Industry in Northern Iraq has been prepared. In this study, the factors have been gathered from different resources such as papers and articles from scientific journals, and other publications. Also, articles available on the internet containing topics associated with both Competitiveness and Innovation in Construction Industry to understand the relation of Competitiveness and Innovation in Kurdistan construction companies and how they have been affected by each other. To guarantee the accurateness of the study outcomes, selecting new and related resources were occupied into attention while making this research. Additionally, Questionnaires have been sent through online websites and the hard copies has been distributed. Totally, 150 companies, 70 online linking and 80 through distributing hard copies and face to face interviews.

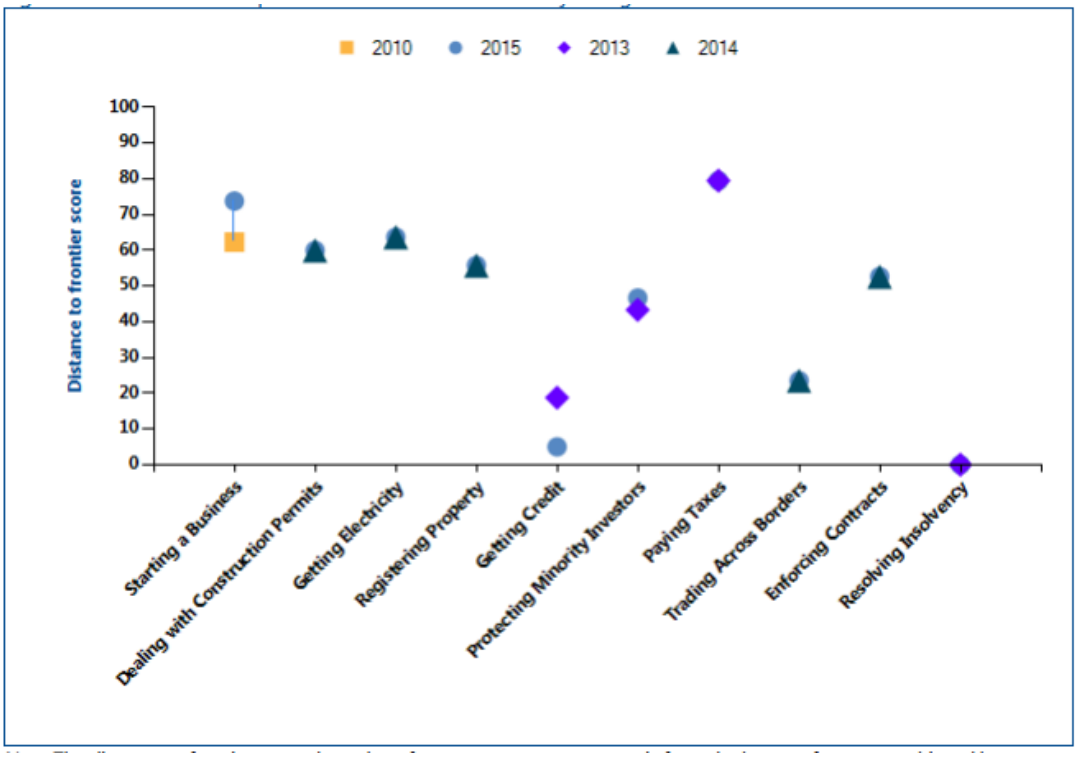


Figure 6: The Iraqi situation in construction and business in general for four years

4.5 Questionnaire of the Survey

Analyzing some significance factors to recognize its impact on the Competitiveness and Innovation has an important role in making a long-term strategic decisions for companies. In order to test its convenience for use, a research was considered and managed to industry specialists. “Quantitative Research” gives emphasis to the dimensions and examination of fundamental relations among variables, not process (Lincoln, 1998).

There is a vigorous and systematic approach to observe and measure advanced research paradigms meaningfully (Lincoln, 1998). In this thesis, a questionnaire survey analysis has been used by participating of 150 different companies as quantitative method of the research. The questionnaire was administered via e-mail to construction companies as well as by giving printed copies, 70 online and 80 printed

copies in companies established in Northern Iraq. The questionnaire form was sent to some construction related organizations like project management companies, designers, suppliers, sub-contractors and other small, middle and large scale contractors. The 85 completed questionnaires returned for analyzing out of 150 sent out. The rate of response was 57 %.

4.6 Population of Research

This research consists mainly of two directions (Competitiveness and Innovation) with examining the factors which impact them in different governorates in Northern Iraq, Silemani, Erbil, Duhok and Halabja. The data is collected from public and private construction companies. In order to conduct a dependable survey the questionnaires are distributed to people at several positions in the companies. The positions are supervisor engineer, executive engineer, company manager or owner, assist manager, designer, head of office (civil engineer), site engineer, head of engineers, direct commissioner, project manager and rapporteur of company's project manager.

4.7 Content of the Questionnaire

The questionnaires aimed to collect the appropriate answers for the factors which are asked through the form. The main aim of the target response was to explain the relationship between the factors those are connected to competitiveness with innovation. The contents of a questionnaire, which can be seen in the appendix in figures numbered from Figure 64 to Figure 71, contains two portions. The first one is associated to innovation. The second one is for competitiveness. Furthermore, the first part consists of two subparts, general information and innovation questions, and they have been written in English and Arabic languages. The questionnaire contains 49 questions, grouped into three parts A, B and C:

The part A consists of two parts the first one is organized to examine over-all info of answers with experience. The key goal from asking the company about their information was to make an appropriate profile of the respondent companies in Northern Iraq. The demographic evidences about the companies are grouped by seven questions about the name of the company, the years that companies have been in the sector of construction, areas of expertise, and the type of projects that executed by each company as well as the total annual turnover of the company. The number of employees in the company has been asked and the job title of the respondent. Finally, they are asked if they satisfy about the importance to follow such innovate system in their company's work. The second subpart consists of 24 questions about five different dimensions of innovation: Inputs, Drivers, Barriers, Enablers and Impacts.

Part (B) consists of 18 questions that have been asked to indicate the role of competitiveness and it's relation with the innovation in contracting companies in Northern Iraq.

The following tables (1-6) illustrates all the factors and their associated sources of references.

Table 1: Input factors and their associated sources of references

	Inputs (Ozorhon et al, 2009d)
1	Capital (investment in ICT, Software, and Equipment)
2	Research and Development Expenditure (R&D), and (R&D) projects
3	Number of Employees who Devote to Innovation
4	Consultancy (To provide valuable advices)
5	Internal and External idea generation

Table 2: Driver factors and their associated sources of references

	Drivers
1	Customer Requirements(Ozorhon et al, 2009d)
2	Technology Development(Ozorhon et al, 2009d)
3	Regulation and Legislation(Beliz, 2010)
4	Project Performance Improvement(Oral,2009)

Table 3: Enabler factors and their associated sources of references

	Barriers
1	Unwillingness to Change (Oral, 2009)
2	Lack of Technology (Oral, 2009)
3	Lack of Experienced and Qualified Staff (Oral, 2009)
4	Time Constraint (Oral, 2009)
5	Financial Constraint(Almedova,2015)
6	Government Policy(Ho et al, 2015)

Table 4: Impact factors and their associated sources of references

	Enablers (Oral,2009)
1	Collaborative Partnering
2	Commitment
3	Reward System
4	Education and Training Policy
5	Early Contractor Involvement (ECI)

Table 5: Barrier factors and their associated sources of references

	Impacts(Oral,2009)
1	Improvement of Experience
2	Improve Competitiveness
3	Increase in Technical, Organizational, Management Capability
4	Short and Long term Profitability

Table 6: Competitiveness factors and their associated sources of references

	Competitiveness
1	Research and Development(Matsumura et al, 2013)
2	Adaption to Change(Matsumura et al, 2013)
3	Rate of Marketing Budget(Bughin et al, 2010).
4	Motivation and Employ Satisfaction(Rusconi, 2008)
5	Strategic Management Plans(Barney, 1991)
6	Change of Target Market(Makin & Ratnasiri, 2015)
7	Level of Success(Walker and Brown, 2004).
8	Intellectual Property(Patents, Brand Registration)(Oral,2009)
9	Information Communication Technology(ICT)(Cosgrove & Borowitzka, 2010)
10	Internationalization(Kunday & Şengüler, 2015)
11	Pioneering Leaders(Komppula, 2014)
12	Improvement of Experience(Sekuloska, 2014)
13	Short and Long Term Profitability(Hasun, 2011)
14	Product Competitiveness(Makin & Ratnasiri, 2015)
15	Accounting and Financial System(Islam,2011)
16	Level of performance(Ab Rahman & Rami, 2014)
17	Cooperative Working Atmosphere(Barney ,1991)
18	Company Culture(Yeravdekar & Tiwari, 2014)

4.8 Innovation Research Dimension

Here are the list of construction innovation activities which are asked to questionnaire participants in order to implement their projects. The questions meant to identify the various innovation purposes by a Likert Scale (1-5):

1. To which level do the following issues facilitate the innovation of the company? (Inputs).
2. To what level do the following issues are able to make the necessity for the company to modernize? (Drivers).
3. To what degree do the following issues impede the uptake of innovation in the company? (Barriers).

4. To which level do the following characteristics provide a promotion by applying an innovation for the company? (Enablers).
5. To what extent does the company influenced by the external sources of innovation for the company? (Impacts).

4.8.1 Inputs

4.8.1.1 Capital (investment in ICT, Software, and Equipment)

By investing in a modern knowledge, R&D and organizational practices, construction companies can growth or extend their innovative experiences (Cohen and Levinthal, 1990; Teece and Pisano, 1994). In this time, the projects of constructing are more troublesome than in the previous time. The financial investing are being enlarged, holds several disciplines, extend scattered job contributors, more limiting timetables, hard goodness standards etc. All the previous issues united through great quick progresses in (ICT) and impact the job managing performance. Also it forced us for using a new advantages of recently advanced managing factors and the modern technology. Investment in R&D events may need the progressing of novel technology. These activities are ranged from main R&D labs to grow a modern computer program specifically or machine. This strategy includes setting priorities which build on the difficulties of situated operations and increasing new technology as well as specifying assets and effectively managing development activities (Tatum, 1989a).

4.8.1.2 R&D and R&D Projects

Construction experts see the research and development is a part of their project managing and not count it as a precise power to make improvements. Meanwhile research and development spending is the main exponents of innovation. Although, this may not remain applicable to firms recording their expenditure in research and development. Numerous metrics are measured in the literature for defining the inputs

of innovation. R&D expenditures can be calculated as the gross value involved by all manufacturing companies consumed on research and development, while the overall expenses done on innovativeness are considered as the proportion of the whole income of manufacturing companies expended on innovativeness (Hesen and Faber, 2004). Depend on the work by Milberg (2004) ranking of innovation input features are recorded as R&D (funding, intellectual property, patents, and scientific publications), talent (human capital, education, competencies, and experience), capital, and networks (knowledge communities, linkages, collaborations, public/private partnerships). The knowledge molded in industry, universities and government study institutions is clearly another elementary input for any innovation system (Özorhon, 2009d).

4.8.1.3 Number of Employees Who Devote to Innovation

One of the significant resource in the construction industry was considered as "human resource". Warszawski (1996) stated that human resource perhaps is the most serious resource and key to achieve the innovative manufacturing industry. Additionally, the relation among the accomplishment of different plan and human resources is also stated by (Van de Ven and Sun, 2011). Tatum (1989) discovered that companies that raise the innovativeness regularly, have managerial structures to preserved elasticity in unit size and arranging in groups in order to let maintaining the innovativeness process. These administrations did a hard work to take distinct links for interior and exterior organization (Ling, 2003). To specify the knowledge held by personnel, the European Innovation Scoreboard (EIS) specify employee's percentage of hardworking effort with specific educational accomplishments as an additional. This substitution is based on the assumption that the more advanced the attainment, the more likely the people are acquainted of knowledge and are capable to capture knowledge for value formation (Commission of the European Communities, 2004). Another amount

planned by the OECD (2002) is to use the full time equal (FTE) value of R&D personnel. FTE is distinctive by the Frascati Manual (OECD, 2002) as adding the true volume of R&D. It is a measurement of the man-year utilization of immaterial and non-replicable knowledge exist in in researchers. Past studies, have similar quantification of knowledge and services in examining their influences on construction innovation. For instance Na *et al* (2006) and Lim *et al* (2010) have employed FTE as amount of the research abilities of construction firms. The contribution of each worker builds on numerous limits such as experience, effort, skills and education (Kafouros, 2008).

For the construction industry, innovation often create from the on-site to resolve instant problems and do not continuously need expert. Consequently, measuring R&D alone may be inadequate. To recognize the influence of experience, effort, skills and education of the construction personnel on construction firms' performance in innovation, a suitable substitution for the human capital of construction firms' innovation must be expressed not only in FTE of research and development personnel, then with the FTE of non-research and development personnel in innovation activities (Na Lim and Peltner, 2011).

4.8.1.4 Consultancy (To provide valuable advices)

The innovation usage might need distinct incomes (e.g. some machines or skilled persons) also the resources can just be existed through special firms. Hence, the third contemplation of combination for innovating to a precise job is the kind and foundation of distinct assets (M. Slaughter, 1998). Innovation resulted from distributing of thoughts in general discussions. Resources used by advisors to raise competitiveness innovation contain employing relation with principal customers encountering important trials; association with machinery contractors to comprehend predictable

modern technology; formalization and systematization of planned or engineering practices; with gathering the previous knowledge in records, information administration methods or knowledge manuals.

4.8.1.5 Internal and External Idea Generation

4.8.1.5.1 Internal Idea Generation

Administrators may have numerous action to simplify the interior direction and unusual kind of response which are compulsory for the innovativeness system. Technical transmission between energetic plans is a significant form of internal communication. For instance, several firms conduct periodic planning meetings involving the re-presentative from a specific discipline, such as electrical engineering or construction on numerous projects. It raises interconnected concerning mutual difficulties and innovative answers. The plan includes locating precedence built on the difficulties of situated processes and increasing the modern technology through allocating money and efficiently improving activities of improving (Tatum 1989a). Incremental innovation seem extremely frequently inside the organizations that contain the information, familiarity, and control to the developments which may be any of the organizational kinds recorded as references (Slaughter, 1998).

4.8.1.5.2 External Idea Generation

The technological management innovation is required for firm jobs and doubt through organizational borders, through systems of inter-reliant providers, clients and controlling persons. Information is distinguished with dispersed through these grids. Below the situations, the experience technical management has develop an important planned thought for providers and workers. There is a necessity for reliability of info between dealers, designers, engineers, constructors, (Gann and Salter, 2000).

Applied journals and trade magazines might account responsively linked research, but rarely define original building approaches sophisticated on innovative jobs. Possibly extra important is the capital of modern knowledge advanced in other industries, such as manufacturing with atmosphere that has important probable works in construction. Sophisticated apparatuses, lasers, and regulator systems are some few examples (Tatum, 1989b).

4.8.2 Drivers

4.8.2.1 Customer Requirements

Customers may have a positive agent to increase the innovativeness by providing a compression on the job contributors to develop the total act, with assisting them with plans to overcome with unexpected variations. They can extend the innovation driving by asking for great standards of job and by defining a precise original necessities for a job (Seaden and Manseau, 2001b) (Harty, 2005).

The customer acted an important role in the project and formed a helpful environment for a novel idea (Ozorhon et al, 2013a). Information and monetary facility, efficient management, with distribution of innovation are amongst the important character which customer might play (Anumba et al, 2008). Clients have optimistic character (public or private) in subjects of innovation. Moreover, customer supplies as the main motorist of inventive keys in the construction side (Ozorhon et al, 2013a). Customers indorse invention in structure plans over their supporting characteristics containing proactive participation, info distribution, and effective organization (Kulatunga et al, 2011). A champ to drive the construction business, important care is rewarded on the possible character of the manufacturing customer appealed that the customers must not only have part, but must take the headship to push innovativeness in construction (Lim and Ofori, 2007). In a report presented by Fairclough (2002), an obligation a

government as a main customer of the construction manufacturing to its progress is emphasized. Alternatively, the building customer is observed to an association or responsible person which may organize and straight the construction process to innovation. The effect of customers stimulate companies and persons to innovate. Some of the customers had precise needs and loads focusing sustainability, a typical example, an tremendously great energy competence ratio, and activated designers to adopt to innovation answers and philosophies recognized two chief drivers: business social accountability and customer demands promising constructers to assimilate sustainability in their progressing (Tookey et al, 2011) (Osmani and O'Reilly, 2009).

Customers who accomplish interior (R&D) or project designs, have been used innovation in the past, or preserve long-term relations with the similar inventers/contractors are originate to greatest set the requirements for innovativeness performance on a job (Nam and Tatum, 1997). The main customers have dedicated themselves to bucketing frontward the modernization of the construction industry. Additionally, the public sector has an energetic part to show an important growth of additional sophisticated and difficult customer base for construction.

4.8.2.2 Technology Development

The construction business is disjointed according to the participation of numerous parts and stages complicated in a building job, there occur problems in certification, communication, and coordination. While, the usage of IT can assist overwhelming these problems, principally web-based systems (Nitithamyong and Skibniewski, 2004). Consequently, the firms' container may use the web base systems to distinguish themselves (Budayan, 2013).

To encounter, persuade, or classify owner's stresses or projects difficulties, the designer's or contractors' diverse mix of technology need be entirely measured in the process. Furthermore, their banks of technology, disjointed and self-motivated in nature, ought to be rationalized endlessly. Moreover, the designer or servicer necessity effectually accomplish the process over which modern technological info flows in from numerous sources (Nam and Tatum, 1997). The select of technology in construction establish under circumstances which is not typically possible to test the full prototypes scale. Imitation and displaying is thus of countless significance in front-end decision-making, scheduling and accomplishment. Invention explanation, growth, simulation, testing and manufacture typically include the transmission of information inside composite nets of contractors and contain a great amount of connections among many diverse authorities. Instead of the deliberate rate of technical progression in many sections of the construction manufacturing, numerous kinds of companies source modern skill. This comprises modern resources, apparatus, and gears industrialized exactly for construction and also taking new technology from other industries, e.g., atmosphere and industrial, that have possible construction applications. This power agrees to the "technology push" procedure recognized in other industries.

4.8.2.3 Regulation and Legislation

Policy controlling shifts might generate a structure which technical innovation. Generally regulations purpose to administer the behavior and the time instructions which remain sensitive to moving marketplace circumstances and technology (Breyer, 1982). The advanced regulation procedure is complicated, depend on the information of vital performers. The degree to industrial technological alteration is promoted by locating standards based on the obtainability of new knowledge as well as an expansion of appropriate mechanisms. Porter contends rigorous rules for performance

of product, security and ecological effect may generate reassuring the firms to apply the innovation, developing technologies and the work quality (Porter, 1990). Compulsory standards which power technical growth are in effect exactly due to their elasticity in convinced zones. Through impressive necessities which are very severe to present technology, the manufacturing power to grow the modern technology to conform. Great principles might consequently encourage request for developed technologies those could be tardily ineffective. Regulation can encourage innovation and progress firms' competitiveness. Clearness and easiness are wanted for governing procedure to allow a respectable preparation and boost invention (Manley, 2008b).

The relationship between clients and manufacturers were in a case dumped by government environmental regulations. In the examined case studies that customer applied for representation of attentiveness to aid for encountering Australian administration orders to supply consumption, and to decrease energy consumption. A typical example is, to decrease the usage of energy in many national administrations ask their activities to bond only individual structures having a five-star energy assessment from the Australian Greenhouse Office. Numerous environmental assessment schemes offer important inducements for Australian and their firms of construction to encounter and surpass greatest training. (Manley, 2008b).

4.8.2.4 Project Performance Improvement

Markets and production globalization together with new areas of economic progress generated stress to companies in construction to develop the approaches, complicate engineering and building projects may be prepared on the scheduled time, according to financial plan and to identify the value. They also demand to develop lifespan performance features with adding the elasticity in seeing unexpected variations in request (Gann and Salter, 2000). Naturally, the firms and company which are in private

sectors belong more elasticity for accepting modern technological devices than public institutions. Also the growing competitiveness in the U.S. This outcome in U.S. results with asking for the financial needs for constructing projects. Due to see this request, workers are observing aimed to well-organized and creative incomes of construction which innovativeness can offer (Goodrum and Haas, 2000).

4.8.3 Impacts

4.8.3.1 Improvement of Experience

A very effective communication with the field services in the case of using very modern technology is a perfect chance in order to achieve operator effort to improvement with more innovativeness. Gaining the knowledge in the technology usage can offers info to support the preparation and assessing in order to use it in the projects in future time. Immediately when a modern technology is applied on numerous altered kinds of works, with positive results and demonstrated profits in a lot of applications, it may consider as a regular exercise to the company. Additionally, these requests consciousness with approval for every practical basics included in project works (Tatum, 1987a). The corporations achieve the experience over the innovation which can be useful to future projects.

4.8.3.2 Improve Competitiveness

Since Competitive Strategy in the Porter's landmark book was established in 1980 as a first time, the word 'competitiveness' has achieved reputation quickly and become public jargon both in business and in research. In the construction zone, competitiveness has also become one of the newest topics, and subsequently, many of research studies are published. The research goals to investigate methodically what they distinguish about competitiveness in construction. It will benefit entrepreneurs to

grow a body of knowledge about competitiveness and to notify their competitive strategies (Flanagan et al,2007).

4.8.3.3 Increase in Technical, Organizational, Management Capability

Using the experience of technology in the applying of projects frequently results in a richness basis of thoughts for upgrading. Also giving the chances, arena labors to cooperate with engineers and mechanical expert in order to progress approaches the capacity. It contains both recent hardware and recent technology systems to get benefit from the current apparatus and tools. Furthermore, the stage highlights the assistances of experience for numerous works consuming parallel technologies and the necessity plans of transmitting experience between projects (Tatum, 1987a).

4.8.3.4 Short and Long Term Profitability

During the work with unchanging conditions, providing the innovation will add a strategic usefulness plus successful development with growing the reputation for firms and companies (Christensen and Rosenbloom, 1995; Hampson and Tatum, 1997). However, the usefulness of projects that based on innovation do not cause the rapid grow in the expected costs, the company usefulness in having the strategic competitive plans as well as increasing in the project numbers will encourage the use of innovativeness (Slaughter, 2000).

4.8.4 Barriers

4.8.4.1 Unwillingness to Change

There are a lot of industries are extensively stated to have mainly unsuccessful task in order to apply modern approaches and styles of process (Reichstein, Salter, and Gann, 2008). In the global framework the construction has been approximately criticized as unhurried as engross novel organization practices and new technologies (Fairclough, 2002).

A refusal inside organization management for recognizing the long-standing compensations of organizational and national alteration, compliant in its place a small project earning process". In addition, management provision is needed to break the employees' confrontation to alteration (Cole, 2003). To breakdown the struggle to change in the construction firm, the managing executive has to be as an innovation winner (Ozorhon et al, 2013). However, human resistance to modification in the construction manufacturing has a lot of rare to construction innovations. Moreover, the construction business completely is a traditional in commerce through risks. Contractors frequently prepare a work through income and approaches that have established lucrative in the past (Goodrum and Haas, 2000). A study on issues that outcome in confrontation to variation in the construction work industry is extensive.

4.8.4.2 Lack of Technologies

Companies that have maintainable policies incline to be technological leaders, as they search imaginative new methods for growing efficiency, e.g., by dipping pollution. In so many cases, these businesses are capable to come out with new, advanced products that outstrip most of their competitors (Hardie, 2010).

A modern constituent should gain receipt not just the final through buyer but from the diversity of consultants as well, suppliers and tradesmen who can mix the modern constituent into their individual processes. Many advantages need to accumulate the whole portions of the chain or the alteration which probably is hard to contrivance (Hardie, 2010).

4.8.4.3 Lack of Experienced and Qualified Staff

Modern technological devices frequently need modern approaches of functioning and discerning, i.e. need change. Alteration, may barely established, not be in effect without a "good" and "disciplined" staff that armed by the "suitable" services (Gurjao,

2006). The progression in new substantial, equipment, organizations, procedures, and performs require the outline of new services not to reference improving remaining services (Construction Skills, 2008). Services verbalized through alteration regularly need operative rules for teaching with exercise to aid grow and "refinement" the skills. In the admiration, policy creators remain obligatory for describing and amount those services (Nadim and Goulding, 2010).

Education is understood as a main constituent of the potential solution. The fundamental problems vary though, typically counting demographic propensities that see young people picking to assume vocational training, rather favoring the advanced education way and vocations in additional sectors. The copy of the building sector as unsafe, wearing and thankless was also seen as a main blocker of inward talent. An effect of the declining numbers of persons pending into the sector and the obligatory workforce retiring is the corrosion of knowledge and skills. Davidson et al (2012) reveals that the skills and difficulties can be displayed in services deficiencies and/or services space in work.

4.8.4.4 Time Constraint

While time is one of the greatest precarious factor in structure operations and has important legal significances. The project possessor sets rigid beginning and ending dates for the construction process. Postponements are pricey and are precisely talked in contract documents in expectation of discharged and other compensations. Valuing in construction can be lump sum, cost plus, transferred, or unit price. All valuing in construction be contingent on the time that the contractor controls it will take to whole job. Barring any conditions produced by the project owner and outdoor of the control of the servicer, the contractor should meet the time usual by the project proprietor or lose money. Time issues are even more complex in construction since the working

atmosphere may be separate for part or all of a project, which means that development is effected by weather conditions (Benton *et al,* 2010).

4.8.4.5 Financial Constraint

The financial need resource is the greatest serious mean and distinguished facilities for firms by original plan growth. So, monetary capitals were measured as a significant resource (Budayan et al, 2013).

Different approaches of thoughtful arise about the role of industry-based issues in innovations. The project founded nature of the construction industry delays the innovation process, as the period for the return on investments for innovation may be longer than the project period, or an innovation process/product assumed in one project control not be valuable in another. The concerned that retaining the hazards of innovation is not possible as the projects are not monotonous in nature (Dikmen, Birgonul and Artuk 2005).

4.8.4.6 Government Policy

There are a lot of studies that have been examined the politics perspective and finance. Political topics contain with political events, such as, government policy (GP), political connection (PC), political intervention, elections, and corruption. Amongst the trainings linked to politics, Belo, Gala, and Liu concentrates on the impact of the GP on government expenditure on the stock returns of firms (Liu, 2013)(Ho et al, 2015).

4.9 Competitive Advantage

Competitive advantage is concerned with the capability to gain returns on exploitation regularly above the average for the industry (Porter, 1995). Other researchers such as Barney precisely distinguished that competitive advantage might be determined in a case if the company realizes a generating strategies which is not instantaneously

become applied through any existing or possible competitors (Barney, 1991). On the other hands, researchers recommended the simple kinds of competitiveness advantage connected to actions for the one that a firm looks to accomplish them resulted with three common strategies (Green et al, 1993) and (Allen and Helms, 2006).

4.9.1 Enablers

4.9.1.1 Collaborative Partnering

Scholars argue that successful innovation often requires effective cooperation, organization and working relationships between the various parties in construction projects such as the contractors, subcontractors, providers, architects, engineers, clients, the government, universities, etc. For instance, strategic joining among the customers with the servicers, initial participation of workers, and companies performing chains have been experiential to consume the trust build sides and become committed to innovation. Construction schemes include the cooperative impact of numerous organizations. The similar code is available for applying innovativeness in construction (Ozorhon et al, 2013).

Associating includes two and may be more government job composed to progress the work done level and structural the agreement by relations joint purposes, inventing the method for deciding arguments, and obligating to incessant development, calculating development and distribution aids (Egan, 1998). Applying modern goods and processes typically need concentrated R&D, substantial asset, strong promise, and cooperative joining amongst the supply chain (Ozorhon et al, 2010).

4.9.1.2 Commitment

In order to make the innovativeness to be successfully worked, it is important to have the stakeholder's commitment. A good team to do a strategic plans and willing to determine the alternatives. Also, inter disciplinary association together with the team

of designers are essential for commitment of innovating success of the work. There is also a need for the key persons, who carry a role of gate keepers in order to indicate the external technological factors and champions for absorbing the risks during the innovation (Tatum, 1984).

Top hard workers in innovative companies display to have the active responsibility of making decisions and belong sufficient technological experience to do so (Nam and Tatum, 1997).

4.9.1.3 Reward System

It is mentioned in the paper published by Tatum (1989), the companies that boost the innovativeness already belong an administrative structures that preserved elasticity a scope with alliance to provide the innovativeness to the jobsite. The administrations prepared a power to belong distinctive connections the exterior and interior associations. The good innovation might provide a reward system in order to indorse innovation. Additionally, they created that improved co-working innovators and administrations inside a specific project might result with a successful innovation (Dulaimi et al, 2002) and (Ling, 2003).

4.9.1.4 Early Contractor Involvement (ECI)

Early commitment in projects is essential approach for increasing trust among parties and thus enabling innovation. In addition, initial participation of the contractors is serious in finding a trust build on association for simplifying the workers' aids in a project stage. Cooperation and growing incorporation by primary participation of workers are supposed to assist team memberships attain well-organized and value-adding answers. Early Contractor Involvement (ECI) includes the formation of a contractor/design advisor team, ran by the contractor, which provides for the deliberation of build ability subjects previous in the design process, principal to shorter

construction times and reduced effects throughout construction. The advantage of ECI is that it utilizes workers' unique thoughtful of construction procedures to optimize the design and distribution process. The change is, as the name suggests, that ECI contains the contractor far past. With ECI, the contractor enrolls the group right at the start and is convoluted with planning, evaluating buildability, cost approximating and value engineering (Briscoe et al, 2004).

4.9.2 Competitiveness Dimensions

The factors related to competitiveness dimension are explained below:

4.9.2.1 Research and Development

According to Matsumura et al (2013), the formulating of a duopoly model of enterprises focused on an associated revenue ,the individual profit and examines the relationship among R&D expenditures with the level of competitiveness in a market. Later on, they measured a non-routine connection between the two variables. Meanwhile, at the time that the duopoly market is not completely competitive and once it is tremendously competitive, research and development activities are focused. Subsequently, they were able to bring associated outcomes to both the pro-competitive and the Schumpeterian views in one framework. Furthermore, they also discuss the welfare interpretations of fluctuating competitiveness and mirror status of oligopoly and R&D association as provision principal to their principal model.

4.9.2.2 Adaption to Change

In the study clarified by a group of researchers showed the partnership between a region revision and worldwide trade to modify in the environment and financial specification for finance adaptation (Schenker and Stephan, 2014). It links concepts of a theoretic framework of North-to-South change over the recognition of an identical multi-region multi-sector measureable popular symmetry model which gained the

effects of the variation in the climate and the adaptations to it. Besides, evaluating the influences of fund adaption identifies that adapting fund in improving areas may be Pareto-developing.

Moreover, objects in trade growths with very high and medium revenue contributor states may switch moving prices and consequently result with a net-welfare development in practically any manufacturing region without North America.

4.9.2.3 Rate of Marketing Budget

If you are a leader of a minor industry or a very rich and financially prepared company. The market work is a vital to the success and development. Nevertheless, there are a lot of small skills without assign adequate currency to promoting or, inferior, devote it randomly. Numerous work assign a proportion of a real or predictable gross incomes which is most of time is from 2-3 percent of run-rate and from 4-5 percent for beginner marketing. A good example, from the initial product structure time trade industry work devote more than other trades on marketing – above 20 percentages of sales (Bughin et al, 2010).

4.9.2.4 Motivation and Employ Satisfaction

SMEs must be strongly concentrate on enhancing their outcome, competitiveness and competences, as the principle basics of the economy of every country (Rusconi, 2008; Weerakkody, 2013). Characteristic of the work production build on the humans' inventiveness, facilities and talents and not easy to be sophisticated by a repetition strategy (Suparman et al, 2012). Moreover, stimulation in job groups has a base role to display for the being and competitiveness of industries in the severe atmosphere of financial downturn. Furthermore, the paper represented inducement in small and medium-sized construction companies in Portugal. It accomplished on Data collected from in-person experiences which were accepted out to employees of 32 companies.

As a result, it reveal the presence of some exciting issues specific to the profession such as the fact that the job requires a wide range of amenities and is not very repetitive. Also, yet employees in general sense an stimulating of equity and distinguish that bosses add constant observation and outcomes show the need for advancing in motivation's management, mainly in admire to further independence and contribution in locating of goals (Cardoso et al, 2015).

4.9.2.5 Education and Training Policy

The Data of World Economic Forum (WEF) global report indicates the interdependence among exercise system and educational quality and the competitiveness level. Also, the survey delivered by Sekuloska (2014) is focused on South East European (SEE) countries and the drawbacks of their lag in competitiveness is the bad quality of educational and training system which measured a base reason. The paper comprise some correlation index to discover the variety in the relationship of education and training/competitiveness index between SEE, Central European and Baltics (CEB) economies and some European country members.

Based on the knowledge founded economy, the creating of knowledge and its impact on the moving of economy is a main factors might effect in growing the competitiveness nations. Besides, spending in higher education considers expenditure in knowledge quantitative and qualitative growth, skills and capabilities is a vital to create bigger output and higher extra price.

Consequently a human development is determined and measured as one of the principal damage in the formation of competitiveness. Moreover, the study inspected resolves the good connection among the human capital quality and competitiveness, therefore an expenditure in teaching and training technique must be an important

weapon for the all system of competitiveness idea for overall SEE financial prudence. (Sekuloska, 2014).

4.9.2.6 Strategic Management Strategies

Porter (1990) specified the procedure to attain overhead regular performance in a manufacturing which are managing, variation, and concentrating. Cost management typifies a considered substitute which builds on outstripping competitors above competence more than the product class or facility (Porter, 1990).

4.9.2.7 Change of Target Market

Outcomes created on three-monthly data from 1998 to 2013 proposes that government spending on non-tradable products and facilities was the most important influence to deteriorate Australia's competitiveness (Makin and Ratnasiri, 2015). Competitiveness has conventionally been supposed to take the volume of an economy's inventors to compete against foreign manufacturers of goods and services that are alternates. Approached by the real argument degree, competitiveness variations when insignificant disagreement rates and national prices transfer relative to trading associates. The economy produces and specifies two distinct classes of things and services — tradable and non-tradable. GPD is the total amount of tradable and non-tradable goods and services formed in the economy (Makin and Ratnasiri, 2015).

4.9.2.8 Level of Success

Firm performance associated with the company's achievement in the marketplace with a numerous results (Walker and Brown, 2004). Dimension performance organizations act an important character to the growth of the firm plan and to the assessment of the attainment of administrative purposes (Vélez-González et al, 2011). Conventionally, calculating an administration's accomplishment through consuming data is extensively skillful. Though, computing company's performance by means of only

monetary information has the limits. It originates that the monetary dimension methods are no lengthier enough to indicate the industry performance (Vélez-González et al, 2011).

4.9.2.9 Intellectual Property (Patents, Brand Registration)

The idea of intellectual capital was promoted by Tom Stewart in 1991 by the occasion that Fortune Magazine published his article entitled "*Intellectual capital is becoming corporate America's most valuable asset and can be its sharpest competitive weapon. The challenge is to find what you have -- and use it*". It may be distinct as the alteration between a company's marketplace value and a cost of substituting its possessions (Kalkan et al, 2014).

Tatum (1989) recognized that companies that raise innovation have administrate structures that preserved plasticity in unit size and group to permit care to innovation. These administrations made the power to have special connections for both internal and external coordination.

4.9.2.10 Information Communication Technology (ICT)

Practically, lack of information amongst businesspersons in the using of technological devices carriages difficulties for entrepreneurs to keep going on (Bailetti et al 2012). Developing competitiveness needs a vast research stunning work in many techniques. Much possible leftovers untapped because small- and mid-sized businesses SMEs use IT in an incompetent way, foremost European experts call for the full utilization of IT to reinforce the competence and innovation of constructing companies as a driver of European growth. The useless usage of IT in the manufacturing atmosphere is considered a serious test. So far, the inquiry cannot be replied whether businesses use information technology correctly or to put it variously, what advantage is gained from the use of IT as contrasted to the requested endeavours.

The object of the offered approach is to add a uniform methodology for SMEs to study, assess and advance the performance of the applied IT in organized steps. In the planned methodology, the approach to IT efficiency dimension and advancement covers three planned phases: a) efficiency analysis, b) efficiency improvement, and c) efficiency simulation. In the first stage of analyzing of efficiency , a structured technique is practical to model and examine the company order contentment process, suggesting an widespread set of original key performance indicators (KPI) for effectiveness dimension and for categorizing potential weaknesses. In another phase of efficiency development, a modern and organized method is used to originate concrete development actions for the recognized potential weaknesses. The third phase of effectiveness simulation focused on imagining the structure of the IT system in joining with the order contentment process (Koslowski and Strüker, 2011).

4.9.2.11 Internationalization

The works about the internationalization of companies is mainly build on research by the US and western European countries, whereas there is a few number of investigation showed in Turkey (BAL and Kunday, 2014). The internationalization of SMEs has been typically explored within the marketing works and there is an absence on this subject within the Management and Organization literature. this newspaper is to examine the entrepreneurial services of the entrepreneur who originated the SME, the reason of the entrepreneur for opening the business, the innovativeness of the company, and the relationship of these issues with the internationalization of companies (Kunday and Şengüler, 2015).

Afterward the 1980s, due to the result of globalization procedure, a fast upsurge was understood in technical developments, innovative info and entrepreneurial actions all over the world. As an outcome of these impacts, the thought of entrepreneurship

desired to be planned in more detail organized with the internationalization procedure of firms and BGs.

To understand the concept planned by the ground-breaking works on entrepreneurship, one wants to inspect the fast internationalization philosophies earlier. In the literature, fundamentally three chief theories have been planned (Kunday and Şengüler, 2015). Traditional Internationalization Theory, which contains the Uppsala and Innovation-related Model; Network Theory; and the Modern Approach Theory, recognized as the BG theory. The Old-style Internationalization Model is built on the concept of slow internationalization, which income that a company, in the beginning, starts marketing in its individual country pending it upsurges its income and market share, and, then, profits to the next stage – unintended export - and on to the latest stage – global internationalization – by openly distributing its products. This model concentrates on the problems produced by lack of information, risk dislike and physical distance all of which straight delay the fast internationalization of firms. When knowledge is augmented, the risks and chances in a given market can be detected more easily (Johansson and Valhne, 1977).

Another traditional internationalization concept is the innovation- connected model intended by Bilkey and Tesar (1977). Rendering to this method, a company has to familiarize new approaches of doing occupational in an innovative approach. The internationalization procedure may start by satisfying an unwelcome instruction from a distant company, and an ending in a state where the company is a knowledgeable exporter observing for modern export markets. Innovation activities are commonly recognized as one of the chief causes of internationalization like firm features, skills

and productivity level. Successful creation innovations in specific are a precondition of responsibility well in international marketplaces.

Formerly, the process of internationalization of companies was seen as an expensive and timewasting effort. For these reasons, firms continue discussing for a long time before they could begin increasing international and upward strongly in the domestic market (Bingman and Cederang, 2008). While proceeding on to the foreign marketplaces, companies could still face sure problems and needed to move gradually. In this admiration, conservative businesses have been create to have a comparatively long local business period before progressing through the phases of internationalization (Luostarinen, 1970).

Recently, the arena of entrepreneurship has concentrated on some simple tools of the entrepreneurs in explanation of the internationalization process of BG companies (Danskin, 2000). From this viewpoint, internationalization principally outcomes from the firms' examination to discover and help the worldwide place markets with uniform products by familiarizing a global image and risk-recording ability, and by generating new innovative products/services to be established by internationally skilled businesspersons. Furthermore, a firm is managed by an entrepreneur, who is talented of working on chances that others do not (Danskin, 2000).

4.9.2.12 Pioneering Leaders

Komppula in his research studied the increase of the conceptualization of the role of businesspersons in increasing the competitiveness of a rural tourism target. In addition, destination competitiveness literature review of the research with a concentrate on the roles of various stakeholders is firstly offered, followed by a description about rural tourism improvement. The discoveries test the usual DMO conquered method to

destination competitiveness growth, and call for the response of teamwork between small tourism companies in the improvement of rural destinations (Komppula, 2014).

4.9.2.13 Improvement of Experience

McMullen et al (2011) stated that using innovation, and taking the risk may provide valuable advantages to administrations. Maritz (2004) and Sekuloska (2014) specified a businessperson is an individual who previously usually generate, update to base the documented value about apparent chances. In addition, High knowledge level and exercise are significant conditions to provide competitive development, but the problem that result with growing a space among progressive of economy.

4.9.2.14 Short and Long Term Profitability

A businessperson is a responsible individual who has the ability to gross chances, evaluate unsafe condition with growing a modern industry to increase revenue (Hasun, 2011). A company which has low position price can consume better competitiveness above costly competition with low-raise in businesses especially if they have to contest in a developed industries (Wernerfelt, 1984).

4.9.2.15 Product Competitiveness

An adequate performance capital must be measured as a significant background to product and eventually to performance (Wernerfelt, 1984). Accepting motivation and holding strategies may advance organizational effectiveness, upsurge productivity and productivity as well take care of the individual requests of workers (decreasing stress and job anxiety while enhancing loyalty, obligation and job fulfilment). Furthermore, both competitiveness and output bolster financial growth, though strong competiveness can recompense for low productivity as a basis of growth and vice versa (Makin and Ratnasiri, 2015). Additionally, the annual Global Competitiveness Reports have observed the competition level as an agreement of chain of balancing tools which

allow or disable making the competitiveness of nations. The 2011-2012 global competitiveness report describes the competitive advantages as the series of organizations, strategies and policies may control the output of each country (Sekuloska, 2014).

4.9.2.16 Accounting and Financial System

Unfortunate funding idea and poor management considered the basic causes for small firms to fail (Islam et al, 2011). The performance level for a company in terms of monetary performance is containing monetary adeptness events, for instance, return equity and investment, profit methods, net revenue margin (Reijonen and Komppula, 2007).

4.9.2.17 Level of Performance

Shortage in investigation in the Craft Industry relatively to company's performance in construction of the capability and ability of businessperson achievement, development and performance dimension has been found. Additionally, outcomes of the exploration may help as a resource to parts such as top management to improved support the works by increasing their entrepreneurial services. The objective of the study by Ab Rahman, Ramli (2014) was to discover the relation of issues may impact commercial management with company behavior within the border of SMEs in the Craft Industry.

4.9.2.18 Cooperative Working Atmosphere

The Resource Build on View (RBV) model characteristically based on the interior sources of governments (Ferreira and Datta, 2009). A company should cooperate to improve the products, and make a superior competitiveness level. In addition, competitive advantage must keep going over time (Ahumatah, 2006).

4.9.2.19 Company Culture

The concept that job competencies should be obligatory to attain company competitiveness considered an essential part of global development. In dissertation on globalization, the view that competition is serious to administrative development was in a high level percentages. Therefore, it drops to good education level of organizations in order to become receptive to the skills are establish (Yeravdekar and Tiwari, 2014).

4.10 Data Analysis

4.10.1 Factor Loading

Factor loading is indicating the ability of factor in explaining a specific dimension during examining of factors. Consequently, factor loading demonstrates the connection between the indicator and the element (Livesley et al, 1998). By means of "Ensuring Practical Significance" method, the first proposition is not build on any mathematical proposition but correlated more to the applied significance (Livesley et al, 1998).

Ensuring Practical Significance is a theory of thumb utilized commonly as a mean of creation an initial investigation of factor matrix. In other words, loading element more than ±.30 are measured to encounter the minimum level; loadings of ±.40 are theorized greater than significant; and in the case if the loading is ±.50 or larger, it believed almost important. Thence, the greater the absolute magnitude of the factor loading, the more significant the loading in understanding the factor matrix. Additionally, factor loading is the connection of factor and variable, the squared loading is the quantity of the variable's total modification accounted for by the factor. Consequently, a 0.30 loading interprets to approximately 10 percent clarification, and a 0.50 loading represents that 25 percent of the variance is considered for by the factor. The loading

should exceed 0.70 for the factor to report for 50 percent of the variance. The researchers must understand that excessively high loadings (0.80 and above) are not idealistic and that the applied significance of the loading is a vital criterion. These rules are appropriate when the sample size is 100 or larger. The confirmation in this method is practical, not statistical, significance (Livesley et al, 1998).

4.10.2 Reliability (Coefficient Alpha Cronbach) (α)

Reliability can be represented in relations of constancy, equality and consistency. Checking of consistency, which is usually districted in the way of Cronbach Coefficient Alpha. Cronbach's alpha is usually used when carrying multi-items scales e.g., measurement process, such as a survey, with several questions. It is also an adaptable test of reliability as inside consistency because it can be utilized for attitudinal measurements, which are common amongst investigators e.g., demeanor measurements contain Likert scales with choices such as very high, high, medium, low, very low. Although, Cronbach's alpha does not conclude the unit dimensionality of a dimension procedure i.e., that a measurement process only measures one concept (Cronbach, 1951).

4.10.3 Software Used

The questionnaires are collected and analyzed using statistical software such as SPSS and MS Excel. Illustrative charts are created using MS Excel software while SPSS is used for the rest of statistical calculations such as the mean scores and standard deviations for each factor.

4.10.4 Relative Importance Index (RII)

The following formulations are used to compute Relative Importance Index (RII) (Mbamali, 2012):

The investigator arranged the dimensions to five groups on Likert Scale

$$RII = \frac{\sum Fx}{\sum F} \times \frac{1}{K}$$

- RII: Relative Importance Index
- X: Idea on Likert Scale (1, 2, 3, 4, and 5)
- F: Frequency of sets
- K: Maximum point among the five scales

Once the classification issues consuming RII, the maximum magnitude taking the first rank, subsequently one receipts the 2nd rank and so on till the last rank (Mbamali, 2012).

The following limits are used in the understanding of RII results (Mbamali, 2012).

- RII < 0.60 mentions influence or element which has low rating.
- 0.60 ≤ RII ≤0.80 denotes element or entry has a high rating.
- RII > 0.80 mentions the element which is Very High score.

Chapter 5

ANALYSIS AND DISCUSSION OF RESULTS

5.1 Introduction

In this chapter, data analysis and discussions are presented. The questionnaires were distributed to 150 construction firms using hardcopies and online forms, 85 of them replied with answers, making the percentage of respondents 57% as in the Table 7. The data is analysed using MS Excel and Statistical Package for Social Science software (SPSS). Relative Importance Index (RII) is utilized to rank the factors according to the importance of variables. Pearson correlation factors for each of the variables are determined to examine how factors correlate with each other.

Table 7: Response Rate

Kind of study	Number of Targeted Respondents	Number of Distributed Copies(Online +Printed)	Number of Response	Percentage of Responses
Questionnaire	100	150	85	57%

5.2 Demographic Information

The questionnaires were distributed to professionals who carry positions in the companies contacted, such as supervisor engineer, executive engineer, company manager or owner, assist manager, designer, head of office (civil engineer), site engineer, head of engineers, direct commissioner owner of company project manager and rapporteur of company. The questionnaire include general information about the

companies as well such as the name of the company, years of experience, projects they're concerned in, estimated annually profits and number of employees. The position of the person who fill in the questionnaire is also asked. Figure 7 shows the percentages of employee's position in the company.

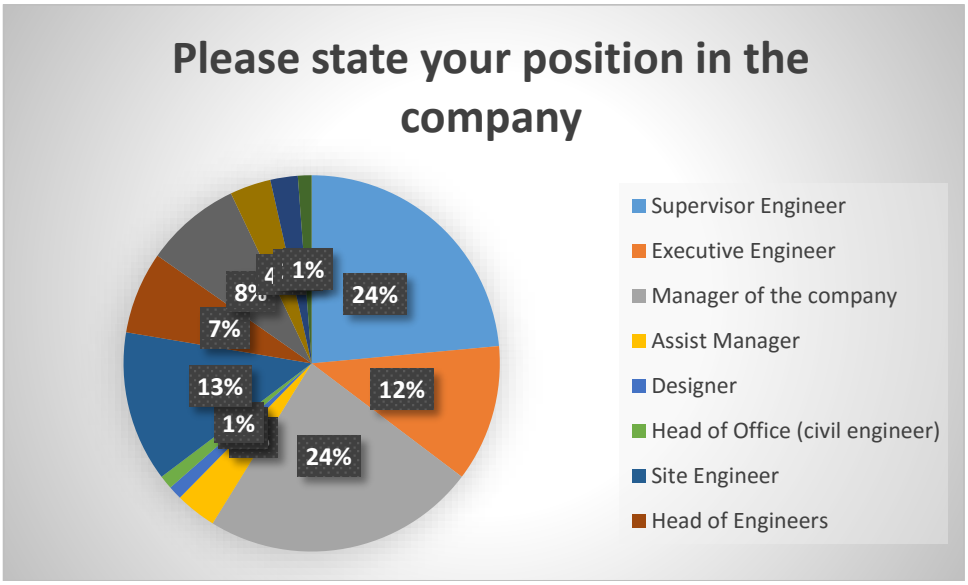


Figure 7: The percentages of employee's position in the company

5.2.1 The Positions Holding of the Employees in the Construction Industry

The data analysis indicated that 1% of the answers were the rapporteur of the company, designer, and head of office (civil engineer) which indicate the minimum percentage amongst all other employees.

The maximum percentage was 24% for supervisor engineers and company managers. Additionally, the percentage of site engineers was 13% and 12% was for executive engineers. Furthermore, the percentage of direct commissioners was 8%. The head of engineers were 7%, assist managers and the owners of the company were 4% and the project manager's percentage was 2%.

5.2.2 The Companies' Year of Practice in the Industry Work

As it is clear in Figure 8 that percentages of years of experience for companies was detailed. The 23, 25, 13 years of companies' experience was covered 1%. The 4% was the percentage for the companies that have 12, 14, 16 years of experience. In addition, 9, 14, 10 was the years of company's experience that have 5% among the total percentages.

Figure 8: The percentages of years of experience for companies

Some of companies included in the research with 6, 2, 1 years of experience and the percentage was 6%. Furthermore, the 7% was for three experience years companies and hard - working company. Also, the organizations that participate with 8% owned 8,5,15 years of experience. Additionally, the 4 years of companies' experience resulted with 12%. Finally, 12% was for the companies of 7 years' experience.

5.2.3 Companies' Estimated Annual Turnover

Table 8 shows the frequencies and the percentages of the annual revenue of companies in USD.

Table 8: The frequencies and the percentages of the annual revenue of companies

Please provide the name of the company	Please provide the company's estimated annual turnover (USD)	Frequencies	The percentages
Ismail Company	230,000	1	1%
Bahravi	12,000	1	1%
Darin group	6,000,000	1	1%
Yasin group of companies	1,000,000	1	1%
Kêsta	200,000	7	8%
Line	800,000	3	4%
High Land	200,000	7	8%
Palkana Company	500,000	2	2%
Silevaney	100,000	4	5%
Goman Company	150,000	6	7%
rolesen group	50,000	6	7%
heja	10,000	1	1%
Rukin Al-Qima	2,900,000	1	1%
Mzori company	370,000	2	2%
Hejar Company	150,000	6	7%

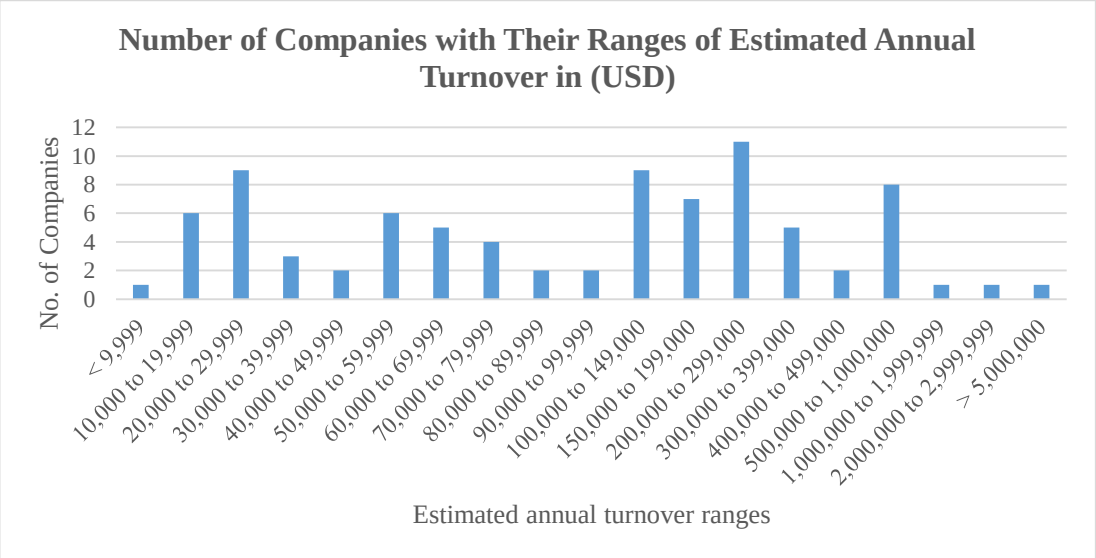


Figure 9: Number of companies with their ranges of estimated annual turnover in (USD)

In addition, Figure 9 and Figure 10 are illustrating estimated annual turnover in number of participated companies and percentage of them respectively.

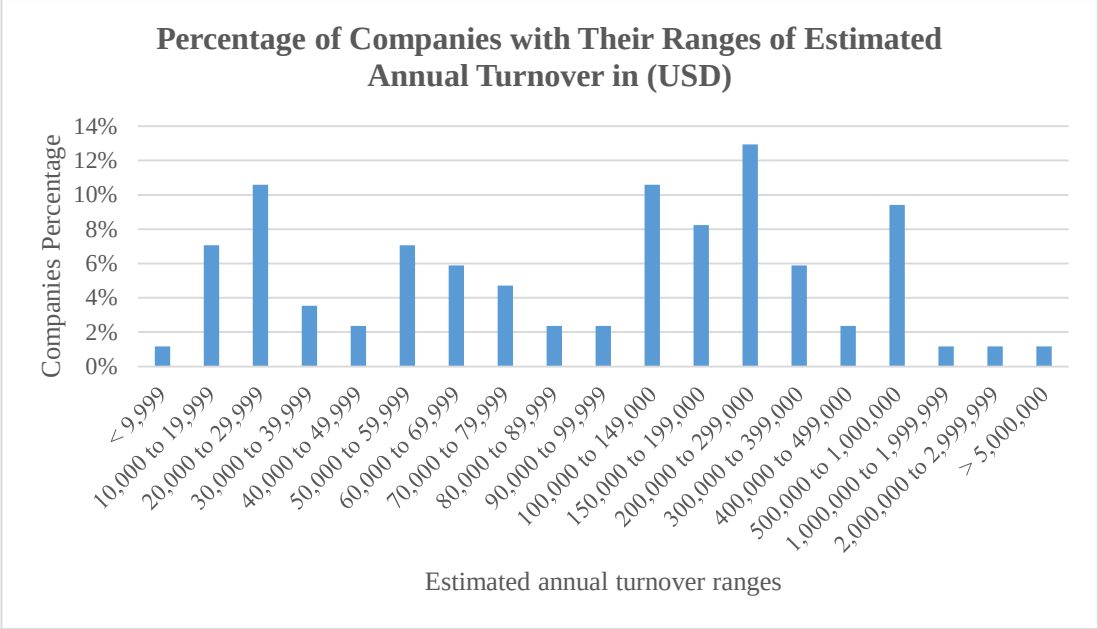


Figure 10: Percentage of companies with their ranges of estimated annual turnover in (USD)

5.2.4 Number of Employees in the Company

Table 9 shows the frequencies and percentages of number of employees in the companies. Furthermore, Figure 11 and Figure 12 show the employees number in their companies and their percentage respectively.

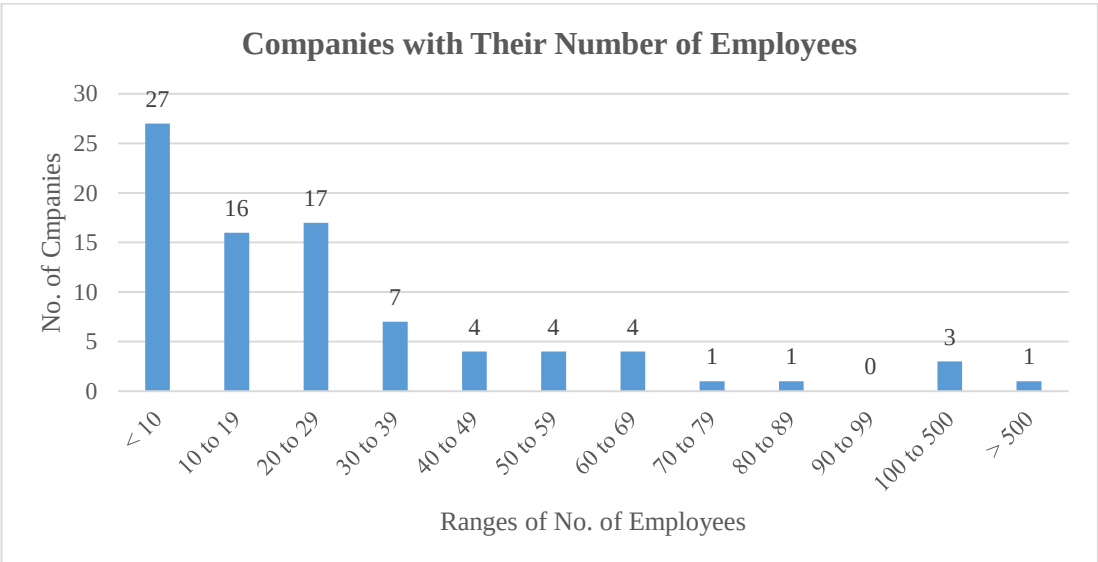


Figure 11: Companies with their number of employees

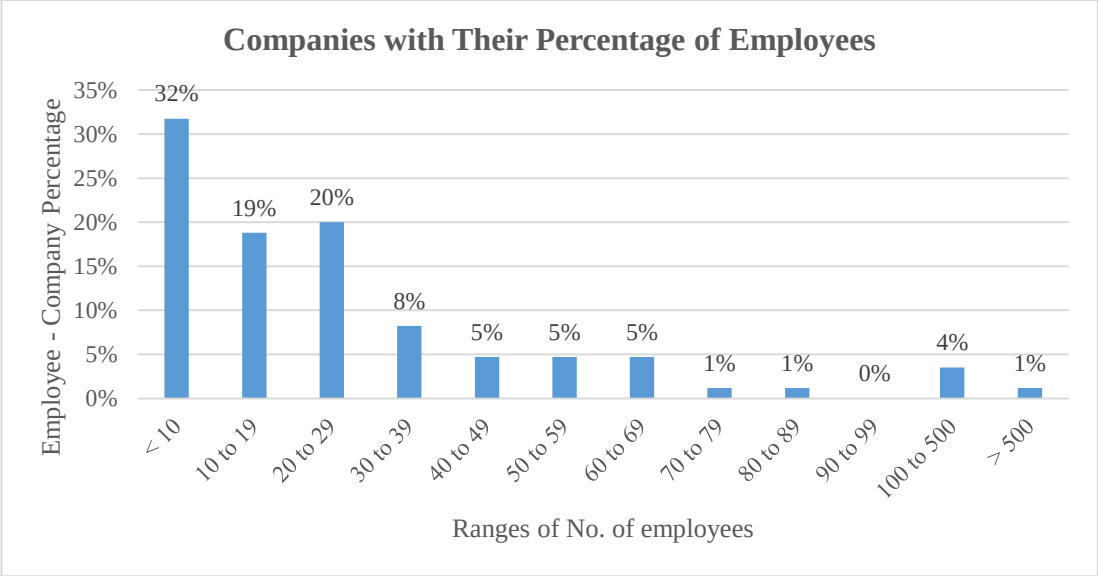


Figure 12: Companies with their percentage of employees

Table 9: The frequencies and percentages of number of employees in the companies

Please provide the name of the company	Please provide the number of employees in the company	Frequencies	The percentages of Employees
Ismail Company	23	3	4%
Bahravi	16	3	4%
Darin group	640	1	1%
Yasin group of companies	100	1	1%
Kêsta	65	2	2%
Line	50	1	1%
High Land	16	3	4%
Palkana Company	10	2	2%
Silevaney	60	1	1%
Goman Company	9	6	7%
rolesen group	25	4	5%
heja	20	7	8%
Rukin Al-Qima	64	1	1%
Mzori company	53	1	1%
Hejar Company	8	6	7%
Giz Construction	57	1	1%
Samyan	9	6	7%
darkus	6	6	7%

5.3 Innovation Dimension Analysis

Our survey depends on the five different variables which consider innovation dimensions, input, driver, barrier, enabler, impact. Each of these variables have different factors related to it. The following results below are the analyzing results of this research which depends on the received respondents from the participants.

5.3.1 Inputs

Inputs include five different factors that have been selected according to their relativeness and importance with the research subject. Also, to determine how these factors are essential for innovation in Northern Iraq Construction Industry. Figure 13 illustrates the average of given scales for each of the factors inside the input dimension. The details of each of the factors are explained in the following sections.

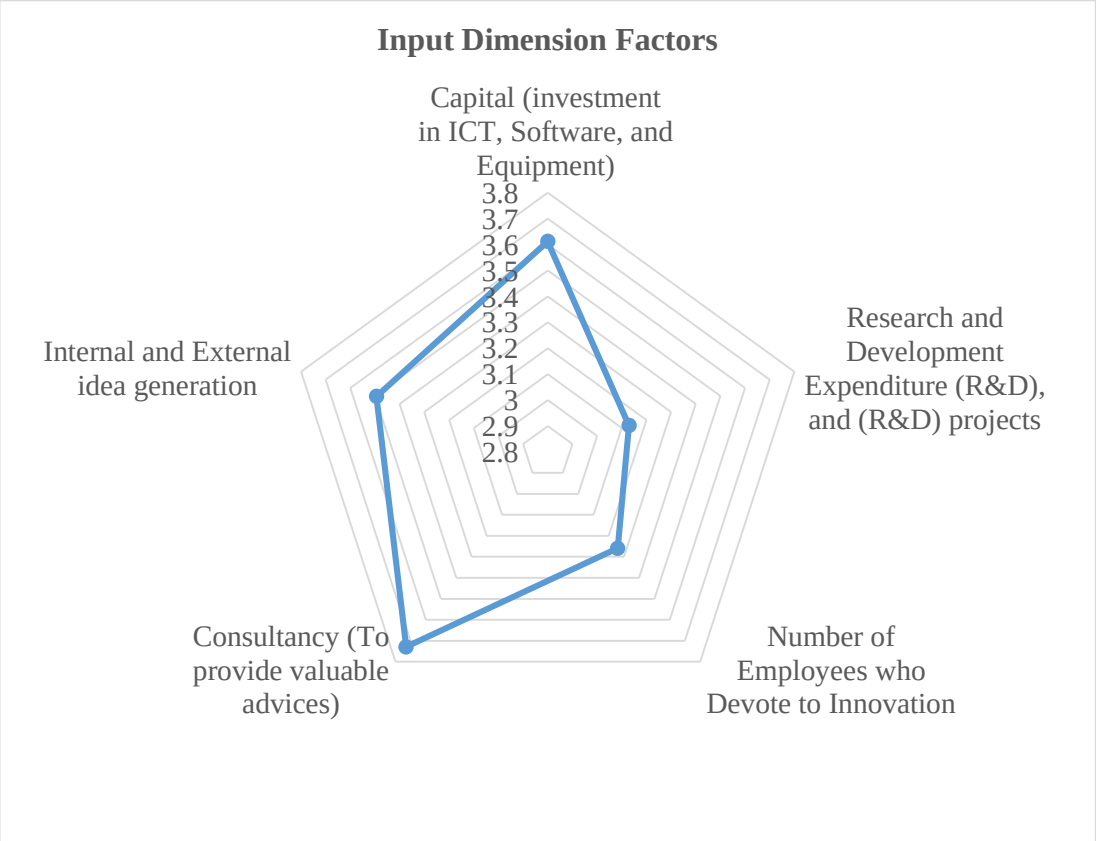


Figure 13: Mean values of input dimension factors

5.3.1.1 To What Extend Do You Satisfy That the Innovation is Essential for the Company's Work Which You are Working in?

In the Figure 14 the company has been asked through both online and distributing the printed copies about their degree of satisfaction in having the innovative system. The purpose was to ask the companies about their opinions in satisfying with the necessity of applying the innovation in their companies. In addition, it can be said that all companies need innovation for their company's work. The most important is the RII, .87 for this factor it means that it has a very high rating and get the 1st position for its dimension. A standard deviation and mean in Table 55.

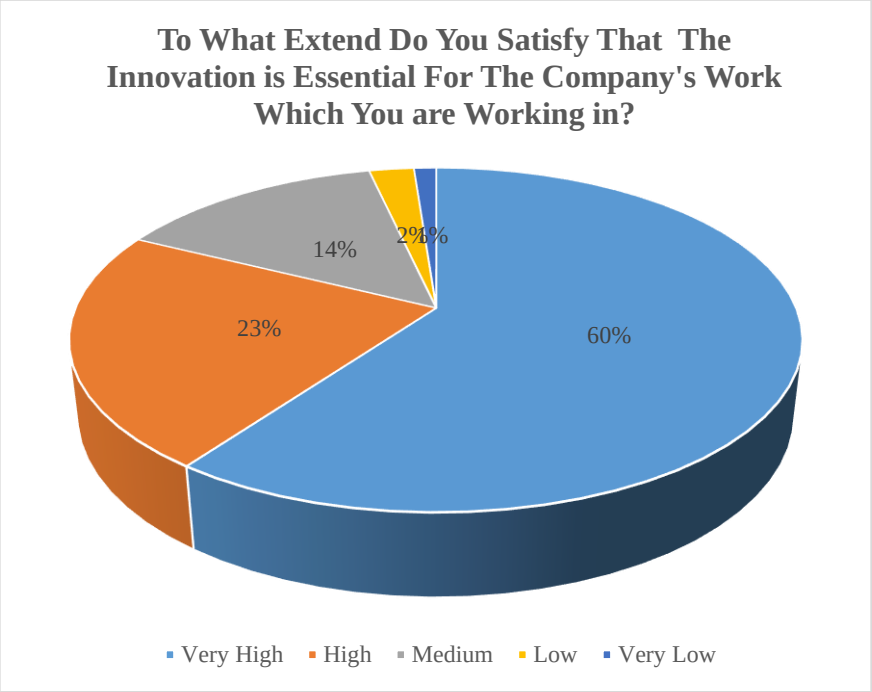


Figure 14: The percentages of the Likert scales in asking the companies if they are satisfy with the innovation or not satisfy

Table 10: The percentages of the Likert scales in asking the companies if they are satisfy with the innovation or not satisfy

Very high	High	Medium	Low	Very Low
60%	22%	14%	2%	1%

5.3.1.2 Capital (Investment in ICT, Software, and Equipment)

As it's clear in the Figure 15 which indicates the percentages of each Likert scale (Very high, High, Medium, Low, Very low) also it was clear in the Table 11. The RII of this factor is 0.72, it considers high rating factor according to the research paper published by Mbamali (2012).

Table 11: The percentages of respondents on ICT investment in innovation

Very high	High	Medium	Low	Very Low
14%	46%	28%	11%	1%

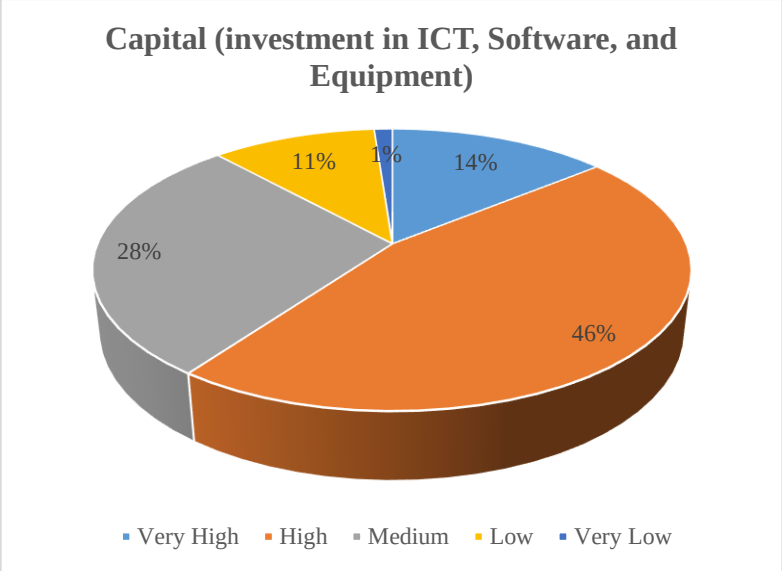


Figure 15: The percentages of ICT investment for innovation

5.3.1.3 R&D, and R&D Projects

It is clear in the following table that the percentages of employees who answer to the question: *what extent do the following characteristics facilitate innovation for the company*, was 15% very high, 27% highly, 27% medium, 16% low and 14% very low. Table 12 illustrates the percentage of respondents on R&D in innovation.

Table 12: The percentage of respondents on R&D in innovation

Very high	High	Medium	Low	Very Low
15%	27%	27%	16%	14%

The RII was 0.62 which can be considered as a high rating factor according to Mbamali (2012). Also the standard deviation with the mean are calculated for every elements as it can easily be seen in Table 55.

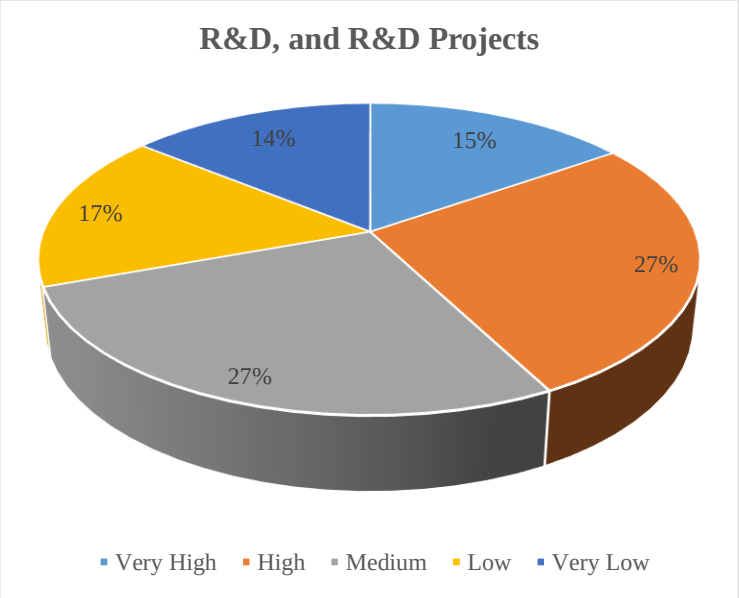


Figure 16: The research and development respondents in innovation

5.3.1.4 Number of Employees Who Devote to Innovation

The percentages of the question "*To what extent do the following characteristics facilitate the innovation for the company*" are shown in the Table 13. Moreover, The RII for this factor is 0.65 which can be considered as a high rating factor.

Table 13: Number of employees who devote to innovation

Very high	High	Medium	Low	Very Low
14%	32%	31%	13%	11%

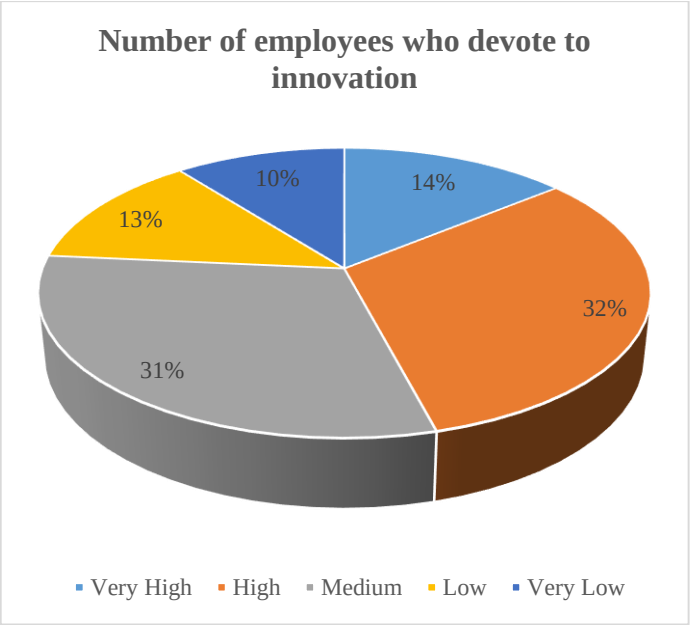


Figure 17: Number of Employees who devote to Innovation

5.3.1.5 Consultancy (To Provide Valuable Advices)

The following table discovers the different percentages of each scale according to online respondents and printed copies can easily recognized in the Table 14 as well as in the pie chart Figure 18.

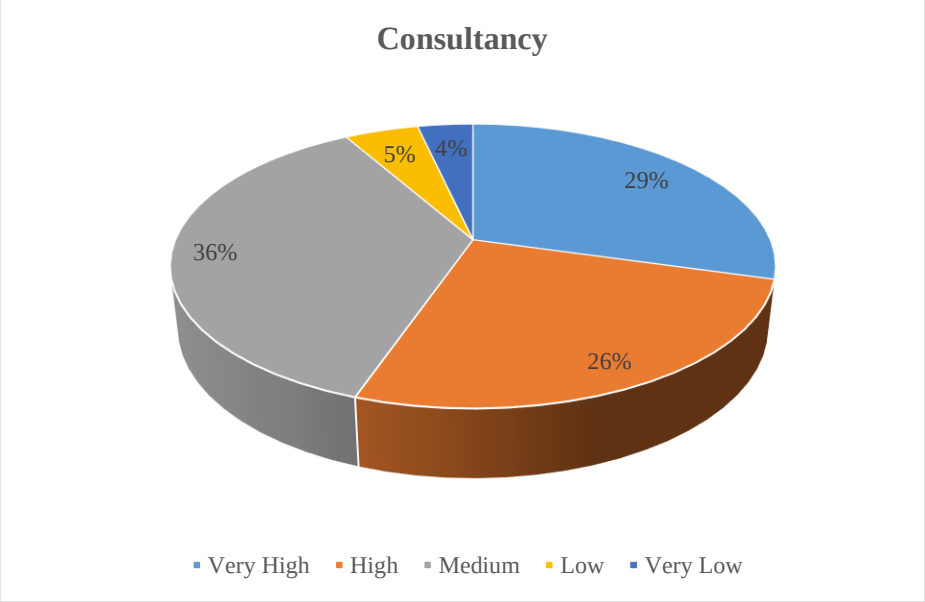


Figure 18: The percentages of consultancy in innovation

Moreover, the RII is 0.74 which can be considered as a high rating factor. The standard deviation and mean score are in the Table 55.

Table 14: The percentages of respondents on Consultancy

Very high	High	Medium	Low	Very Low
29%	26%	36%	5%	4%

5.3.1.6 Internal and External Idea Generation

The percentages can be directly seen in the pie chart in Figure 19 as well as in the Table 15. The Relative Importance Index, RII was 0.69. As a result, it can be considered as a high rating factor.

Table 15: The percentages of external and internal idea generation

Very high	High	Medium	Low	Very Low
22%	31%	28%	12%	7%

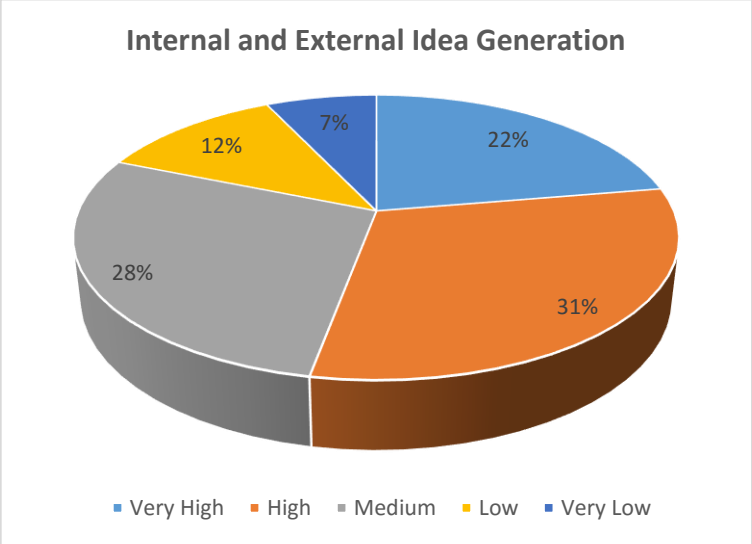


Figure 19: The percentages of internal with external idea generation in innovation

5.3.2 Drivers

The driver dimension has four factors which have been chosen according to their association and importance with the research subject as well as to determine how these

factors are useful for innovation in Northern Iraq Construction Industry. An overview of the factors in this dimension is illustrated in Figure 20. The following sections explain the details of each of the factors.

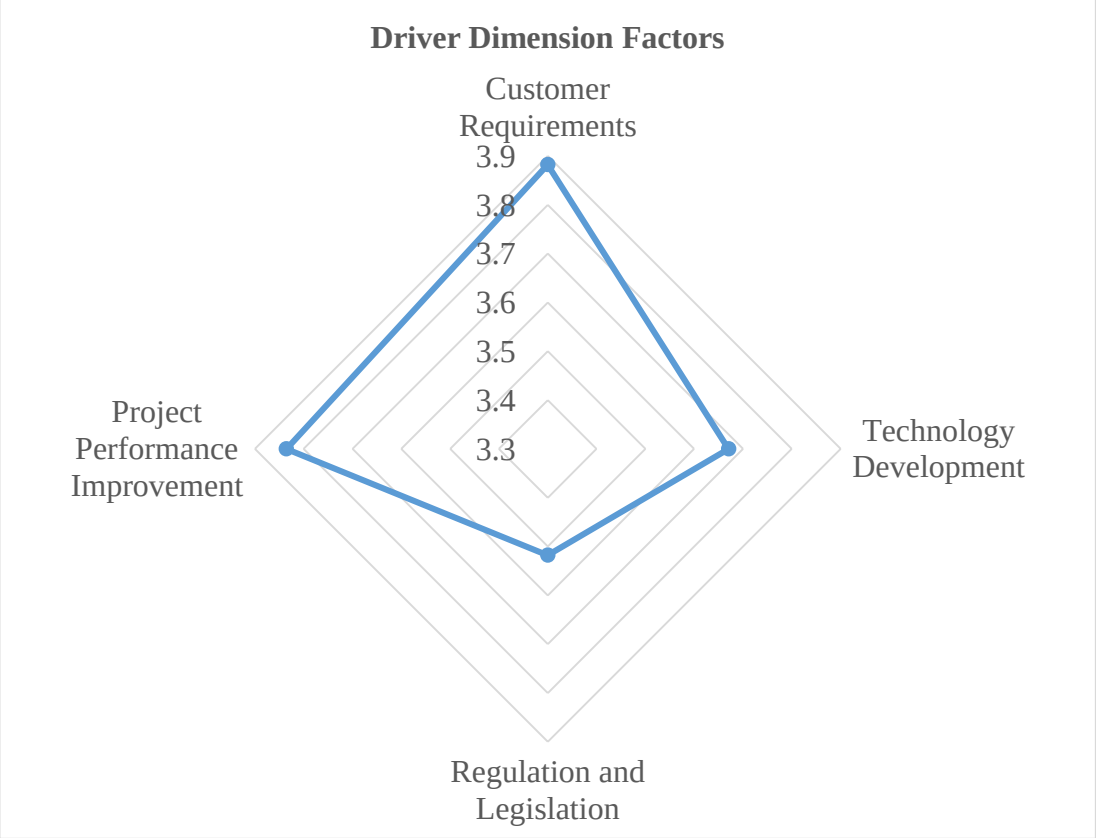


Figure 20: Means for factors of driver dimension

5.3.2.1 Customer Requirements

In the Table 16 the percentage of customer satisfaction respondents in innovation are illustrated

Table 16: The percentage of customer satisfaction respondents in innovation. Also they arranged in the Pie chart after getting the answer of this question; to what level the factors below are able to create the necessity for the company to apply the innovation. The RII is 0.77 which can be considered as a high rating factor.

Table 16: The percentage of customer satisfaction respondents in innovation

Very high	High	Medium	Low	Very Low
29%	34%	32%	5%	0%

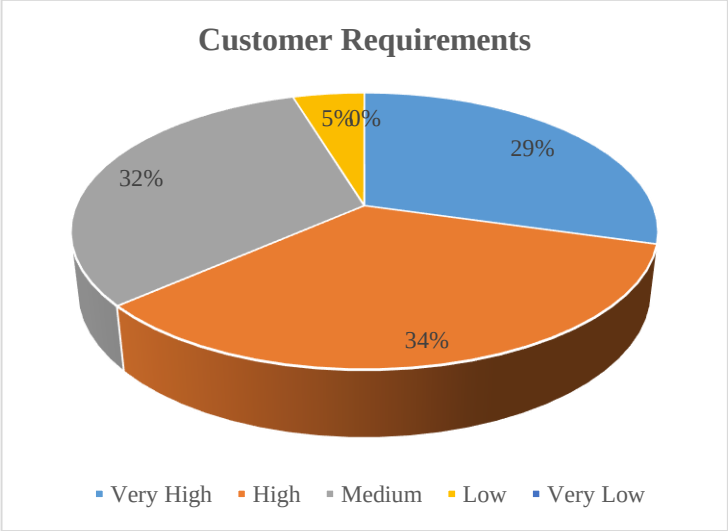


Figure 21: The customer requirements in innovation

5.3.2.2 Technology Development

In the Table 17 the percentages of technology development in innovation is clearly written. Also, the percentages of technology development is plotted by pie chart. The RII is 0.73 so it can be considered as a high rating factor also the mean and standard deviation are illustrated in the Table 55.

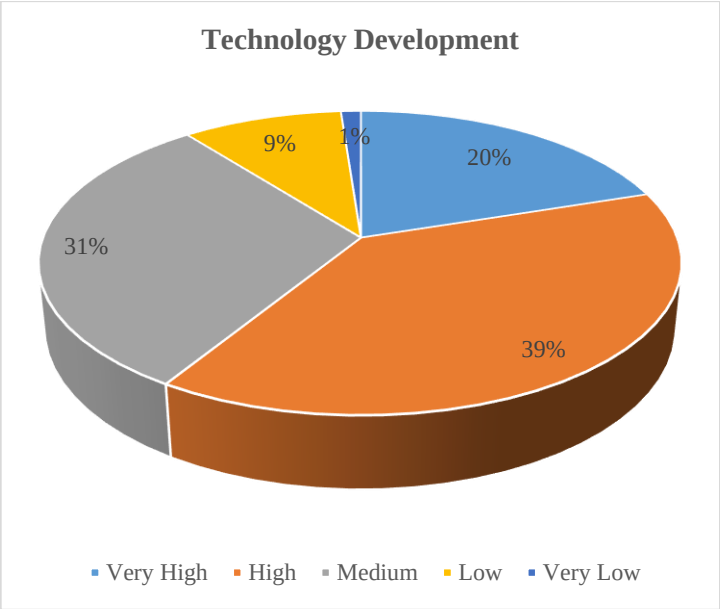


Figure 22: The percentages of technology development respondents in innovation

Table 17: The percentages of technology development in innovation

Very high	High	Medium	Low	Very Low
20%	39%	31%	9%	1%

5.3.2.3 Regulation and Legislation

Medium scale is considered the highest value. As a result this factor is getting the second position. RII is 0.70 which can be considered as a high rating factor effect on its dimension.

Table 18: The percentage of regulation and legislation respondents

Very high	High	Medium	Low	Very Low
22%	26%	36%	12%	4%

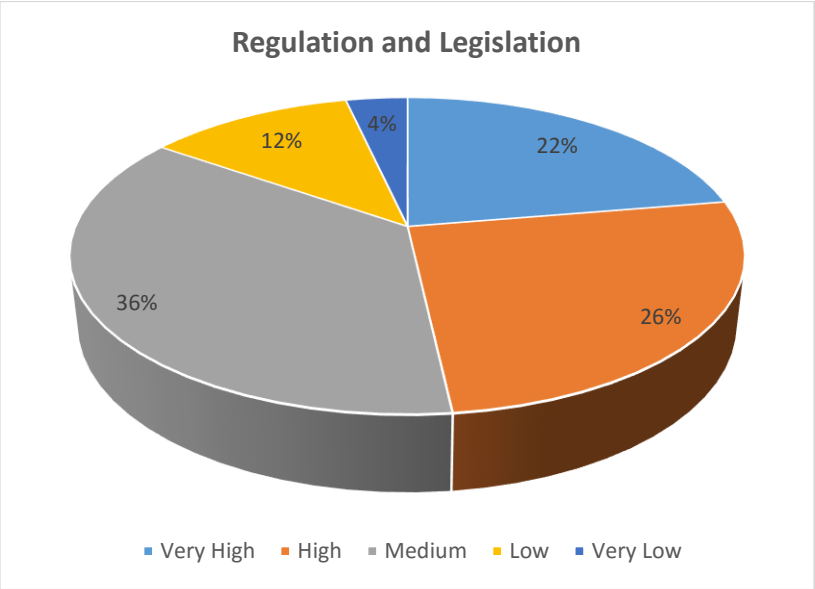


Figure 23: The percentages of legislation and regulation in innovation

5.3.2.4 Project Performance Improvement

In the Table 19 the percentages of project performance improvement in innovation is illustrated. Additionally, the pie chart is plotted. The following project performance improvement is indicated. At the end, 0.76 was the RII of this factor which can be considered as a very effective factor for its dimension.

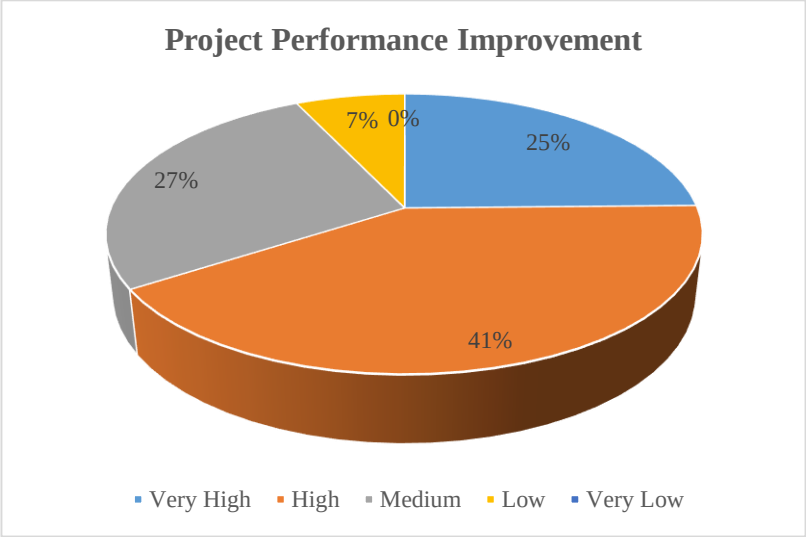


Figure 24: The percentages of project performance improvement in innovation

Table 19: The percentages of project performance improvement in innovation

Very high	High	Medium	Low	Very Low
25%	41%	27%	7%	0%

5.3.3 Barriers

Barriers dimension of innovation has six factors. These factors or drawbacks are very important to be implemented for improving innovation in Northern Iraq Construction Industry. Barrier factors and their means are illustrated in Figure 25. The following sections explain each of the factors in details.

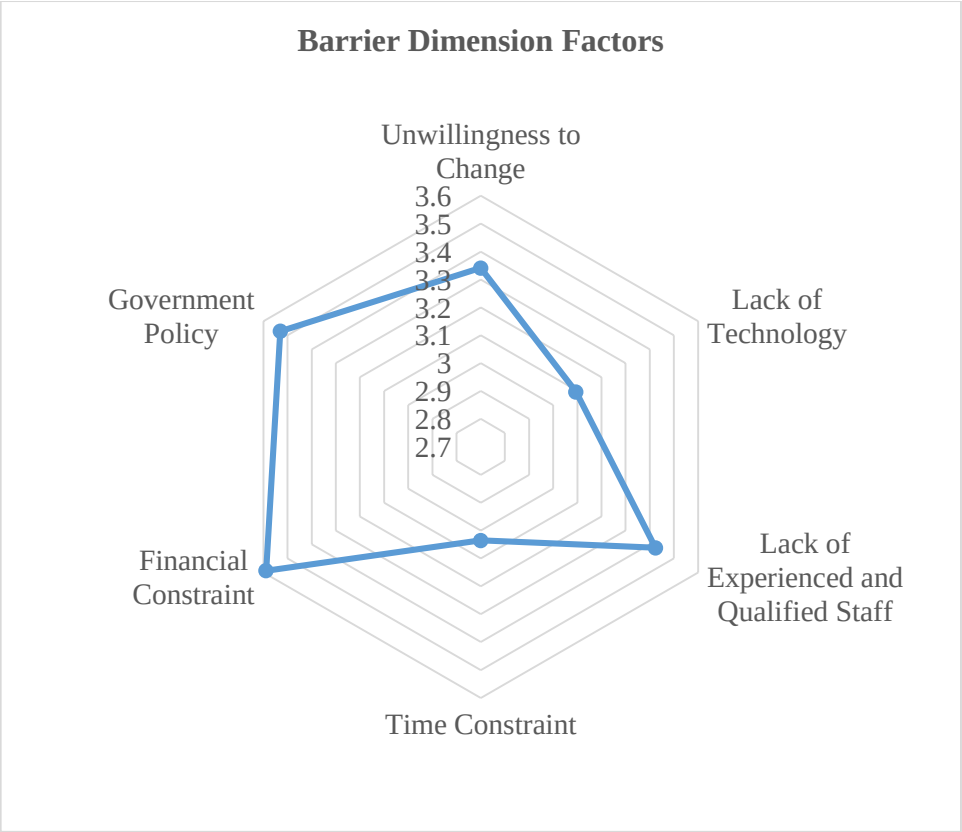


Figure 25: Mean values for factors of enabler dimension

5.3.3.1 Unwillingness to Change

As it can be seen in the table and bar chart below the percentages of each part of Likert scales is clearly written. In answering the question of: *"to what level do the following*

features block the uptake of the innovation in the company?" Also the RII is 0.66 so it can be considered as an important factor for the dimension.

Table 20: The percentages of unwillingness to change respondents

Very high	High	Medium	Low	Very Low
27%	24%	21%	13%	15%

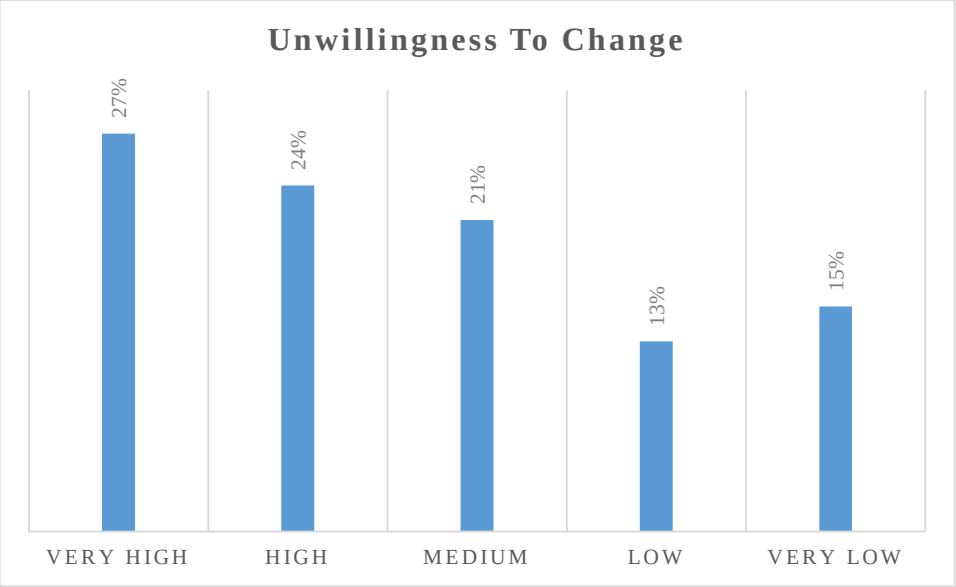


Figure 26: The percentages of unwillingness to change in innovation

5.3.3.2 Lack of Technology

It can easily be seen that the change in the percentages of the following respondents in the Table 21 and also in Bar chart below. Additionally, the percentages was very understandable and very logic. 0.61 is the RII of this significant factor, so it can be considered as a high rating factor.

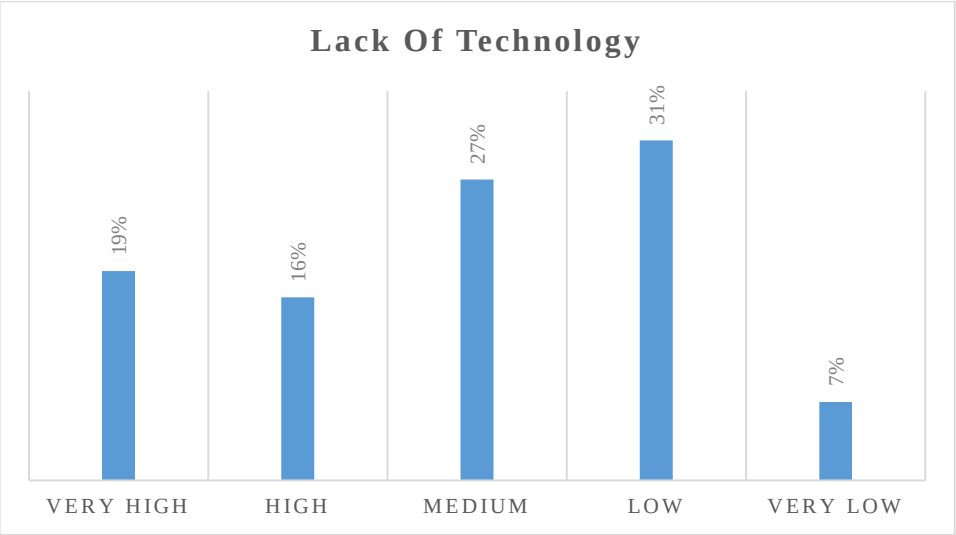


Figure 27: The percentages of lack of technology respondents

Table 21: The percentages of lack of technology in innovation

Very high	High	Medium	Low	Very Low
19%	16%	27%	31%	7%

5.3.3.3 Lack of Qualified and Experienced Staff

The Figure 28 and Table 22 are representing the percentages of respondents of the specific survey. The RII is 0.68 which can be considered as a high rating factor.

Table 22: The lack of experienced and qualified staff in innovation

Very high	High	Medium	Low	Very Low
28%	26%	16%	19%	11%

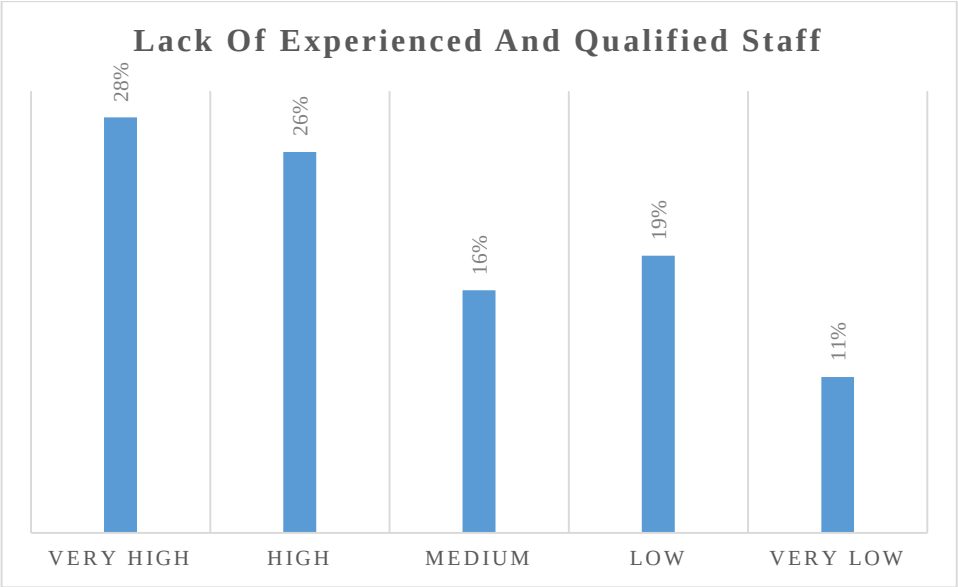


Figure 28: The percentages of lack of experienced and qualified staff respondents

5.3.3.4 Time Constraint

In the Table 23 and Figure 29, the RII is 0.60 for this specific factor which can be considered as a good factor rating for dimension.

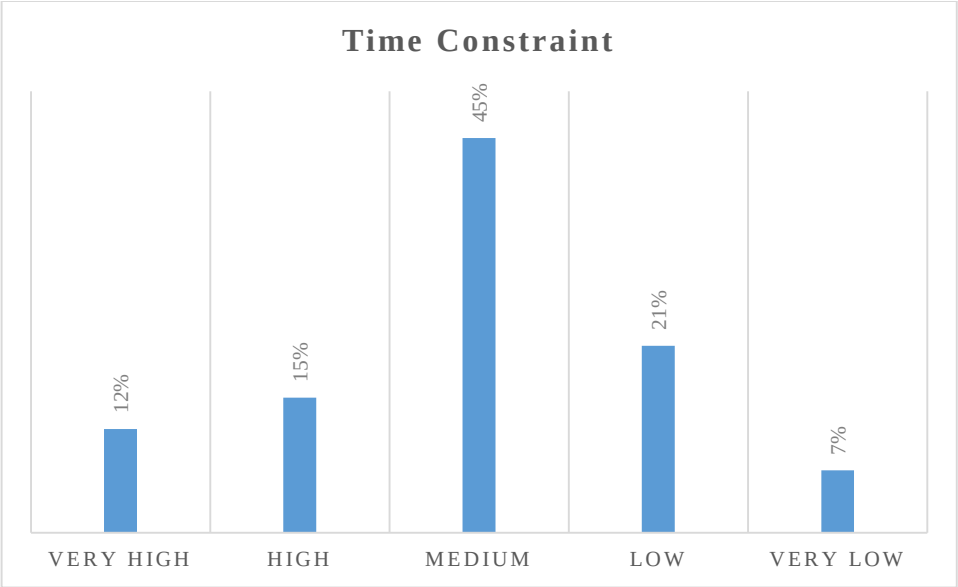


Figure 29: The percentages of time constraint in innovation

Table 23: The percentages of time constraint respondents

Very high	High	Medium	Low	Very Low
12%	15%	45%	21%	7%

5.3.3.5 Financial Constraint

Table 24 and Figure 30 are responsible for illustrating the financial constraint percentages. The RII is 0.71, so it can be considered as a high rating factor.

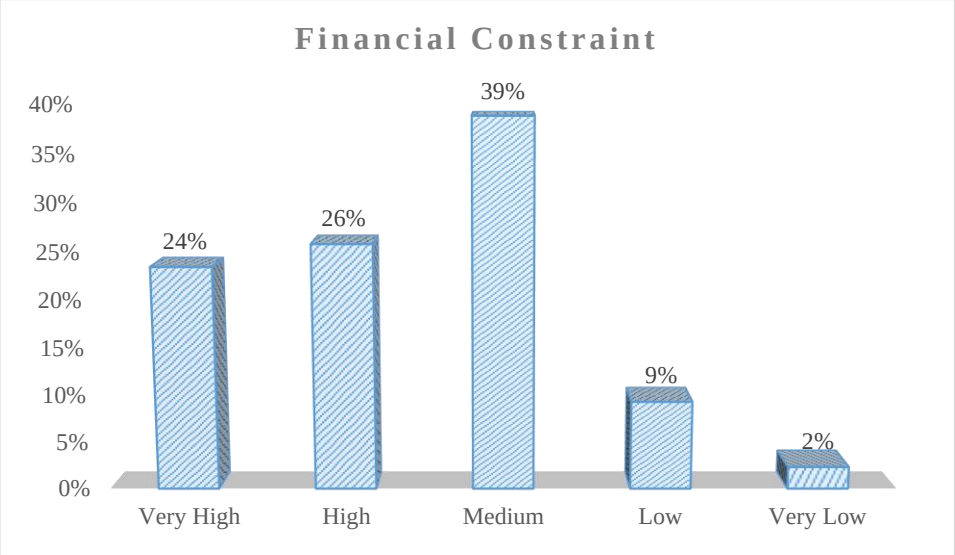


Figure 30: The percentages of financial constraint in innovation

Table 24: The percentages of financial constraint respondents in innovation

Very high	High	Medium	Low	Very Low
24%	26%	39%	9%	2%

5.3.3.6 Government Policy

It can easily be seen from the following bar chart in Figure 31 and from the percentages in Table 25 that the 38% is a very high percentage for government policy which acts as a prevent factor to avoid innovation. The RII is 0.70 which can be indicated as a high rating factor.

Table 25: The percentages of government policy respondents

Very high	High	Medium	Low	Very Low
18%	38%	31%	8%	6%

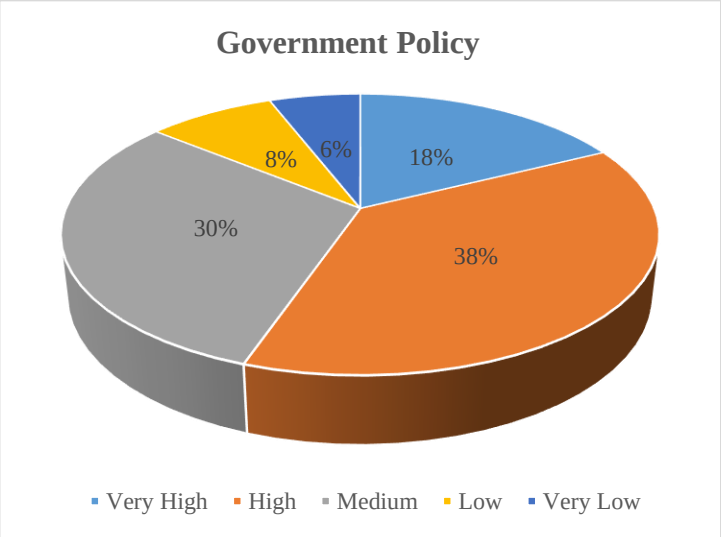


Figure 31: The percentages of government policy in innovation

5.3.4 Enablers

In innovation, enabler dimension act an important role in developing and applying innovation in every sector.

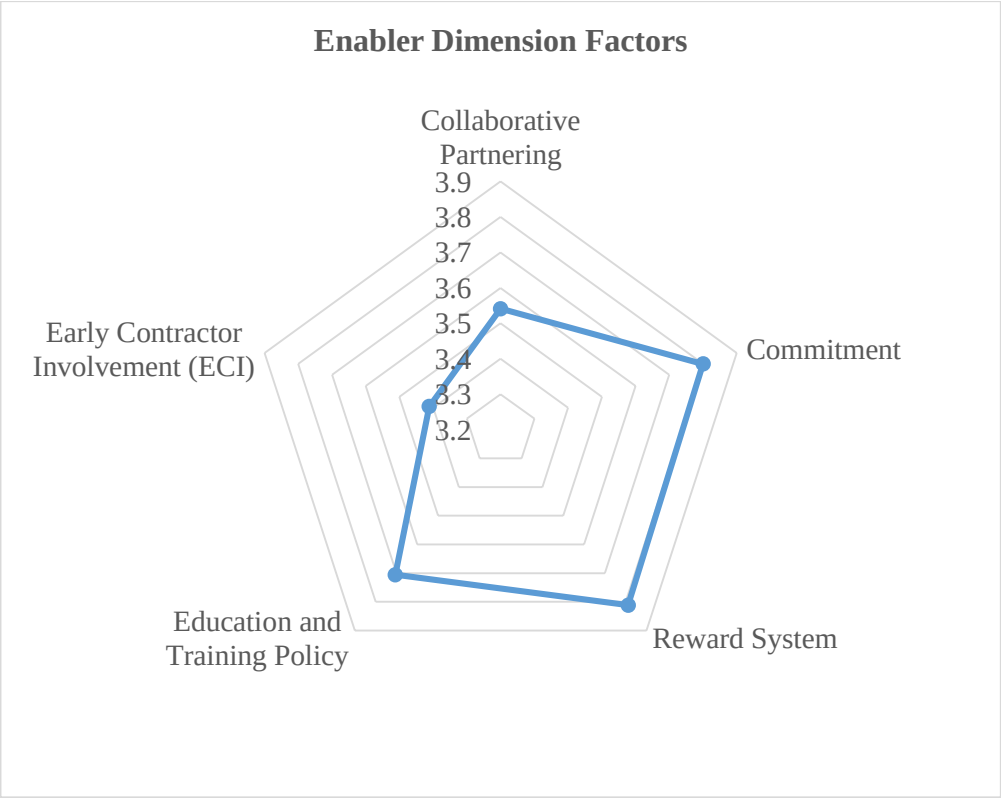


Figure 32: Mean values for factors of enabler

In this research five different barriers are asked and answered to indicate their role in improving innovation of Northern Iraq Construction Industry. Figure 32 demonstrates the mean values of all of the factors in enabler dimension. Detailed information for each of the factors in the dimension are explained in the following sections.

5.3.4.1 Collaborative Partnering

Firstly, the table below indicates the percentages of the respondents which are received from the participants. Furthermore, the partnering collaborative is a very necessary factor in assigning the innovation for companies as it can be seen in Table 26 as well as in the Figure 33. The RII of this factor is 0.70 which can be considered as a high rating factor. Also the mean score and standard deviation and all details can clearly be seen in Table 55.

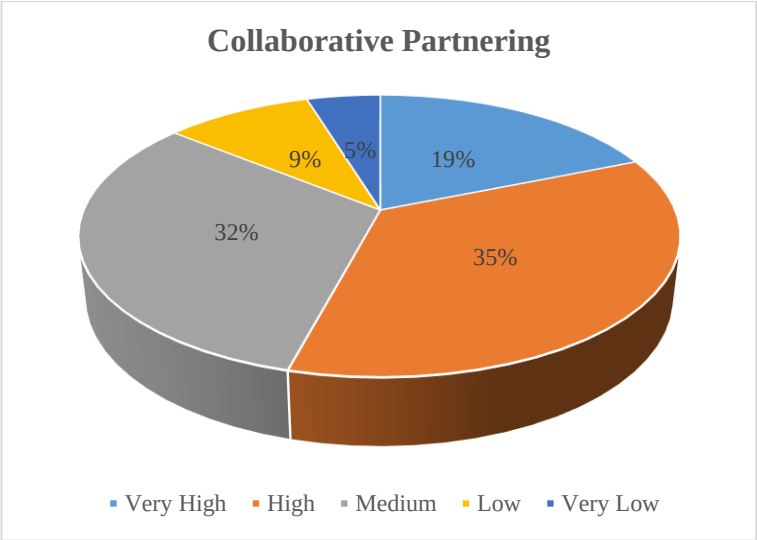


Figure 33: The percentages of collaborative partnering in innovation

Table 26: The percentages of collaborative partnering respondents

Very high	High	Medium	Low	Very Low
19%	35%	32%	9%	5%

5.3.4.2 Commitment

The commitment factor is the first step in arranging the management of the organization for applying the innovation in their companies. In addition, companies should be very strict in the regulation of accomplishing the projects in order to control the high innovative work in the future. Table 27 shows the percentages of commitment. The RII is 0.76 so it can be considered as a high rating factor.

Table 27: The percentages of commitment respondents

Very high	High	Medium	Low	Very Low
29%	34%	27%	6%	4%

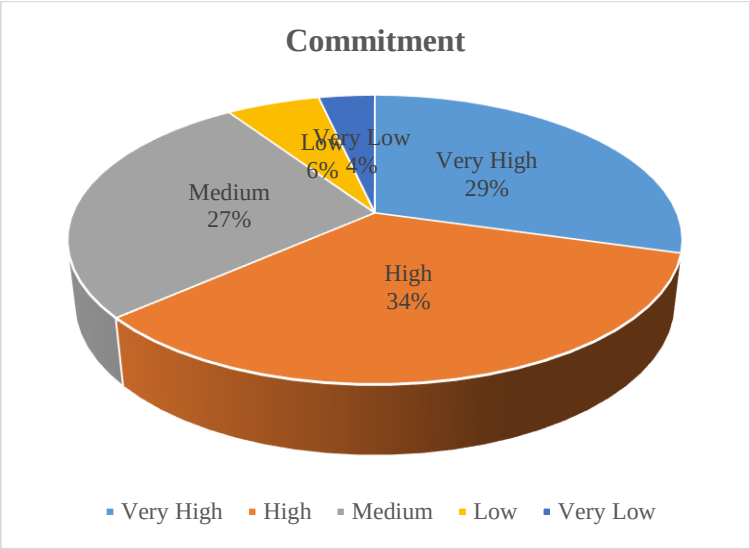


Figure 34: The percentages of commitments in innovation

5.3.4.3 Reward System

The percentage of a very high scale is 25% from the Likert scales, illustrating how much this factor is effective for innovation as enabler. Moreover, the RII of this factor was 0.76 which can be considered as a very powerful factor.

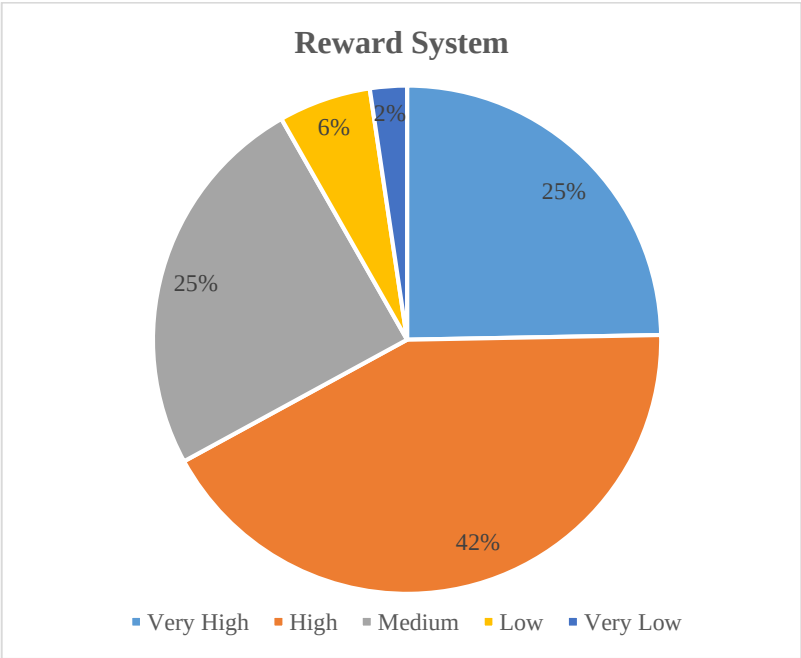


Figure 35: The percentages of reward system in innovation

Table 28: The percentages of reward system respondents

Very high	High	Medium	Low	Very Low
25%	42%	25%	6%	2%

5.3.4.4 Education and Training Policy

It can be distinguished that this factor has an important act in enabling of innovation system. The 41% is considered as an important factor. The RII of this factor is 0.74 which can be considered as a high rating factor.

Table 29: The percentages of education and training policy respondents

Very high	High	Medium	Low	Very Low
21%	41%	28%	6%	4%

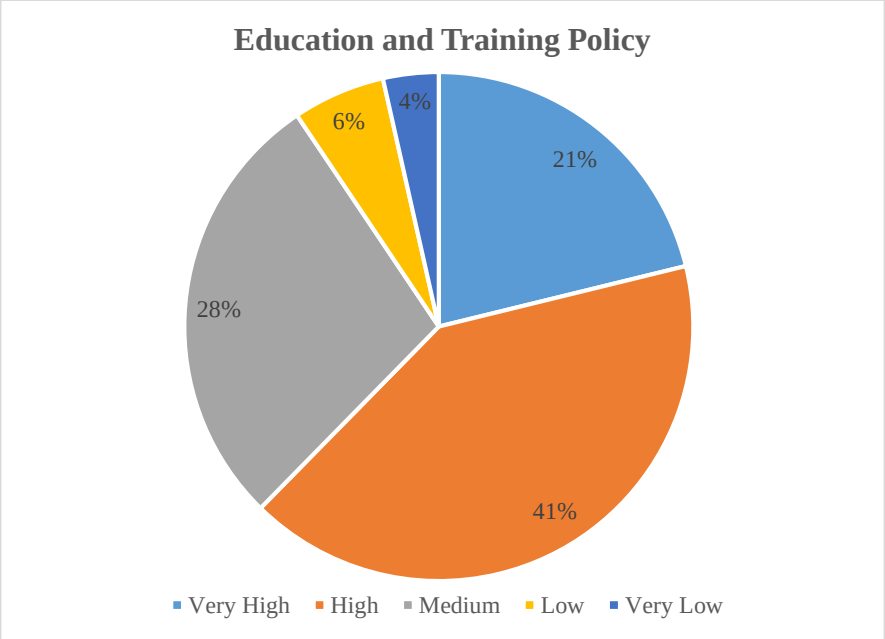


Figure 36: The percentages of education with training policy respondents in innovation

5.3.4.5 Early Contractor Involvement (ECI)

The following information is explaining the percentages of the respondents. The Medium scale is the highest one. So it can be said that this factor comes in the second degree. The RII is 0.68 so it can be considered as a high rating factor.

Table 30: The percentages of early contractor involvement (ECI) respondents

Very high	High	Medium	Low	Very Low
11%	35%	41%	11%	2%

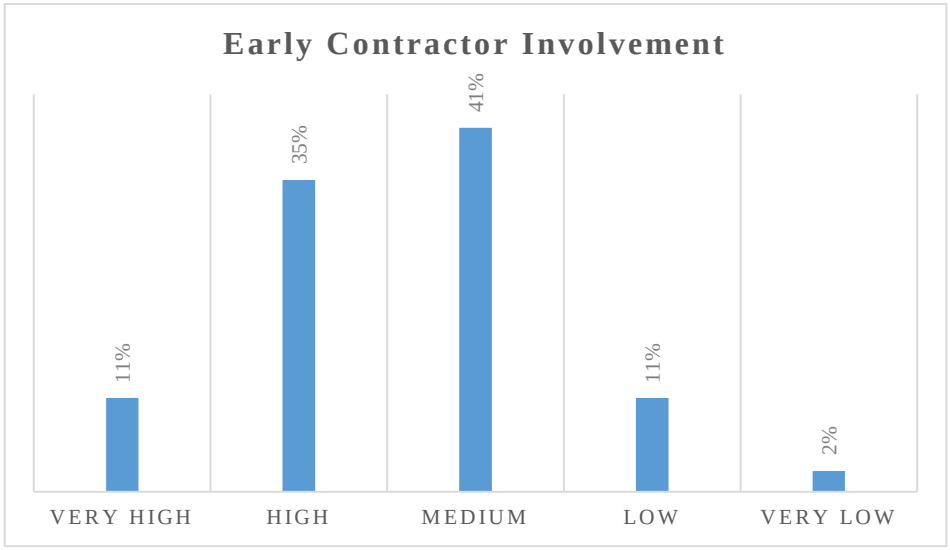


Figure 37: The percentages of Early Contractor Involvement (ECI) in innovation

5.3.5 Impacts

Four factors have been discussed in impact variable, as one of the main variable of innovation. In addition, these factors are answered and analyzed to explain their significance role in innovation development. Figure 38 explains the means for each of the factors in the dimension. Each of the factors in this dimension is explained in details in the following sections.

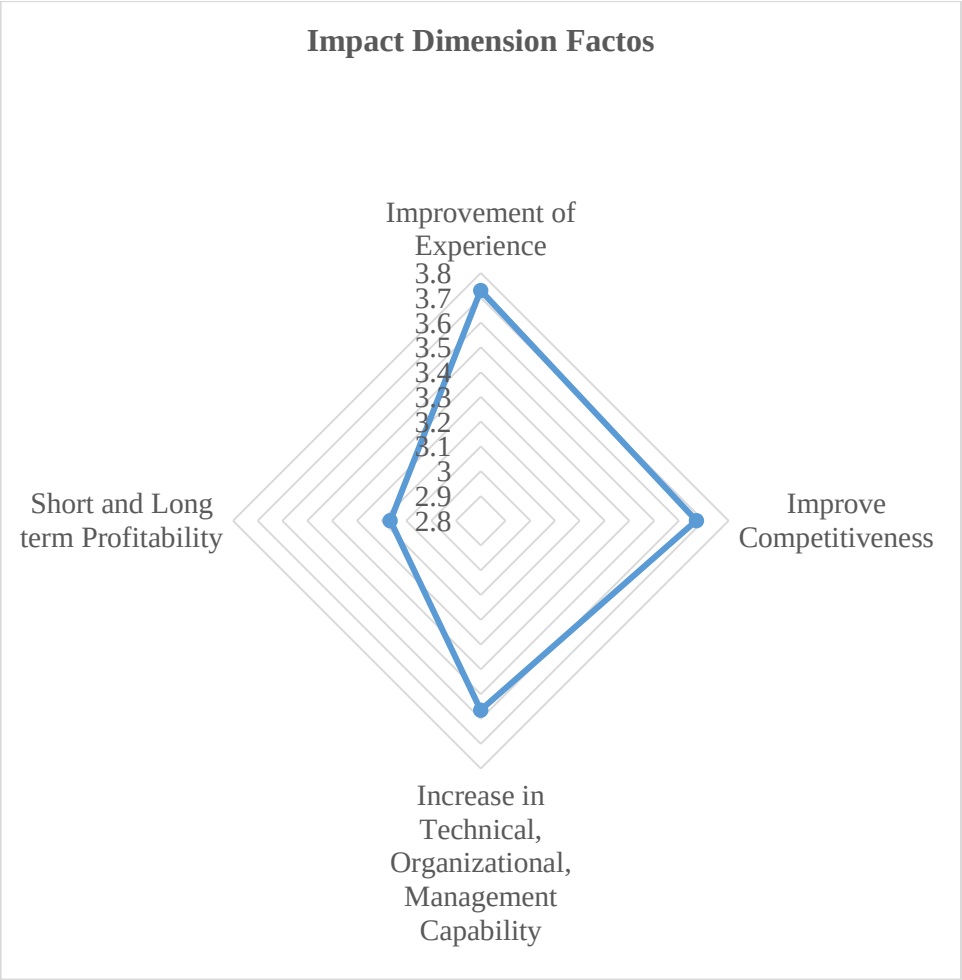


Figure 38: Mean values for impact factors

5.3.5.1 Improvement of Experience

This factor importance of experience was at medium level for importance in innovation. However, the RII is 0.74 which can be considered as a high rating factor.

Table 31: The percentages of the improvement of experience of respondents

Very high	High	Medium	Low	Very Low
22%	38%	34%	2%	4%

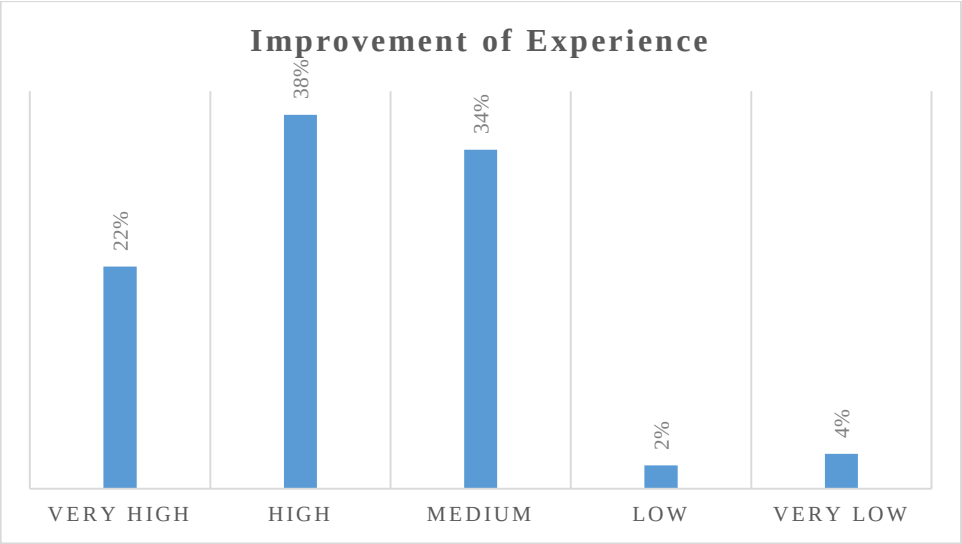


Figure 39: The percentages of improvement of experience in innovation

5.3.5.2 Improve Competitiveness

The highest percentage is the Medium percentage but the difference is very small amount between the High and the Medium percentage. The RII was 0.73, which can be considered as a high rating factor.

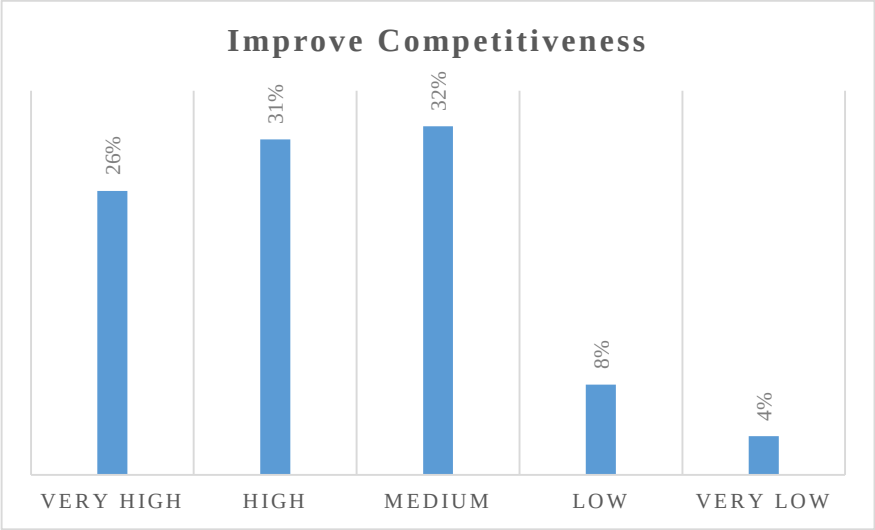


Figure 40: The percentages of improve of competitiveness in innovation

Table 32: The percentages of improve competitiveness respondents

Very high	High	Medium	Low	Very Low
26%	31%	32%	8%	4%

5.3.5.3 Increase in Technical, Organizational, Management Capability

As it is resulted from the respondents that the Medium scale got the highest percentage which means that this factor come in the second position. The RII is 0.71, which can be considered as a high factor rating in dimension.

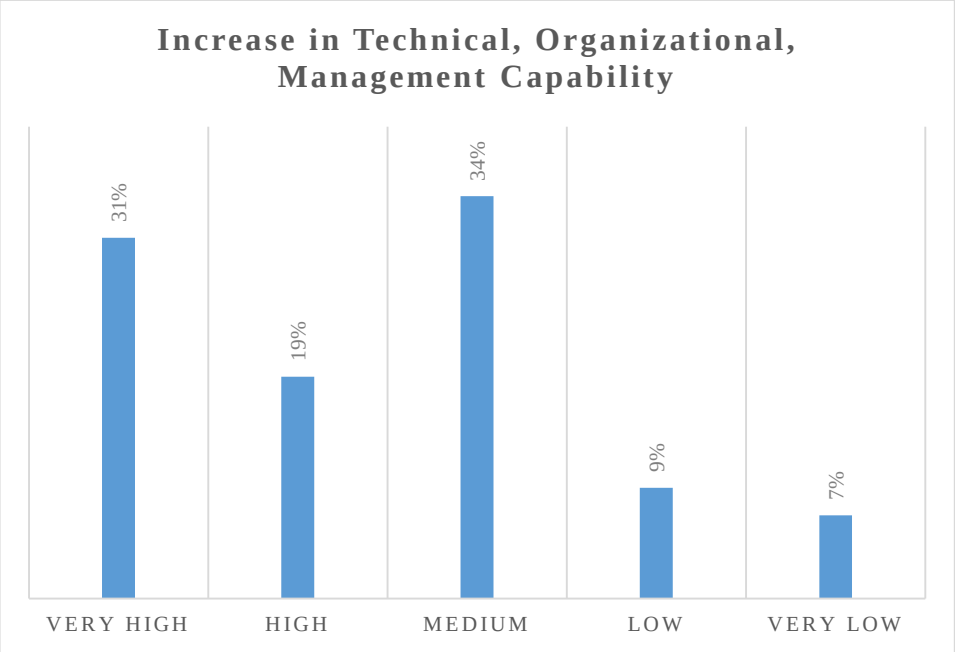


Figure 41: The percentages of increase in technical, organizational, management capability

Table 33: The percentages of increase in technical, organizational, management Capability respondents

Very high	High	Medium	Low	Very Low
31%	19%	34%	9%	7%

5.3.5.4 Short and Long Term Profitability

As it is produced from the answers that the medium scale got the highest percentage which means that this factor come in the second position. The RII is 0.63, which can be considered as a high factor rating in dimension.

Table 34: The percentages of short and long term profitability respondents

Very high	High	Medium	Low	Very Low
12%	26%	34%	24%	5%

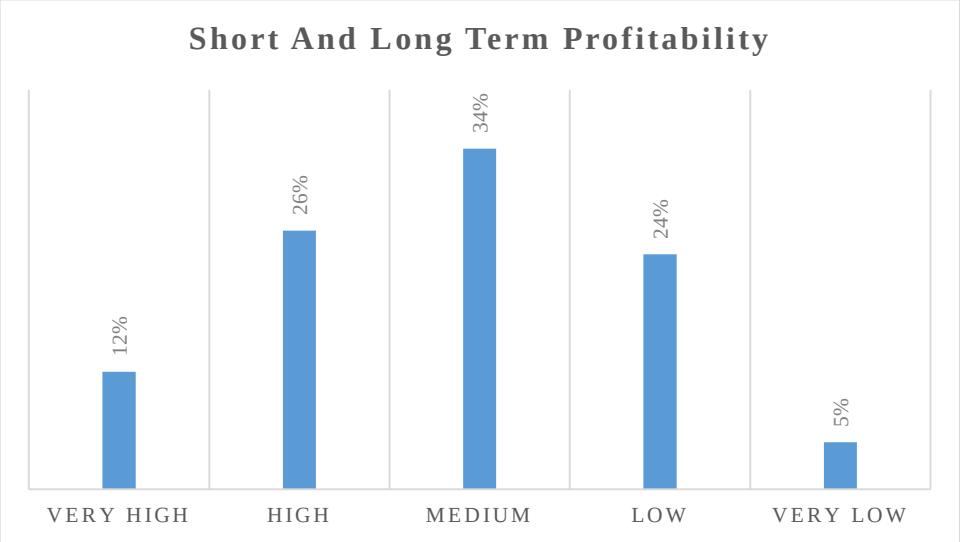


Figure 42: The percentages of short and long term profitability in innovation

5.4 Competitiveness Dimensions

The competitiveness has eighteen different factors, which are the most usable and valuable factors for estimating the level of competitiveness in the construction industry. Figure 43 illustrates a brief details for each of the factors inside the competitiveness dimension. The details of each of the factors are explained in the subsequent sections.

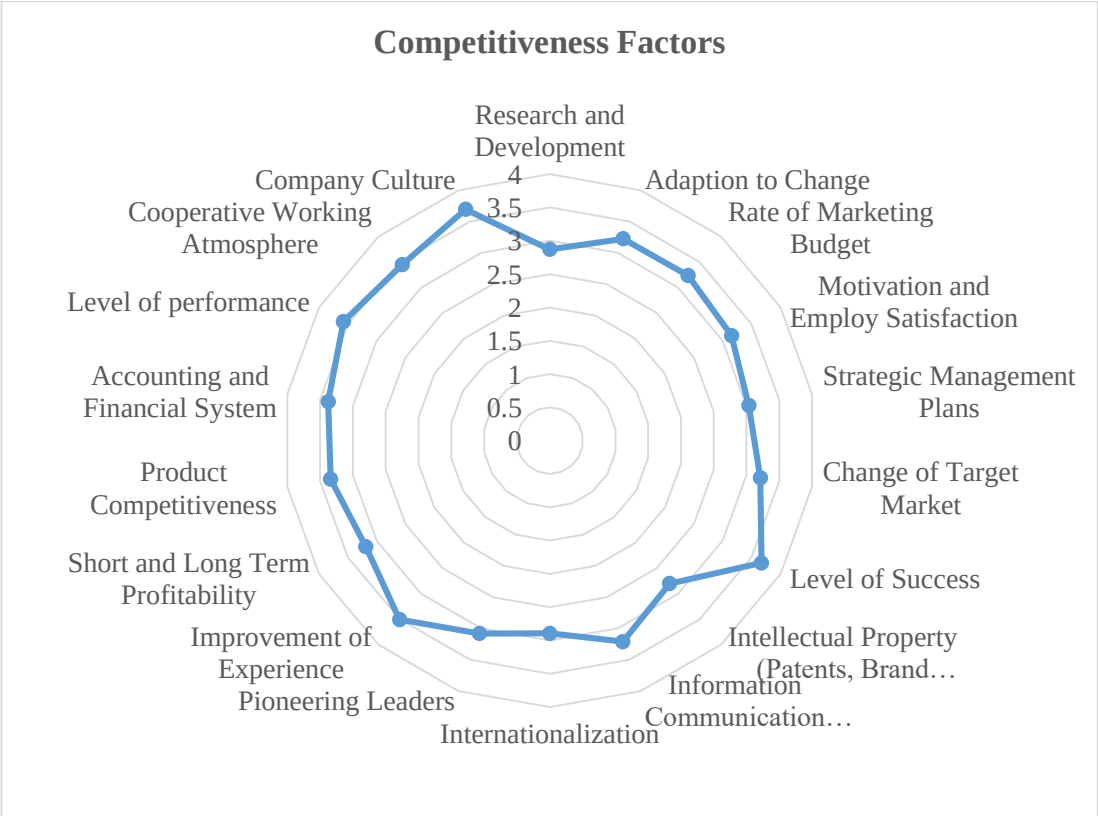


Figure 43: Mean values for factors of competitiveness

5.4.1 Research and Development

As in the below table and in the Pie chart, the medium percentage is the highest one. The RII was 0.57, it means that it is low rating factor. The details of this factor can be seen from Table 35 and Figure 44.

Table 35: The percentages of research and development respondents

Very high	High	Medium	Low	Very Low
7%	25%	34%	16%	18%

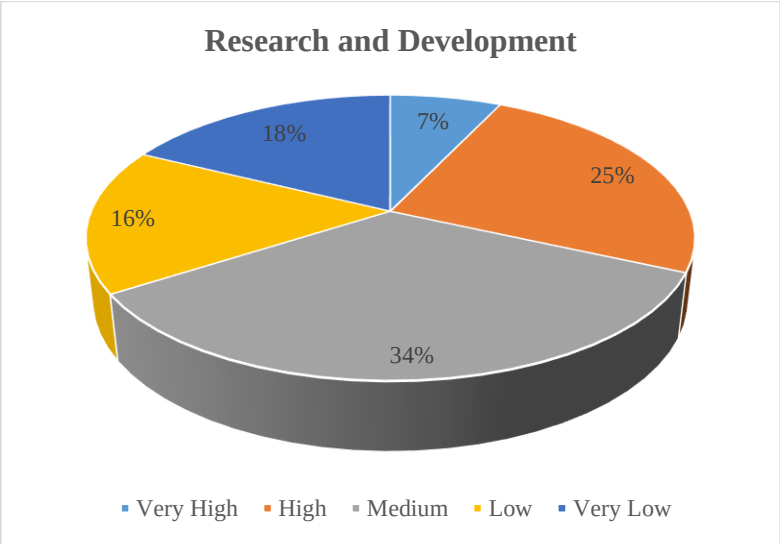


Figure 44: The percentages of research and development in competitiveness

5.4.2 Adaption to Change

As it is triggered from the answers that the Medium scale got the highest percentage among others. The RII is 0.64 so it can be considered as a high rating factor.

Table 36: The percentages of adaption to change respondents

Very high	High	Medium	Low	Very Low
7%	35%	36%	15%	6%

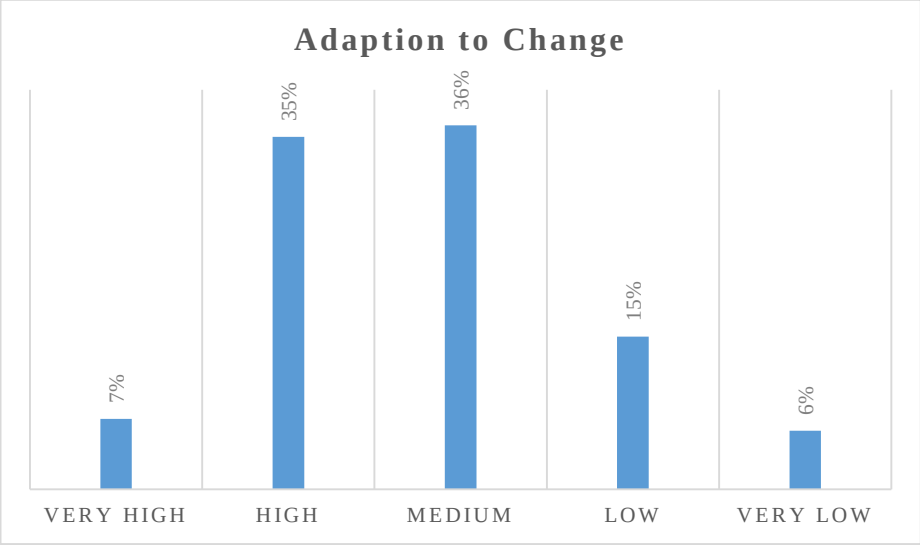


Figure 45: The percentages of adaption to change in competitiveness

5.4.3 Rate of Marketing Budget

From the answers, it is observed that the Medium scale got the highest percentage which means that this factor come in the second position. The RII is 0.64, it can be considered as a high factor rating in the dimension.

Table 37: The percentages of rate of marketing budget respondents

Very high	High	Medium	Low	Very Low
12%	28%	35%	21%	4%

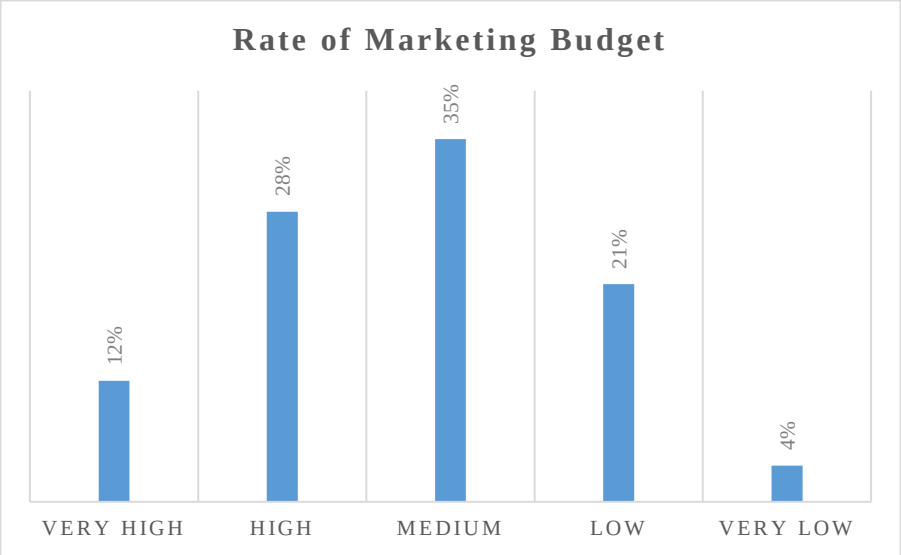


Figure 46: The percentages of rate of marketing budget in competitiveness

5.4.4 Motivation and Employ Satisfaction

The answers showed that the Medium scale got the highest percentage which means that this factor come in the second position. The RII was 0.63, it can be considered as a high factor rating in dimension.

Table 38: The percentages of Motivation and Employ Satisfaction respondents

Very high	High	Medium	Low	Very Low
13%	21%	41%	18%	7%

Figure 47: The percentages of motivation and employ satisfaction in competitiveness

5.4.5 Strategic Management Plans

As shown below that the 39% is the highest percentage of the respondents. The RII was 0.60, so it can be considered as a high rating factor.

Table 39: The percentages of strategic management plans respondents

Very high	High	Medium	Low	Very Low
12%	20%	39%	19%	11%

Figure 48: The percentages of the strategic management performance in competitiveness

5.4.6 Change of Target Market

As it is resulted from the respondents that the Medium scale as well as the High scale got the highest percentage which means that this factor come in the second position. The RII was 0.64, which can be considered as a low factor rating in dimension.

Table 40: The percentages of change of target market respondents

Very high	High	Medium	Low	Very Low
6%	35%	35%	21%	2%

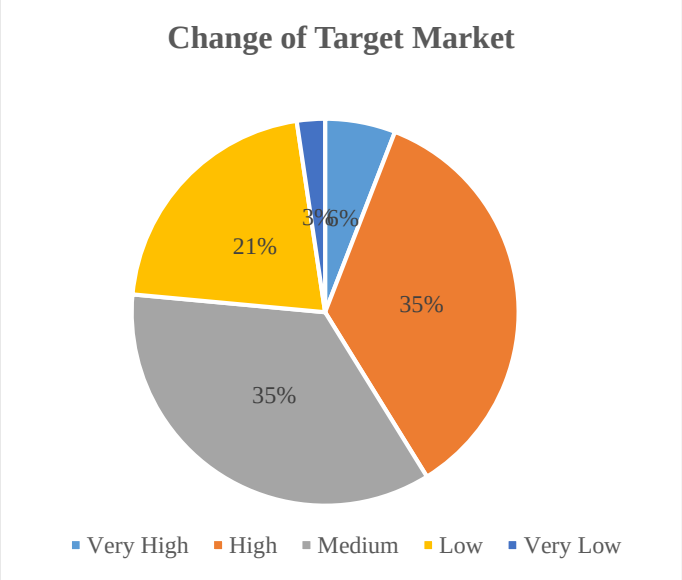


Figure 49: The percentages of change of target market in competitiveness

5.4.7 Level of Success

As it is resulted from the respondents that the highest percentage is equal to 36%. The RII was 0.73, it can be considered as a high factor rating in dimension.

Table 41: The percentages of level of success respondents

Very high	High	Medium	Low	Very Low
21%	36%	33%	7%	2%

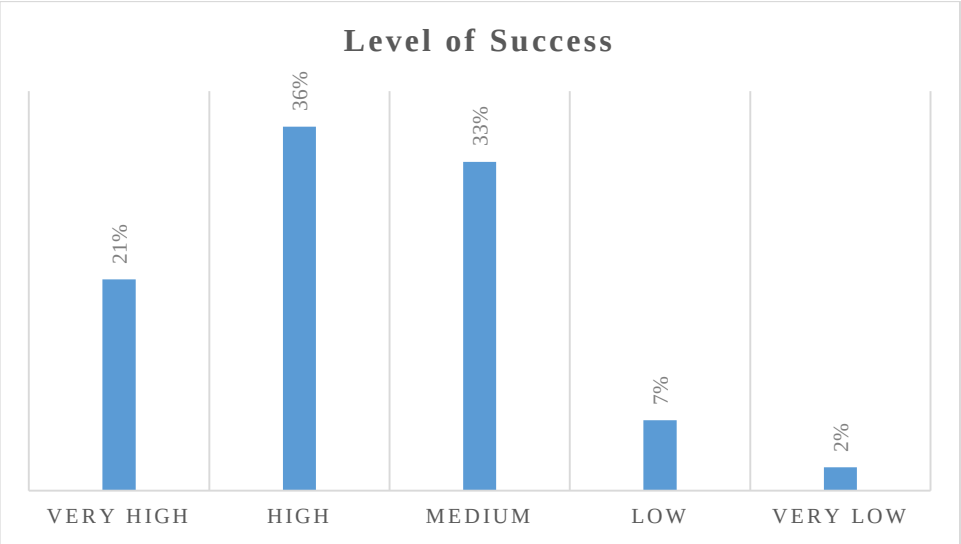


Figure 50: The percentages of level of success in competitiveness

5.4.8 Intellectual Property (Patents, Brand Registration)

As it is proposed from the answers that the Medium scale got the highest percentage which means that this factor come in the second position. The RII was 0.56, which can be considered as a high factor rating in dimension.

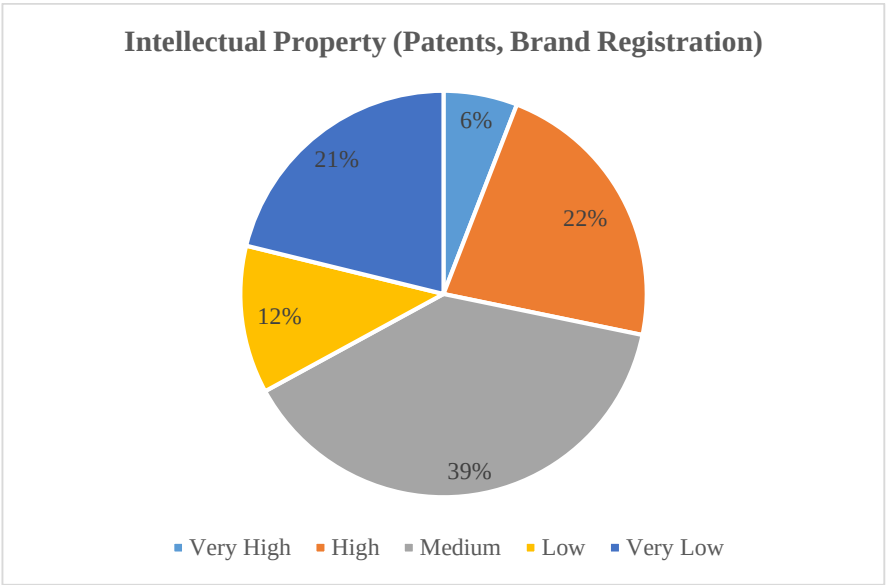


Figure 51: The percentages of intellectual property (patents, brand registration) in competitiveness

Table 42: The percentages of intellectual property (patents, brand registration) respondents

Very high	High	Medium	Low	Very Low
6%	22%	39%	12%	21%

5.4.9 Information Communication Technology (ICT)

As it is planned from the answers that the high scale got the highest percentage which means that this factor is at medium level. The RII was 0.64 which can be considered as a high factor rating in dimension.

Table 43: The percentages information communication technology respondents

Very high	High	Medium	Low	Very Low
9%	34%	31%	20%	6%

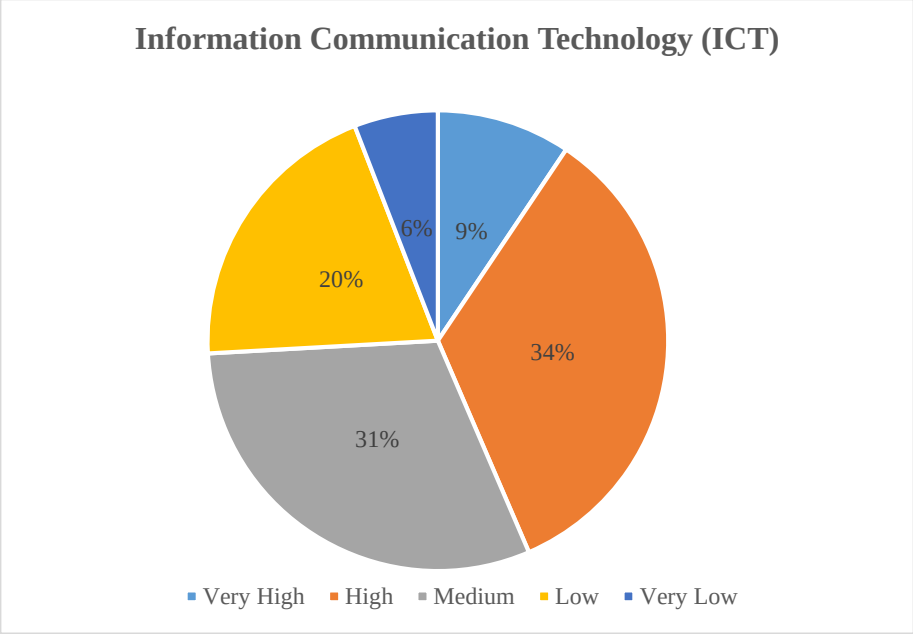


Figure 52: The percentages information communication technology respondents

5.4.10 Internationalization

As it is planned from the answers that the Medium got the highest scale which means that this factor not come in the first position. The RII was 0.57, which can be considered as a low factor rating in dimension.

Table 44: The percentages of internationalization respondents

Very high	High	Medium	Low	Very Low
7%	21%	36%	25%	11%

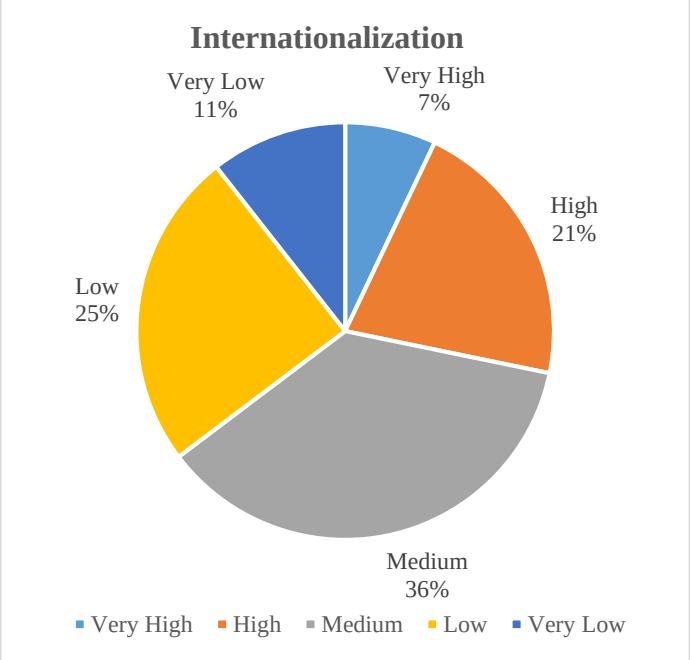


Figure 53: The percentages of internationalization in competitiveness

5.4.11 Pioneering Leaders

As it is proposed from the answers that the Medium scale got the highest percentage which means that this factor come in the first position. The RII is 0.61, which can be considered as a high factor rating in dimension.

Table 45: The percentages of pioneering leader's respondents

Very high	High	Medium	Low	Very Low
14%	24%	29%	22%	11%

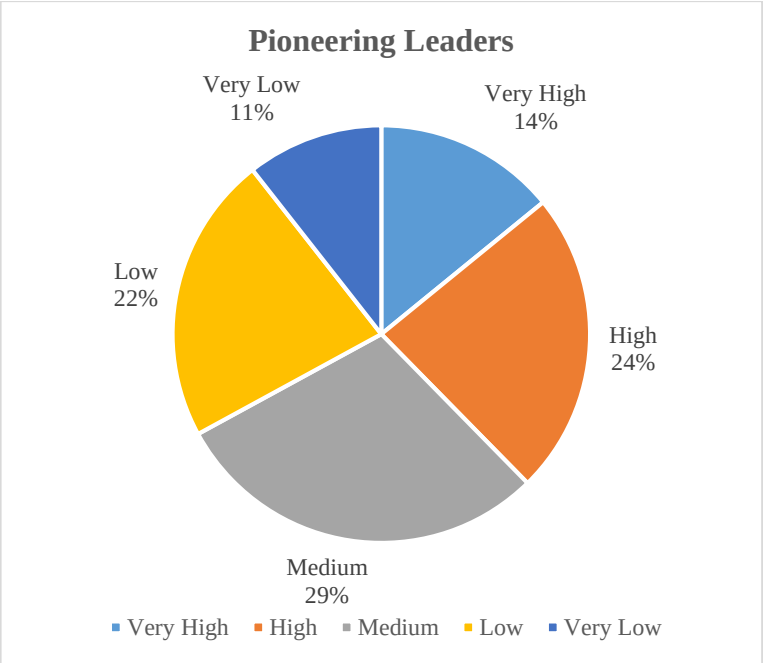


Figure 54: The percentages of pioneering leaders' respondents

5.4.12 Improvement of Experience

As it is proposed from the answers that the highest scale got the highest percentage which means that this factor come in the first position. The RII was 0.70, which can be considered as a low factor rating in dimension.

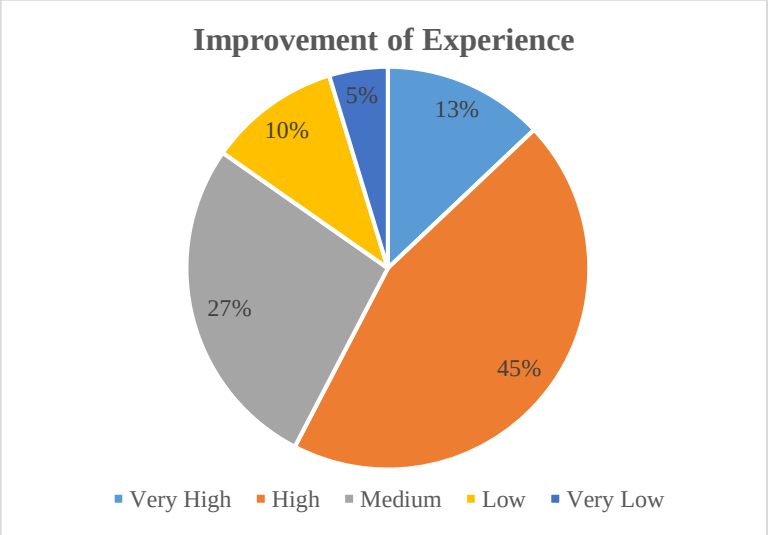


Figure 55: The percentages of improvement of experience in competitiveness

Table 46: The percentages of improvement of experience respondents

Very high	High	Medium	Low	Very Low
13%	45%	27%	11%	5%

5.4.13 Short and Long Term Profitability

The 36% considered the highest percentage as in the following Table 47. Also in pie chart it can be seen that certainly. The RII is 0.63 which can be considered as a low rating factor.

Table 47: The percentages of short and long term profitability respondents

Very high	High	Medium	Low	Very Low
14%	22%	36%	22%	5%

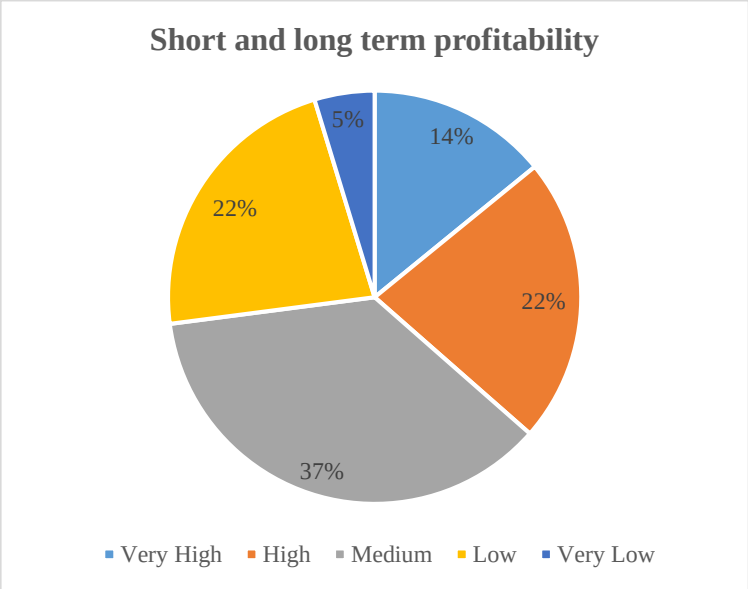


Figure 56: The percentages of short and long term profitability respondents

5.4.14 Product Competitiveness

In this case the Medium percentage is the highest one and the RII was 0.66, which can be considered as a high percentage.

Table 48: The percentages of product competitiveness respondents

Very high	High	Medium	Low	Very Low
19%	24%	33%	22%	2%

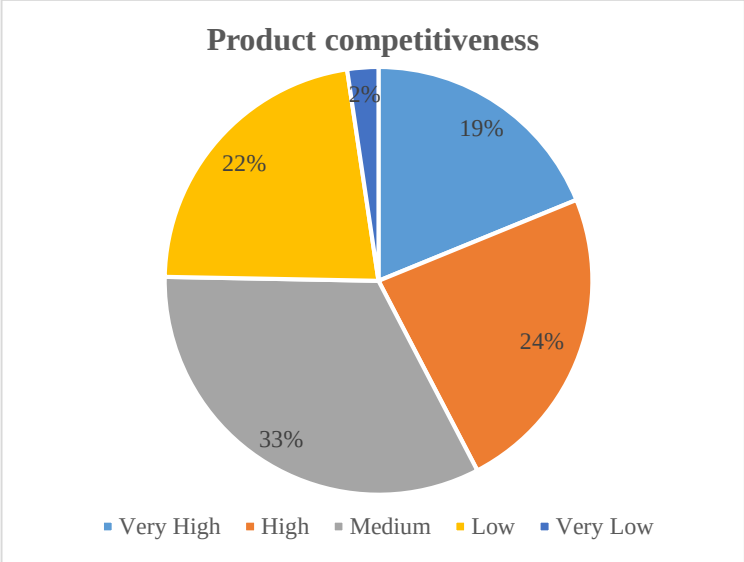


Figure 57: The percentages of product competitiveness respondents

5.4.15 Accounting and Financial System

The 36% is the highest percentage as in the follow Table 49. Also in the Pie chart as of Figure 58 it can be seen that certainly. The RII is 0.67 which can be considered as a low rating factor.

Table 49: The percentages of accounting and financial system respondents

Very high	High	Medium	Low	Very Low
15%	29%	36%	15%	4%

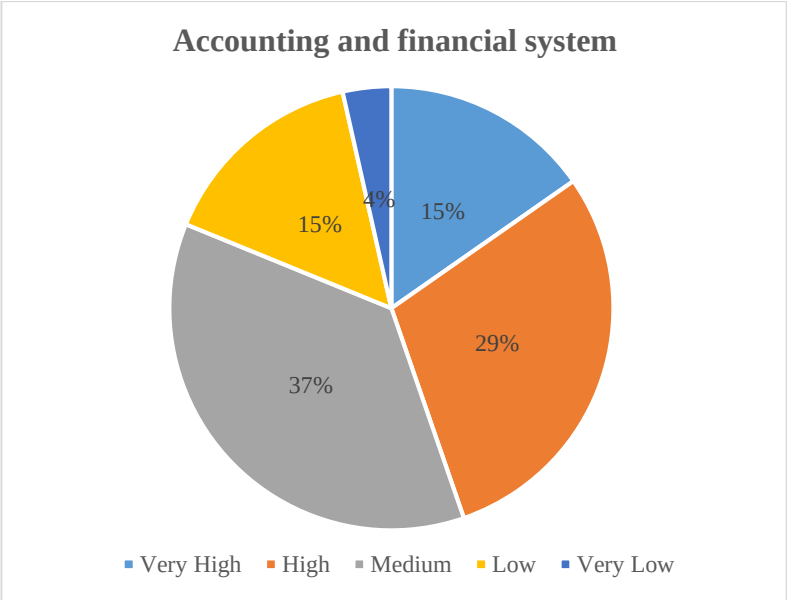


Figure 58: The percentages of accounting and financial system respondents

5.4.16 Level of Performance

The 32% is for both the high and medium level of performance, as it can be seen from Figure 59. Also in the Pie chart it can be seen that. The RII was 0.71 which can be considered as a high rating factor.

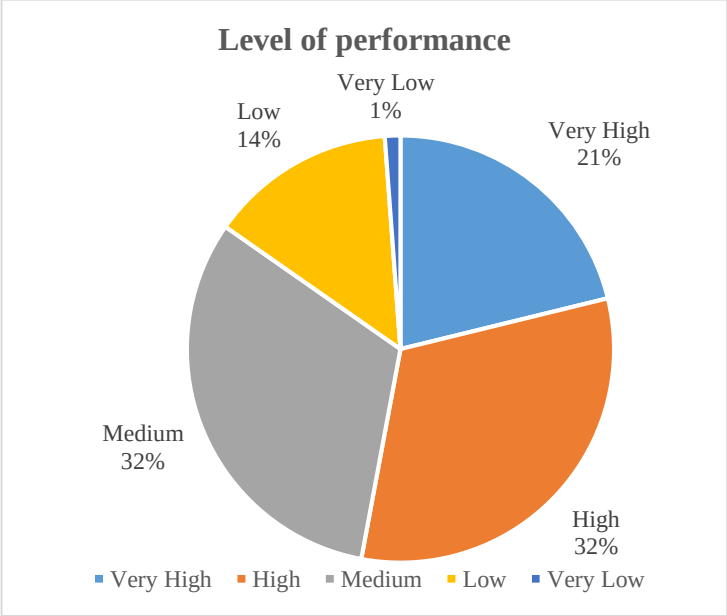


Figure 59: The percentages of level of performance respondents

Table 50: The percentages of level of performance respondents

Very high	High	Medium	Low	Very Low
21%	32%	32%	14%	1%

5.4.17 Cooperative Working Atmosphere

The 42% is the highest percentage as in the follow Table 51. The below pie chart also illustrates that. The RII was 0.68 which can be considered as a high rating factor

Table 51: The percentages of cooperative working atmosphere respondents

Very high	High	Medium	Low	Very Low
13%	42%	25%	16%	4%

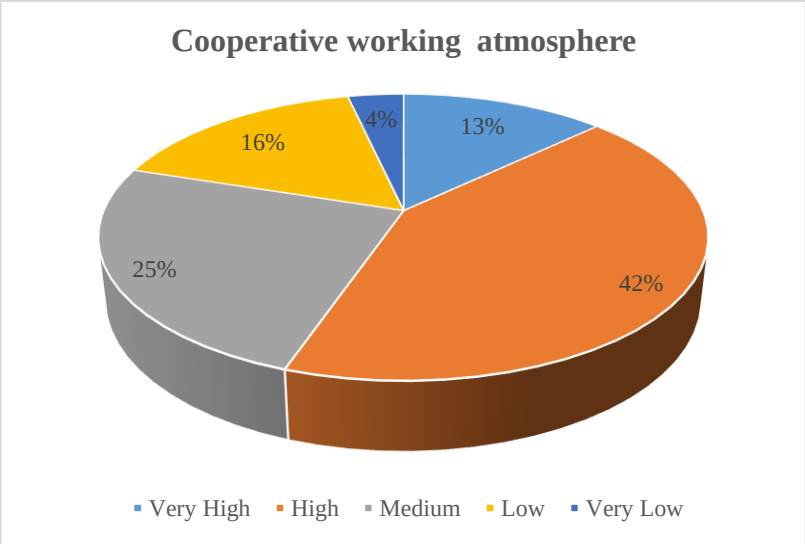


Figure 60: The percentages of cooperative working atmosphere respondents

5.4.18 Company Culture

In the Figure 61 it can be seen that 32% is the highest percentage of the respondents which was received from the questionnaires. Also in the Pie chart it can see that clearly. The RII was 0.73 which can be considered as a high rating factor.

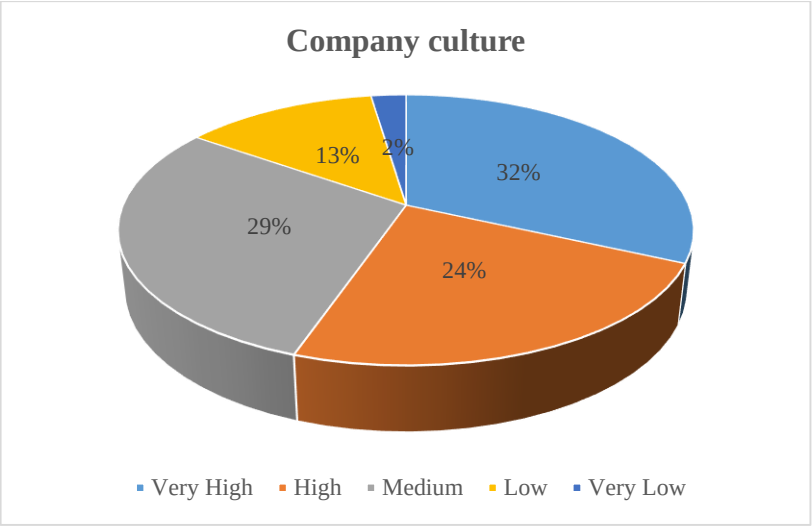


Figure 61: The percentages of company culture respondents

Table 52: The percentages of company culture respondents

Very high	High	Medium	Low	Very Low
32%	24%	29%	13%	2%

5.5 Factors Analysis

5.5.1 Factor Loading and Reliability Coefficient (Cronbach á)

They are assigned for every element to "Guaranteeing Applied Significance" (Livesley et al, 1998). Reliability coefficient is considered for every indicator. Loading factors ranges are from 0.700 to 0.820, and indicates that all elements have effect on the indicators. Table 53 has been resulted from the analysing of the study Data by using SPSS. To ensure that the Data are not missed or excluded.

Table 53: Valid and excluded percentage of data

Case Processing Summary			
		N	**%**
Cases	Valid	85	100.0
	Excluded	0	.0
	Total	85	100.0
A. Leastwise deletion based on all variables in the procedure.			

In this table the Cronbach's Alpha with the number of the factors for both innovation and competitiveness has been conducted. Additionally, means and variances which are very significant metrics are explained with correlations between the factors in order to determine strengthen of the relationship between them. The factors from 1_43 are the factors that been investigated for both innovation and competitiveness level in construction industry sector.

Table 54: Measurement reliability statistics of data

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
.898	.900	43

Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
Do you satisfy that the innovation is essential for your company	143.0588	394.508	.233	.	.898
Capital (investment in ICT, Software, and Equipment)	143.8235	387.576	.430	.	.895
Number of Employees who Devote to Innovation	144.3059	382.905	.385	.	.896
Number of Employees who Devote to Innovation	144.1765	384.123	.393	.	.896
Consultancy (To provide valuable advices)	143.7059	388.734	.333	.	.897
Internal and External idea generation	143.9412	377.723	.539	.	.894
Customer Requirements	143.5529	392.322	.298	.	.897
Technology Development	143.7647	386.896	.427	.	.895
Regulation and Legislation	143.9176	380.600	.522	.	.894
Project Performance Improvement	143.6000	391.386	.328	.	.897
Unwillingness to Change	144.0941	398.015	.066	.	.902
Lack of Technology	144.3412	394.537	.155	.	.899
Lack of Experienced and Qualified Staff	144.0118	391.774	.187	.	.899

Time Constraint	144.4000	395.005	.178	.	.899
Financial Constraint	143.8471	399.083	.086	.	.900
Government Policy	143.9059	401.372	.027	.	.901
Collaborative Partnering	143.8941	382.858	.478	.	.895
Commitment	143.6353	387.544	.365	.	.896
Reward System	143.6235	397.285	.143	.	.899
Education and Training Policy	143.7294	386.890	.407	.	.896
Early Contractor Involvement(ECI)	144.0235	387.428	.433	.	.895
Improvement of Experience	143.7059	385.734	.453	.	.895
Improve Competitiveness	143.7647	381.754	.500	.	.894
Increase in Technical, Organizational, Management Capability	143.8706	376.447	.544	.	.893
Short and Long term Profitability	144.2706	393.509	.213	.	.898
Research and Development	144.5647	376.106	.570	.	.893
Adaption to Change	144.2118	378.693	.621	.	.893
Rate of Marketing Budget	144.2000	387.519	.371	.	.896
Motivation and Employ Satisfaction	144.2824	380.348	.523	.	.894
Strategic Management Plans	144.4000	374.505	.632	.	.892
Change of Target Market	144.2235	388.318	.396	.	.896
Level of Success	143.7647	380.444	.590	.	.893
Intellectual Property(Patents, Brand Registration)	144.6353	386.544	.338	.	.897
Information Communication Technology(ICT)	144.2235	388.795	.329	.	.897
Internationalization	144.5412	379.561	.545	.	.894
pioneering Leaders	144.3529	374.303	.597	.	.893
Improvement of Experience	143.9294	377.876	.632	.	.893
Short and Long Term Profitability	144.2471	384.926	.412	.	.895

Product Competitiveness	144.0941	377.420	.587	.	.893
Accounting and Financial System	144.0588	387.604	.368	.	.896
Level of performance	143.8588	381.885	.522	.	.894
Cooperative Working Atmosphere	143.9882	384.059	.459	.	.895
Organization Culture	143.7412	384.504	.406	.	.896

Table 55: Mean and Standard deviation

Item Statistics			
	Mean	**Std. Deviation**	**N**
Do you satisfy that the innovation is essential for your company'	4.3765	.89942	85
Capital (investment in ICT, Software, and Equipment)	3.6118	.90098	85
Research and Development Expenditure (R&D), and (R&D) projects	3.1294	1.27044	85
Number of Employees who Devote to Innovation	3.2588	1.17669	85
Consultancy (To provide valuable advices)	3.7294	1.05094	85
Internal and External idea generation	3.4941	1.17132	85
Customer Requirements	3.8824	.89192	85
Technology Development	3.6706	.94350	85
Regulation and Legislation	3.5176	1.07584	85
Project Performance Improvement	3.8353	.88435	85
Unwillingness to Change	3.3412	1.40198	85
Lack of Technology	3.0941	1.23079	85
Lack of Experienced and Qualified Staffs	3.4235	1.35731	85
Time Constraint	3.0353	1.06287	85
Financial Constrain	3.5882	1.02695	85
Government Policy	3.5294	1.06445	85
Collaborative Partnering	3.5412	1.05281	85

Commitment	3.8000	1.04426	85
Reward System	3.8118	.95735	85
Education and Training Policy	3.7059	.98589	85
Early Contractor Involvement(ECI)	3.4118	.90362	85
Improvement of Experience	3.7294	.95604	85
Improve Competitiveness	3.6706	1.06221	85
Increase in Technical, Organizational, Management Capability	3.5647	1.21936	85
Short and Long term Profitability	3.1647	1.06734	85
Research and Development	2.8706	1.18310	85
Adaption to Change	3.2235	.99255	85
Rate of Marketing Budget	3.2353	1.03103	85
Motivation and Employ Satisfaction	3.1529	1.08568	85
Strategic Management Plans	3.0353	1.13858	85
Change of Target Market	3.2118	.92703	85
Level of Success	3.6706	.96841	85
Intellectual Property(Patents, Brand Registration)	2.8000	1.18322	85
Information Communication Technology(ICT)	3.2118	1.05891	85
Internationalization	2.8941	1.08038	85
Pioneering Leaders	3.0824	1.20724	85
Improvement of Experience	3.5059	1.00740	85
Short and Long Term Profitability	3.1882	1.08556	85
Product Competitiveness	3.3412	1.09711	85
Accounting and Financial System	3.3765	1.03483	85
Level of performance	3.5765	1.01625	85
Cooperative Working Atmosphere	3.4471	1.02940	85
Organization Culture	3.6941	1.12359	85

5.6 Pearson Correlation Coefficient (PCC)

PCC is a statistical measure calculating the linear relationship between two variables in a model and used as an estimation of the entire population correlation which results values between -1 and 1. The -1 means the strongest negative linear between variables, while 1 means the strongest positive linear between variables. 0 means there is no linear relation between the variables.

Based on the data analyzed, the PCC can be seen in the Table 56.

Table 56: PCC for innovation and competitiveness variables

	Is innovation essential for the firn?	*Inputs*	*Drivers*	*Barriers*	*Enablers*	*Impacts*	*Competitiveness*
Is innovation essential for the firm?	1						
Inputs	0.28989728	1					
Drivers	0.50133845	0.972768	1				
Barriers	0.36792224	0.935766	0.934285	1			
Enablers	0.40015696	0.983643	0.985223	0.888694	1		
Impacts	0.41351981	0.963886	0.965856	0.979596	0.9363	1	
Competitiveness	-0.05358168	0.913123	0.814177	0.899093	0.829651	0.871364	1

5.7 Developed Hypotheses

Based on the results of data analysis, the following hypotheses are provided for both Innovation and Competitiveness:

- **Hypothesis 1**: Construction companies in Northern Iraq activating their inputs, drivers, and impacts of innovation can improve their project performance.

- **Hypothesis 2**: Construction companies in Northern Iraq activating their inputs, drivers, and impacts of innovation can increase their competitive advantages.
- **Hypothesis 3**: Construction companies stimulating enablers and dimensions of competitiveness can improve their project performance.
- **Hypothesis 4**: Construction companies unable to overcome barriers cannot improve their competitiveness and project performance.

5.8 Hypotheses Testing

The data has been collected from questionnaires distributed to 150 construction firms. 85 firms have replied with results making the response rate 57%. From these results hypotheses testing is performed.

5.8.1 Testing Hypothesis 1

Data analysis shows that, 66 firms who have selected high scales for input factors, their project performances are high. Therefore, the firms that considering the input dimension is essential for the innovation, they have an improved project performance. For the driver dimension, the results of data reveals that 64 construction firms having high driver's scales, have high project performance, which means that, the construction sectors paying attention for driver dimension, have high performance in their projects. Similarly, 69 construction firms having high impact in their scales, have high project performance. This also means that, the firms which care for their impacts, have excellent project performance. Thus, from the results in the Table 57, it can be concluded that hypothesis 1 is definitely true. Hypothesis 1 testing is highlighted with light blue color in the table.

5.8.2 Testing Hypothesis 2

In the results of the survey, 58 construction firms have given high ranges to input factors. These firms have been found with high competitive advantages. In the same

way, it has been discovered from the results, 58 of the construction firms having high scales of drivers, have high scale of competitiveness. Similarly, the firms with high values of impact factors, have high values of competitiveness. The statistical information can be seen from the Table 57. Therefore, the facts in the table ensures the validity of the hypothesis 2.

Table 57: T-Test results for the developed hypotheses

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Input - Project Performance	-.26118	.96302	.10445	-.46889	-.05346	-2.500	84	0.014
Driver - Project Performance	.12891	.62041	.07755	-.02607	.28388	1.662	63	0.101
Impact - Project Performance	-.17353	.87968	.09542	-.36327	.01621	-1.819	84	0.073
Input - Competitiveness	.19373	.84090	.09121	.01235	.37510	2.124	84	0.037
Driver - Competitiveness	.47549	.83877	.09098	.29457	.65641	5.226	84	0.000
Impact - Competitiveness	.28137	.77441	.08400	.11434	.44841	3.350	84	0.001
Enabler - Project Performance	.08933	.67415	.07784	-.06577	.24444	1.148	74	0.255
Competitiveness - Project Performance	-.45490	.65068	.07058	-.59525	-.31455	-6.446	84	0.000
Barrier - Competitiveness	.52186	.92514	.11845	.28492	.75880	4.406	60	0.000
Barrier - Project Performance	-.37059	.96820	.10502	-.57942	-.16175	-3.529	84	0.001

5.8.3 Testing Hypothesis 3

Data analysis discovered that 75 of the firms that gave high metrics to enabler dimension, have high project performances. On the other side, 58 of the construction firms having high competitiveness have high project performance. The two aforementioned evidences confirm the correctness of hypothesis 3. The yellow colored rows in the Table 57 illustrate the statistical data for testing hypothesis 3.

5.8.4 Testing Hypothesis 4

61 of the firms in the questionnaires gave high scales to barrier factors, which means that they consider these factors as obstacles and eventually avoid them. The firms with high scales of barriers, have high competitive advantages. The same way, 61 of the firms who have high barrier scales have high project performance. Therefore, these analysis details approves hypothesis 4. The statistical details for hypothesis 4, which are highlighted with green color, are shown in the Table 57.

5.9 Conceptual Framework of Innovative System and Competitiveness in Construction Industry

From the conceptual framework, which is illustrated in Figure 62 it can be noticed that activating the factors of input, driver and impact, affect positively on project performance of the construction firms. While by stimulating enablers' factors and competitiveness dimensions, results in improving the competitive advantage of the construction sectors.

The factors of the variables inputs, drivers and impacts, have positive influences on increasing the firms' competitive advantages, which means by activating these variables, the competitive advantages improve proportionally.

The barriers dimension of the companies, have negative affect on both of project performance and competitiveness. So, without overcoming the current barriers, the construction firms are incapable of improving the project performance and competitive advantages.

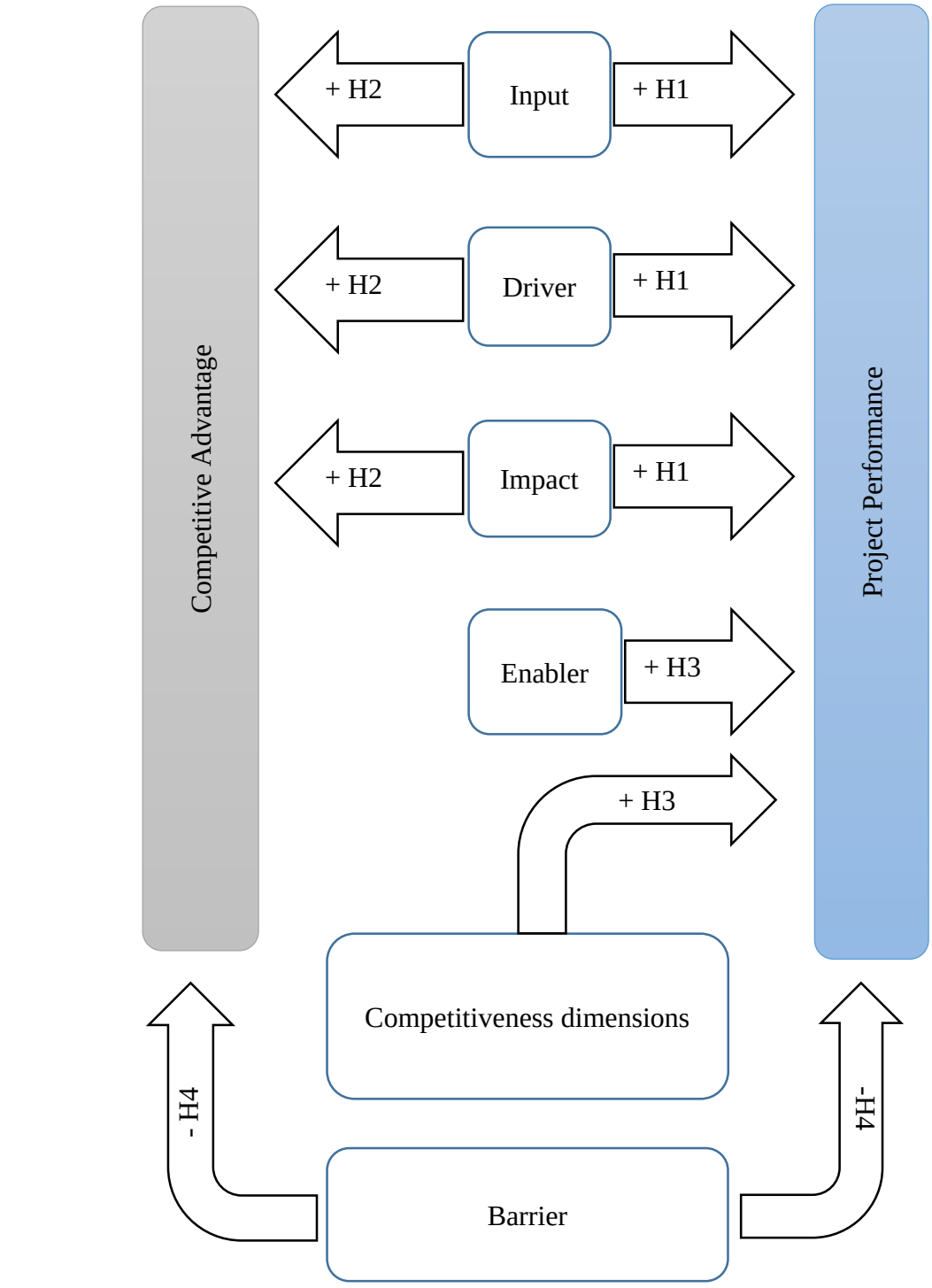
From the Table 57, it can be ensured that the input dimension has a positive effect on project performance of the companies and competitiveness at the same time. The significance P-value for input to project performance is 0.014 which is less than 0.05 (1-confidence level), similarly, the P-value of input to competitiveness is 0.073 which is also less than 0.05. As a result, these values ensures that input dimension affect both of project performance and competitiveness.

Driver dimension affect directly to both of the project performance and competitiveness. As it is shown in Table 57, P-value of driver to project performance is 0.101, which is statistically accepted to be considered as a confidence level, and P-value of driver to competitiveness is 0, which is a strong confidence level. Therefore, both of the values are statistically accepted to consider the driver dimension effect on project performance and competitiveness.

Impact dimension has a positive influence on both of project performance and competitiveness. It can be seen from the Table 57, the P-values of both impact-project performance and impact-competitiveness are 0.073 and 0.001 respectively. These values are less than confident value which means that the impact dimension affect positively on both project performance and competitiveness.

Enabler and competitiveness dimensions, have positive influence only on project performance. The Table 57 illustrates that P-values of enabler and competitiveness to project performance are 0.255 and 0.0 respectively. These values confirms the effect of these dimensions on project performance.

While barrier dimension affect negatively to competitiveness and project performance. The P-values of the dimension to both of competitiveness and project performance shows that they are less than 0.05, or the confident level. This means that when the barrier dimension increases in a company, the competitiveness and project performance decrease for that company.



H1, H2, H3, H4: Hypotheses (1,2,3,4)
+ : Positive impact
- : Negative impact

Figure 62: Conceptual framework of developed hypotheses for construction industry

Chapter 6

CONCLUSION AND FURTHER STUDY RECOMMENDATIONS

6.1 Conclusion

Innovation is the key success of any firm worldwide, competitiveness is the organizations' ability of providing services with standard qualities at competitive costs. A collection of factors effecting innovation and competitiveness have been studied and selected forming a group of dimensions for innovation and competitiveness. Based on these dimensions, a structured questionnaire survey approach was considered to study the impact of various attributes and factors affecting innovation and competitiveness for construction industry, and distributed to experienced engineers such as projects managers, site engineers and office engineers in Northern Iraq.

Forty three factors were considered in this study and were listed under seven dimensions based on literature review. The dimensions considered in this research are: 1) input, 2) driver, 3) barriers, 4) enabler, 5) impact, 6) competitiveness, and 7) firm's need of innovation.

150 questionnaires were distributed and 85 questionnaires (57%) were received. The results were analyzed and discussed to obtain the most factors affect innovation and competitiveness, followed by developing four hypotheses outlining the improvements of project performance of the construction firms and their competitive advantages.

A conceptual framework describing the developed hypotheses are designed, ended up with exposing two main theories: 1) through stimulating the variables of innovation such as inputs, drivers, enablers and impacts, the competitive advantages and project performance of construction sectors increase; 2) the construction sectors unable to overcome barriers are unable to increase their project performance and competitiveness.

The following recommendations are presented so as to improve project performance, innovation and competitiveness for construction industry in the region:

1. The most important factors agreed by participants to be improved for innovation are listed below:
    a. R&D expenditure and R&D projects
    b. Short and long term profitability
    c. Number of employees who devote to innovation
    d. Financial constraint
    e. Government policy
2. The most significant factors for competitiveness agreed by respondents to be improved are the following:
    a. Intellectual property (patents, brand registration)
    b. R&D
    c. Internationalization
    d. Strategic management plans
    e. Pioneering leaders
3. Managers and employees of firms are recommended to organize regular meetings so as to discuss, monitor and control the progress of projects.

These meetings further help them to evaluate current performance, overcome existing problems and improve the future work.

4. Northern Iraq government should be aware of financial shortages in the construction industry sector to help them apply the innovation system.
5. In order to improve the managerial skills at firms, there is need for continuous work-training programs for personnel in the industry to update their knowledge and be familiar with project management techniques and processes.

6.2 Recommendations for Further Study

Failure measurement systems for the construction industry in Northern Iraq are not effective to measure construction projects performance and identify their problems. Therefore, it is highly recommended to develop performance measurement framework and modelling system in order to measure performance of construction organizations and projects. Furthermore, it is recommended to develop a specific unit in all construction firms so as to encourage the innovation. Finally, it is also recommended to investigate and evaluate the most essential factors such as R&D expenditure and R&D projects, number of employees devoting to innovation and strategic management plans as a case study of construction projects in Northern Iraq.

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APPENDIX

Appendix A: Questionnaire Sample

Eastern Mediterranean University
Faculty of Engineering
Civil Engineering Department

Factors Affecting the Competitiveness and Innovation in Northern Iraq Construction Industry

Sevar Dilkhaz Salahaddin
Supervisor
Assoc. Prof. Dr. Ibrahim Yitmen

A research study for master thesis under the supervision of Assoc. Prof. Dr. Ibrahim Yitmen at the Eastern Mediterranean University - Cyprus.
The research is aiming to examine a group of factors impacting the relationship between competitiveness and innovation for contracting companies in Kurdistan region of Iraq.
We wish your contribution in this research study in order to collect the required data to be analyzed.

Cover of the questionnaire

General information for questionnaire

THE QUESTIONNAIRE		
	General Information	**Answers**
1	Please provide the name of the company	
2	Please provide the years of experience of the company	
3	Please provide the type of projects in the company	
4	Please provide the company's estimated annual turnover	
5	Please provide the number of employees in the company	
6	Please state your position in the company	
7	Do you satisfy that the innovation is essential for the company's work which you are working in	

Questionnaire inputs

To what extent do the following characteristics facilitate innovation for the company						
Inputs		Very Low	Low	Medium	High	Very High
		1	2	3	4	5
1	Capital (investment in ICT, Software, and Equipment)					
2	Research and Development Expenditure (R&D), and (R&D) projects					
3	Number of Employees who Devote to Innovation					
4	Consultancy (To provide valuable advices)					
5	Internal and External idea generation					

Drivers of the questionnaire

To what level the following factors are able to create the necessity for the company to innovate?						
Drivers		Very Low	Low	Medium	High	Very High
		1	2	3	4	5
1	Customer Requirements					
2	Technology Development					
3	Regulation and Legislation					
4	Project Performance Improvement					

Barriers of the questionnaire

To what level do the following features block the uptake of the innovation in the company?						
	Barriers	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
1	Unwillingness to Change					
2	Lack of Technology					
3	Lack of Experienced and Qualified Staff					
4	Time Constraint					
5	Financial Constraint					
6	Government Policy					

Enablers of the questionnaire

To what level do the following characteristics provide the promotion for innovation within the company?						
	Enablers	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
1	Collaborative Partnering					
2	Commitment					
3	Reward System					
4	Education and Training Policy					
5	Early Contractor Involvement (ECI)					

Impacts of the questionnaire

To what extent does the company influenced by the following external sources of innovation?						
	Impacts	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
1	Improvement of Experience					
2	Improve Competitiveness					
3	Increase in Technical, Organizational, Management Capability					
4	Short and Long term Profitability					

Competitiveness factors of the questionnaire

To what extent does the company belong these specifications in their product and work?						
	Competitiveness	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
1	Research and Development					
2	Adaption to Change					
3	Rate of Marketing Budget					
4	Motivation and Employ Satisfaction					
5	Strategic Management Plans					
6	Change of Target Market					
7	Level of Success					
8	Intellectual Property(Patents, Brand Registration)					
9	Information Communication Technology(ICT)					
10	Internationalization					
11	Pioneering Leaders					
12	Improvement of Experience					
13	Short and Long Term Profitability					
14	Product Competitiveness					
15	Accounting and Financial System					
16	Level of performance					
17	Cooperative Working Atmosphere					
18	Company Culture					