Conceptual Framework of Performance Management for Northern Iraq Construction Industry

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ABSTRACT

Due to increasing competition between construction companies and changing demands on the type and quality of construction projects in the last two decades, the importance of performance management has been significantly elevated. Therefore, in the recent years a need for a comprehensive system of performance management has been identified for construction organizations. Performance management is a proactive closed loop control system which provides effective strategies for the organizational procedures, tasks, and activities and performs feedback on the whole processes of the system.

Since 2003, construction industry in Northern Iraq (NIQ) has been significantly developed and business links of the region with the other countries has been substantially progressed. In addition, due to the stability which exists in the region compared with the other parts of Iraq, the region has been focused by international construction companies. Despite of that, the involvement of foreign companies in the region has been facilitated by Kurdistan Regional Government (KRG) as a strategy to gain international expertise and foreign technical competency. As a result, a competitive environment for international and local companies has been created in the region that made construction companies make a great effort for improving their performance within the industry.

The main objectives of this study are to analyze the existing performance management system (PMS) in NIQ construction industry on the base of recognizing the most appropriate performance measures for construction companies working in

the region and proposing a framework by using these measures. For the purpose of forming a suitable framework for NIQ construction industry, two different techniques Balanced Scorecard (BSC) and European Foundation for Quality Management (EFQM) have been adapted with the addition of a number of perspectives regarding to the business environment of construction industry in NIQ. Furthermore, a questionnaire survey has been performed among the construction organizations working in the region to know the importance level of the framework variables/perspectives. The questionnaire has been sent through e-mail, transmitted in social networks, and filled in face-to-face meetings among NIQ construction companies.

As a result, a framework of performance management has been introduced that can be used as a management control system for managing and evaluating performance of NIQ construction organizations. Since in developing the framework two different frameworks have been used and some other perspectives have been added based on experience, the study can be considered as a significant contribution to the field. Furthermore, the framework can be further investigated to be used as a control system in different times and countries.

Keywords: Performance management, Performance measurement, Management control system, Strategic management, Northern Iraq Construction industry.

ÖZ

İnşaat şirketleri arasında artan rekabet ve son yirmi yılda inşaat projelerinin türü ve kalitesinde değişen talepler, nedeniyle performans yönetiminin önemi önemli ölçüde yükselmiş oldu. Bu nedenle son yıllarda inşaat kuruluşları için kapsamlı bir performans yönetim sistemine olan ihtiyaç tespit edilmiştir. Performans yönetim sistemi, örgütsel prosedürler, görevler ve etkinliklere katılım için etkili stratejiler sağlayan proaktif kapalı çevrim bir kontrol sistemidir ve sistemin tüm süreçlerine performans geri bildirimi gerçekleştirir.

2003 yılından bu yana, Kuzey Irak'ta (KI) inşaat sektörü önemli ölçüde geliştirilmiştir ve diğer ülkelerle bölgenin iş bağlantıları önemli ölçüde ilerlemiştir. Buna ek olarak, Irak'ın diğer bölgeleri ile karşılaştırıldığında bölgede var olan istikrar nedeniyle, bölge uluslararası inşaat şirketleri tarafından odanlanmıştır. Buna rağmen, bölgedeki yabancı şirketlerin katılımı, uluslararası uzmanlık ve yabancı teknik yeterliklerini kazandırmak için bir strateji olarak Kürdistan Bölgesel Hükümeti (KBH) tarafından kolaylaştırılmıştır. Sonuç olarak, bölgede büyük bir çaba ile inşaat şirketlerinin sektörde kendi performanslarını artırmalarını sağlayayan uluslararası ve yerel şirketler için rekabet ortamı oluşturulmuştur.

Bu çalışmanın temel amacı, bölgede faaliyet gösteren inşaat firmaları için en uygun performans ölçütlerini belirlemeye ve bu ölçütleri kullanarak bir çerçeve önermeye yönelik KI inşaat sektöründeki mevcut Performans Yönetim Sistemini (PMS) analiz etmektir. KI inşaat sektörü için uygun bir çerçeve oluşturulması amacıyla, iki farklı teknik olan Dengeli Karne (DK) ve Avrupa Kalite Yönetimi Vakfı (AKYV), KI

inşaat sektöründeki iş ortamına ilişkin bir dizi bakış açılarının eklenmesi ile adapte edilmiştir. Ayrıca, çerçeve değişkenler / bakış açıları önem seviyesini öğrenmek için bölgede faaliyet gösteren inşaat frmaları arasında bir anket çalışması yapılmıştır. Anketler sosyal ağlarda iletilen, e-posta yoluyla gönderilen ve KI inşaat şirketleri arasında yüz-yüze yapılan mülakatlarla doldurulуştur.

Sonuç olarak, KI inşaat firmalarının performansını yönetmek ve değerlendirmeye yönelik bir yönetim kontrol sistemi olarak kullanılabilecek bir çerçeve performans yönetimi sunulmuştur. Bu çerçevenin geliştirilmesi ile iki farklı çerçeve deneyimi gerçekleştirilmiş ve diğer bazı perspektiflerin de eklenerek, çalışılan alanında önemli bir katkı sağlanmıştır. Bundan başka, çerçeve daha farklı zamanlarda ve ülkelerde, bir kontrol sistemi olarak kullanılmak üzere araştırılabilir.

Anahtar kelimeler: Performans yönetimi, Performans ölçümü, Yönetim control sistemi, Strateji yönetimi, Kuzey Irak İnşaat Sektörü.

This thesis is dedicated to:

- **My lovely family for their continuous support and encouragement**

- **My lovely city of birth Rania in Iraqi Kurdistan and her sister city Duluth in USA**

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LIST OF ABBREVIATIONS

BPO	Behavior to Performance to Outcome
BPR	Business Process Reengineering
BSC	Balanced Scorecard
CSF	Critical Success Factor
EFQM	European Foundation for Quality Management
HRM	Human Resources Management
IPMF	Integrated Performance Measurement Framework
IT	Information Technology
JIT	Just-In-Time
KPI	Key Performance Indicator
KRG	Kurdistan Regional Government
MBNQA	Malcolm Baldrige National Quality Award
NIQ	Northern Iraq
PM	Performance Management
PMM	Performance Management and Measurement
PMS	Performance Management System
R&D	Research and Development
SCM	Supply Chain Management
SMART	Strategic Measurement Analysis and Reporting Technique
TQM	Total Quality Management
UK	United Kingdom
USA	United States of America

Chapter 1

INTRODUCTION

1.1 Introduction

Throughout the last 20 years, many industries, particularly manufacturing, have developed and familiarized new approaches and tried to pass from traditional models or methods for the purpose of improving their performance, because organizational performance has been measured through financial measures as turnover, profit, and etc. (Sagar, 2013). Therefore, performance management (PM) has become the topic of many researchers and organizations over the last two decades. As a result, Johnson, (1992) and Watson, (1993) stated that new techniques and philosophies have been introduced such as concurrent engineering/construction, lean production/construction, Just-In-Time (JIT), total quality management (TQM), business process reengineering (BPR) and etc. (Sagar, 2013). The main philosophy behind the creation of these models was to enhance organizational performance internally and externally with the considerations related to marketplace. It is evident that measuring performance is a key to guarantee the organizational success since it leads to be more ensured about the future investment.

Bititci et al., (2012) identified the challenges that may face to the future of project management; in their study besides of using some terms like ‘performance management’, ‘performance measurement’ , ‘performance indicators’ they have used ‘management control’ and ‘strategic control’ as well (Siska, 2015). Commonly for

evaluating the success or failure of construction organizations the objectives of clients as time, cost and quality are considered as central keys and measures for an improved performance. These three measures were identified as the traditional performance indicators (Ahmed & Kangari, 1995). In the recent years business environment of construction industry has become more competitive and the level of requirements of customers has increased significantly. Furthermore, because of the changes and developments happening within the industry as the existence of new technology and increased competition, financial performance measures alone cannot guarantee the future performance of the industry (Sagar, 2013). In the 21st century due to the increasing of international competition, the demands and requirements on projects have also increased (Steyn & Stoker, 2014). In an analysis that have done by Anand et al., (2010), it have been showed that a people-oriented organizational system has a significant role in project success (Chen, 2015). Lerch and Spieth, (2013) inspected the effect of human resources on innovation and the satisfaction of the different parties within projects and concluded that these factors can drive project and organizational performance to a better level (Chen, 2015). As a result, construction industry was forced to take more attempt for exploring new models and techniques to measure and evaluate its performance not only regarding to the financial measures, but also with the consideration to the non-financial measures. From this point of view, construction performance management has become a topic with a considerable significance level for both researchers and organizations.

1.2 Background of the Research

PM acted as an effective strategic management technique in many industries through the use of some performance measures. Performance management and performance measurement are seen as a system for evaluating organizational performance. Neely,

(1999) mentioned that there are some crucial factors that have effect on developing and advancing performance measurement. The factors that have effect in developing PM, particularly for construction industry, can be indicated as increasing competitiveness, quality awards, initiatives for improvement, information technology (IT), modification in organizational functions, changing external requirements, and job environment changes.

1.2.1 Management Control Systems

Through the use of management control systems that are considered as the strategic management systems and use performance measurement as information system, managers can gain the ability of job execution and organizations will be assisted to improve their organizational behavior. Therefore, to evaluate the effectiveness of such a system, the use of the system by managers should also be evaluated. The common problems that exist in the construction projects let us prove a need for a comprehensive framework in which the project performance could be tested (Colin & Vanhoucke, 2015).

1.2.2 Performance Management in General

In the recent years, the main goal for organizations has been obtaining competitive advantage over their competitors. For this reason, it was stated by Kagioglou et al., (2001) that many companies all over the world tried to achieve the ability to compete with their competitors (Vukomanovic & Radujkovic, 2013). As a result, new techniques and models have been derived like lean production, concurrent engineering, and some others like TQM, BPR, JIT, and benchmarking (Egmond et al., 2001). Despite of acquiring the competitive advantage, it was stated by Kagioglou et al., (2001) that different industries have developed a numerous of models and philosophies to reach the desired organizational performance which is

suited to the environment of their marketplace, and also to revise the systems of PM through the use of performance measurement as an effective technique.

The most important issue of the process of performance measurement within a company is management of performance in the line with financial objectives and strategies (Bititci et al., 1997). Through the use of such a process a "proactive closed loop control system" will be served which provide effective strategies to organizational procedures, tasks, and activities. Furthermore, feedback will be performed on the whole processes of the system through performance measurement processes. On the light of this philosophy Schalkwyk, (1998) mentioned that making strategic decisions, obtaining a systematic management system for the companies are the most essential benefits of performance measurement systems. In addition, the rate of success of companies in gaining their strategic objectives will be measured and assessed through the use of performance management and measurement (PMM) systems. Bititci et al., (1997) described performance measurement as the heart of performance management and act as an information system (Kagioglou et al., 2001). The weak point of traditional performance measurement as criticized by Love and Holt, (2000) is that the system was only focused on the financial measures as productivity, profit, and etc., (Jin et al., 2013). By emphasizing on the financial measures companies can only determine the past performance but they cannot introduce the effective factors that influenced on gaining that outcome (Kagioglou et al., 2001). Financial measures of performance does not provide organizations for making long-term strategic decisions but only serve in making short term decisions. As described by researchers working in the field of PMM, choosing appropriate performance measures is not an easy task. Supporting to that, the issue has described by lots of writers (Love & Holt, 2000). There are some shortcomings in the financial

performance measures that have pointed by researchers and described as the out of date performance measures. The most distinct shortcomings of financial measures are shareholders were not focused clearly, customer requirements were not identified, enough information to get competitive advantage were not provided, failed in making strategic decisions, the product quality could not be assessed, lack in providing suitable information on how improvements performed consistently, and innovation processes were considered as have minimum importance. On the base on these weak points the traditional financial measures cannot ensure the future performance for organizations. Furthermore, it was perceived that business performance should be evaluated with the use of non-financial measures besides of the financial measures, in order to guarantee the future performance (Love & Holt, 2000). Additionally, it was likewise introduced to the literature by Neely, (1999) that the environment of business was changed in a manner that organizations' success will be assessed on how organizations are successful in implementing operational measures with the line of financial measures (Braz et al., 2011).

1.2.3 Performance Management in Construction

Construction sector like all the other sectors was influenced by global changes occurred in the recent years due to developing technology and becoming business environment more competitive. Many reports were published by a number of researchers (Andersen et al., 2000; Braam, Nijssen 2004; Bassioni et al., 2004; Beatham et al., 2004, 2005; Barad, Dror 2008; Yang 2009) on the lack of an effective performance technique for the industry (Vukomanovic & Radujkovic (2013). Construction companies in United States of America (USA) also reported a drop in their performance (Yasamis et al., 2002). At the same time, Egan's report was published by United Kingdom (UK) government in (1998) that clarified the main

goals behind the improvement processes for construction organizations. The reports and researches that published in the field show that improvements are must within construction to solve the current problems exist in the industry. Neely, (1999) described that for an actual improvement within the construction companies and gaining the capability of making strategic decisions, it is important for companies to perceive that what should they improve and why should they improve, and they should also recognize their position in the business environment. As a result of understanding the significance and importance of measuring performance for construction organizations, a new topic in academic and practice life were raised for assessing and evaluating organizational performance. After this revolution in the management field, many new terms were introduced to the literature as performance measures, key performance indicators (KPIs), project performance, project success, project failure, critical success factors, company performance, project performance, performance drivers, performance results, and success criteria. However, the a large portion of these advancements were in manufacturing phase, but developing technology, and shortage of a good PM technique were acted as an effective factor in pushing construction industry towards exploring new methods and models for improving performance. In construction industry, the performance of projects was considered as central in performance measurement (Alarcon & Ashley, 1996). Furthermore, for the purpose of evaluating the project performance some traditional measures were used as time, cost, and quality that are meanwhile the main objectives of clients (Smallwood & Venter, 2001). As illustrated in the literature, these three measures can indicate the success or failure of a project only when the project is finished. Therefore they will be categorized under the performance "lagging" indicators not "leading" indicators (Kagioglou et al., 2001). Moreover, many papers

could be found in the literature that emphasizes on the influence of some other operational measures as “safety, employee satisfaction, productivity, and environment” on the traditional measures as “time, cost, and quality” (Smallwood & Venter, 2001). Firms in construction industry should correctly realize their current and future performance in order to they can keep their position in the competitive environment and go with the line of the worldwide market changes. Further related to construction sector, Love and Holt, (2000) mentioned that financial measures of performance will not offer appropriate guidance for construction organizations in making long term strategic decisions. Chenhall and Langfield-Smith, (2007) presented a description related to the construction companies, in which the satisfaction of stakeholders in the line with customers is also considered as the base for ensuring about the future performance. In accordance to the description reported by Chinowsky and Meredith, (2000), construction firms can take a large advantage form the criticizing papers that identifying the shortage of strategic planning and long term decisions in the industry.

1.3 Problem Statement of the Research

In the recent years, construction industry became more competitive. Therefore, construction companies were obliged to take more effort in order to gain the ability of making long-term strategic decisions. The method that through which the construction organizations can make strategic decisions and will be placed in a competitive environment is PM, which is a broad system for managing and evaluating performance and can be employed in construction industry. Besides of lacking such a broad system in construction, the outcomes from current management system that grounded on financial measures cannot ensure future performance for the industry. Without the existence of a broad management system which can guarantee

the future performance, improving performance within construction organizations is impossible. For this reason, construction industry needs a comprehensive system of performance management which included with financial and non-financial measures.

Since 2003, construction industry in Northern Iraq (NIQ) (that is formally known as Kurdistan Region of Iraq) has been significantly developed by starting a huge infrastructure investment and housing projects. In the early stages of the process of development, the involvement of foreign companies was facilitated as a strategy to gain international expertise and foreign technical competency. As a result, a competitive environment for international and local companies has been created in the region that made construction companies make a great effort for improving their performance within the industry.

1.4 Research Questions and Objectives

The main question of the research is "What is the appropriate performance management framework which construction organizations in NIQ can adopt for the purpose of ensuring their future performance?"

The main objectives of the research are to:

- Analyze the existing performance management system (PMS) in NIQ construction industry.
- Recognize the most appropriate performance measures for NIQ construction companies.
- Develop a framework of performance management for NIQ construction industry based on the defined performance measures.

1.5 Research Methodology

A comprehensive literature review will be performed for the purpose of identifying performance, performance management and performance measurement both in general and in construction industry. After that, a performance management conceptual framework will be introduced on the base of developing a framework. Then, a questionnaire survey will be designed on the measures involved in the introduced framework and distributed among NIQ construction companies to know the importance level of each measure. The questionnaire will be sent through e-mail, transmitted in social networks, and filled in face-to-face meetings among NIQ construction companies. Finally, the collected data of the respondents will be analyzed.

1.6 Research Limitations

The research limitations are mostly associated to the process of collecting data. The data will be collected among the construction companies working in NIQ. Although some of the companies that involved in the survey are international companies, the research will only focus on evaluating performance in accordance to the NIQ construction industry.

1.7 Organization of the Thesis

This thesis is included of five chapters. The first chapter will demonstrate an introduction associated with the research background along with defining the research problem, question, objective, method, and limitations. In the second chapter a detailed literature review will be performed on the performance, performance management, and performance measurement both in general and in construction industry. Research methodology and the developed conceptual performance management framework will be showed in chapter three. Chapter four will explain

the analysis and discussion of the developed framework on the base of the performed questionnaire. Finally, conclusions will be illustrated in the fifth chapter.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The context and the outline of the research was clarified and discussed in the previous chapter. In this chapter a wide-range literature review will be performed to identify the term of performance. The papers that have published in the literature showed that performance can be considered as a very important topic for enriching research and improving organizational efficiency. Although the interest to research on performance was increased, there are some ideas reflecting it because they think that the companies or organizations face difficulty while using it in practice. Performance management is another term that has been addressed in this chapter on the base of the existing literature. Additionally, performance measurement has been clarified in the chapter that literature showed it as the heart of the performance management. Moreover, the literature on the frameworks for PMM is another section in this chapter. Finally, PMM in construction industry is the last section that has been included in this chapter.

2.2 The Term "Performance" in General

2.2.1 Definition of Performance in Literature

As performance is the main image of this research, in this section the term of performance will be defined and its usage in the literature will be clarified. In literature "performance" has used in a very wide-range and has been the focus of many researchers as a helping tool in making strategic decisions and focusing on

shareholder value (Deng & Smyth, 2013). One of the comments on the meaning of performance was stated by Lebas, (1995) that was “there are a few agreements between the people on the real meaning of performance: the meaning could be everything relative to efficiency, to be powerful and have enough resistance in investment, or any other definition that may not be fully satisfied for the term”.

2.2.2 Terms Similar to Performance

In the literature the term of performance has used as a flexible term. There are some other similar terms that have been appeared as “value”, ”success”, ”effeteness”. The term “success” was used as a very close and similar term to performance. Success was demonstrated by Ritter and Gemunden, (2004) as a positive notion either if it is existed or not and addressed during comparing their competitors by having more success in innovation of new products. The term of success does not have a very wide-range usage in the literature, while the term of performance has a diversity usage, for example performance management and measurement or etc. On the other hand, performance is a two sided term that could be positive or it could be negative whereas success has an opposite term of failure.

Another term that is relative with the meaning of performance is “value”. The definition of what really value is and how is generated is actually performed by a very limited researches (Tzokas & Saren, 1999). The use of value is originated from its usage as a financial term, for instance ‘money value’ (Anderson et al., 2000). It can be said that value alone cannot give the meaning of accomplishment or attainment, while performance does. Another term that is more close to performance is effectiveness which can define some features of performance (Cormican & O’Sullivan, 2004).

2.2.3 Literature on Performance

There are so many papers that stated and discussed performance generally, and the subject has increasingly been the topic of many researchers that enriched the knowledge in the field. Because of increasing competition, customer requirement changes, and the wish of companies and organizations for improvement, there is a revolution in the field of PMM which is in a high level of importance for practical use in organizations (Neely, 1999). Most of the researches that have performed on performance were related to the field of strategy (Simons, 1995). Furthermore, there are some journals that are more specified to the area like innovation and management of operations which participated to enrich the study on performance. However performance originates from manufacturing, it has become a very significant topic in many industries for the purpose of both research and practical use. For further understanding of performance, in the next section the different aspects of performance will be discussed and illustrated.

2.2.4 Performance Aspects

In this section aspects of performance will be illustrated as it is found in the literature. There are numerous of discussions on performance and its measures for the purpose of further understanding of the concept. In the proceeding sections there will be discussions and illustrations for PMM, but this section focuses on performance in general.

2.2.4.1 Financial Performance Aspects

A diversity of research areas stated the concepts of performance, especially operational management and accounting (Jin et al., 2013). The financial concepts of performance considered as the earliest one in the field, and also an extensive literature exists on that concept which deals with the productivity and profit (Barlev,

1995). There is a study in literature which performed by Hendricks and Singhal, (2003) on the problems related to performance with considering financial measures and shareholder assets. During their investigation they have found a traditional method of research on performance. In the method, only financial measures have been shown as a single factor for assessing and evaluating performance.

2.2.4.2 Non-financial (Operational) Performance Aspects

With the development of literature on performance, financial measures have not been considered as the only measures of performance anymore. Operational measures likewise were accounted by researchers as the factors that have a vital role in evaluating performance. There is a suggestion by Ittner et al., (2003) for organizations that have been desired to have a comprehensive management system which includes operational factors affecting performance operationally and financially (Davis & Albright, 2004). Furthermore, there is an attempt by Pertusa-Ortega et al., (2010) describing the success of organizations dependent on their financial and operational factors. Balanced scorecard (BSC) acted as a very effective tool for developing this new concept; because the base of creation of BSC was that they recognized that it is impossible to consider only the traditional financial measures for the organizational performance particularly for contemporary organizations. The main important feature of BSC is to keep balance between all the performance measures of an organization from different aspects and perspectives.

2.3 Performance Management

However Performance management can be found in literature, performance measurement more exists than performance management. Furthermore, the two terms sometimes used as the same and not separated with each other. In this section the

theory of PM will be illustrated with respect to pure concept of management as it exists in the literature.

2.3.1 Performance Management Regarding to Performance Measurement

While studying literature, no precise and exact information can be found on the separation of the two terms (performance management and ‘performance measurement). Although there are so many researchers who defined and showed illustrations about these two terms, some of them did not show a clear difference between the two and use them as the same (Radnor & McGuire 2004). The term of PMS was used by Radnor and Lovell, (2003) as a system that includes both performance management and performance measurement which showed an unclear image for the separation of the two terms. Additionally, some papers in the literature can be found that provide information on how are the two terms be distinguished and identified. The theories on management concept propose that planning and controlling performance are the main features of PM. Simultaneously, there are some reflective theories for that; for instance Bourne et al., (2003) showed the concentration of organizations on the improvements within performance management and performance drivers along with measurement of performance. The wide range use of PM was found in the literature either as a kind of performance measurement or as a planning and controlling action.

PM is defined by Aguinis, (2009b, p. 2) as it is a system which includes some processes that can measure and develop performance of all entities within projects and aligns with the strategic objectives (Aguinis et al., 2011). PM was illustrated by Halachmi, (2005) as it is more comprehensive, extensive and more meaningful than performance measurement by identifying the processes that indicate PM for instance: supplying stakeholders, issues relative to managing or handling and the factors

affecting the human behavior. There is another definition for PM by Bititci et al., (1997) as the process by which the organizations can manage and evaluate their performance aligned to the strategy and objectives (Sagar, 2013). Bourne et al., (2005) clarified that even the former researches concentrated on the selection and implementation of performance measures, there is a need to do research on the use of performance measures in the process of PM. Therefore, it can be said that PM is a system or process that employ performance measures for evaluating and determining of whether the improvements are done within the performance process. By getting benefit from information provided in the literature it was known that PM is further consists of comprehensive planning and controlling than measuring of performance of organizations. Additionally, feedback was recognized as the tool having a great importance in the PM process.

During the analysis of performance measurement it was emphasized by Globerson, (1985) that feedback in an extensive planning and control and the process of management have a great importance in comparing the outputs of performance measurement and the actual performance of organizations (Braz et al., 2011). Furthermore, he showed that taking action and starting changes within an organization can be assured through feedback. It was proposed that feedback give managers the ability of performance controlling for a certain step or level (Lohman et al., 2002). Moreover, Radnor and Barnes, (2007) recommended that it is a must to add feedback control to performance measurement system so as to gain a PMS. They explained that there is something that PM must do for instance: communicating and exchanging information, encouraging suitable action or behavior, and providing or supplying an appropriate mechanism for controlling, intervening and learning. Halachmi, (2005) supported the concept feedback as an important tool and the

proactive processes in management systems and thought that the main purpose of PM is to provide a control system which deploys strategies for all the processes within the business such as activities, duties and tasks, and feedback that can be attained from the performance measurement system which act as a helping tool for making suitable managerial and strategic decisions. Further to what they suggested is that they described performance measurement as the heart of performance management and explained that performance measurement acts as an information system that managers can use it for management planning and control. In addition, Chiesa and Frattini, (2007) discussed and described performance measurement as a process of collecting data, analyzing the outputs and detecting the corrective actions. Generally, the papers that have published in this field emphasized on that performance measurement must have a clear objective. Moreover, interpretation and identification of the difference between performance management and performance measurement was performed by a very limited number of researchers. Lebas, (1995) gave a detail on performance management and performance measurement that is shown in Table 2.1.

Table 2.1: The same processes and the same preoccupations do not apply to measurement and to management (Lebas, 1995)

Performance measures	Performance management
• Measures based on key success factors • Measures for detection of deviations • Measures to track past achievements • Measures to describe the status potential • Measures of output • Measures of input • Etc.	• Training • Team work • Dialogue • Management style • Attitudes • Shared vision • SPC • Employee involvement • Multicompetence • TQC • Incentives, rewards • Etc.

A different and exceptional research to differentiate between performance management and performance measurement was done by Lebas, (1995), as summarized in Table 2.1, it was not mentioned that performance management and performance measurement were processes, but it was concentrated on measures for performance measurement. Furthermore, it was explained that performance measurement and performance management con not completely be separated yet as showed in Figure 2.1 and Figure 2.2.

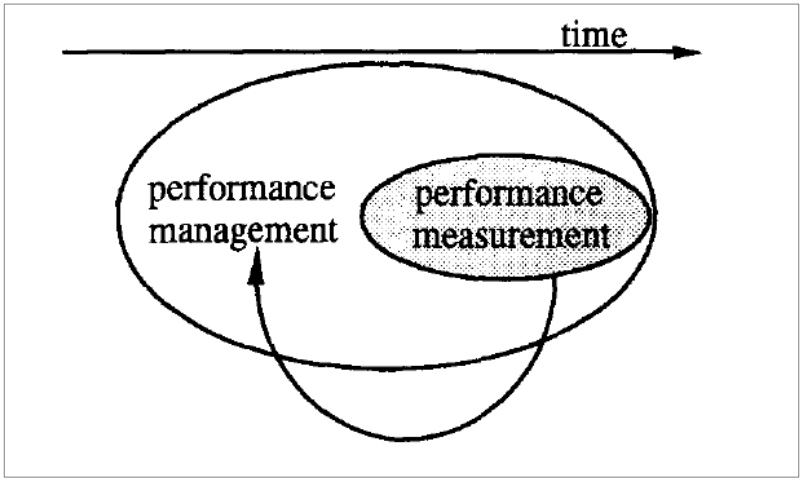

Figure 2.1: Intertwinement of Performance management and performance measurement (Lebas, 1995)

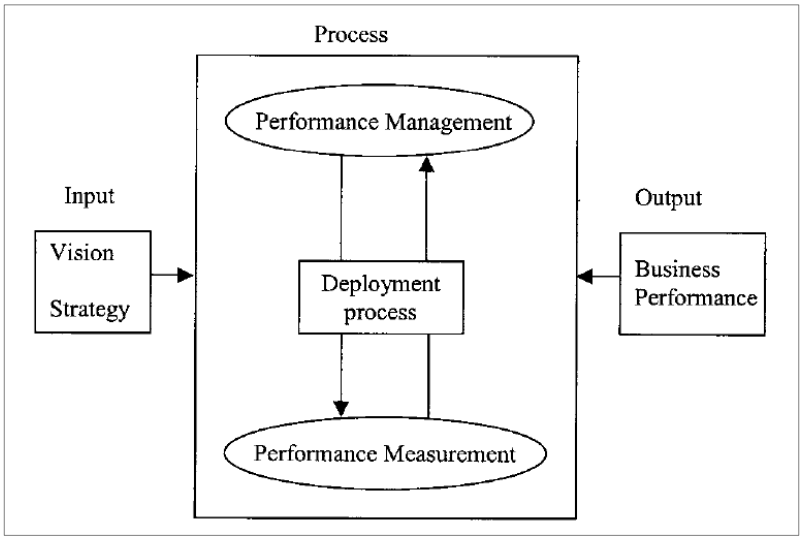

Figure 2.2: Performance management and measurement process (Kagioglou et al., 2001)

The formulation or concept that derived by Lebas, (1995) showed graphically that PM is wider that performance measurement, which it is the opposite of some concepts in the literature (Sagar, 2013). In his suggestion Lebas, (1995) proposed that performance measurement precedes performance management which does not match with the processes of PM as feedback (Sagar, 2013). Furthermore, it was suggested that PM is more comprehensive than performance measurement and it follows up on the processes of performance measurement (Halachmi, 2005). In literature some research was found that highlight the effect of both performance management and performance measurement on the performance. It was clarified that performance measurement alone cannot have an effective role on improving performance while with planning and control it can have (Hume & Wright 2006).

2.3.2 The Processes of Performance Management

In the literature performance has comprised with a number or collection of planning and control processes that are more comprehensive than performance measurement which can be considered as PM processes. It was underlined in the literature that different forms of exchange among cooperated organizations or entities reinforce the processes of PM. Interchanging information extracted from performance measurement has used as a tool for planning and control activities which involve issuing strategic objectives, practice guidelines and tools (Hume & Wright 2006).

In this section the theory of performance management and performance measurement was clarified with the line of differentiating between them. It was likewise explained that performance management is broader than performance measurement and includes the processes of planning and control. Furthermore, in the literature it was showed that PM processes are more effective than performance measurement in influencing performance. This idea leads to more research on the main objectives and

purposes of both PMM. Figure 2.3 and Figure 2.4 shows the research trends on PMM in the period (1991 to 2000) and (2001 to 2011).

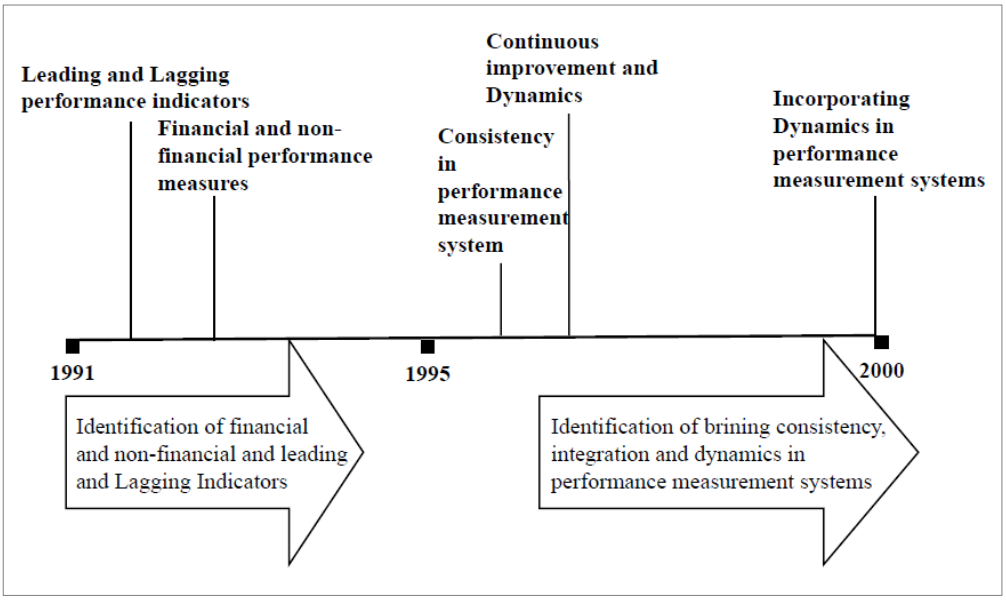

Figure 2.3: Research trends of Performance management and measurement for the period 1991-2000 (Sagar, 2013)

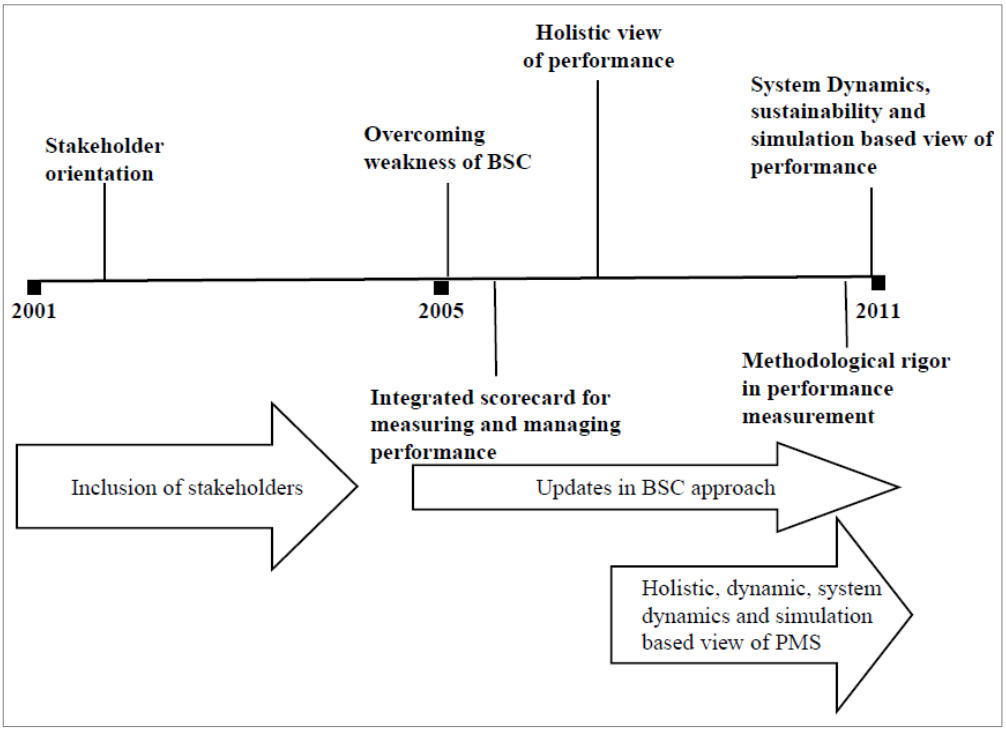

Figure 2.4: Research trends of Performance management and measurement for the period 2001-2011 (Sagar, 2013)

2.4 Performance Measurement

In this section, the related definitions to the concept of performance measurement will be presented as a research theoretical background. Regarding to the studies derived from the observation of manufacturing industry, the literature of construction management has developed with the studies performed on performance. Performance measurement has a very wide range place in the literature of performance and there are too much researches and publications that discus this topic. In this section the concept of performance measurement will be identified as it was found in the literature and then performance measures will be discussed with the basic idea behind their selection.

2.4.1 Performance Measurement Concept and Its Definition

The process of PM is defined as a control system acting as a closed loop, which organizes strategy and policy and attains feedback from a numerous of levels for managing the performance of the business. Performance measurement is defined as the information system of operating PM effectively and efficiently. Additionally, performance measurement was correspondingly considered as the heart of PM which is of a crucial importance (Bititci, 1997). Moreover performance measurement is defined as the process of measuring the effectiveness and efficiency of an action (Amaratunga & Baldry, 2000). Another definition of performance measurement was derived by Zairi et al., (1994) as "assigning of numbers to entities systematically".

Neely et al., (2005) defined the concept of performance measurement as "a metric used to quantify the efficiency and/or effectiveness of an action". Since this definition was derived by taking benefit from the literature of performance measurement, it is not such a broad definition that covers the wider concept of

performance mentioned in the literature. The most accurate and most appropriate definition of performance is effectiveness and efficiency that is a comprehensive definition of it. Quality of life is another aspect of performance that can be found in the literature (Skevington, 1999). In the description before, measures are accounted as the objectives and also there are subjective measures that should be considered. As it was observed in the literature the researches on the accounting has used financial performance measures (Biddle et al., 1997). Focusing on the operational performance measures in research has proceeded with the proceeding literature on the performance concept, and some papers showed them as future assurance for financial measures, while financial measures indicate the outcome of the management activities (Kaplan & Norton 1992). In the last two decades studying on the effects of the financial and non-financial measures of performance has been the topic of many researchers, and among of them there are some views that explain the modality of improving financial measures through non-financial measures. Anderson et al., (1994) performed a study on Swedish companies and clarified that the satisfaction of customers is related to the rate of profit of company assets but the relation seems to be weaker in service companies. Correspondingly, it was emphasized by Kaplan and Norton, (1996b) that the satisfaction of customers can be considered as the indication of financial measures for instance the values of markets and the growth of returns (Jin et al., 2013). Although, they showed non-financial measures as a crucial tool in driving financial measures, it was stated that the effect of non-financial measures on financial measures will be different in accordance to the industry.

2.4.2 Performance Measures and Indicators

The measures performance has been defined as the features or characteristics of outputs that are recognized for the reason of assessment and evaluation. Hronec,

(1993) defined performance measures as the critical and vital signs of the organization which "quantify or evaluate how well the activities within a process carry out or how a process output achieves the specified goal" (Kagioglou et al., 2001). Performance measures are supportive in our understanding, managing and improving the actions of our organization. Effective performance measures offer us enough information on, how effectively we are performing, to what extent we are gaining our objectives, if the satisfaction of customers is assured, if the process is statistically controlled, and if improvements are needed in any level of the process. Performance indicators can be illustrated as measurable characteristics of outcomes, services, procedures and operations or actions that an organization employs to trace performance (Bititci et al., 1997). A powerful PMS will extremely rely on the performance indicators utilized to specify the performance of an organization from a number of viewpoints. Consequently, it is substantial to understand these indicators since they are applicable for a diversity of perspectives that an organization can adopt.

2.4.3 Significance of Performance Measurement

Measuring performance has become a success key for any business in the past two decades, since some crucial factors as the development of technology, expanding customer requirements, and increasing competition in the business environment. All the processes, resources, and activities within organizations will be well-organized in order through the use of performance measurement. Performance measurement concentrates on making long-term strategic decisions and setting the goals to see the requirements in the long term point of view, for that purpose it derives reasonable measures for appropriate improvements. Using performance measurement systems has a great importance in establishing a set of standards that can be used for

comparing the processes of the organization with best experiences of other organizations, furthermore, it presents fitting and proper base for comparison and takes environment changes as consideration. Additionally, it offers the company a broader understanding to the future goals and helps it to have a clearer vision to make strategic decisions. Providing a good communication is another good point of the system. Overloading information is avoided while the system focuses only on the most important measures that have a great influence on the performance. When a system of PM implemented successfully within an organization in accordance to the recognized strategy the result will be enhanced organizational behavior and increased employee and activity performance. Since performance measurement defines all available and needed competencies in the firm, suitable strategic decision and planning will be provided consistently. By using performance measurement companies can gain the ability of making decisions on the objectives obviously, as a result, the operations of the company can be sunned smoothly and optimized effortlessly. Through this system the organizations can easily transform actions to outcomes, develop or enhance the current communication within the processes, and perform feedback on the objectives for the purpose of achieving more organizational success. Performance is also described as a continuous process for making strategy and is not only one-time concentrated.

2.4.4 The Role of PMM

In the literature it was suggested that the only way to differentiate between performance management and performance measurement is to investigate the modality of enhancing and driving of both concepts to the improvements of performance (Radnor & Barnes, 2007). Although, there is a very few literature on this idea, but still a very limited publications focused on it. Through an investigation

for financial performance Davis and Albright, (2004) clarified a comparison between the bank branches that employ BSC in their system and those that does not. In the study they found that the bank branches that employed BSC showed better financial performance than those that does not. Correspondingly, Perera et al., (1997) uncovered that the performance of an organization is not related to the operational measures of the organization. Besides of the results, the performed studied cannot be considered as a base for the organizational performance since they concentrated on the quantitative measures particularly financial measures. Another research which was conducted by Evans, (2004) used quantitative measures for performance and showed more productivity in terms of financial, market and customer performance. On the other hand, André and Coevert, (2007) investigated the qualitative methods for performance and the importance of PMSs, that discovered a different result although their study was done in accordance to a small organization.

For the purpose of improving performance, some researches on performance field was published and showed the modality of improving PM through using of performance measurement. Robson, (2005) suggested that performance improvements can be obtained through managing performance, and for this purpose Robson supported designing measurement systems. Similarly, Neely, (2004) took an attempt to identify a number of basic and essential processes for establishing a performance measurement system especially the processes related to managing through measures (Braz et al., 2011). All these studies and publications showed the significance of the processes of performance measurement, but showed more significance level for planning and control processes that take benefit from performance measurement for managing performance and achieve greater performance improvements. Bourne et al., (2005) proposed that PM is an important

requirement besides of the importance of performance measurement for better improved performance. Melnyk et al., (2005) reported that strategic objectives and performance measurement together have an important role for more fitting performance results, at the same time it was explained that performance measurement alone cannot improve performance for organizations if it is not supported with PM. Agreeing to what stated before Olsen et al., (2007) emphasized that performance measurement is an information providing system that is helpful for operations management through the functions of monitoring, controlling, evaluating and doing feedback. Hume and Wright, (2006) in a research on public sector illustrated that performance measurement alone cannot be used as a tool for improving performance. Moreover, Radnor and McGuire, (2004) described the importance of PM in modifying performance and clarified that performance measurement should be complemented with PM for better performance improvement. Correspondingly, Robson, (2005) underlined that it is a very crucial point for the entities within an organization to know that they are in control system for improving performance with the use of performance measurement as an information system. As a result, the researches emphasized that performance measurement is important for improving and enhancing performance, but it does not ensure some other important processes as learning, communication and decision making. It is important to highlight that it was showed in the literature that an effective management process uses performance measurement as a key for making strategic decisions. Literature has also underlined the importance of implementing PMM in some organizations working in public sector. As an instance Gupta et al., (1994) proposed that if a performance measurement system familiarized to on organization, the organization turns to be modern and well-organized, despite the

other benefits of cultivating performance. This idea is very meaningful in the literature, since the individuals and entities observe on their own behavior to be well-responded to the measures employed within the system. It was also mentioned by Kaplan and Norton, (1992) that what you measure is what you get emphasizing on that measurement is reflective. As a result it can be demonstrated that performance measurement alone cannot ensure improvements for performance within organizations. In addition, literature emphasized that PM have a great role in affecting performance with the use of planning and control processes and performance measurement as a providing information system.

2.5 Frameworks of PMM

Researchers in the performance field took a great effort to derive an appropriate definition of both performance measurement system and the frameworks of performance measurement. One of the definitions that stated by Bassioni et al., (2004) reported that the system of performance measurement is an expression of the measurement system that can be applied in different firms, whereas the framework of performance measurement is a notional and theoretical or hypothetical framework that cultivated by researchers to assist the system of performance measurement of different firms. Such a system is very helpful for organizations to guarantee continuous improvement within the organizational processes, since the system concentrates on the business in a broader context for performance measures. The main objective of performance measurement implementation is to achieve appropriate improvement for organizations, because the business environment continuously changes and the order of clients, stakeholders and investors for these improvements consistently increases. It was stated by Bititci et al., (1997) that incorporating the activities within an organization into several levels of management

is the main goal of performance measurement systems. Reinforcing to the idea of integrating activities, it can be argued that performance measurement systems is a mechanism that keeps balance between a diversity of measures (cost, time, and quality) across different levels (organization, procedures, individuals).

For designing a system of performance measurement, there are some points that organizations should take them as consideration for a proper design that are "the strategy of the company and the performance measures should be interrelated, non-financial measures should be included within the system, the measures should be used in appropriate locations, the measures should be vary with varying situations, simplicity and easiness of measures is also a must, feedback should be provided with measures, and continuous improvements should be simulated with measures".

2.5.1 Advancement of Performance Frameworks

The last two decades was the time of developing PMM that many researchers added publications to the field and enriched the literature on it. Otley, (1999) suggested that it is very important to observe on both financial and non-financial measures and keep balance between them for gaining better performance. For the purpose of measuring and managing performance, throughout past two decades emerging systems and procedures has been raised for instance benchmarking, business process management, TQM and BPR. In addition, Cross and Lynch (1991) suggested a model for the purpose of analysis of strategic measurement named Strategic Measurement Analysis and Reporting Technique model (SMART), and this model was proposed as a complementary for the process of measurement (Folan & Browne, 2005). As an advancement of non-financial measures, Atkinson, (2012) stated that companies should employ measures that have different dimensions. Munns and Bjeirmi, (1996) stated that time is one of the most important measures for the firms

that working in time based projects. Additionally, different classifications made by a number of researchers for the separation between factors and results within organizational processes (Braz et al., 2011). Kaplan and Norton, (1992) described the association of the four BSC perspectives that organizations can use them to measure their performance. From understanding all the literature clarified before, it will be clear that performance measurement is a tool for deriving strategy. Furthermore, the literature showed that there are many frameworks that have developed for the purpose of measuring and managing performance, but here some of these frameworks will be stated that have a particular importance in the field. A summary of PMM frameworks is illustrated in Table 2.2.

Table 2.2: Review of PMM frameworks/models/systems for the period 1991-2011 (Sagar, 2013)

Name of PMM framework	**Author and year**
Results and determinants framework	Fitzergald et al., (1991)
Measures for time-based competition	Azzone et al., (1991)
Performance pyramid	Lynch and Cross (1991)
Economic value added	Stewart (1991)
EFQM-excellence model	European Foundation (1991)
Balanced scorecard	Kaplan & Norton (1992)
Input-process-output-outcome framework	Brown (1996)
Consistent performance management system	Flapper et al., (1996)
Integrated dynamic performance measurement system	Ghalayini et al., (1997)
Shareholder value	Rappaport (1998)
Dynamic performance measurement system	Bititci et al., (2000)
Integrated performance measurement framework	Medori and Steeple (2000)
Quantitative models for performance measurement systems	Suwignjo et al., (2000)
The action-profit linkage model	Epstein and Westbrook (2001)
Performance prism	Neely et al., (2001)
Kanji's business scorecard	Kanji and Sa´ (2002)
Beyond budgeting	Hope and Fraser (2003)
Dynamic multidimensional performance framework	Maltz et al., (2003)
The performance planning value chain	Neely and Jarrar (2004)
Holistic scorecard	Sureshchandar and Leisten (2005)
Total performance scorecard	Rampersad (2005)
Holistic performance management framework	Anderson et al., (2006)
Flexible strategy game-card	Sushil (2010)
"System dynamics-based" balanced scorecard	Barnabe (2011)
Proactive balanced scorecard	Chytas et al., (2011)
Sustainability performance measurement system	Searcy (2011)

2.5.1.1 Balanced Scorecard (BSC)

In 1992 Kaplan and Norton developed a technique with the name of BSC for strategic management purposes, since business environment has become more competitive and the organizations needed new techniques to improve their performance (Vukomanovic & Radujkovic, 2013). BSC is a collection of financial and non-financial measures, as it is shown in Figure 2.5. Financial measures describe the results of the activities undertaken by the company, and non-financial measures that shown as complementary tools for financial measures indicate the satisfaction of customers, innovation of the organizations, internal processes, and activity improvements that these measures were identified as operational measures. BSC took benefit from the weaknesses of some managerial concepts that have developed before, so it provides suitable guidance for selecting measures. BSC cannot be considered as measurement system only, but it is accounted as a management system that provides organizations the ability of seeing their vision and strategy, as a result they can effortlessly change them into actions. In this approach feedback has a special and great importance as it performed in both internal and external processes so as to consistently gain strategic performance improvements.

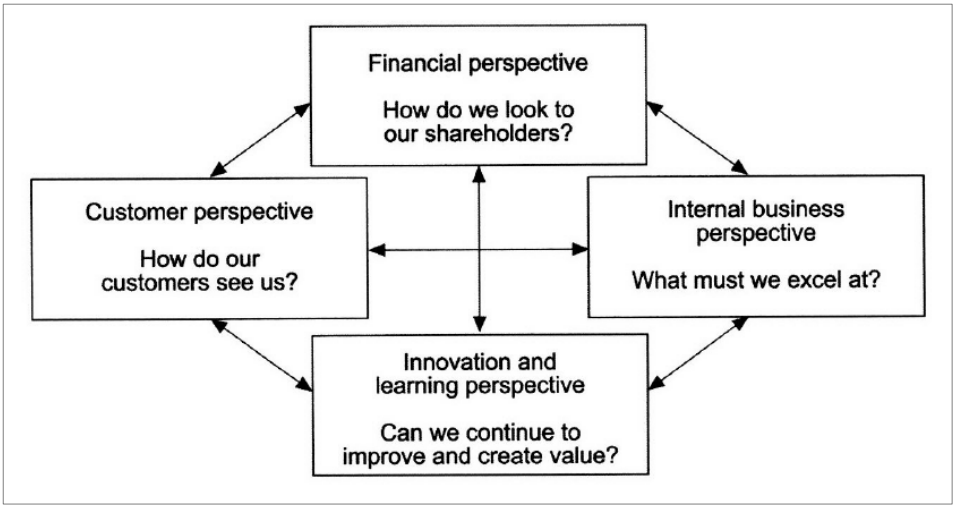

Figure 2.5: Kaplan and Norton's four-box BSC (Neely et al., 2005)

The main objective behind developing BSC was to act as a strategic framework for performance measurement that takes both financial and operational measures as consideration. BSC provides fitting values for satisfaction of customers, operational goals, the value and expectancy of shareholders, and the ambitions, abilities, and objectives of employees (Folan & Browne, 2005). As it was illustrated in Figure 2.5, BSC let the managers to concentrate on four main perspectives to evaluate the organizational performance and it presents meaningful answers for four important questions.

2.5.1.2 Performance Pyramid or (SMART)

Performance pyramid is also called Strategic Measurement Analysis and Reporting Technique (SMART). The main objective behind developing this measurement system was to solve the problems related to the traditional financial measures as profit, competency, and other variables related to these measures (Folan & Browne, 2005). The system was emphasized on the satisfaction of customers in a manner that the whole strategy of the enterprise was derived to be connected with it and also non-financial measures were identified as a complementary tool and directly interrelated to the financial measures. Figure 2.6 is an illustration of the SMART system.

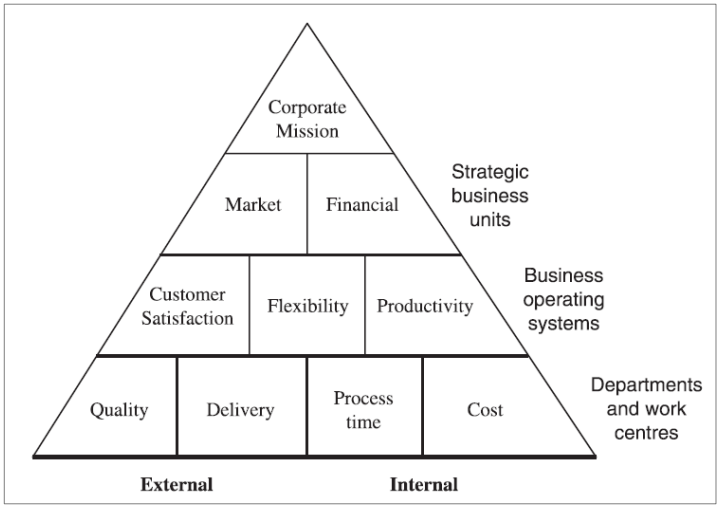

Figure 2.6: The SMART performance pyramid (Pun & White, 2005)

The system was designed in four levels. The first level is corporate vision that carriers will be indicated for all the entities within the business and enough support and resource will be provided to them. The second level gives the guidance for identifying the objectives behind the business divisions in both terms of market and financial. The third level focuses on defining priorities and main goals for divisions of the business with respect to satisfaction of customers, flexibility and productivity. The fourth level is a representation of the third level in other terms for instance flexibility, satisfaction of customers, and productivity were expressed as delivery, quality, time of procedure and waste.

2.5.1.3 International Quality Awards

Whereas many organizations have devised and gained new methods for improving their business performance, there was some awards have been determined in national and international level. The awards were for making the business environment more competitive that organizations will be qualified for these awards that provide an appropriate direction for better improvement within performance for construction enterprises. Through which the suitable performance measures and parameters will be described in identified.

2.5.1.4 Malcolm Baldrige National Quality Award (MBNQA)

MBNQA (2001) has defined some important success factors and integrated in this technique, and these factors were strategic planning, management and the advancement of human resources, leadership, process management, information and analysis, satisfaction of customers, and the results of the business (Lee et al., 2003). The factors that considered as having more significance level were managing human resources and its development, managing the progress of actions, customers, and business results. This award is founded on some points as the most important factors

for success and the points were learning and improvement consistently, providing quick solution for the customer demands and the changes occurred in the environment, long term strategic decisions, development of partnership, and business results.

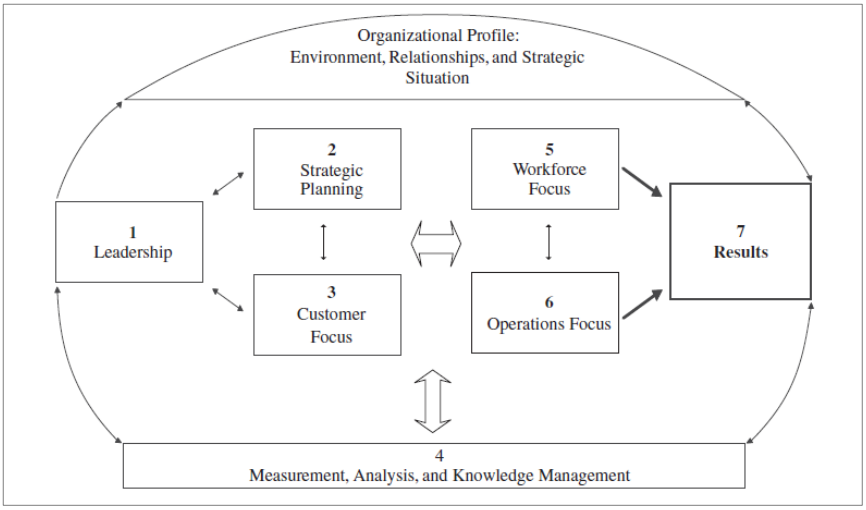

Figure 2.7: The 2013–2014 MBNQA performance excellence framework (Peng & Prybutok, 2015)

2.5.1.5 European Foundation for Quality Management (EFQM)

Hillman, (1994) stated that this model which has devised in 1991 by the EFQM and it is focused on supporting quality as the most significant factor that can affect performance and consistently improve the business (Vukomanovic & Radujkovic, 2013). This model that is also termed as EFQM Excellence Model can be identified as the framework that can improve and assess the performance on organizations to excellent. The model is showed in Figure 2.7.

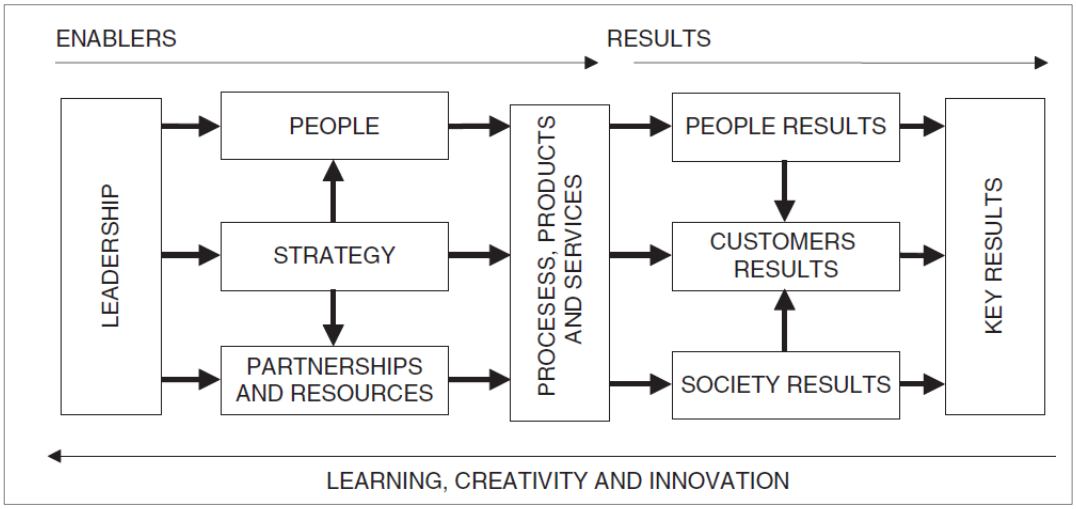

Figure 2.8: EFQM-excellence model (Gómez et al., 2015)

In this model some principles of TQM that is related to the innovation processes have applied in a manner that is appropriate to the European environment.

2.5.2 A Review on Performance Frameworks

The most important points that firms and organizations have used for further improvement within their organizational processes and making appropriate strategic decisions were technology, planning and strategic view, learning and innovation, flexibility, corporate culture, and strategic partnership. Additionally, most of the companies believe that the satisfaction of customers is the base factor of success for any business, therefore, customers considered as the central and bold line for designing performance frameworks. Further to the review on the frameworks, there are some points that can be underlined as the weaknesses or inadequacies of these frameworks, that there is no guidance for applying the systems of performance measurement in practice, and the frameworks are not as flexible as they could be adapted if the environment was changed.

2.6 PMM in Construction Industry

2.6.1 Construction Performance in Literature

Relying to the changes that has been happened in construction industry, using performance measurement in the industry has significantly increased (Deng & Smyth, 2013). In 1997 a model of performance measurement was devised by Robertson for a construction company in two levels of profit or outcome. This model was developed as an organizational philosophy on the basis of Behavior to Performance to Outcome cycle (BPO). IT was investigated by Bititci et al., (2000) and used as a system for performance measurement. Furthermore, a framework has developed by Medori and Steeple, (2000) as Integrated Performance Measurement Framework (IPMF). Edum-Fotwe and McCaffer, (2000) have described an important guideline for contracting firms that desired to have a measurement system for their organizational processes. In the first stage the project managers were requested to clarify their thoughts on the most suitable and appropriate measures that are effective for organizational performance. The older and master managers will review the measures to know if the selected measures are suitable or not. Later on the measures will be introduced to the top management to show their thoughts and the final measures will be identified. It was mentioned by Deng and Smyth, (2013) that many conceptual frameworks for performance measurement processes in construction firms were suggested by a number of researchers, for instance Kagioglou et al., (2001), Bassioni et al., (2005), Yu et al., (2007), El-Mashaleh et al., (2007), Luu et al., (2008), Horta et al., (2010), and Jin et al., (2013). Yasamis et al., (2002) has developed a concept that defines the factors that have effect on the performance of the construction firms, the satisfaction of clients and quality of the projects within the construction sector. Tang and Ogunlana, (2003) showed in detail that the

organizational structure which may include with many complex constituents has a great importance and effect on the performance of construction companies. Pheng and Hui, (2004) identified the six sigma perception that statistically defines and indicates the appropriate measures for organizational performance with regards to the satisfaction of customers. Bassioni et al., (2005) established a conceptual framework for performance measurement in construction phase based on the business excellence and balance scorecard models. A model was established by Pun and White, (2005) for performance measurement and strategy integration. In addition, a framework for industry identification was developed by Phua, (2006) that influence the performance of construction companies by combining organizational perspectives and resources. El-Mashaleh et al., (2006) tried to know the influences of IT on the performance of construction firms and as a result of that a good relation between them was found. Yu et al., (2007) used the perspectives of BSC to develop a system of performance measurement for construction enterprises. Elyamany et al., (2007) identified a model for assessing company's performance and took benefit from some characteristics of the companies as economic, industrial, and financial characteristics. By using experimental data Nudurupati et al., (2007) supported that all these systems that have stated before are suitable for applying in construction firms.

2.6.2 Performance Measures in Construction

Performance measures are in a very high significance level in the process of assessing performance. Although they are very important, the manner of using them is more important. Therefore, the effectiveness and degree of efficiency of the measures is deepening on the way their usage. Furthermore, it was emphasized by Franco-Santos et al., (2012) and Ittner, (2008) that association between effective PM and effective performance measures exists (Deng & Smyth. 2013). El-Mashaleh et

al., (2007) stated that the operational scorecards that have effect on performance include involvement of employees, providing information, satisfaction of employees, effect on society, organizational resources, financial perspectives, zero delays, customer focus, training and development, people, safety, and market conditions (Deng & Smyth, 2013). In addition, there are some other scorecards for construction performance that described by Lee et al., (2003) as the success factors and include Supply Chain Management (SCM), partnering, innovation, teamwork and leadership that are very important for construction organizations to be with the line of world-class organizations. Furthermore, Peng and Prybutok, (2015) identified the measures that most construction firms that work internationally are tended to use some indicators to performance such as the rate of energy consuming, accidents, number of completed projects that consistently improved, number of incidents due to environmental causes, number of customer objections, number of implemented suggestions of employees, defects, and predictability of time and cost. There are also five other basics that have presented in London by Construction Task Force for the processes of construction companies that are customers, quality, leadership, loyalty to people, process and team incorporation. For the purpose of measuring performance within construction industry,

2.6.3 Key Performance Indicators (KPIs)

Kerzner, (2011) stated that the most suited definition for KPIs should be included with identifying the future actions and the processes of decision making (Todorović et al., 2015). The performance of operations within construction phase can be evaluated by some indicators that are called KPIs and are the data collection and classification of measures (Cox et al., 2003). KPIs provide enough guidance and information that are useful to know the degree of achieved performance for the

activities and processes in construction. Kagioglou et al., (2001) stated that these indicators have a great importance and influence if implemented in the construction industry. Therefore, for the purpose of evaluating performance within the whole industry companies should employ the KPIs of the industry, but for assessing performance of their internal processes they should employ company measures.

Chapter 3

RESEARCH METHODOLOGY

3.1 Introduction

Shortage of a suitable PMS within construction industry is one of the main problems and difficulties for improving performance and stepping towards success in projects, companies and stakeholders. To guarantee the future of performance, making appropriate strategic decisions, and providing continuous improvement for performance, having a PMS is a must for construction companies.

3.2 Characteristics of NIQ Construction Industry

Although, construction industry in NIQ is not such a well-developed industry compared with the other developed countries, it plays a very significant role in driving the region's economy because of its impact on the other sectors and its contribution in providing jobs. The fast growing of the sector in the region mostly depends on the private sector firms. Because of the lack of good construction experience and deficiency of technical capabilities, the region is highly dependent on the foreign construction firms. There are so many shortcomings and obstacles exist in the industry that is needed to be solved, and the region is in need for the supervision of foreign organizations to manage and regulate its construction activities. Therefore, the involvement of foreign companies either consultants or contractors have been facilitated by KRG since 2003. Due to the free market facilities, a broad law for investment and a unique security compared with the other parts of Iraq, foreign investment in the region has exploded (Gunter, 2011). In the Northern region of Iraq

a high level of security and stability have been existed for several years, but the middle and south of Iraq have been suffered for the lack of stability (Bekr, 2015). Figure 3.1 is a clarification for the location of NIQ among the World and Middle East countries .Despite of this fast growth, still there are some other challenges exist in the construction industry of NIQ; and as reported by (RTI-International) in (December, 2008) the main challenges include shortage of skilled technicians, engineers, and managers, and shortage of a precise quality control system.

NIQ comprises of the four governorates (Erbil, Sulaymaniyah, Duhok and Halabja), the capital city is Erbil (also known as Hewler), and the study has concentrated on collecting data in these four governorates and the districts and sub-districts that belongs to them. As it has been shown in the formal webpage of Kurdistan Regional Government, the population of the region has been estimated to 5.2 million in 2004, the total area is 40,643 square kilometers and the population is 3,757,058.

Figure 3.1: The location of Northern Iraq in the World and Middle East (Google maps)

In the light of the developments and barriers that has mentioned, it can be argued that construction industry in NIQ needs a comprehensive management control system to

keep its rate of developing and overcome the barriers ahead of the future of the its performance. Therefore, in NIQ construction companies the need for such a system was raised during the last decade due to increasing competition between the construction companies. Therefore, in this research a PMS with appropriate measures and indicators was developed for NIQ construction industry. For the purpose of checking its validity in practical use a survey was performed through a questionnaire specially designed for this study and was administered to the professionals in the NIQ construction industry.

3.3 Construction Performance Management Framework

A wide range literature review was performed for the purpose of identifying the most appropriate performance measures and indicators. For the purpose of identifying the measures and indicators, benefit was taken from BSC and EFQM techniques. Besides of that, some measures and indicators have been added to both techniques based on the experience and taking advice from expertise of the phase (this is a significant contribution of this study to the field of knowledge). The measures and indicators that adapted from BSC and EFQM techniques and the ones that added based on experience were all shown in Table 3.1.

Table 3.1: Performance Drivers and Results

DRIVERS OF PERFORMANCE	
1. Leadership: *Adapted from EFQM model (Gómez et al, 2015)*	**7. Resources:** *Adapted from EFQM model (Gómez et al, 2015)*
Leaders' role in developing clear objectives	Financial resources
Leaders' improvements within project processes	Technical capability
Communicating leaders directly with stakeholders and employees	Material and equipment resources
2. Strategic management and planning: *Adapted from EFQM model (Gómez et al, 2015)*	**8. Supplier and partnership:** *Adapted from EFQM model (Gómez et al, 2015)*
Strategy of project selection	Partner satisfaction
Strategy of partner selection	Supplier satisfaction
Strategy of market selection	Teamwork culture with partners and suppliers
Strategy of client selection	**9. Feedback:** *Adapted from EFQM model (Gómez et al, 2015)*
Organizational and project management strategies	Doing survey among the society and the end users
3. Project management *(Added)*	Collecting information among stakeholders and employees
Time management	Doing feedback at the beginning and at the end of any process
Cost management	**RESULTS OF PERFORMANCE**
Quality management	**1. Project results** *(Added)*
Human resources management	Project profitability
Risk management	Project health and safety
Project procurement management	Quality of the constructed project
Claims management	Client satisfaction
Knowledge management	Project teamwork and harmony
Health and safety management	Society satisfaction to the project
Supply chain management	**2. Company results** *(Added)*
4. Continuous learning: *Adapted from BSC Technique (Neely et al. 2005)*	Financial perspectives
Employee training	Company image
Knowledge and information sharing	Flexibility of internal processes
Reviewing past experience	**3. People and other stakeholders:** *Adapted from EFQM model (Gómez et al, 2015)*
Taking benefit from other projects' best practice	Identification of the stakeholder needs
5. Innovation: *Adapted from BSC Technique (Neely et al. 2005)*	Good communication between leaders and stakeholders
Efficiency of research and development	**4. Project end users:** *Adapted from BSC Technique and EFQM model (Neely et al. 2005 and Gómez et al, 2015)*
Application of IT	Identification of the end user requirements
6. External relations *(Added)*	Translation of end user needs into actions within the project
Relations with client	
Relations with government	
Relations with labors union	
Relations with other companies	

3.4 Reason for the Questionnaire

The aim of the survey or questionnaire is to explore the validity of the selected performance measures and indicators by distributing it among the companies and professionals working in the industry.

3.5 Design of the Questionnaire

As showed in Table 3.1, the variables were divided into two parts (drivers of performance and results of performance). The drivers are Leadership, Strategic Management and Planning, Project Management, Continuous Learning, Innovation, External relations, Resources, Supplier and Partnership, and Feedback. Furthermore, the results are Project Results, Company Results, People and other Stakeholders, Project end users. Furthermore, based on the nature of construction industry in NIQ some other sub-parameters or factors were selected to evaluate each variable. The questionnaire was designed to ask questions about the validity of sub-parameters of the above variables. A sample of the questionnaire is shown in (Appendix A).

3.4.1 Characteristics of the Respondents

The questionnaire were sent through e-mail, transmitted in social networks, and filled in face-to-face meetings among NIQ construction professionals and companies. In the beginning the main objective of the study was clarified for the respondents and a brief introduction was presented to those who do not have enough information about the idea of PM. About 365 requests including the link of the survey form (designed by using the New Google Forms) were sent through email, social networks and face-to-face meetings, but only 115 of these requests were answered.

3.4.2 Performance Drivers

It was perceived that a company is included of some components that have a great influence on the performance of the company and the executed projects by the company. Each of these components will be clarified in the following parts.

3.4.2.1 Leadership

Leadership is one of the important drivers that have a great influence of the performance (Lee et al., 2003). A successful leader is the one who can develop mission and vision for the company and can identify values for the company members. Leadership is said to be successful when it can produce a good environment for supporting different entities, learning, and innovation (Bassioni et al., 2005). Leaders are considered as one of the most significant factors in bringing success or failure for an organization, company or even the whole country. It can be pointed that bad effects of unexpected incidences and the external factors that have negative influence on the companies, projects and stakeholders can be minimized by an experienced and well trained leader. In addition, one of the drivers of EFQM is leadership that recommends the organizations to have an effective leadership for making more suitable strategic decisions (Vukomanovic & Radujkovic, 2013). In the questionnaire survey three points were asked to the participants that were (Leaders' role in developing clear objectives, Leaders' improvements within project processes, and communicating leaders directly with stakeholders and employees).

3.4.2.2 Strategic Management and Planning

Strategic management and planning was pointed as a very crucial factor for organizations to have a clearer objective and more flexibility in the organizational processes (Bassioni et al., 2005). In this research some strategies were selected that are suited for the construction sector and shown in the following.

- **Project, Partner, Market and Client, Selection Strategies:** these are evaluated through some other characteristics that specialized to the projects in construction sector as project complexity and location, subcontractor competencies, environmental situations, equipment and material availability, client's financial stability, and the capabilities of the partners.
- **Organizational and Project Management Strategies:** these are involving the strategies relative to the planning and control systems, and organizing the different entities working within the project and company (Bassioni et al., 2005). Additionally, for gaining the project objectives the strategies should be related to some other managerial functions as planning, Time, cost and quality controls, risk management, safety management and etc.

3.4.2.3 Project Management

Construction phase is known as the industry that its success or failure can be assessed through the success or failure of the projects (Edum-Fotwe & McCaffer, 2000). Although, each project in the construction has its own characteristics, the managerial aspects are the same across all the projects, companies and stakeholders. Therefore, project management aspects are considered as the significant drivers for the project performance. The most popular and effective factors in this area are presented below.

- **Time Management:** it is one of the most important aspects of the project management. It is very important for the contractors to finish and deliver the projects on time by using different techniques in processes management (Edum-Fotwe & McCaffer, 2000). The processes can be identified to be activity definition, sequencing, resource estimating, duration estimating, schedule development and schedule control (Munns & Bjeirmi, 1996). Time

management is an experience based process that is relative to the project managers' experience (Colin and Vanhoucke, 2015). Project managers should be well trained and have enough experience for more accuracy in estimating process durations and complete the project ahead or on time.

- **Cost Management:** it is to ensure about the overall cost of the project. Many processes should be taken as consideration as planning, estimating, budgeting, and controlling of the project. The aim of these processes is to complete the project with a minimum cost without changing the demanded quality of the project (Colin and Vanhoucke, 2015).
- **Quality Management:** related to the processes that affect the quality of the constructed projects and the corrective actions for the parts of the project that is not the same as demanded in the standard (Munns & Bjeirmi, 1996). And the processes can be summarized as quality planning, quality assurance, and quality control (Edum-Fotwe & McCaffer, 2000). If the quality of the project was poor, it will be corrected only with increasing cost and may be the result of project delays. A project with a high quality can be achieved by a good harmony between the leaders and top management in implementing the quality principles.
- **Human Resources Management (HRM):** it is of the most significant factor for a better performance, while it is the people who complete and deliver the projects. The most crucial action that HRM can perform is management of the project team work (Edum-Fotwe & McCaffer, 2000). There is a good relationship between the people and the completed project that indicate the rate of success of the project.

- **Risk Management:** it is a collection of some processes that affect the performance, productivity, and quality that decreases the bad effect of unexpected incidences (Colin & Vanhoucke, 2015). The processes are planning, identification, analysis, reactions, checking and controlling. For the purpose on improving the project performance, it is a must to implement these processes correctly (doing the correct thing correctly).
- **Project Procurement Management:** project procurement management can be illustrated as gaining the needs and requirement of a specific project form outside the team and the entities participating within the project procedures (Chen, 2015).
- **Claims Management:** while construction is a very complex industry and the construction projects are included with a variety of parties and entities, it is very important to take the claims as consideration. At this point of view, there are some important activities that affect the processes in construction projects as documentation, processing, monitoring and management of claims.
- **Knowledge Management:** Knowledge management is one of the subjects that have mentioned very little in the literature (Todorović et al., 2015). It is also one of the most common and essential factor that can be gained through taking benefit from the best practices, previous data, and any relevant information to the project (Todorović et al., 2015). A successful knowledge management leads to a company having the capability of executing and delivering complex projects.
- **Health and Safety Management:** it is one of the human related factors, while the humans are the victims of the accidents happening in the project (Edum-Fotwe & McCaffer, 2000). It is also indirectly a cost related factor, while it

increases cost due to the insurance cost, inspection and etc. There are some essential points that can improve the problems related to the health and safety and are planning and management of health and safety, employing a skilled safety representative on site, teaching and training of employees and managers, supplying safety tools, medical monitoring of workers, provision of safety leaflets, project site safety, new technologies, providing safety environment (Edum-Fotwe & McCaffer, 2000).

- **Supply Chain Management (SCM):** it can be defined as the network of processes needed to complete and deliver a product which is a project in construction industry (Hendricks & Singhal, 2003). The network is involved with all parties and entities participating in the project processes from the supplier of materials to the end users of the project. The owner, consultants, contractor, subcontractors and suppliers are the parties and entities in construction industry (Hendricks & Singhal, 2003). Therefore, the quality of the relationship between the different parties within a project is a very important factor for improving and increasing performance.

3.4.2.4 Continuous Learning

As identified in the literature continues learning is a key for making organizational strategic decisions (Todorović et al., 2015). In this research some aspects of this perspective has identified that are very common in construction sector.

- **Employee Training:** the main objective of this point is relative to improve employee skills. Through this point the productivity of employees will be increased and they will be more motivated to the work as they perceive the development in their personal abilities. The employees should be aware to the

importance of teamwork and the leaders should provide a law for rewarding the successful employees.

- **Knowledge and Information Sharing:** this point is greatly influence on the success of an organization, while it increases the self-awareness and knowledge of all the individuals within the project. Knowledge and information sharing build a strong communication among the individuals from the top management to the employees and this leads to make trust between them. While the people working in a project trust each other, they can run the processes better and smoothly, they will learn in a very short time, and they will be more productive.
- **Reviewing Past Experience:** one of the aspects of learning management is highly related to the past experience. Learning management will effectively work when the lessons and documents related to the completed projects were kept by the company and employed in other future projects (Edum-Fotwe & McCaffer, 2000).
- **Taking Benefit from Other Projects' Best Practice:** for every specific project, there is another completed project which has been executed in a very good quality with high operational techniques. The construction managers should observe such projects in their project type, in order to know the suitable procedure for doing an activity with a high quality and minimum cost and time.

3.4.2.5 Innovation

The communication of the construction companies with the environment of their projects and manipulating the unexpected events within the project can be involved in the innovation processes (Bassioni et al., 2005). Construction companies were forced to develop new techniques to be with the line of the new global developments and can compete with their competitors in the industry (Bassioni et al., 2005).

Despite of gaining the competitive advantage there are some other achievements in innovation as cost leadership, differentiation, and focus. In this research some important aspects of innovation considered as stated below.

- **Efficiency of Research and Development (R&D):** due to globalization and increasing competition between the construction companies, the requirements and the needs of the construction projects were increased as a reaction to these changes mentioned; therefore, R&D is an effective factor for the companies to provide appropriate solutions for the demanded needs within the industry (Edum-Fotwe & McCaffer, 2000).
- **Application of IT:** the use of IT gives the construction companies the advantage of coordination, collaboration, and exchanging information between all the parts participating in executing a specific construction project (El-Mashaleh et al., 2006). The most common categories IT application that affect the performance of projects are related to (cost estimation, scheduling, planning, site management, information management) (El-Mashaleh et al., 2006).

3.4.2.6 External Relations

External relations of a construction company with other parties participating in executing the project has a great influence on the performance of both construction project and the company. The strength of the relation of the parties will be gained when they were satisfied with their duties and rights. The parties can be subcontractors, material suppliers, financial institutions, labor unions and etc. In this research the relationships with some parties will be discussed that have a specific importance in the NIQ construction industry and have a great effect for a better performance in that Region, as clarified below.

- **Relations with Client:** however it is difficult to achieve a good relation between clients and contractors; it is one of the most important relations that companies should keep it strong. Therefore, for having a good relationship between the clients and contractors, the contractors should satisfy the clients by knowing their opportunities in time, cost and quality (Smallwood & Venter, 2001).
- **Relations with Government:** The relation with government is mostly related to the influence of the government regulations and policies concerned to construction sector. The very common government barriers ahead of construction companies are related to the financial support and the required standards to be applied in the company daily operations within projects.
- **Relations with Labors Union:** a good relation with labor unions affect the company in the side of employment policy and the company should take it as consideration with the aspects related to the human recourses management. Labor unions can force the companies by strike threatening in the case when the company desired to reduce its internal costs by reducing the number of its employees. A good relation with the labor unions offers the companies to have a free environment of employment.
- **Relations with Other Companies:** it is difficult for construction companies to provide all its needs by its own capabilities in the way of a project execution. Therefore, good relations with other companies pave the way for the companies to gain their needs in a very short time. While information and knowledge sharing is a key for a better performance, construction companies can have this opportunity with other companies within the same industry.

3.4.2.7 Resources

Resources for a construction company are defined as the company's physical and potential wealth and strength. In this research some important sides of this part will be clarified that are financial resources, technical competencies, and Material and equipment resources (Bassioni et al., 2005).

- **Financial Resources:** it shows that how a company is strong in executing and accomplishing projects. It was realized that if a company is strong financially, its reputation and reliability will be stronger in the suppliers' and clients' point of view (Perera et al., 1997).
- **Technical Capability:** it indicates the physical strength of the company that is needed for project execution such as equipment, range of technical knowhow and machinery (Bassioni et al., 2005). Two main dimensions cam be considered as significant factors influencing project management that are the system complexity and technological uncertainty. The technical capability of a construction company can be evaluated through the company's construction methods, efficiency of operational processes, expertise of technical staffs, and quality of the project.
- **Material and Equipment Resources:** it is one of the most important sides which indicate the way of the company to success or failure. Construction companies are highly relative to other third party suppliers as material and equipment suppliers; therefore, any shortage or defect in these suppliers or resources affects the performance of the company and the project (Bassioni et al., 2005).

3.4.2.8 Supplier and Partnership

Suppliers and partners are accounted as the most important parts of projects; therefore, some aspects of them are pointed in this research as stated below.

- **Partner Satisfaction:** this factor is considered to have a great significance level for gaining success and having a better performance (Bassioni et al., 2005). While the partners of a specific company are strong in terms of financial and technical capability, the overall performance of the company to undertake different projects will be more improved. Therefore, mutual satisfaction between partners and contractors is very important.
- **Supplier Satisfaction:** construction companies need a variety of suppliers in order to can carry out different projects (Bassioni et al., 2005). Supplier companies as concrete, material, or machinery equipment suppliers should be satisfied when working with a construction company, because any defect of these suppliers affect the daily operations and activities of the company within the projects.
- **Teamwork Culture with Partners and Suppliers:** in a teamwork environment every entity and individual has their own responsibilities and duties. In order to this function can work effectively, the company and its partners and suppliers must understand this and the responsibilities should be defined for each of them at the startup of every project (Bassioni et al., 2005).

3.4.2.9 Feedback

Feedback was recognized as the tool having a great importance in the PM process. Feedback gives managers the ability of performance controlling for any step of a specific project (Otley, 1999).

- **Doing Survey among the Society and the End Users:** while the main target of construction companies are projects and the projects are serving the people and the end users in a particular society; it is a meaningful concept to argue a practical survey among the society where the project will be served.
- **Collecting Information among Stakeholders and Employees:** stakeholders and employees are the machine of the projects. They have the idea and precise information about the defects and the weak points of the company in executing the project. For this reason doing feedback among stakeholders and employees will have its own importance for managers to improve the company and project performance (Otley, 1999).
- **Doing Feedback at the Beginning and at the End of Any Process:** the processes of any activity within construction projects include many variables to be considered before starting the activity. Knowing these variables depends on the experience and knowledge level of the company managers and leaders. For this purpose doing feedback at the beginning of any activity will be very helpful for the construction managers and leaders to solve any unexpected incident which may happen. In addition, feedback at the end of the activities indicates the rate of performance of the company and it will be beneficial for the future projects.

3.4.3 Results of Performance

In the above parts the measures of the performance were clarified in detail that has influence of the performance indicators or they will have some results in the project's and company's point of view. The most important results that indicate the performance of the construction projects, companies and stakeholders in the NIQ construction industry will be stated in the below parts.

3.4.3.1 Project Results

Construction industry is a complex industry that its projects are varying and each project has its own characteristics. Although, each project has a specific fracture, most of the processes needed to carry out in such projects are the same. Therefore, for the purpose of identifying the performance of the construction projects, different components should be considered, that the most important ones were selected and will be discussed below.

- **Project Profitability:** it is of a high significant level for indicating the rate of growth of a company in the business environment. Project profitability is also an indicator for easily perceiving the financial success of a company (Munns & Bjeirmi, 1996). On the other hand, it provides the competitive advantages for the companies in the market. A proper project management and an improved system of PM results with a project profitable company (Chen, 2015).
- **Project Health and Safety:** health is defined as the protection of the people working in the project from illness that may be the result of using some special types of materials or some processes in the project (Edum-Fotwe & McCaffer, 2000). It means that in the project site no danger should be existed due to the damage of something which may be the cause of accidents. A company with a high level of project health and safety can have the advantage of a better performance in the project processes, financial objectives, and provides a better quality for working in the project site (Edum-Fotwe & McCaffer, 2000).
- **Quality of the Constructed Project:** an aspect that is in a particular concern for project managers is quality. While a defect exists in a project, it may be the cause of a large cost, because in most of the cases re-construction may be necessary (Bekr, 2015). Despite of increasing costs, defects due to bad quality

results with delays in projects. Therefore, a successful project manager takes a great effort to be sure about the quality of the project.

- **Client Satisfaction:** in the construction industry client satisfaction is the achievement of the physical characteristics of projects (Ahmed & Kangari, 1995). In other words, reaching the specified project quality with a minimum cost and time can satisfy the clients and also the success of a project will be guaranteed when the client was satisfied with the project (Ahmed & Kangari, 1995). Additionally, one of the basic components of TQM is the satisfaction of clients that the client requests have a position with a high significance level (Schalkwyk, 1998). For this reason, construction managers must recognize the satisfaction of clients as the bold lines of the project.
- **Project Teamwork and Harmony:** Construction is a sharing operation, therefore, only by collecting experience and knowledge of a lot of people companies can achieve an improved project performance. Teams can be defined as the number of people who are skilled in a particular field and grouped to achieve and fulfill a specific objective in the framework of a project (Bassioni et al., 2005). Some of the benefits in project teamwork can be summarized as powerful responses to changes, better understanding, greater confidence, motivation, broader range of thoughts, and effective usage of resources.
- **Society Satisfaction to the Project:** this factor is greatly associated to the culture and the level of the wealth in the society, because the demand of the society varies with the changes in their financial conditions. Therefore, construction companies should realize the nature of the society where they are working for and fulfill all their requirements in the projects.

3.4.3.2 Company Results

There are a lot of factors indicating a construction company performance, In this research the most importance one that have placed a high significance level in the NIQ construction Industry will be argued.

- **Financial Perspectives:** one of the most important indicators of a construction company performance is the financial perspectives that can be measured through the rate of profit in projects. Furthermore, financial measures can be classified under some other sub-parameters as the value for shareholders, turnover, and growth (Kaplan & Norton, 1992). Financial perspective of performance can be measured with some measures as economic value, decreasing costs, increasing profit and revenue, improving productivity, market value.
- **Company Image:** in a competitive environment as exists in construction industry, the image of companies will be accounted as important factors in market place. The construction contractors should take a great attempt to have an image that can be fitted with the clients' and market wishes. Furthermore, a good company image will gain more profit for the company by appealing better investors and clients.
- **Flexibility of Internal Processes:** the rate of success in managerial and operational processes in construction projects is an indication for an improved performance of the company (Davis & Albright, 2004). The basic objectives of the organizational internal processes in flexibility are specified as producing innovative products, realizing customer requirements, safety, quick response to demands, partnerships, increase customer value, risk management, chain management, service quality, loss control, tender effectiveness and etc.

3.4.3.3 People and Other Stakeholders

- **Identification of the Stakeholder Needs:** it is also accounted as the important factors influencing the performance of both projects and the companies. Stakeholders in an organization are any individual or group who can affect or is affected by achieving the organization's objectives (Chenhall & Langfield-Smith, 2007). Stakeholders in construction can be categorized to client, consultant, managers and leaders that directly associated to the projects, and also employees, governmental authorities, investors, sub-contractors, suppliers, and banks that indirectly associated to the projects. Identifying the needs of the stakeholders is a key for more flexibility in the project processes.
- **Good Communication between Leaders and Stakeholders:** it as likewise improves the harmony and performance within the operational processes in construction projects. Leaders are project runners and have a great influence for a better performance; therefore, a strong relation between the leaders and other stakeholders will improve the efficiency of the project processes.

3.4.3.4 Project End Users

Any construction project can be accounted as a successful project when the satisfaction of the end users were gained through the facilities provided in the constructed project (Anderson et al., 1994). Construction projects are said to be efficient when the end users' expectations were attained.

- **Identification of the End User Requirements:** construction projects are for serving the end users; therefore, the contractors should pay attention to what the end users want to be existed in the projects. This can be beneficial for the company image while the end users were satisfied or agreed with the final characteristics of the project.

- **Translation of End User Needs into Actions within the Project:** during the execution of construction projects, companies have to do surveys and feedbacks among the end users in order to realize their needs and suggestions to the project. This will create a positive view on the company and give the managers the opportunity of changing something and substituting it by the possible suggestions of the end users.

3.6 Hypothesis for the Importance of Performance Measures in NIQ

- **Drivers of Performance**

H 1: There is a positive relationship between leadership and performance of projects, companies and stakeholders.

H 2: There is a positive relationship between strategic management and planning and performance of projects, companies and stakeholders.

H 3: There is a positive relationship between project management and performance of projects, companies and stakeholders.

H 4: There is a positive relationship between continuous learning and performance of projects, companies and stakeholders.

H 5: There is a positive relationship between innovation and performance of projects, companies and stakeholders.

H 6: There is a positive relationship between external relations and performance of projects, companies and stakeholders.

H 7: There is a positive relationship between resources and performance of projects, companies and stakeholders.

H 8: There is a positive relationship between supplier and partnership and performance of projects, companies and stakeholders.

H 9: There is a positive relationship between feedback and performance of projects, companies and stakeholders.

- **Results of Performance**

H 10: There is a positive relationship between project results and performance of projects, companies and stakeholders.

H 11: There is a positive relationship between company results and performance of projects, companies and stakeholders.

H 12: There is a positive relationship between people and other stakeholders and performance of projects, companies and stakeholders.

H 13: There is a positive relationship between project end users and performance of projects, companies and stakeholders.

The validity of these hypotheses above will be analyzed and tested in the next chapter.

Chapter 4

DATA ANALYSIS

4.1 Introduction

This chapter illustrates the analysis and discussions of the performance measures and indicators on the base of the knowledge gained form the literature review and the collected data from the questionnaire survey. A questionnaire survey is an effective and practical technique to find out the effectiveness of each measures and indicators regarding to the nature of construction industry in NIQ.

4.2 General Information about the Respondents

NIQ is a quick developing region compared with the other countries in the Middle East. In the past decade a huge infrastructure investment was started. Therefore, the companies are trying for more investigation in the project management field. The prepared questionnaire survey was administered to about 365 professionals working in different organization in the construction industry through e-mail social networks and face-to-face meetings. The number of received responses was 115 responses that are about 32% of the total requests. The majority of the responses (67 responses, 58.3%) were gained through face-to-face meetings with the companies and the professionals of the industry. And the other responses (48 responses, 41.7%) were received through emails and social networks.

4.2.1 Gender of the Respondents

As it is shown in the Figure 4.1, most of the respondents were male (88.7%, 102 responses) and the others were female (11.3%, 13 responses). Indeed it was expected

that most participants may be male, because most of the professionals working in this field especially in NIQ are male.

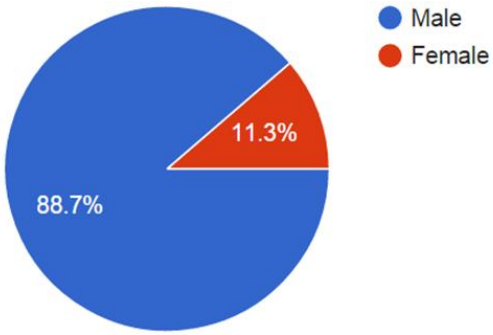

Figure 4.1: The gender of respondents

4.2.2 Type of Organization or Company

The types of the organization of respondents are illustrated in Figure 4.2. Contractors involve the biggest ratio among the other types by recording (49.6%, 57 responses). After the contractors consultants recorded (22.6%, 26 responses) and clients recorded (11.3%, 13 responses). In addition, there is a ratio of (16.5%, 19 responses) for other types of organization for the respondents working as lecturer in universities and office holders in Kurdistan Regional Government (KRG) ministries. While the majority of the responses have been worked as contractors, it can be said that the data can represent the nature of works and projects in NIQ.

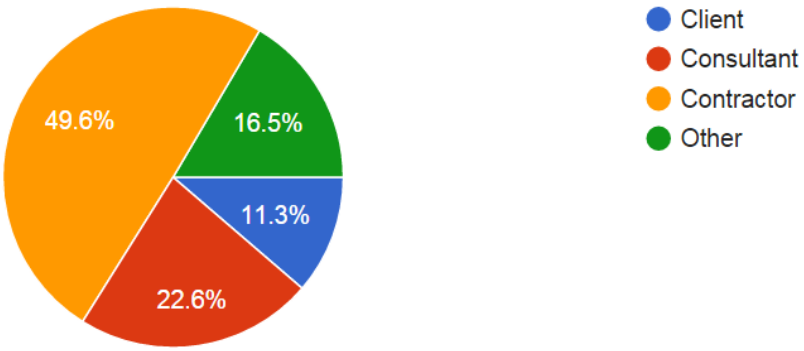

Figure 4.2: Type of respondents' organization

4.2.3 The Field within the Industry of Respondents

In this part the respondents had the ability of selecting more than one choice as the area of their expertise; therefore, the total number of responses that answered by 115 respondents was 214 responses Figure 4.3. The majority of the responses were involved in buildings by recording (78.3%, 90 responses). After buildings the consequence of the recordings were as Transport (38.3%, 44 responses), Infrastructure (27%, 31 responses), Hydraulic structure (24.3%, 28 responses), Industrial buildings (13.9%, 16 responses), and others (4.3%, 5 responses). Furthermore, other fields that specified by respondents include teaching and research in universities.

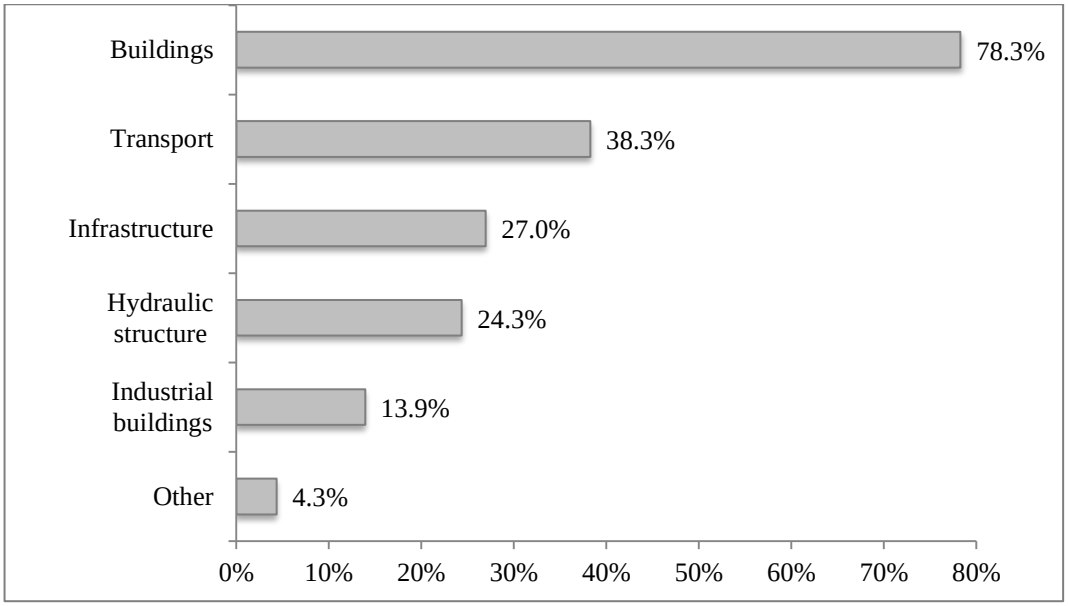

Figure 4.3: Respondents' field of working

4.2.4 Position of Respondents

As shown in Figure 4.4, most of respondents were Site engineers be having the ratio of (61.7%, 71 responses), then Project managers (20%, 23 responses), Designer (5.2%, 6 responses), and (13.1%, 15 responses) were specified other responsibilities within their organization that were (Instructors in universities, Quantity surveyor,

Chief Executive Manager, and geologist). Since site engineers involve the majority of the responses and site engineers are the ones who directly connected to projects, companies and stakeholders, the evaluations in this study can be more trusted.

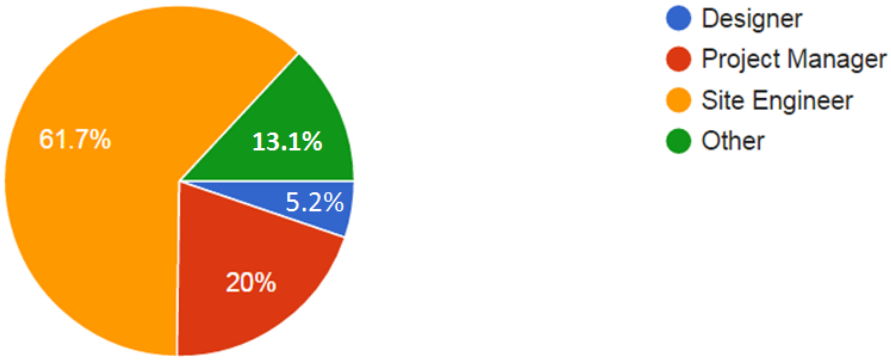

Figure 4.4: Position of respondents

4.2.5 Academic Qualification of Respondents

Most of the respondents have got their academic qualification in between (1-5) years that rated (59.1%, 68 responses), after that the ones who have achieved their academic qualification in (5-10) years rated (23.5%, 27 responses), and then (10-15), (15-20), (Less than 1) and (More than 20) rated (5.2%, 6 responses), (4.4%, 5 responses), (4.4%, 5 responses) and (3.4%, 4 responses) respectively as illustrated in Figure 4.5.

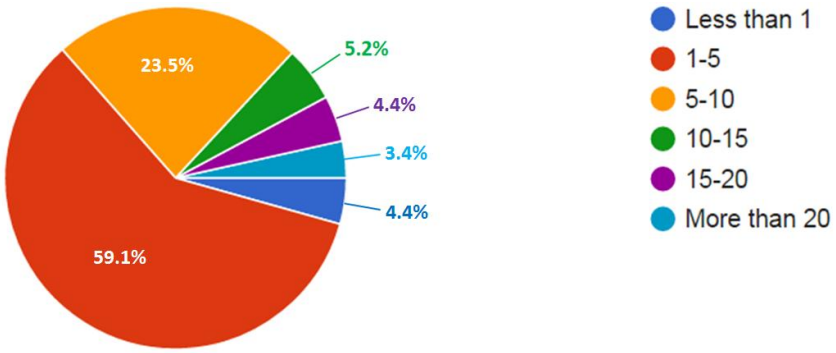

Figure 4.5: Academic qualification of respondents

4.2.6 Years of Experience

The experience of most respondents were between (1-5) years by recording (62.6%, 72 responses), after that (5-10), (10-15), (Less than 1), (More than 20), (15-20) recorded (20%, 23 responses), (8.7%, 10 responses), (4.4%, 5 responses), (2.6%, 3 responses), and (1.7%, 2 responses) respectively. In addition, none of the respondents specified the option of (Do not have experience). Figure 4.6 shows the ratios related to the years of experience.

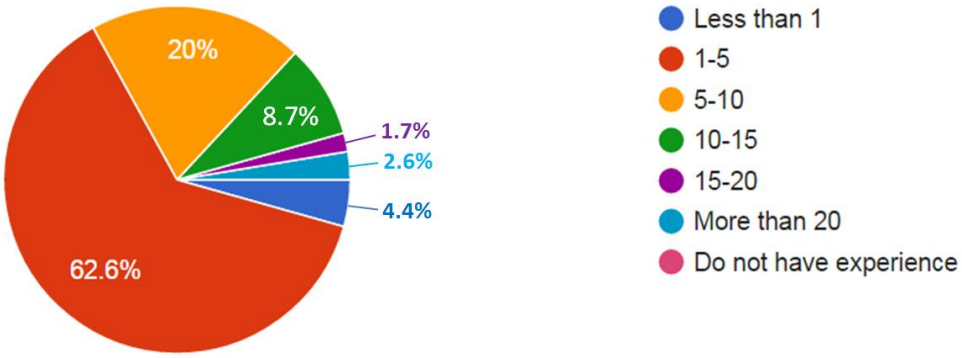

Figure 4.6: Years of experience of respondents

4.2.7 Understanding Level

As clarified in Figure 4.7, the majority of the participants were well understood with the concept of PM who rated (40.9%, 47 responses), and the other results were as: familiar with the concept (32.2%, 37 responses), understand very well (13%, 15 responses), unclearly understand the concept (9.6%, 11 responses), and unfamiliar (4.3%, 5 responses). This data explain that most of the participants have understood very well, understood well and familiar with the concept. For this reason, the collected data can be used in academic studies and trusted as a representative to the nature of the construction industry in NIQ.

Figure 4.7: Understanding level of respondents

4.2.8 Usage of Performance Management Systems

As illustrated in Figure 4.8, most of the respondents (54.8%, 63responses) showed that they did not use any PM systems in their companies or organizations and only (45.2%, 52 responses) showed that they have used PM systems within their companies or organizations. It means that there is a need to develop a PM framework or system for the NIQ construction companies.

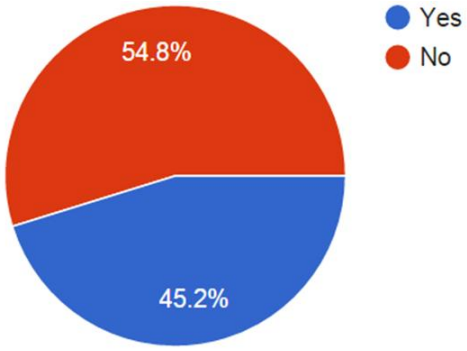

Figure 4.8: Usage of performance management systems within companies

4.3 Discussion of the Results

In the proceeding sections the level of importance of each performance drivers and results will be investigated on the base of the responses achieved in the questionnaire survey. Generally, all the performance drivers, results and their sub-parameters were found to be important as specified by the respondents. It means that there is a need

for a broad system of performance management for the NIQ construction companies. The questionnaire survey was designed to evaluate the level of importance of the factors on the base of level of agreement of respondents. Agreement levels were divided onto five levels that are (Strongly agree, Agree, Neutral, Disagree, Strongly disagree) and for the purpose of finding the level of importance in ratios, these levels were numbered from (5, 4, 3, 2, and1) respectively. The tables of the collected data have been shown in (Appendix B).

4.3.1 Drivers of Performance

4.3.1.1 Leadership

In accordance to the Figure 4.9, all sub-parameters of leadership "Leaders' role in developing clear objectives", "Leaders' improvements within project processes", and "Communicating leaders directly with stakeholders and employees" were considered to have a great importance, since most responses were strongly agree and agree to that these sub-parameters have impact on the performance of projects, companies and stakeholders. But among these sub-parameters, "Leaders' role in developing clear objectives" was found to be the most important factor. Regarding to the results obtaining from the questionnaire, leadership recorded the average importance level of (85.1%). It is very important for this measure to record high values of importance, because all the processes of project management is directly linked to this factor, in a manner that literature have identified leadership as the effective processes in organizational management systems.

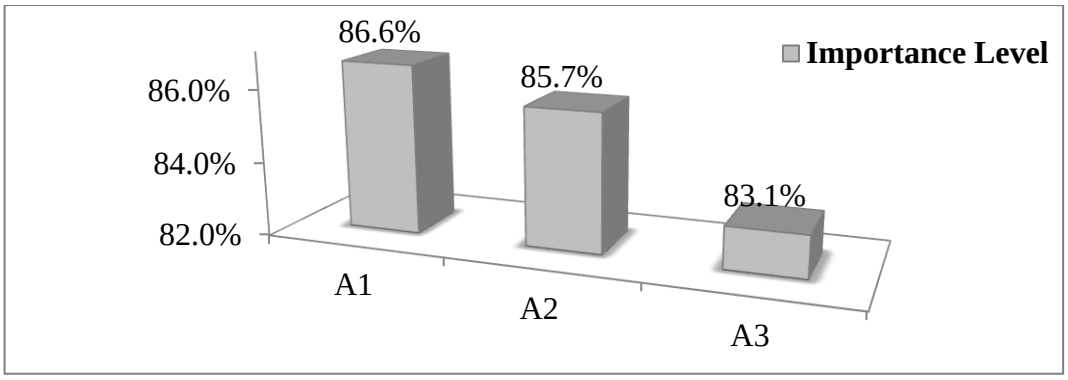

Figure 4.9: Importance level of Leadership sub-parameters

Leadership	Legend
Leaders' role in developing clear objectives	A1
Leaders' improvements within project processes	A2
Communicating leaders directly with stakeholders and employees	A3

4.3.1.2 Strategic Management and Planning

Having a look to the Figure 4.10, the idea that will be achieved is that project selection was considered as the most important ones, since the type and location of construction projects have a great influence on the overall project processes. After that project and organizational management strategies place the second level of importance among the other sub-parameters and this strategy is more related to the project management aspects as managing of time, cost, quality and etc. Therefore, the validity of that the NIQ construction companies are more desired with the traditional measures that have financial dimension was more proved. As this variable was rated by the average of (81.4%), it has impact on the performance of projects, companies and stakeholders. By having a strong strategic plan the direction of the actions and operations within projects will be clearer and the organizational performance will be more improved.

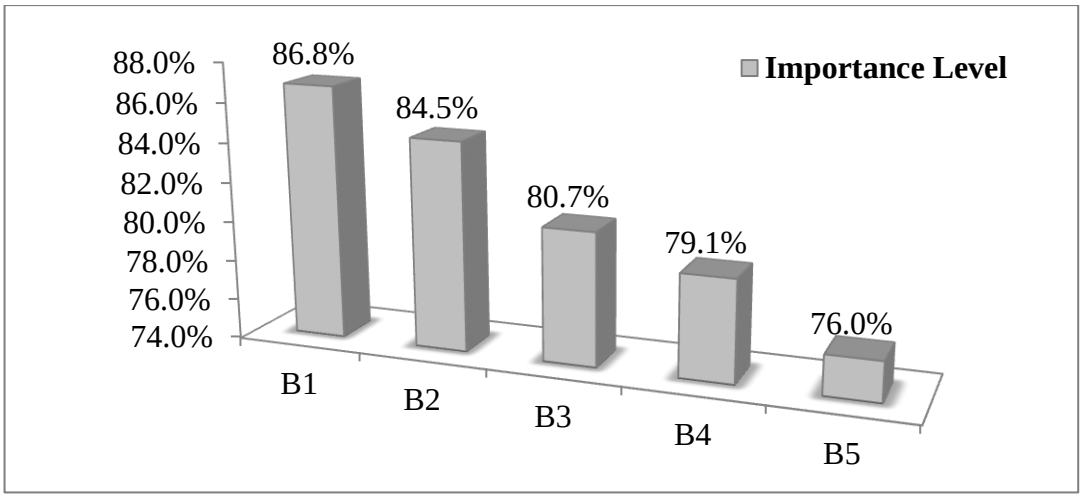

Figure 4.10: Importance level of Strategic management and planning sub-parameters

Strategic management and planning	Legend
Strategy of project selection	B1
Organizational and project management strategies	B2
Strategy of partner selection	B3
Strategy of market selection	B4
Strategy of client selection	B5

4.3.1.3 Project Management

As it was clarified in Figure 4.11, the factors that known as the project management triangle (time, cost, and quality) have greatest importance among all the other factors that drive project management. These three measures "that also known as the traditional measures of performance" were found to be the most important one throughout the whole literature and have the financial benefit for the companies. Additionally, "claims management" had the least importance while all the other sub-parameters have nearly the same importance. Furthermore, as the significance of project management aspects were largely found in the literature, the same importance of this perspective was emphasized in this research which leveled by the average of

(84.9%) by the respondents. It can also be underlined that the success and failure of projects mainly depends on the effectiveness of project management.

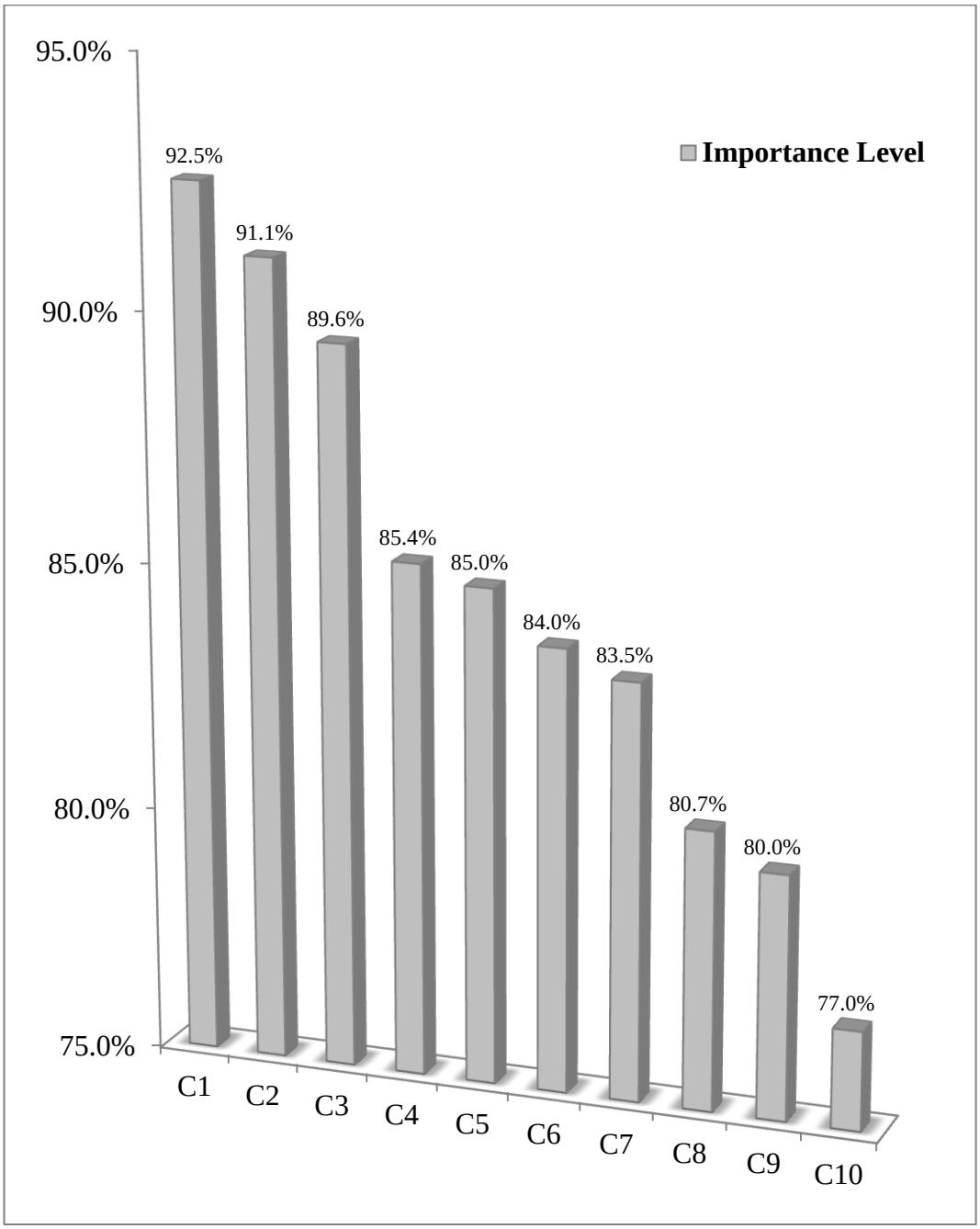

Figure 4.11: Importance level of Project management sub-parameters

Project management	Legend
Time management	C1
Cost management	C2
Quality management	C3
Health and safety management	C4
Human resources management	C5
Risk management	C6
Knowledge management	C7
Supply chain management	C8
Project procurement management	C9
Claims management	C10

4.3.1.4 Continuous Learning

Figure 4.12 shows the illustrations relative to Continuous learning. As we see, one of the most important aspects in learning was found to be employee training which rated (89.6%) in the survey. One of the main problems of construction companies in NIQ is the shortage or lack of skill labors and employees. That is why the respondents reported this problem by giving high importance level of impact for this aspect. Another aspect in this measure with the high importance level of (86.6%) is completed projects to be taken as consideration by the construction companies, because in some cases construction projects may be complex and the managers or leaders may not have enough idea about the processes of a specific action. Therefore, seeing a completed successful project in the same type aids the leaders in imagining the processes and reduces time and cost. Furthermore, information sharing and reviewing past experience were also reported to have impact on improving organizational performance and recorded (86.4% and 81.9%) respectively. Moreover, in among major measures the second position of importance level was placed by learning that was (86.2%). As showed in the chapters before, learning is

one of the essential factors affecting success and failure of construction companies. Learning is a part of one of the major perspectives of BSC which was "innovation and learning".

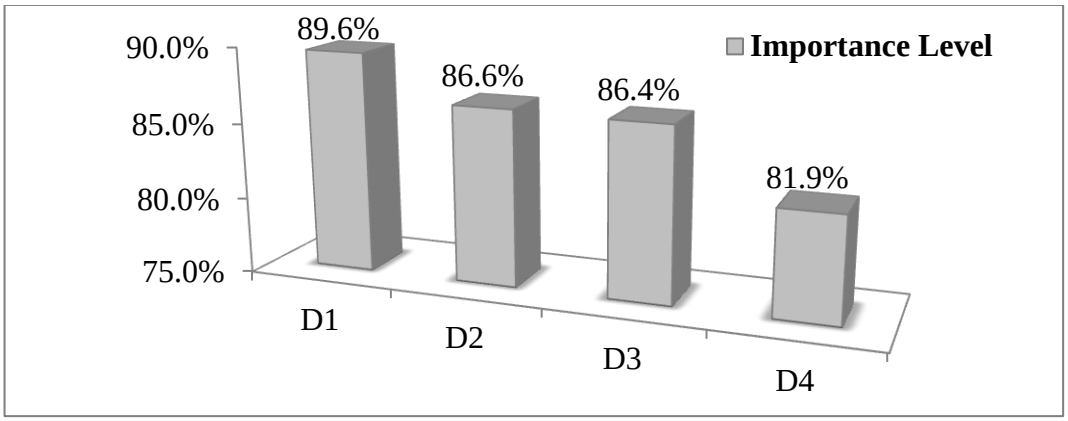

Figure 4.12: Importance level of Continuous learning sub-parameters

Continuous learning	Legend
Employee training	D1
Taking benefit from other projects' best practice	D2
Knowledge and information sharing	D3
Reviewing past experience	D4

4.3.1.5 Innovation

The two sub-parameters of innovation were found to have nearly the same importance as clarified in Figure 4.13. Based on the nature and environment of the Region, two different aspects of innovation were asked in the questions that were "Application of IT – 81.7%" and "Efficiency of R&D – 81.4%". These two aspects were supported significantly by the respondent companies and professionals in a manner that they recorded very close ratios to each other. Additionally, these two sub-measures give the competitive advantage to construction firms, since they have a very great effect on improving scheduling methods, estimation of costs, and

protecting the information and memories of the company that needed for knowledge management and strategic decisions. In this research there was an attempt to examine the importance of innovation. Innovation has been showed to be neutrally important in the performed survey among the NIQ construction companies by recording (81.6%) of importance level, because the companies in the region are not desired for the measures that their benefit can be seen in long-term.

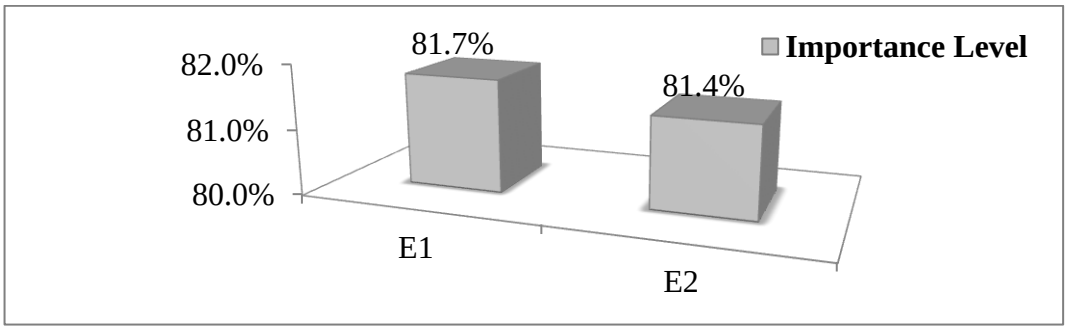

Figure 4.13: Importance level of Innovation sub-parameters

Innovation	Legend
Application of IT	E1
Efficiency of R&D	E2

4.3.1.6 External Relations

As it is shown in Figure 4.14 in this perspective, four different relations were investigated. Two of these "Relations with client" and "Relations with government" were found to have higher importance level by recording (86.4% and 85.2%) respectively. But the other two "Relations with other companies" and "Relations with labors union" were reported to be a less important as they recorded (77.4%and 75.7%) respectively. The results tell us that the relations with clients and government should be focused by the construction companies, because keeping these two

relations strongly improves the internal operations and leads to a better performance. It can be underlined that a good client relation helps in creating long-term strategic relations. And also in a strongly social relation environment "as exists in the society of NIQ" the relation with agencies of government can have effective role in improving internal operations and higher performance level. On the other hand, construction company relations with other companies have the advantage of making collaborations between them in the project operations. Furthermore, in the case of labors union's dissatisfaction the construction projects can be terminated; therefore, labors union relations should also be taken as consideration. In this research the importance of external relations was supported by the respondents as it recorded (81.2%) of importance level.

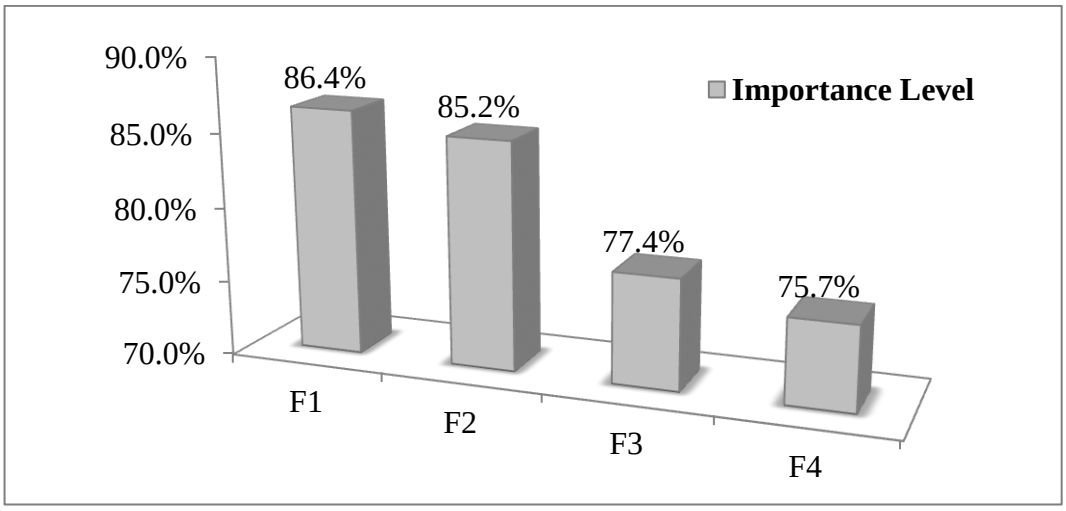

Figure 4.14: Importance level External relations sub-parameters

External relations	Legend
Relations with client	F1
Relations with government	F2
Relations with other companies	F3
Relations with labors union	F4

4.3.1.7 Resources

As shown in Figure 4.15, in this research, resources of a construction company were evaluated in three views that were “Financial resources”, “Technical capability”, and “Material and equipment resources”. All these dimensions were found to have a critical importance that reported by respondents. Financial aspect was defined to be more important than the other two, while it has an importance level of (92%). Additionally, “Technical capability” and “Material and equipment resources” recorded (88.7% and 88.5%) respectively. Although, all the dimensions of resources were found to be important, they may be different with respect to different companies and the business environment that the company works in. A construction company cannot survive without having enough resources related to these two aspects. While among the performance drivers, “resources” was indicated to have the average importance level of (89.7%) in the survey; it can be argued that resources have a considerable importance. Therefore, it can be demonstrated that resources make companies to be strong, and if a company were strong it will bring more opportunities for the company.

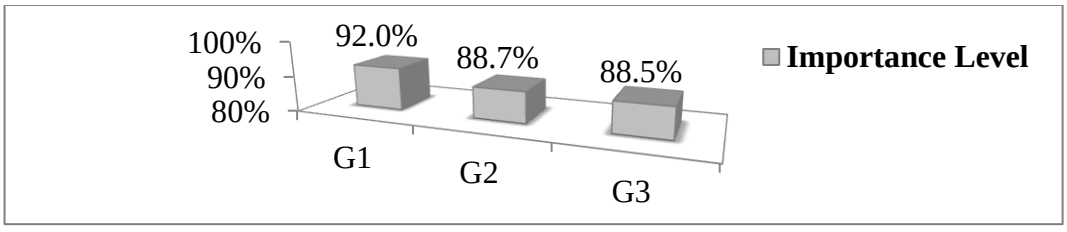

Figure 4.15: Importance level of Resources sub-parameters

Resources	Legend
Financial resources	G1
Technical capability	G2
Material and equipment resources	G3

4.3.1.8 Supplier and Partnership

According to Figure 4.16, this measure was evaluated through three different dimensions that was the satisfaction of suppliers and partners and company teamwork with the two. All these three sub-measures was evaluated by the respondents and recorded about the same ratio (81.0%, 82.8% and 83.3% respectively). Teamwork with partners and suppliers has been specified even to be more important than "Partner satisfaction" and "Supplier satisfaction". It means that, satisfaction of partners and suppliers in not enough for a better performance. Teamwork with these two entities makes them to feel as they are a part of the project or company. Suppliers and partners in construction industry have a considerable value in evaluating performance of projects, because any shortcoming in these entities directly affects the processes within the projects. This variable recorded the average of (82.3%) among the other measures that is a considerable ratio.

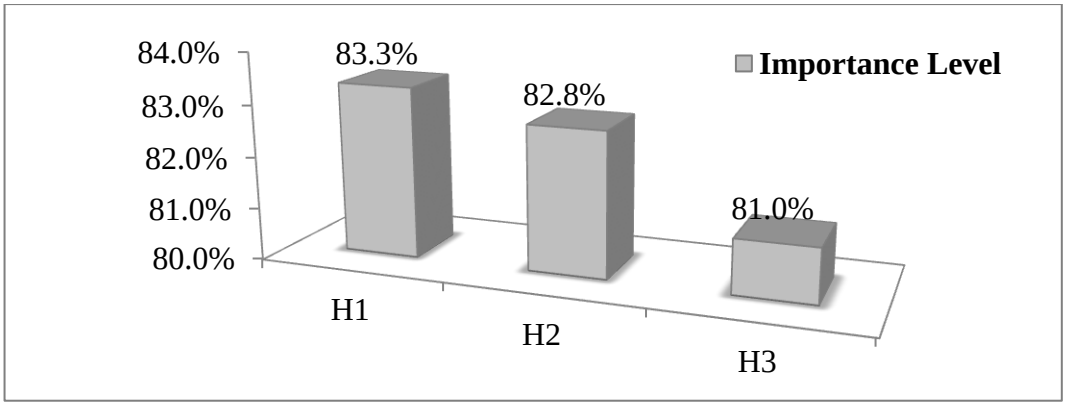

Figure 4.16: Importance level of Supplier and partnership sub-parameters

Supplier and partnership	Legend
Teamwork with partners and suppliers	H1
Partner satisfaction	H2
Supplier satisfaction	H3

4.3.1.9 Feedback

As it is presented in Figure 4.17, regarding to the environment and nature of works in NIQ, three sub-parameters were selected for the survey that were related to do feedback in the processes, among employees, stakeholders, and in the society that they recorded (82.6%, 79.3%, and 78.4%) respectively. This result shows more weight for the processes, it means that recording and transferring daily problems reported by the individuals working in the project to the control office will have a great impact on the performance of daily activities. On the other hand, less weight was given to feedback among employees and the society, because they may not have enough information on the type and the function of the project. However, the researchers and professionals pointed the lack of using feedback in construction projects; it can be used as a useful tool for improving performance. Therefore, feedback as a tool having a neutral impact on company, project and stakeholders' performance was reported by the respondents participated in the survey since it recorded (80.1%) of importance level. Although, feedback was reported as the least important parameter compared with the other major parameters driving performance, it is importance cannot be neglected.

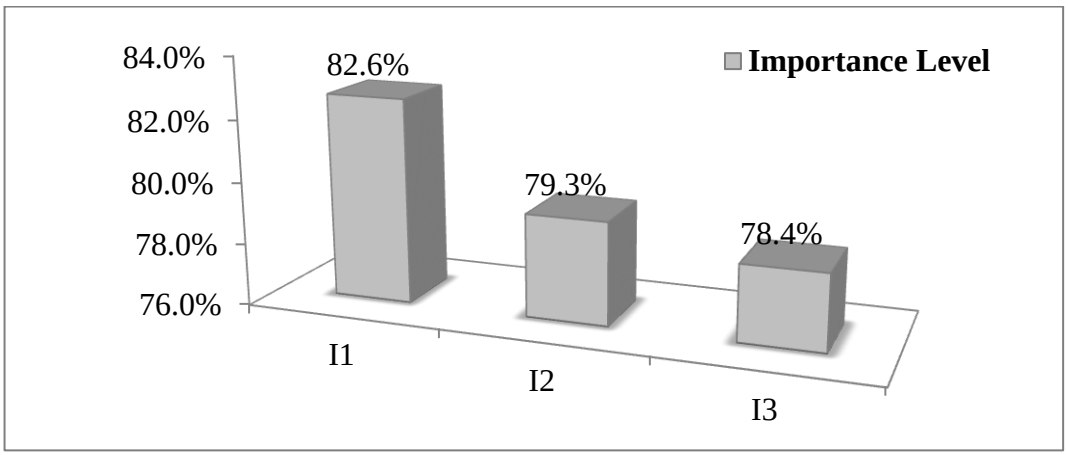

Figure 4.17: Importance level of Feedback sub-parameters

Feedback	Legend
Doing feedback at the beginning and at the end of any process	I1
Collecting information among stakeholders and employees	I2
Doing survey among the society and the end users	I3

4.3.2 Results of Performance

4.3.2.1 Project Results

As clarified in Figure 4.18, in this study project results were considered to evaluate performance through six different aspects. The results obtained from the survey gave the maximum position to the traditional measure of profit which termed as “Project profitability” by reaching 91.3% of importance level. It means that NIQ construction companies are searching for achieving more profit in terms of financial perspectives than other non-financial perspectives of the companies. After this factor, the construction professionals reported “Quality of the constructed project” and “Project health and safety” as most important indicators by rating the importance of (90.3% and 87.5%) respectively. Quality is the indicator that supports companies indirectly with financial aspects, because sometimes a bad quality of a part in a project may be the cause of reconstructing of this part and it leads to waste of time and money. On the other hand, health and safety can indirectly affect the profitability of the project, because in the case of an injury or a fatal accident the company will be obliged to provide the insurance cost. Moreover, the respondent companies and professionals specified “Project teamwork and harmony”, “Client satisfaction”, and “Society satisfaction to the project” as the least important factors among the project results’ aspects by recording the importance level of (83.1%, 81.6%, and 80.7%) respectively. It can be underlined that the companies are more focused on the aspects

that are more related to financial profit in the short-term, because, except the project teamwork and harmony (that indirectly affect project profitability) the two other factors are more related to the customers that may not have benefit to the companies in long-term. This result will give the signal of the fact that employing PMSs in NIQ is in the early stages of development, since the respondent companies are more concentrated on the traditional short-term measures. Among the other four major results within the developed framework, “project results” were found to be the most important by recording the average importance level of (85.7%).

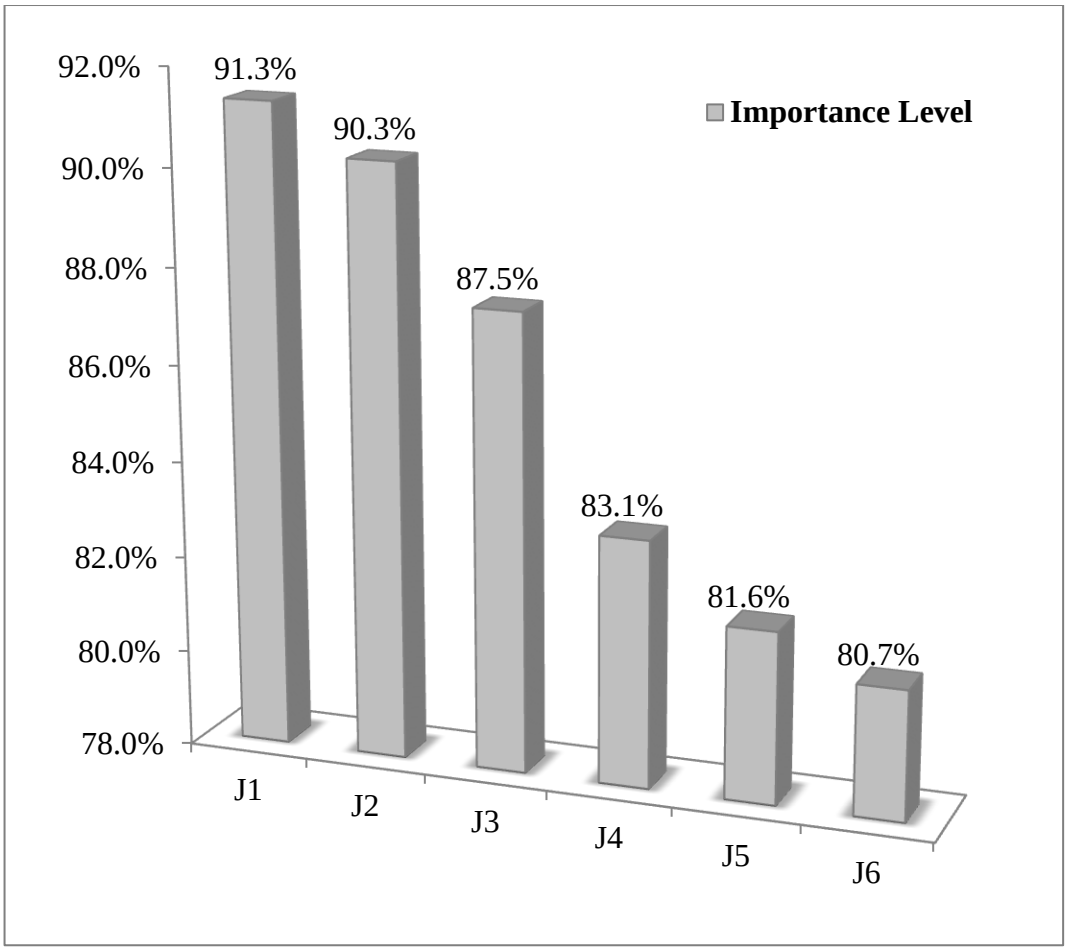

Figure 4.18: Importance level of Project results sub-parameters

Project results	Legend
Project profitability	J1
Quality of the constructed project	J2
Project health and safety	J3
Project teamwork and harmony	J4
Client satisfaction	J5
Society satisfaction to the project	J6

4.3.2.2 Company Results

In this study the results related to the companies were identified as a three dimensional measure that were "Financial perspective", "Company image", "Flexibility of internal processes" (Figure 4.19). Financial perspectives were specified to have a highest level of importance in evaluating the performance of projects, companies and stakeholders by recording (84.7%); after that "company image with 82.3%" and "Flexibility of internal processes with 77.2%" came respectively. Since the variable's average value of importance level was (81.4%); it can be argued that, while traditionally construction organizations measure their performance through financial terms in project level, the wish to measure performance in company level was also increased due to increasing competitiveness within the industry in the region.

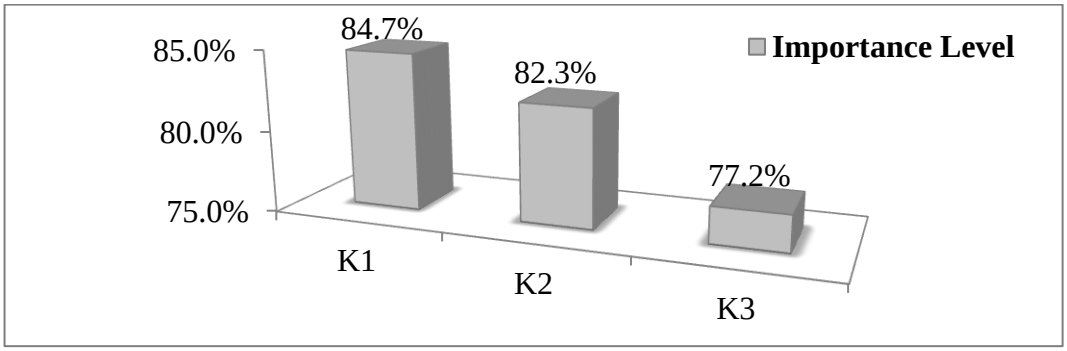

Figure 4.19: Importance level of Company results sub-parameters

Company results	Legend
Financial perspectives	K1
Company image	K2
Flexibility of internal processes	K3

4.3.2.3 People and Other Stakeholders

For the purpose of evaluating performance, two sub-evaluators were chosen related to this perspective that were stakeholders' communication and providing their needs with the values of (84.7% and 81.6%) respectively, as shown in Figure 4.20. Since there is a little bit difference between the ratios, both sub-measures of this perspective were found to be important. Thus, it can be underlined that managing people and other stakeholders is a key for gaining a better performance within projects, companies and stakeholders. This perspective is largely connected to motivation of stakeholders; therefore, the harmony of the project processes will increase as the different entities were more motivated. In the survey the importance of this dimension was emphasized by recording the average value of (83.1%).

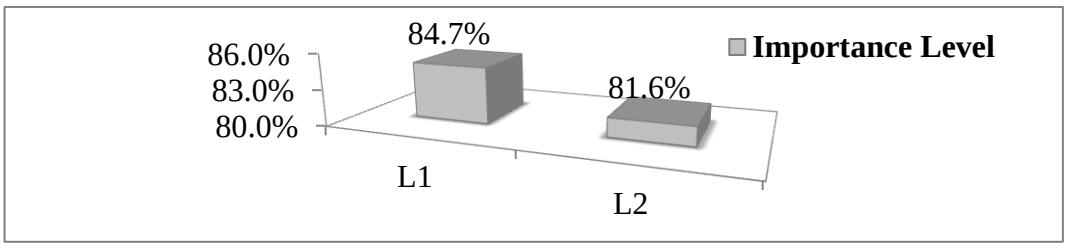

Figure 4.20: Importance level of People and other stakeholders sub-parameters

People and other stakeholders	Legend
Good communication between leaders and stakeholders	L1
Identification of the stakeholder needs	L2

4.3.2.4 Project End Users

As it is presented in Figure 4.21, two sub-factors were identified to construction companies on the base of NIQ society that were "Identification of the end user requirements with 84.5%" and "Translation of end user needs into actions within the project with 83.0%". Both of the factors were found to be important, since the end user requirements are very crucial to be defined in the projects to ensure the satisfaction of the society with the completed projects. Furthermore, the end user needs can be translated to actions in the projects by providing quick response to their needs if exist. However, this aspect has a great importance, sometimes it may be neglected by the companies. In the survey the construction professionals placed end users in a high level of importance that was (83.7%). Therefore, it is very important that end users will be satisfied to the projects.

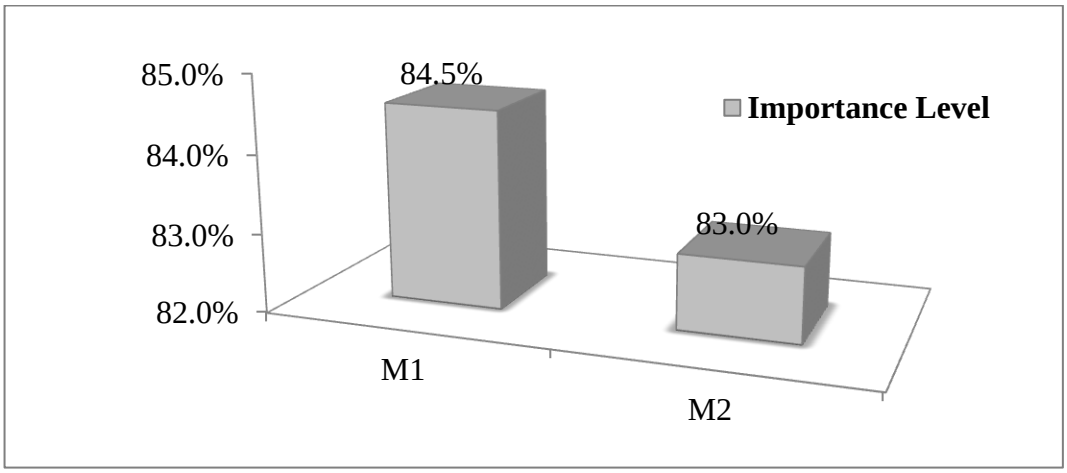

Figure 4.21: Importance level of Project end users sub-parameters

Project end users	Legend
Identification of the end user requirements	M1
Translation of end user needs into actions within the project	M2

4.4 Correlation Analysis

In the previous sections a detailed discussion was presented on the analysis of the importance of performance drivers and results. In this section a bigger image for the drivers and results affecting organizational performance will be illustrated. It includes correlation analysis and a comparison between the variables. For this reason, average of the collected data has been taken for each importance level of all the variables, as it was shown in Table 4.1. The purpose of doing correlation analysis is to find out the overall satisfaction on the selected variables and also discover the correlation between them Microsoft Excel program has been used to do the analysis.

For the purpose of analyzing the results, the scale that have been used to estimate the effect of the variables have specified to be (-1) to (+1) by the program. If the result of the analysis was (+1), it means that the two variables have exactly the same influence on performance. But if the result was (-1), it indicates that the two variables are different in affecting performance. The Excel program shows the results in a matrix form, as it was shown in Table 4.2. All the variables are exactly correlated to each other and have the same effect in driving and evaluating performance of projects, companies and stakeholders, because all the results are very close to (+1) and can be considered as a large effect. Regarding to Table 4.1 and Table 4.2, the minimum and the maximum value of correlation will be stated for the purpose of clarifying the idea behind the concept. The minimum correlation has been found to be (0.81) that is between (M7 and M13) “Resources and Project end users”, since there is a large difference between the means of these two variables. Additionally, the maximum difference has been found to be (0.99) that is in-between most of the variables, this is because the mean of these variables are very close to each other; for instance the

mean between (M1 and M110) “Leadership and Project results”, (M2 and M5) “Strategic management and planning and Innovation”, and etc.

Table 4.1: Average of the recordings for performance variables

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
Strongly agree	50.3	39.4	53.4	57.2	41.5	42	65.7	41.4	37	53.5	40	44.5	38.5
Agree	47.7	49.8	39.8	39.5	46	44.5	40.3	48.3	48	43.2	48.3	48	60.5
Neutral	14	21	18.8	14.8	23.5	23	8.3	23	24.3	16.5	22	18.5	15
Disagree	2.3	4.2	2.5	3.2	3	4.2	0.7	2.3	5	1.5	4	4	1
Strongly disagree	0.7	0.6	0.5	0.3	1	1.3	0	0	0.7	0.3	0.7	0	0
Total responses	**115**	**115**	**115**	**115**	**115**	**115**	**115**	**115**	**115**	**115**	**115**	**115**	**115**

Table 4.2: The results of correlation analysis from excel

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13
M1	1.00												
M2	0.97	1.00											
M3	0.98	0.93	1.00										
M4	0.98	0.90	0.99	1.00									
M5	0.97	0.99	0.95	0.92	1.00								
M6	0.97	0.99	0.96	0.94	1.00	1.00							
M7	0.96	0.85	0.98	0.99	0.88	0.89	1.00						
M8	0.97	1.00	0.94	0.91	1.00	1.00	0.87	1.00					
M9	0.94	1.00	0.91	0.87	0.99	0.99	0.82	1.00	1.00				
M10	**0.99**	0.94	1.00	0.99	0.96	0.97	0.98	0.95	0.92	1.00			
M11	0.97	1.00	0.94	0.91	1.00	1.00	0.86	1.00	1.00	0.95	1.00		
M12	0.99	0.99	0.96	0.95	0.99	0.99	0.91	0.99	0.98	0.98	0.99	1.00	
M13	0.94	0.98	0.87	0.85	0.96	0.95	**0.81**	0.97	0.97	0.90	0.97	0.97	1.00

Variables	Legend
Leadership	M1
Strategic management and planning	M2
Project management	M3
Continuous learning	M4
Innovation	M5
External relations	M6
Resources	M7
Supplier and partnership	M8
Feedback	M9
Project results	M10
Company results	M11
People and other stakeholders	M12
Project end users	M13

4.5 Hypothesis Testing

In this section the validity of the hypotheses that have been developed in previous chapter will be proved through using SPSS program by doing one sample t-test. The data that have been achieved in the survey were put in the program and the results in the tables below have been gained. As it has been shown in all tables, the significance level of all the variables are less than (0.05), it means that the impact level of all variables that have been specified by respondents are significantly higher than the average. It also indicates the validity that most of the participants are significantly agree or strongly agree with the high impact of variables on performance. In this section despite of showing the output results for all the variables, a hand calculation has been shown for one variable (that is leadership) as a double check for the results gained from SPSS program. As shown in the calculation below, the results have been matched with the output of SPSS program.

Hypothesis testing by hand calculation for Leadership:

Leadership has (50 strongly agrees, 48 agrees, 14 neutrals, 2 disagrees, 1 strongly disagrees). In the following formulas some abbreviations have been used. Here is the meaning of all these abbreviations:

$y_1, y_2, y_3 \ldots y_i$: represents a sample (a response)

n: Sample size

df: Degrees of freedom

$\bar{y}$: Sample mean

S: Standard deviation

$SE_{\bar{y}}$: Standard error mean

μ: Hypothesized mean

∴ Sample size = n = 115 and Degrees of freedom = df = 1–n= 1-115=114

$$\text{Mean} = \bar{y} = \frac{\sum_{i=1}^{n} y_i}{n} \quad \ldots \text{(Montgomery, 2001)}$$

$$= \frac{50\times5+48\times4+14\times3+2\times2+1\times1}{115} = 4.252$$

$$\text{Standard deviation= S} = \sqrt{\frac{\sum_{i=1}^{n} (y_i-\bar{y})^2}{n-1}} \quad \ldots \text{(Montgomery, 2001)}$$

$$= \sqrt{\frac{(5-4.252)^2+(3-4.252)^2+(1-4.252)^2+\ldots+(y_n-4.252)^2}{115-1}} = 0.804$$

$$\text{Standard error mean} = SE_{\bar{y}} = \frac{S}{\sqrt{n}} \quad \ldots \text{(Montgomery, 2001)}$$

$$= \frac{0.804}{\sqrt{115}} = 0.075$$

$$t = \frac{\bar{y}-\mu}{\frac{S}{\sqrt{n}}} \quad \ldots \text{(Montgomery, 2001)}$$

$$= \frac{4.252-3}{\frac{0.804}{\sqrt{115}}} = 16.702$$

And from Table 4.3, the theoretical (t) for (α=0.05 and df=114) is equals to (1.659) by interpolation between (60 = 1.671 and 120 = 1.658).

Since t = 16.702 > 1.659

∴ The hypothesis that has been developed in this study relative to Leadership cannot be rejected. For this reason it can be concluded that leadership has a great impact on the performance of companies, projects and other stakeholders.

Table 4.3: Percentage Points of the t Distribution (Montgomery, 2001)

ν \ α	.40	.25	.10	.05	.025	.01	.005	.0025	.001	.0005
1	.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	.289	.816	1.886	2.920	4.303	6.965	9.925	14.089	23.326	31.598
3	.277	.765	1.638	2.353	3.182	4.541	5.841	7.453	10.213	12.924
4	.271	.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	.267	.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	.265	.727	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	.263	.711	1.415	1.895	2.365	2.998	3.499	4.019	4.785	5.408
8	.262	.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	.261	.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	.260	.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	.260	.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	.259	.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	.259	.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	.258	.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	.258	.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	.258	.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	.257	.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	.257	.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	.257	.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	.257	.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	.257	.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	.256	.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	.256	.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	.256	.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	.256	.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	.256	.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	.256	.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	.256	.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	.256	.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	.256	.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	.255	.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	.254	.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	.254	.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	.253	.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291

ν = degrees of freedom.

[a] Adapted with permission from *Biometrika Tables for Statisticians*, Vol. 1, 3rd edition, by E. S. Pearson and H. O. Hartley, Cambridge University Press, Cambridge, 1966.

As it is seen in table 4.4 ($t = 16.702$, $P = 0.000 < 0.05$), Leadership has impact on the performance of projects, companies and stakeholders. Therefore, it can be said that one of the important factors that directly has influence on the performance of projects, companies and stakeholders is leadership, because leaders can provide

suitable advice for developing project objectives, managing operational process and communicating directly with different parties of the project.

Table 4.4: The output analysis from SPSS for Hypothesis 1

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H1: There is a positive relationship between leadership and performance of projects, companies and stakeholders	4.252	0.804	0.075	16.702	114	0.000

In this study strategic management and planning is considered by having a high significance level in measuring performance of NIQ construction projects, companies and stakeholders. The result in table 4.5 ($t = 13.208$, $P = 0.000 < 0.05$) shows a high significance level for this level. Therefore, it can be said that this measure can greatly affect the performance of NIQ construction companies.

Table 4.5: The output analysis from SPSS for Hypothesis 2

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H2: There is a positive relationship between strategic management and planning and performance of projects, companies and stakeholders	4.061	0.861	0.080	13.208	114	0.000

Regarding to the table 4.6 ($t = 15.55$, $P = 0.000 < 0.05$), it can be argued that project management can influence the performance of projects, companies and stakeholders. Since NIQ construction companies are mainly focused on the traditional measures and do not have experience with the non-financial measures, this measure may have a specific importance for them.

Table 4.6: The output analysis from SPSS for Hypothesis 3

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H3: There is a positive relationship between project management and performance of projects, companies and stakeholders	4.235	0.852	0.079	15.55	114	0.000

Based on the analysis of the data in table 4.7 ($t = 16.123$, $P = 0.000 < 0.05$), it can be expected that continuous learning may be one of the most important measures in driving performance of NIQ construction projects, companies and stakeholders. Because there are some aspects of learning that have neglected by the companies and they have a specific significance level for example employee training, reviewing past experience, information sharing and etc.

Table 4.7: The output analysis from SPSS for Hypothesis 4

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H4: There is a positive relationship between continuous learning and performance of projects, companies and stakeholders	4.287	0.856	0.080	16.123	114	0.000

The importance of innovation in driving performance of projects, companies and stakeholders has been approved in the analysis gained from SPSS program as shown in table 4.8 ($t = 13.489$, $P = 0.000 < 0.05$). Since construction in industry in the region is in developing stage and companies are less concentrated on the sides needed for innovation as R&D and IT applications.

Table 4.8: The output analysis from SPSS for Hypothesis 5

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H5: There is a positive relationship between innovation and performance of projects, companies and stakeholders	4.087	0.864	0.081	13.489	114	0.000

Based on table 4.9 (t = 12.949, P = 0.000 < 0.05) and the social environment exists in the region, it can be resulted that external relations put a considerable impact on organizational performance, because in a society just like exists in NIQ strong relations with external organizations (especially relations with government) provides more facility for the company to execute projects.

Table 4.9: The output analysis from SPSS for Hypothesis 6

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H6: There is a positive relationship between external relations and performance of projects, companies and stakeholders	4.070	0.886	0.083	12.949	114	0.000

It has been found in the results in table 4.10 (t = 23.904, P = 0.000 < 0.05) that resources have a vital role in improving performance of projects, companies and stakeholders. The reason for that is any shortage in the material or financial resources leads to slowing down or even stopping the construction projects. Another reason is that most of the NIQ construction companies are not such a big company that can provide all the resources by themselves, but they are strongly dependent on the third parties suppliers.

Table 4.10: The output analysis from SPSS for Hypothesis 7

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H7: There is a positive relationship between resources and performance of projects, companies and stakeholders	4.278	0.854	0.080	23.904	114	0.000

By seeing the results in table 4.11 (t = 14.625, P = 0.000 < 0.05) and under the light of the nature of the region's construction industry, the high importance of supplier and partnership can be perceived, since if the suppliers and partners were not satisfied they can make barriers ahead of the processes of construction projects.

Table 4.11: The output analysis from SPSS for Hypothesis 8

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H8: There is a positive relationship between supplier and partnership and performance of projects, companies and stakeholders	4.104	0.810	0.076	14.625	114	0.000

As we can see in table 4.12 (t = 12.069, P = 0.000 < 0.05), feedback can be calculated as the measures that may have a neutral importance level in NIQ, because the companies are less desired to add more costly processes within their organizational procedures that may have benefit in long-term.

Table 4.12: The output analysis from SPSS for Hypothesis 9

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H9: There is a positive relationship between feedback and performance of projects, companies and stakeholders	4.026	0.873	0.081	12.069	114	0.000

Respecting to table 4.13 (t = 16.328, P = 0.000 < 0.05), project results can be accounted as the measures having great impact on the performance of projects, companies and stakeholders because the benefit of most of these results can be seen in short-term and the companies are more desiring for these kinds of measures.

Table 4.13: The output analysis from SPSS for Hypothesis 10

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H10: There is a positive relationship between project results and performance of projects, companies and stakeholders	4.261	0.828	0.077	16.328	114	0.000

As clarified in table 4.14 (t = 13.055, P = 0.000 < 0.05), it can be said that company results indicate the performance of projects, companies and stakeholders, because this variable has financial dimension and profit is the major demand of companies and the most important factor to satisfy them.

Table 4.14: The output analysis from SPSS for Hypothesis 11

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H11: There is a positive relationship between company results and performance of projects, companies and stakeholders	4.061	0.871	0.081	13.055	114	0.000

As it have been shown in table 4.15 (t = 15.027, P = 0.000 < 0.05), people and other stakeholders is found to be important and have influence on performance; because if the people within the projects were not satisfied, the performance of the projects processes may not be improved.

Table 4.15: The output analysis from SPSS for Hypothesis 12

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H12: There is a positive relationship between people and other stakeholders and performance of projects, companies and stakeholders	4.148	0.819	0.076	15.027	114	0.000

Project end users can indicate the performance of projects, companies and stakeholders respecting to the results in table 4.16 ($t = 18.598$, $P = 0.000 < 0.05$), since the projects are for the using of the end users and if they were not agreed with the project it may have bad effect on the image of the company which have executed the project.

Table 4.16: The output analysis from SPSS for Hypothesis 13

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
H13: There is a positive relationship between project end users and performance of projects, companies and stakeholders	4.191	0.687	0.064	18.598	114	0.000

4.6 Comparison between the Variables

As it was shown in Figure 4.22, “Resources” was found to be the most important variable for driving performance in both levels of companies and the projects. Although, “Feedback” has been found to have a great importance for improving the systems of PM, its level of importance is the lowest level compared with the other factors. After that, the other drivers lie in-between “Feedback” and” Resources”.

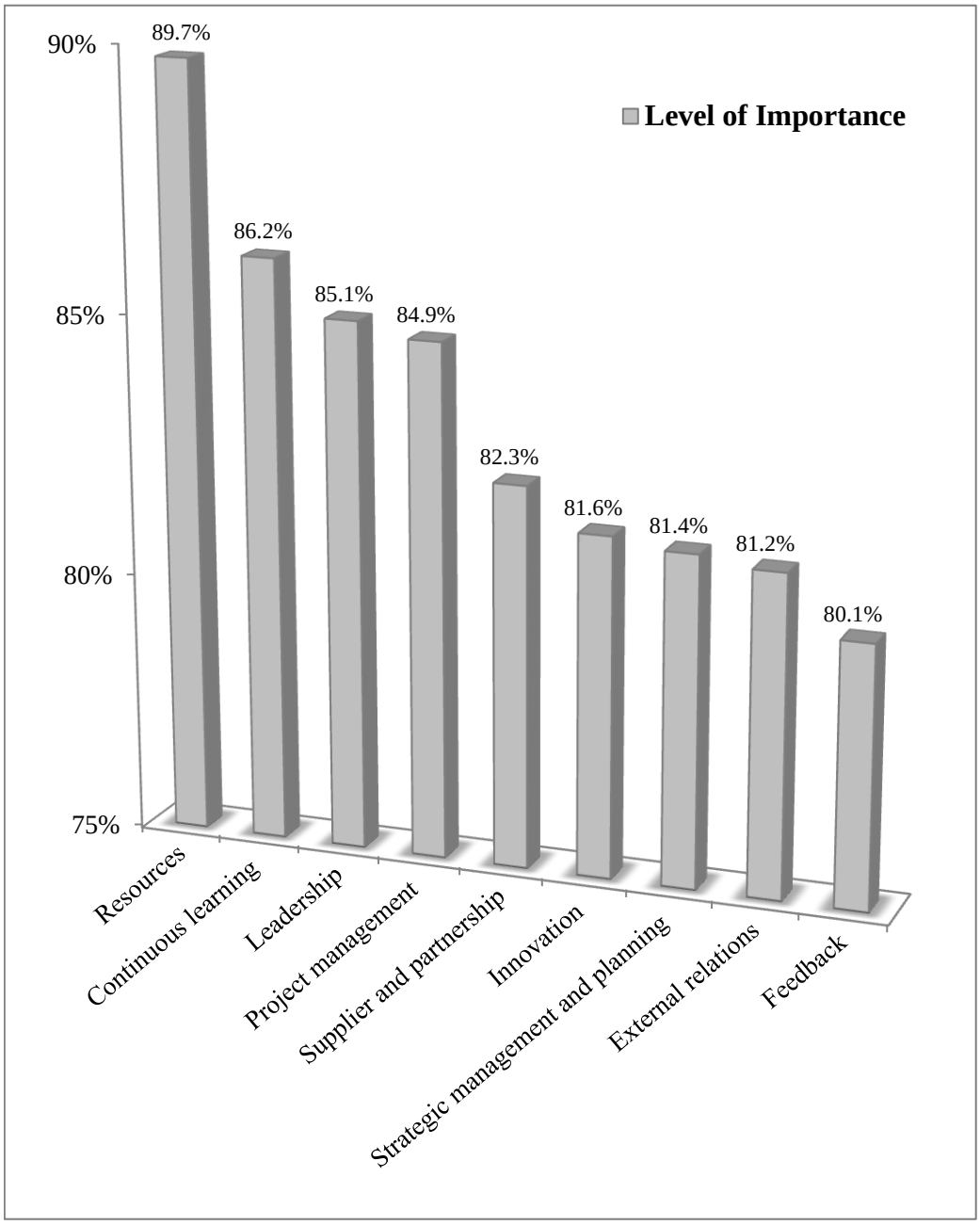

Figure 4.22: Importance level of Performance Drivers

Additionally, among the result variables "Project results" was determined to be the most important variable in evaluating the company, project and stakeholders' performance, as it was clarified in Figure 4.23. Then, it was followed by "Project end users" and "People and other stakeholders" that also recorded a high importance level. Although, "Company results" also considered as a very important factor in

indicating the performance of projects, companies and stakeholders, it has the lowest level of importance compared with the other result factors.

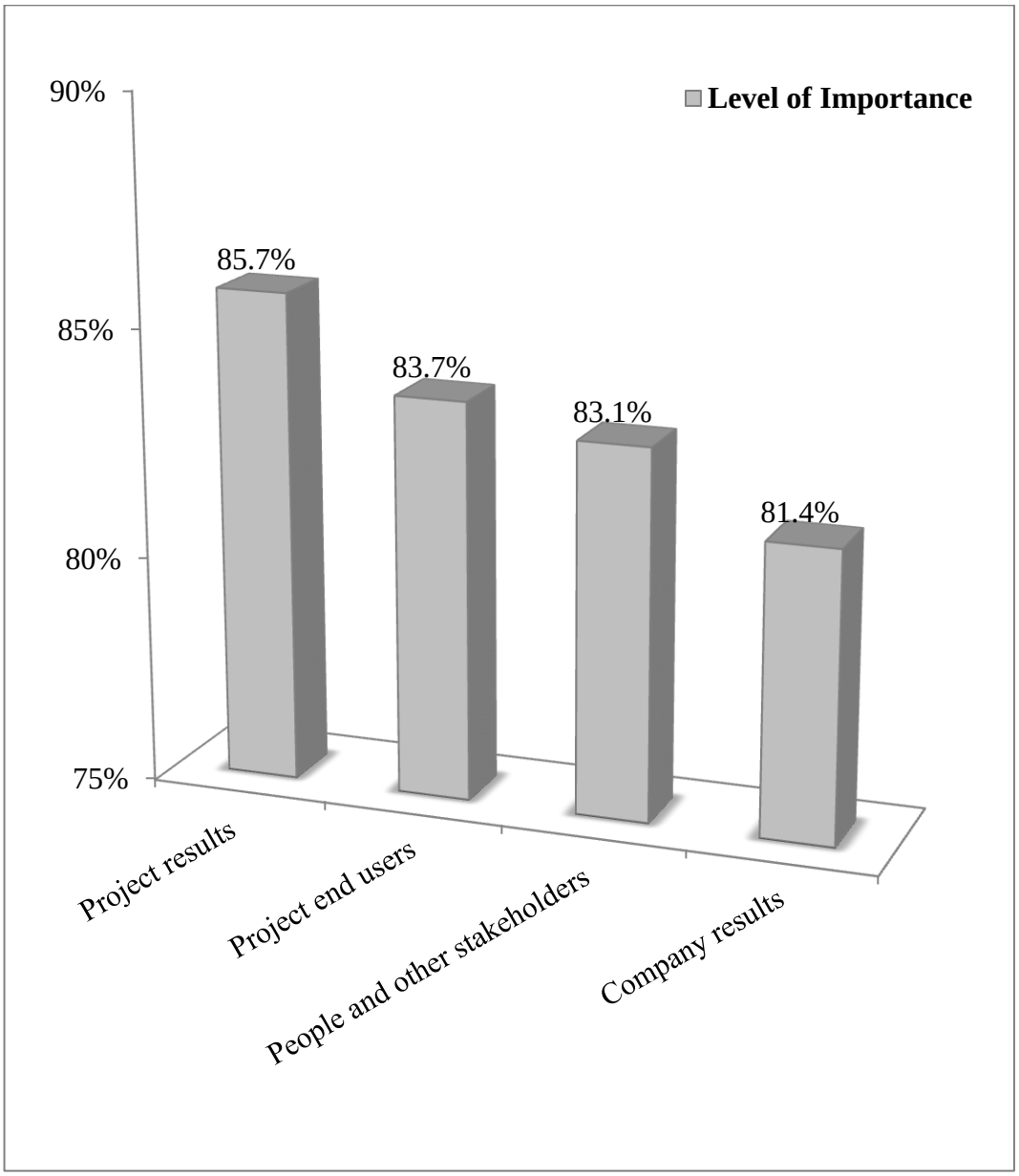

Figure 4.23: Importance level of Performance Results

4.7 The Developed Framework

In the chapters before, a very great attempt was taken to identify the most appropriate performance measures and indicators suited for the NIQ construction companies. Furthermore, the effectiveness and importance of all these measures and indicators

‘that also have identified as drivers and results’ were demonstrated and proved through a very wide range survey among the NIQ construction companies and professionals.

As mentioned before, the framework is constructed grounded on two major approaches, the first is developing of BSC and EFQM techniques, and the second is the addition of some measures and indicators based on experience and recognizing the nature of construction industry in NIQ.

The major perspectives of the constructed framework were grouped in to “Drivers” and “Results” of performance and for each of these major perspectives some other sub-parameters were identified (as illustrated in the chapters before).

The Drivers are “Leadership”, “Strategic management and planning”, “Project management”, “Continuous learning”, “Innovation”, “External relations”, “Resources”, “Supplier and partnership”, and “Feedback”, and Results are “Project results”, “Company results”, “People and other stakeholders”, and “Project end users”. Figure 4.24 shows the constructed framework.

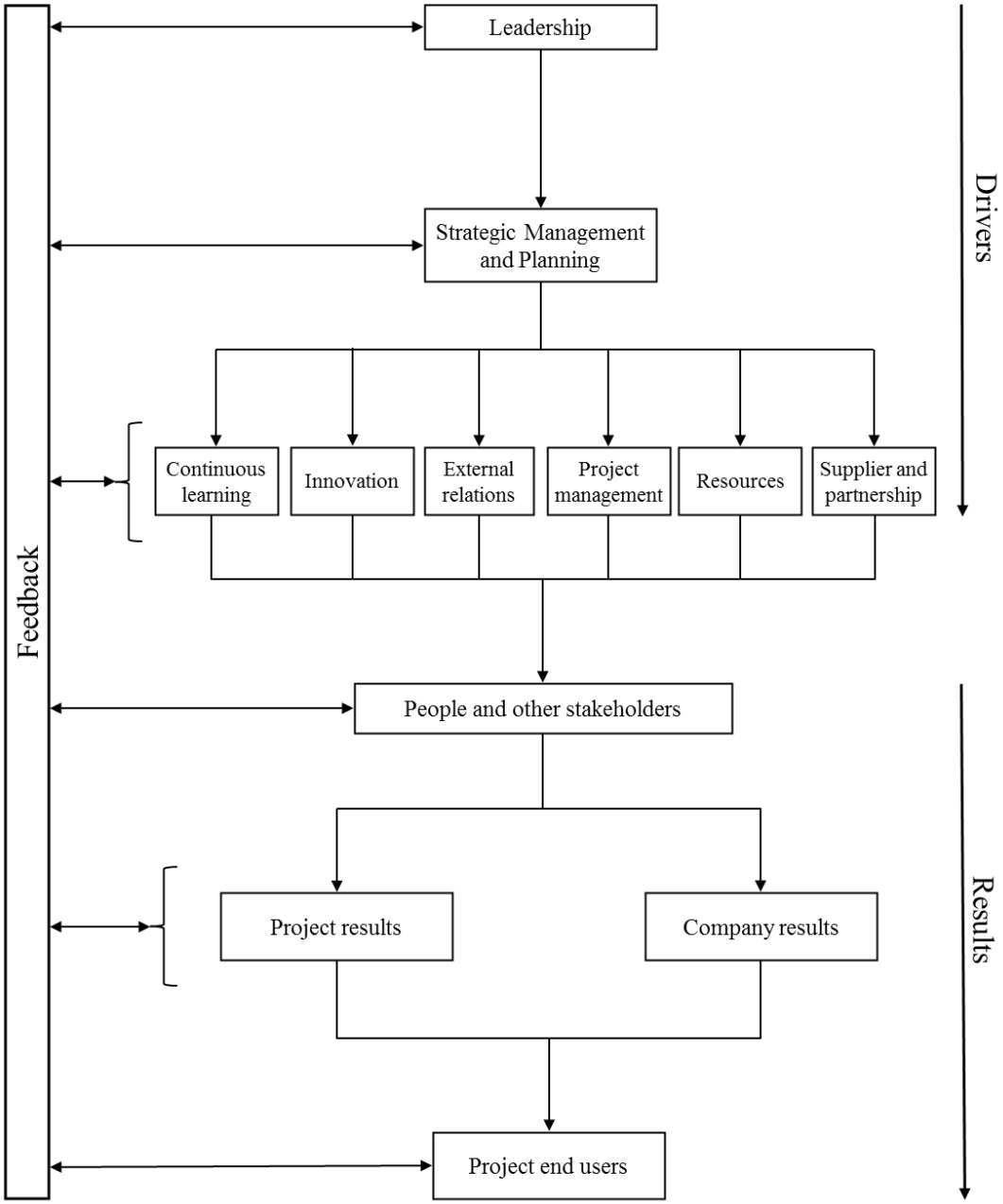

Figure 4.24: The Performance Management Framework which is suited for NIQ Construction Industry

Chapter 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

In this chapter a general assessment and conclusion of this study will be stated. After that, research limitations will be presented. Then the answer for the research question and recommendations for Future studies will be illustrated.

5.2 Conclusion

In this section reviewing the literature part may be a need for the purpose of indicating the bold lines and summarizing the findings. Although many techniques and models were identified in the literature to evaluate the performance of organizations, more attempts should be taken by researchers to introduce and develop new models that can go with the changes as globalization and developments of technology.

Construction business markets have become more competitive and demands on the quality and type of construction projects were increased in the last two decades. Therefore, PMM (that ensure construction companies with an improved performance and help them to make precise strategic decisions) were became the topic of many researchers in the field. The processes of PM aid construction companies to know their situation in the business environment.

5.2.1 Performance Management

Performance management can be defined as the broad system of planning and control that uses different measures and indicators for evaluating performance in both levels of projects, companies and stakeholders, paves the way for making more precise strategic decisions, and also performs feedback in various levels to provide enough information that can be used in analyzing and managing performance. PM is a very important technique that uses performance measurement as an information system to evaluate performance and help the companies to know that if they are doing the right thing in the right way.

5.2.2 Performance Measurement

Performance measurement can be defined as the heard of PMS and is a sub-system of it. Performance measurement can be more expressed as an information system than a management system which is in a critical importance for aiding management control in making strategic decisions. Although, in the literature there is a very little research can be found that clearly specify the differences between performance management and performance measurement, PM was stated as more extensive than performance measurement. For the purpose of managing performance different measurements should be considered in both financial and non-financial aspects. Therefore, a system of performance measurement should be included with both financial and non-financial measures. It was also found that performance measurement systems cannot ensure an improved performance if it is not supported with the PM processes; similarly, PM systems cannot manage performance if information is not provided from performance measurement processes.

5.2.3 NIQ Construction Industry Framework

In the last decade construction industry in NIQ has been significantly developed and due to the stability which exists in the region compared with the other parts of Iraq, more international construction companies came to the region. As a result, a competitive environment for international and local companies has been created. In this study a great attempt was taken to identify the most suitable measures to manage and evaluated performance of NIQ construction industry both in financial and non-financial terms. Therefore, on the base of the outcomes a PM framework was introduced. All parameters of the framework were identified through some other sub-parameters and introduced to the companies and professionals participated in the survey. In the light of obtained results, it was proved that non-financial measures are as important as financial measures in improving the performance of construction organizations.

The framework included with two groups of variable; the first group was titled as performance drivers and were “Leadership”, “Strategic management and planning”, “Project management”, “Continuous learning”, “Innovation”, “External relations”, “Resources”, “Supplier and partnership”, and “Feedback”, and the second group was titled as performance results and were “Project results”, “Company results”, “People and other stakeholders”, and “Project end users”. For each of these variables a number of sub-variables were identified. For the purpose of evaluating and knowing the level of importance of these variables and sub-variables, a questionnaire survey was performed among the construction companies and professionals in NIQ and 115 responses were collected. Despite of the general information about the respondents, the questions were designed in a manner to evaluate the importance of variables in five levels (strongly agree, agree, neutral, disagree, and strongly disagree). As

discussed in the previous chapter in detail, all these variables were found to have a high importance level in affecting and evaluating performance of NIQ construction organizations.

5.3 Research Limitations

In this research the limitations were mostly related to the process of data collection. The survey questions were distributed among construction companies and professionals working in the NIQ. However, some of the companies are working internationally and some of them are involved in the companies that worked in other parts of Iraq, the evaluations and measurements of performance were investigated in accordance to the NIQ construction industry. Since, the evaluations and measurements of performance may change when the environment and the location of the construction projects were changed.

5.4 Answer for the Research Question

The main and most important question in this research was:

What is the framework of performance management that construction organizations in NIQ can adopt?

Throughout all the chapters a great attempt was taken to identify the most appropriate parameters to develop a framework that suited for NIQ construction companies. Despite of adding some measures regarding to the experience and the nature of works in NIQ, two different frameworks were used in structuring the framework that were “BSC and EFQM”. For this purpose a very wide range survey was performed to know the validity and the rate of importance of these parameters. The framework that showed in chapter four (Figure 4.24) is the most appropriate one that have developed.

5.5 Recommendations for Future Studies

In this section some recommendations will be suggested to researchers for the future studies that shown in the following:

i. While the developed framework was constructed to manage performance for the current situation of NIQ construction companies and competition between the construction companies will be increased very fast by passing time, in the future more investigation can be performed by researchers that can included with the updated measures suited to the time of the research.

ii. While the survey was performed in the NIQ, this research developed a framework to manage and measure performance of NIQ construction industry. Therefore, researchers in different countries can use the measurements and the framework of this research by doing a survey in their countries to manage and measure the performance of construction industry within their countries.

iii. This study has proposed a new framework for evaluating and managing performance in industry level for construction (projects, companies and stakeholders). It can be recommended for other researchers to propose and develop new frameworks in project, company or stakeholders level separately.

REFERENCES

Aguinis, H., Joo, H., & Gottfredson, R. K. (2011). Why we hate performance management - and why we should love it. *Human performance, Kelley School of Business, Indiana University*.

Ahmed, S. M., & Kangari, R. (1995). Analysis of client-satisfaction factors in construction industry. *Journal of Management and Engineering*, 11(2), pp. 36-44.

Alarcon, L. F., & Ashley, D. B. (1996). Modeling project performance for decision making. *Journal of Construction Engineering and Management*, 122(3), 265-273.

Amaratunga, D., & Baldry, D. (2000). Performance measurement in facilities management organizations: transition from measurement to management. *Research Centre for the Built and Human Environment, School of Construction and Property Management, University of Salford, UK*.

Anderson, E. W., Fornell, C., & Lehmann, D. R. (1994). Customer satisfaction, market share and profitability: Findings from Sweden. *Journal of Marketing*, 58(3), pp. 53-66.

Anderson, J. C., Thomson, J. B. L., & Wynstra, F. (2000). Combining value and price to make purchase decisions in business markets. *International Journal of Research in Marketing*, 17(2000), 307-329.

André, A., & Coevert, W. V. (2007). The effect of performance management on the organizational results of a bank. *International Journal of Productivity and Performance Management*, Vol. 56, Iss. 5/6, pp. 397-416.

Atkinson, M. (2012). Developing and using a performance management framework: a case study. *Measuring Business Excellence*, Vol. 16, Iss. 3, pp. 47-56.

Barlev, B. (1995). Determining the stage at which it is appropriate to recognize profit under long-term contracts. *Journal of Business Finance & Accounting*, 22(5), pp. 713-732.

Bassioni, H. A., Price A. D. F., & Hassan, T. M. (2004). Performance measurement in construction. *Journal of Management in Engineering, ASCE*, 20(2), 42-50.

Bassioni, H. A., Price, A. D. F., & Hassan, T. M. (2005). Building a conceptual framework for measuring business performance in construction: an empirical evaluation. *Construction Management and Economics*, 23(5), 495-507.

Bekr, G. A. (2015). Causes of delay in public construction projects in Iraq. *Jordan Journal of Civil Engineering*, Vol. 9, No. 2.

Biddle, G. C., Bowen, R. M., & Wallace, J. S. (1997). Does EVA beat earnings? evidence on associations with stock returns and firm values. *Journal of Accounting and Economics*, 24(1997), 301-336.

Bititci, U. S., Carrie, A. S., & McDevitt, L. (1997). Integrated performance measurement systems: a development guide. *International Journal of Operations & Production Management*, Vol. 17, No. 5, pp. 522-534.

Bititci, U. S., Turner, T., & Begemann, C. (2000). Dynamics of performance measurement systems. *International Journal of Operations & Production Management*, Vol. 20, Iss. 6, pp. 692-704.

Bourne, M., Franco, M., & Wilkes, J. (2003). Corporate performance management. *Measuring Business Excellence*, Vol. 7, Iss. 3, pp. 15-21.

Bourne, M., Kennerley, M., & Franco-Santos, M. (2005). Managing through measures: a study of impact on performance. *Journal of Manufacturing Technology Management*, 16(4), pp. 373-395.

Braz, R. G. F., Scavarda, L. F., & Martins, R. A. (2011). Reviewing and improving performance measurement systems. *International Journal Production Economics*, 133(2011), 751-760.

Chen, H. L. (2015). Performance measurement and the prediction of capital project failure. *International Journal of Project Management*, 33(2015), 1393-1404.

Chenhall, R. H., & Langfield-Smith, K. (2007). Multiple perspectives of performance measures. *European Management Journal*, Vol. 25, No. 4, pp. 266-282.

Chiesa, V., & Frattini, F. (2007). Exploring the differences in performance measurement between research and development: evidence from a multiple case study. *R&D Management*, 37(4), pp. 283-301.

Chinowsky, P. S., & Meredith, J. E. (2000). Strategic management in construction. *Journal of Construction Engineering and Management*, 126(1), 1-9.

Colin, J., & Vanhoucke, M. (2015). Developing a framework for statistical process control approaches in project management. *International Journal of Project Management*, 33(2015), 1289-1300.

Cormican, K., & O'Sullivan, D. (2004). Auditing best practice for effective product innovation management. *Technovation*, 24(2004), 819-829.

Cox, R. F., Issa, R. R. A., & Ahrens, D. (2003). Management's perception of key performance indicators for construction. *Journal of Construction Engineering and Management*, 129(2), 142-151.

Davis, S., & Albright, T. (2004). An investigation of the effect of balanced scorecard implementation on financial performance. *Management Accounting Research*, 15(2004), 135-153.

Deng, F., & Smyth, H. (2013). Nature of firm performance in construction. *Journal of Construction Engineering and Management, ASCE*, ISSN 0733-9364/04013040(14).

Edum-Fotwe, F. T., & McCaffer, R. (2000). Developing project management competency: perspectives from the construction industry. *International Journal of Project Management*, 18(2000), 111-124.

Egan, J. (1998). Rethinking construction: a report of the Construction Task Force on UK construction. *Department of Trade and Industry, London*, URN 03/951.

Egmond, E. L. C. V., Ligny, D. W. D., & Smook, R. A. F. (2001). The technology mapping methodology for benchmarking the construction performance. *CIB World Building Congress, Wellington, New Zealand*.

El-Mashaleh, M., O'Brien, W. J., & Minchin, J. R. E. (2006). Firm performance and information technology utilization in the construction industry. *Journal of Construction Engineering and Management*, 132(5), 499-507.

Elyamany, A., Basha, I., & Zayed, T. (2007). Performance evaluating model for construction companies: Egyptian case study. *Journal of Construction Engineering and Management*, 133(8), 574-581.

Evans, J. R. (2004). An exploratory study of performance measurement systems and relationships with performance results. *Journal of Operations Management*, 22(2004), 219-232.

Folan, P., & Browne, J. (2005). A review of performance measurement: towards performance management. *Computers in Industry*, 56(5), 663-680.

Gómez, J. G., Costa, M. M., & Lorente A. R. M. (2015). An in-depth review of the internal relationships of the EFQM model. *The TQM Journal*, Vol. 27, Iss. 5, pp. 486-502.

Gunter, M. M. (2011). Economic opportunities in Iraqi Kurdistan. *Middle East Policy*, Vol. XVIII, No. 2.

Google maps. (2015). Retrieved from https://www.google.com.tr/maps/@ 39. 0876 459,35.1777724,6z.

Gupta, P. P., Dirsmith, M. W., & Fogarty, T. J. (1994). Coordination and control in a government agency: contingency and institutional perspectives on GAO audits. *Administrative Science Quarterly*, 39(2), pp. 264-284.

Halachmi, A. (2005). Performance measurement is only one way of managing performance. *International Journal of Productivity and Performance Management*, 54(7), pp. 502-516.

Hendricks, K. B., & Singhal, V. R. (2003). The effect of supply chain glitches on shareholder wealth. *Journal of Operations Management*, 21(2003), 501-522.

Hume, C., & Wright, C. (2006). You don't make a pig fatter by weighing it - performance management: the experience of the youth justice board. *Public Money & Management*, 26(3), 189-192.

Ittner, C. D., Larcker, D. F., & Randall, T. (2003). Performance implications of strategic performance measurement in financial services firms. *Accounting, Organizations and Society*, 28(2003), 715-741.

Jin, Z., Deng, F., Li, H., & Skitmore, M. (2013). Practical framework for measuring performance of international construction firms. *Journal of Construction Engineering and Management, ASCE*, Vol. 139, No. 9, ISSN 0733-9364/(14).

Kagioglou, M., Cooper, R., & Aouad, G. (2001). Performance management in construction: a conceptual framework. *Construction Management and Economics*, 19(1), 85-95.

Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard - measures that drive performance. *Harvard Business Review*, pp. 71-79.

Kaplan, R. S., & Norton, D. P. (1996). The balanced scorecard: translating strategy into action. *Harvard College, Boston, Massachusetts, USA.*

Kurdistan Regional Government. (2016). Kurdistan at a glance / geography, people and economic and business. Retrieved from http://cabinet.gov.krd/?l=12.

Lebas, M. J. (1995). Performance measurement and performance management. *International Journal of Production Economics*, 41(1995), 23-35.

Lee, S. M., Rho, B. H., & Lee, S. G. (2003). Impact of Malcolm Baldrige National Quality Award criteria on organizational quality performance. *International Journal of Production Research*, 41(9), 2003-2020.

Lohman, C., Fortuin, L., & Wouters, M. (2002). Designing a performance measurement system: a case study. *European Journal of Operational Research*, 156(2004), 267-286.

Love, P. E. D., & Holt, G. D. (2000). Construction business performance measurement: the SPM alternative. *Business Process Management Journal*, Vol. 6, No. 5, pp. 408-416.

Medori, D., & Steeple, D. (2000). A framework for auditing and enhancing performance measurement systems. *International Journal of Operations & Production Management*, Vol. 20, Iss. 5, pp. 520-533.

Melnyk, S. A., Calantone, R. J., Luft, J., Stewart, D. M., Zsidisin, G. A., Hanson, J., & Burns L. (2005). An empirical investigation of the metrics alignment process. *International Journal of Productivity and Performance Management*, Vol. 54, Iss. 5/6, pp. 312-324.

Montgomery, D. C. (2001). Design and analysis of experiments. Fifth edition, USA.

Munns, A. K., & Bjeirmi, B. F. (1996). The role of project management in achieving project success. *International Journal of Project Management*, Vol. 14, No. 2, pp. 81-87.

Neely, A. (1999). The performance measurement revolution: why now and what next? *International Journal of Operations & Production Management*, Vol. 19, Iss. 2, pp. 205-228.

Neely, A., Gregory, M., & Platts, K. (2005). Performance measurement system design: A literature review and research agenda. *International Journal of Operations & Production Management*, 25(12), pp. 1228-1263.

Nudurupati, S., Arshad, T., & Turner, T. (2007). Performance measurement in the construction industry: an action case investigating manufacturing methodologies. *Computers in Industry*, 58(2007), 667-676.

Olsen, E. O., Zhou, H., Lee, D. M. S., Chong, Y. N., Chewn, C., & Padunchwit, P. (2007). Performance measurement system and relationships with performance results: A case analysis of a continuous improvement approach to PMS design. *International Journal of Productivity and Performance Management*, Vol. 56, Iss. 7, pp. 559-582.

Otley D. (1999). Performance management: a framework for management control systems research. *Management Accounting Research*, 10, Article No. mare.1999.0115, pp.363-382.

Peng, X., & Prybutok, V. (2015). Relative effectiveness of the Malcolm Baldrige National Quality Award categories. *International Journal of Production Research*, 53(2), 629-647.

Perera, S., Harrison, G., & Poole, M. (1997). Customer-focused manufacturing strategy and the use of operations-based non-financial performance measures: a research note. *Accounting, Organizations and Society*, Vol. 22, No. 6, pp. 557-572.

Pertusa-Ortega, E. M., Molina-Azorı´n, J. F., & Claver-Corte´s, E. (2010). Competitive strategy, structure and firm performance: A comparison of the resource-based view and the contingency approach. *Management Decision*, Vol. 48, Iss. 8, pp. 1282-1303.

Pheng, L. S., & Hui, M. S. (2004). Implementing and applying six sigma in construction. *Journal of Construction Engineering and Management*, 130(4), 482-489.

Phua, F. T. T. (2006). Predicting construction firm performance: an empirical assessment of the differential impact between industry-and firm-specific factors. *Construction Management and Economics*, 24(3), 309-320.

Pun, K. F., & White, A. S. (2005). A performance measurement paradigm for integrating strategy formulation: a review of systems and frameworks. *International Journal of Management Reviews*, Vol. 7, Iss. 1, pp. 49-71.

Radnor, Z. J., & Barnes, D. (2007). Historical analysis of performance measurement and management in operations management. *International Journal of Productivity and Performance Management*, Vol. 56, No. 5/6, pp. 384-396.

Radnor, Z., & Lovell, B. (2003). Defining, justifying and implementing the balanced scorecard in the national health service. *International Journal of Medical Marketing*, 3(3), pp. 174-188.

Radnor, Z., & McGuire, M. (2004). Performance management in the public sector: fact or fiction? *International Journal of Productivity and Performance Management*, 53(3), pp. 245-260.

Ritter, T., & Gemunden, H. G. (2004). The impact of a company's business strategy on its technological competence, network competence and innovation success. *Journal of Business Research*, 57(2004), 548-556.

Robertson, H. W. (1997). A construction company's approach to business performance measurement. *Total Quality Management*, 8(2-3), 254-255.

Robson, I. (2005). Implementing a performance measurement system capable of creating a culture of high performance. *International Journal of Productivity and Performance Management*, Vol. 54, Iss. 2, pp.137-145.

RTI-International. (December 2008). Kurdistan region economic development assessment. *Produced for review by the United States Agency for International Development (USAID)*.

Sagar, N. Y. M. (2013). Performance measurement and management frameworks. *Business Process Management Journal*, Vol. 19, Iss. 6, pp. 947-971.

Schalkwyk, J. C. V. (1998). Total quality management and the performance measurement barrier. *The TQM Magazine*, Vol. 10, Iss. 2, pp. 124-131.

Simons, R. (1995). Control in the age of empowerment. *Harvard Business Review*, pp. 80-88.

Siska, L. (2015). The concept of management control system and its relation to performance measurement. *Procedia Economics and Finance*, 25(2015), 141-147.

Skevington, S. M. (1999). Measuring quality of life in britain: an introduction to the WHOQOL-100. *Journal of Psychosomatic Research*, 47(5), pp. 449-459.

Smallwood, J., & Venter, D. (2001). The performance of contractors: client's perceptions. *Performance in product and service, CIB World Building Congress, Wellington, New Zealand*.

Steyn, J., & Stoker, P. (2014). Does measurement theory impact project performance? *Procedia - Social and Behavioral Sciences*, 119(2014), 635-644.

Tang, Y. H., & Ogunlana, S. O. (2003). Modeling the dynamic performance of a construction organization. *Construction Management and Economics*, 21(2), 127-136.

Todorović, M. L., Petrović, D. Č., Mihić, M. M., Obradović, V. L., & Bushuyev, S. D. (2015). Project success analysis framework: a knowledge-based approach in project management. *International Journal of Project Management*, 33(2015), 772-783.

Tzokas, N., & Saren, M. (1999). Value transformation in relationship marketing. *Australasian Marketing Journal*, 7(1), pp. 52-62.

Vukomanovic, M., & Radujkovic, M. (2013). The balanced scorecard and EFQM working together in a performance management framework in construction industry. *Journal of Civil Engineering and Management*, 19(5), 683-695.

Yasamis, F., Arditi, D., & Mohammadi, J. (2002). Assessing contractor quality performance. *Construction Management and Economics*, 20(3), 211-223.

Yu, I., Kim, K., Jung, Y., & Chin, S. (2007). Comparable performance measurement system for construction companies. *Journal of Management in Engineering*, 23(3), 131-139.

Zairi, M., Letza, S. R., & Oakland, J. S. (1994). Does TQM impact on bottom-line results? *The TQM Magazine*, 6(1), 38-43.

APPENDICES

Appendix A: Sample of Questionnaire

Dear participant:

You have been asked to voluntarily participate in this research study, which is a part of an MA study being conducted under the supervision of Assoc. Prof. Dr. Ibrahim Yitmen in the department of civil engineering at Eastern Mediterranean University located in Northern Cyprus.

The study aims to develop a Performance Management System for construction companies in Kurdistan Region of Iraq.

Performance of any construction company, project and stakeholders can be evaluated through some measures and indicators. Performance management is a system which manages these measures and indicators, and provides appropriate improvement within the system by obtaining feedback from various levels.

If you agree to participate in this study, you will be asked to fill-in a questionnaire specially designed to collect data for this study. Your responses to the questionnaire will be kept confidential, and used for academic issues only.

In case of having any questions about the study prior, during or after your participation, you can contact me at (145292@students.emu.edu.tr) or on:

- (+905338529422 - KKTCELL), Northern Cyprus
- (+9647503898780 - KOREK), Kurdistan Region

Thank you very much for your participation.

Researcher: Bilal Mohammed Pirot

Part One: General Information

1. What is your gender? *

- ○ Male
- ○ Female

2. What is the type of organization/company do you work for? *

- ○ Client
- ○ Consultant
- ○ Contractor
- ○ Other :

3. What is the area of expertise of your organization/company? *
(You may have more than one choice)

- [ ] Buildings
- [ ] Transport
- [ ] Infrastructure
- [ ] Hydraulic structures
- [ ] Industrial buildings
- [ ] Other: _____

4. What is your responsibility/position within your organization/company? *

- ○ Designer
- ○ Project Manager
- ○ Site Engineer
- ○ Other : _____

5. How many years since you gained your academic qualification? *

- ○ Less than 1
- ○ 1-5
- ○ 5-10
- ○ 10-15
- ○ 15-20
- ○ More than 20

6. How many years do you have experience? *

- ○ Less than 1
- ○ 1-5
- ○ 5-10
- ○ 10-15
- ○ 15-20
- ○ More than 20
- ○ Do not have experience

7. What is your understanding level of performance management in construction? *

- ○ Understand very well
- ○ Understand well
- ○ Familiar with the concept
- ○ Unclearly understand the concept
- ○ Unfamiliar

8. Have you ever used any performance management systems in your organization/company? *

- ○ Yes
- ○ No

Part Two: Drivers of Performance

To what extend do you agree or disagree that the following factors have impact on the performance of companies and projects?

9. Leadership *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Leaders' role in developing clear objectives	○	○	○	○	○
Leaders' improvements within project processes	○	○	○	○	○
Communicating leaders directly with stakeholders and employees	○	○	○	○	○

10. Strategic Management and Planning *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Strategy of project selection	○	○	○	○	○
Strategy of partner selection	○	○	○	○	○
Strategy of market selection	○	○	○	○	○
Strategy of client selection	○	○	○	○	○
Organizational and project management strategies	○	○	○	○	○

11. Project Management *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Time management	○	○	○	○	○
Cost management	○	○	○	○	○
Quality management	○	○	○	○	○
Human resources management	○	○	○	○	○
Risk management	○	○	○	○	○
Project procurement management	○	○	○	○	○
Claims management	○	○	○	○	○
Knowledge management	○	○	○	○	○
Health and safety management	○	○	○	○	○
Supply chain management	○	○	○	○	○

12. Continuous Learning *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Employee training	○	○	○	○	○
Knowledge and information sharing	○	○	○	○	○
Reviewing past experience	○	○	○	○	○
Taking benefit from other projects' best practice	○	○	○	○	○

13. Innovation *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Efficiency of research and development (R&D)	○	○	○	○	○
Application of IT	○	○	○	○	○

14. External Relations *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Relations with client	○	○	○	○	○
Relations with government	○	○	○	○	○
Relations with labors union	○	○	○	○	○
Relations with other companies	○	○	○	○	○

15. Resources *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Financial resources	○	○	○	○	○
Technical capability	○	○	○	○	○
Material and equipment resources	○	○	○	○	○

16. Supplier and Partnership *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Partner satisfaction	○	○	○	○	○
Supplier satisfaction	○	○	○	○	○
Teamwork with partners and suppliers	○	○	○	○	○

17. Feedback *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Doing survey among the society and the end users	○	○	○	○	○
Collecting information among stakeholders and employees	○	○	○	○	○
Doing feedback at the beginning and at the end of any process	○	○	○	○	○

Part Three: Results of Performance

To what extend do you agree or disagree that the following factors can evaluate the performance of companies and projects?

18. Project Results *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Project profitability	○	○	○	○	○
Project health and safety	○	○	○	○	○
Quality of the constructed project	○	○	○	○	○
Client satisfaction	○	○	○	○	○
Project teamwork and harmony	○	○	○	○	○
Society satisfaction to the project	○	○	○	○	○

19. Company Results *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Financial perspectives	○	○	○	○	○
Company image	○	○	○	○	○
Flexibility of internal processes	○	○	○	○	○

20. People and other Stakeholders *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Identification of the stakeholder needs	○	○	○	○	○
Good communication between leaders and stakeholders	○	○	○	○	○

21. Project End Users *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Identification of the end user requirements	○	○	○	○	○
Translation of end user needs into actions within the project	○	○	○	○	○

Appendix B: Tables of Questionnaire Results

Leadership					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Leaders' role in developing clear objectives	60	38	13	3	1
Leaders' improvements within project processes	48	52	15	0	0
Communicating leaders directly with stakeholders and employees	43	53	14	4	1
Total for Leadership	**151**	**143**	**42**	7	**2**

Strategic management and planning					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Strategy of project selection	55	47	10	3	0
Strategy of partner selection	36	52	23	3	1
Strategy of market selection	30	53	29	3	0
Strategy of client selection	26	52	27	8	2
Organizational and project management strategies	50	45	16	4	0
Total for Strategic management and planning	**197**	**249**	**105**	**21**	**3**

Project management					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Time management	82	23	10	0	0
Cost management	76	27	12	0	0
Quality management	70	32	11	2	0
Human resources management	48	49	17	1	0
Risk management	50	41	21	3	0
Project procurement management	32	54	27	1	1
Claims management	28	48	33	6	0
Knowledge management	45	48	19	3	0
Health and safety management	63	28	18	4	2
Supply chain management	40	48	20	5	2
Total for Project management	**534**	**398**	**188**	**25**	**5**

Continuous learning					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Employee training	70	31	13	1	0
Taking benefit from other projects' best practice	54	46	13	2	0
Knowledge and information sharing	42	47	22	3	1
Reviewing past experience	63	34	11	7	0
Total for Continuous learning	**229**	**158**	**59**	**13**	**1**

Innovation					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Efficiency of research and development	42	43	27	2	1
Application of IT	41	49	20	4	1
Total for Innovation	**83**	**92**	**47**	**6**	**2**

External relations					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Relations with client	53	48	12	2	0
Relations with government	55	39	19	0	2
Relations with labors union	29	45	30	9	2
Relations with other companies	31	46	31	6	1
Total for External relations	**168**	**178**	**92**	**17**	**5**

Resources					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Financial resources	73	38	4	0	0
Technical capability	62	42	10	1	0
Material and equipment resources	62	41	11	1	0
Total for Resources	**197**	**121**	**25**	**2**	**0**

Supplier and partnership					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Partner satisfaction	40	52	22	1	0
Supplier satisfaction	38	48	26	3	0
Teamwork with partners and suppliers	46	45	21	3	0
Total for Supplier and partnership	**124**	**145**	**69**	**7**	**0**

Feedback					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Doing survey among the society and the end users	32	47	31	5	0
Collecting information among stakeholders and employees	34	51	24	4	2
Doing feedback at the beginning and at the end of any process	45	46	18	6	0
Total for Feedback	**111**	**144**	**73**	**15**	**2**

Project results					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Project profitability	69	42	4	0	0
Project health and safety	68	28	15	2	2
Quality of the constructed project	71	33	10	1	0
Client satisfaction	34	58	21	2	0
Project teamwork and harmony	40	53	22	0	0
Society satisfaction to the project	39	45	27	4	0
Total for Project results	**321**	**259**	**99**	**9**	**2**

Company results					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Financial perspectives	46	52	15	2	0
Company image	44	44	23	4	0
Flexibility of internal processes	30	49	28	6	2
Total for Company results	**120**	**145**	**66**	**12**	**2**

People and other stakeholders					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Identification of the stakeholder needs	38	52	21	4	0
Good communication between leaders and stakeholders	51	44	16	4	0
Total for People and other stakeholders	**89**	**96**	**37**	**8**	**0**

Project end users					
Sub-parameters	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
Identification of the end user requirements	41	60	13	1	0
Translation of end user needs into actions within the project	36	61	17	1	0
Total for Project end users	**77**	**121**	**30**	**2**	**0**