International Journal of Construction Engineering and Management 2020, 9(3): 81-91
DOI: 10.5923/j.ijcem.20200903.01

Factors Affecting the Application of Project Management Knowledge Guide (PMBOK® GUIDE) in Construction Projects in Yemen

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Abstract As the project management knowledge guide (PMBOK®) Guide can guide project team throughout the project management process and save it from critical failure. This study aims to evaluate the level of PMBOK® Guide application and also identified factors affecting the application of this guide in construction projects in Yemen. In order to achieve the objectives of the study, questionnaire was developed as a main instrument of the study to collect the primary data. The questionnaire consisted of three main parts: the first part relates to general information and the second part relates to the extent of Implementation of the PMBOK® Guide. This study targeted the engineers of the Social Fund for Development, and 76 questionnaires were distributed to the study sample, and were then subjected to statistical analysis using the statistical program (SPSS). The results of this study showed that the PMBOK® Guide in construction projects in Yemen applied partially and Closing Process Group and Project Quality Management; are ranked highest from Process Group and Knowledge Areas respectively. Qualification is found to be the most significant variable. The study recommended that, there is need for the constructions' management and projects managers in Yemen to be exposed to PMBOK® guide and how it could be applied in their construction projects.

Keywords Construction, Project Management, PMBOK®, Yemen

1. Introduction

Controlling project and its cost, in particular, is a very important matter especially in this era, where the earth suffers from resources depletion, and the world witnessing great financial crises that resulted in the abolition of many projects including the strategic projects in several countries. Additionally, many of these projects which were under construction were stopped because the costs exceeded their estimated budgets. The problem faced by the projects managers during following up of their projects was lacking proper tool which guarantees effective control of their projects by performing numeric, concrete, and specific measurements for them. However, even if such tools are available theoretically, it is so hard to be put into practice without using the techniques of the era (Shaban, 2012, 27).

Most of the projects in the construction sector encounter problems and obstacles causing them to deviate from their specific goals, in which cost, time, and quality are the main objectives of any engineering project, and achieving them is the key indicator in assessing performance and ensuring projects success (Bassam, 2001, pg 25). Yemen is one of the least developed countries (Alawi, et al, 2016 and Alawi, & Masood, 2018) having construction industry faces immeasurable challenges which result to its failure. Failure and deficiencies are common issues of construction industry all over the world. For example, Yemeni construction industry suffers frequently from the problem of delay in completing construction projects on time, there is a considerable delay in construction projects, where 80 projects achieved in the Ministry of Education from 2004 to 2008 were studied, and those randomly selected projects showed that 72.5% of projects were delayed. This represents a significant burden on the course of economic development, hampers the development plans of the country, and has a negative impact on the economy in general (Habtoor, 2001, 3).

There are many factors of failure in construction industry in Yemen have been examine by few studies. For example, (Gamil & Abdul Rahman, 2020; Alaghbari et al., 2018; Al-Sabahi et al., 2014) all found that poor construction management is the most causing factor failure in construction industry in Yemen. Project management concepts and methods will help in avoiding project failure (Angarita, & Gallardo, 2018) project management methods

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Received: June 28, 2020; Accepted: August 5, 2020; Published: August 15, 2020
Published online at http://journal.sapub.org/ijcem

provide tools and techniques benefit in all aspects of planning, scheduling and monitoring the time, cost and specifications of projects.

The great development of the business world has led to the innovation of several tools and methods which support the concepts of project management. Academic and business communities have started adopting related researches to improve their project management method, as well as to enhance their function effectively. As a result, many bodies of knowledge and frameworks (e.g., International Project Management Association [IPMA], 2006; Office of Government Commerce [OGC], 2007; Project Management Institute [PMI], 2017) support project management in practice. The most popular body of knowledge worldwide is that described in A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (Zwikael, 2009). Project Management Knowledge Guide PMBOK® is a highly standardized project management framework which slowly developed and grew over the last 30 years (Bolooki, & Bridge, 2007). The goal of this framework is to standardize the very abstract work of project managers so that project success can become more stable and reliable (Rosenberger, & Tick, 2018) and considered to be one of the main fundamental references of such an approach. This guide is adopted by the most internationally famous institute in the field of project management which is project management institute (PMI). PMI keeps updating the guide in a regularly continuous manner. The previous edition of this guide was in 1996, and it was accredited in 1983 by an academic report titled Ethics Standards, Accreditation Committee Final Report.

Afterward, the second edition of PMBOK® was released in 2000, and then the updates followed in succession until the last guide of PMBOK 6 was eventually published in 2017. According to this guide, a body of knowledge was identified and taken for granted as good practices in project management.

In this case, the meaning of "taken for granted as good practices "should be taken into consideration that this knowledge is applicable to the majority of projects, and there is a consensus on that among the experts in the field of project management (Al-Muhaimid, 2017,11). Recognizing the importance of PMBOK® guide as PMBOK® can guide project team throughout the project management process and save it from critical failure. However, there is no pervious study examine the application level of PMBOK® guide in construction projects in Yemen. This study aims at identifying the extent of the PMBOK® guide application, as well as identifying the factors affecting the application of PMBOK® guide in construction projects in Yemen. Hopefully, this study establishes a comprehensive concept of the importance of the application of PMBOK® guide in construction projects, which will benefit managers in particular. The application of the PMBOK® guide allows managers to balance needs that ensure delivering projects in a manner that meets the expectations of the parties concerned as PMBOK® Guide, will helps companies in the construction industry achieve the success they look for, since it satisfies the needs that were identified during its creation. It is also hoped that this study will contribute to the literature of PMBOK® by filling gap in the literature in respect of studies that examine PMBOK® application.

2. Literature Review

2.1. Project Management Knowledge Guide (PMBOK® GUIDE)

The great development of the business world has led to the innovation of several tools and methods which support the concepts of project management. Academic and business communities have started adopting related researches to improving their project management style, as well as to enhance their function effectively.

As a result, several methodologies came out, which have proved to be effective in achieving success in the projects of those communities. At the same time, those approaches can be circulated to other business communities, and one of the most notable methodologies is PMI in project management, which is a very prevalent approach in Asia, Africa, and the United States as the origin of such approach.

The sixth edition of Project management guide or PMBOK® is considered to be one of the main fundamental references of such an approach, and this guide is adopted by the most internationally famous institute in the field of project management which is PMI. PMI was founded in 1996, and it keeps updating the guide in a regularly continuous manner. The previous edition of this guide was in 1996, and it was accredited in 1983 by an academic report titled Ethics Standards, Accreditation Committee Final Report.

Afterward, the second edition of PMBOK® was released in 2000, and then the updates followed in succession until the last guide of PMBOK® 6 was eventually published in 2017. According to this guide, a body of knowledge was identified and taken for granted as good practices in project management. Here the meaning of (taken for granted as good practices) should be taken into consideration that such knowledge is applicable to the majority of projects, and there is a consensus on that among the experts in the field of project management (Al- Muhaimid, 2017,11).

According to the modern concept of project management as referred to earlier, it is defined as the process of applying technical skills, knowledge, tools, and methods to project activities to achieve effective management of project management. It consists of a series of processes in which tools, skills, and methods are used to accomplish project objectives.

According to this concept of global institutions, project management processes (PMBOK®) are applied widely across the globe. It is commonly agreed that good practice and application of such processes will improve the chances of success in a wide range of projects, but it does not actually mean that these processes should be applied consistently to

all projects.

For project manager along with collaborates with the project team, sponsor, organizational management, or some combination should cooperate to determine appropriate processes depending on the nature of the project (PMBOK®, 2017, P:28) and this is known as tailoring project management to the project.

A process is a set of procedures and activities related to each other which are performed to achieve construction projects, and each process includes the use of a variety of inputs, tools, and methods (PMBOK, 2017, P:554). These processes overlap with each other and can be repeated at each phase of the project. In this section, we will learn about the classification of these processes in PMBOK® which are divided into two main types: according to project management processes and according to project management knowledge areas.

1. According to Project Management Processes

Processes of project management can be classified into phases that are divided into five operational groups, and they can also be called "project management life cycle" (Mahmood, 2017, 89).

They are (PMBOK, 2017, P:554):

- Initiation Processes Group (Launching): such a process is done to determine a new project or phase in a certain project, reasons beyond establishing the project to be launched are studied and analyzed in this phase, in other words knowing the estimated cost and economic feasibility of the project.

That is documented in a record called "project charter", which is tantamount to actual consent to provide resources that may be needed for the project (Al-Saman, 2007), it may also be called terms of reference.

- Planning Processes Group: also called the project planning phase which includes defining project scope and time plan that should be followed to execute a project, and identifying all resources that may be needed for the plan, determining the estimated budget or material cost to be monitored, as well as the requirements of quality and specifications that should be met by the project.
- Execution Processes Group: it is also called the project execution phase, which is the process of achieving a project through the team, providing necessary resources and cooperation between parties according to a predetermined plan and quality required.
- Monitoring and Controlling Processes Group: it is also the process of following-up and monitoring, which include comparing the actual achievement and the project's progress with the plan, predicting deviations, analyzing their causes, and addressing them before occurrence.

The researcher considers that processes of execution, control, and monitoring are simultaneous phases since they are two sides of the same coin.

- Closing Processes Group: it is also called the project closing phase in which all activities and processes of the project are closed, the project is initially closed, and the guarantee's duration is closed, the project is finally closed and delivered to the owner, and it becomes under his responsibility, in addition to reviewing all that has been accomplished, recording all lessons learned from project implementation, and preserving project records in the archives.

2. According to Project Management Knowledge Areas

Processes of project management can be divided according to project management knowledge areas, which include the following: -

- Project Integration Management: "it can be defined as interrelated and integrated processes which begin with describing a project in the project charter and ends with closing it (Wysocki, 2014)." It can be further defined as the process of coordinating all aspects of project planning and consolidating and following-up processes in parallel to meet the expectations of clients and stakeholders (Heldman, 2018).

Also, project integration management includes activities and processes to be conducted in order to identify, designate, combine, consolidate and coordinate the processes and activities of project management in the project management processes.

Integration involves characteristics of detailed consolidation, integration, detailed connection, and important integrative procedures to accomplish a project, managing the expectations of stakeholders successfully, and meeting requirements.

For project integration management needs to make a selection regarding resource allocation as well as to make trade-offs between objectives and alternatives (PMBOK®, 2017).

While project integration management is defined by Richman as the process of managing all project activities, maintaining all activities to go collectively, and consolidating them as well as their integration (Richman, 2011).

Manawi has mentioned several activities of project integration management which include: developing project charter and plan, managing project execution, controlling project work, and closing project (Al-Manawi, 2014)". It can be stated that project integration management is the comprehensive management of all project activities in parallel to ensure project success and achieving quality in project outputs for an organization's objectives.

In other words, project integration management describes the necessary processes to ensure that project elements are directed properly, and its primary focus is to develop and execute a coherent, comprehensive, and well-designed plan as well as to control change which occurs during the project life cycle.

- Project Scope Management: refers to all works and

activities of project achievement and identifying which tasks are relevant to the project and which are not (Mousa, 2012)".

European Institute of Sectoral and Institutional Identification defines project scope management as "ascertaining that a project includes processes which help in its success and ensures its quality (Project Scope Management Manual)".

It is also defined as the processes required to define all works, processes, and needs of a project, and determining all irrelevant parts (Heldman, 2018).

Project scope management involves several activities such as defining the requirements and scope, creating a work breakdown structure, and validating and controlling the scope.

One of the causes of project failure is undefined processes, tasks, and needs which are required to achieve them. Therefore, to ensure project success, requirements should be defined in a greatly accurate manner through continuous communication with the stakeholders of the project (Wysocki, 2014)."

"Project scope management includes function delegation and development of scope data to define boundaries and divide work into small, manageable components, and verify that the planned work has been accomplished (Heagney, 2012).

- Project schedule Management: "it is defined as the process through which a project action plan is converted into an operating schedule to ensure accomplishing the project within specific time (Dowdeen, 2012)."

Richman defines it as "using time in an effective and efficient manner to achieve project activities, and ensure that project delivery is not delayed (Richman, 2011).

Project schedule management is also defined as "the future schedule that is used as a guide for executing project activities onsite (Azeez, Al-Thanoon, & Mohammed, 2012)".

Furthermore, Alali has defined project schedule management as "making better use of time in such an effective manner to accomplish the stated objective of the project (Al-Ali, 2011)".

While Al-Manawi has defined it as "those efforts related to planning schedule management, identifying activities and their sequence, estimating their resources and duration, and scheduling control (Al-Manawi, 2014).

Alali has mentioned several methods of project scheduling including critical path and Program Evaluation and Review Technique (PERT). To say project schedule management is concerned with estimating the duration of project activities, developing a schedule for them and monitoring any changes in such schedule, that is to say, it is concerned with accomplishing the project within a specific time (Al-Ali, 2011).

- Project Cost Management: it begins with cost planning with the proposed study for establishing a project which is called an initial study in the project's feasibility study, and the project management team estimates the full costs of the project which might be fully detailed ones beginning with the initial works of the project (Al-Ali, 2011).

Project cost management: "it is defined as a set of processes required to plan and estimate costs, budgeting, project funding, financial resourcing, and manage and control the project costs to ensure completing the project as planned (Al-Manawi, 2014)."

Thus, the knowledge area of project cost management "includes project cost and budget, costing of the costs, as well as funding sources, are determined to ensure project accomplishment and flow of funds according to the approved budget (Heldman, 2009).

- Project Quality Management: "it is the process in which quality is assured and controlled in all activities and inputs of project, using quality assurance and quality control techniques, where project quality is assessed and reviewed in a continuous and regular manner (Westland, 2007)".

Project quality management is also defined by Project Management Institute (PMI) as "the process of applying quality management systems through policies and procedures with continuous improvement activities carried out throughout the project life cycle to ensure high-quality outputs that satisfy all stakeholders (PMBOK®, 2017)."

Therefore, project quality management is the process in which quality is assured and monitored using quality assurance and quality control techniques, and project quality is assessed and reviewed in a consistent and regular manner (Westland, 2007)".

- Project Resources Management: "it refers to a process through which on-site processes are provided and supported with resources needed to deliver works at the right time, as well as to reach a realistic cost within the estimated budget.

In addition, it is the responsibility of a project manager to select highly competent persons to ensure implementing project activities quite competently, and obtain results as planned (Wysocki, 2014)."

Resource management requires the project manager to define resource requirements, which includes identifying the types of resources, time that should be available, in the quantity needed, and making the necessary arrangements to ensure timely arrival of resources with following-up on the implementation of such arrangements.

In the event of a shortage or struggling with resources, proper procedures should be taken to overcome such point, therefore, resource management requires labor, equipment, and resource management (Al-Dairi, 2011)".

"Thus, this area involves processes and activities required to manage and organize project team including perfectly planning of resources and project team management (PMBOK, 2017)."

- Project Communication Management can be defined as "a process of planning, collecting, distributing, managing, and controlling project information to ensure delivering them to stakeholders at right time (Al-Manawi, 2014)".

It can also be defined as "a process which strikes to ascertain that all necessary information is delivered to decision-makers at the proper time to avoid any risks to project, as well as to store data and information of project in the archive for use (Heldman, 2018)."

"Project communication Management includes planning communications, distributing and delivering information, managing relationships with stakeholders, and performance reporting (PMBOK®, 2017)."

In other words, such an area involves processes and activities necessary to ensure that information is perfectly transferred at the right time, in addition to communication planning, information distributing, performance reporting, and stakeholders managing (Nassar, 2005)."

- Project Risk Management: it is an integrated administrative function of project management that includes processes dealing with the diagnosis, analysis and response to risks, as well as monitor, develop, and improve such response continuously (Al-Miqdhad, 2011).

"Project risk management is defined as "the process which deals with developing plans and scenarios to confront the uncertainty of the changing environment that

we live in to ensure that project activity carried out within the expected time and cost (Meredith, 2011)."

"Projects can face risks in administrative, external, technical, and organizational aspects, and therefore they need quantitative and qualitative assessment to ensure understanding and dealing with them properly (Al-Ameri, 2007)."

Olian has "cited several strategies to control risks during project execution which embodied in proactive risk, prevention, mitigation and transformation strategy (Olayan, 2005)."

"Therefore, risk management is a systematic practice to identify and reduce threats in the project and its environment. Risk planning begins during the work development phase, and it continues during definition and planning (Verzuh, 2015)."

- Project Procurement Management: it is defined by Project Management Body of Knowledge as the process of obtaining supplies of goods and services in order to accomplish a project within proper time and quality (PMBOK, 2017)."

"Project procurement management involves implementing a series of subprocesses associated with project procurement planning, procedures, control, and closure (Al-Manawi, 2014)."

Furthermore, the procurement process includes selecting procurement sources, contacting suppliers, conducting procurement procedures, and auditing purchase orders.

"Procurement management's success requires accomplishing a variety of factors, prominent among which are good relations with suppliers, capability to purchase in large quantities confront emergencies that may occur, multiple sources of supply, availability of negotiating team capable of obtaining the best purchase conditions, capability to meet project needs at the minimum level of materials (Abdul Aziz, 2008)."

"Therefore, project procurement management describes the process and methods required to bring and manage goods and resources, and procurement management includes elements such as purchase planning, contracts, and selection of resources according to the required specifications (Brewer, & Dittman, 2018).

- Project Stakeholder Management: involves processes required to identify people, groups, or organizations that affect or be affected by the project, to analyze stakeholders' expectations and their impact on a project, and to develop proper management strategies to get stakeholders engaged effectively in the decisions and implementation of the project.

Moreover, project stakeholder management focuses on constant communication with stakeholders to understand their needs, expectations, addressing issues as they arise, management of conflicting interests, and promoting appropriate participation of stakeholders in project activities and decisions (Bhuiyan, 2015).

2.2. Previous Studies

The study relied on a collection of previous studies relevant to the subject of study or to one of its variables, which were found in the literature review. However, there is a few of studies focused on PMBOK® guide application in particular. (Azozama, 2016) examined the extent of PMBOK® guide application by construction project managers in South Africa's built environment. He found that some construction project managers apply the PMBOK® partially, but generally, they do not apply it structurally. Furthermore, the findings indicate that this structurally limited application of the PMBOK® is one of the main causes of the prevalence of delays and cost overrun within the built environment in South Africa. However, (Bhuiyan, 2015) examined the implication of PMBOK® in the construction industry in Bangladesh, using questionnaires distributed to 20 contractors, 14 of them are local, six are international, four from China, and two from India working in Bangladesh, some of them were certified ISO. He found that projects were not managed according to POMBOK guidelines, while some of the donor-funded projects were managed in accordance with the guidelines of PMBOK. Additionally, the results showed that a lot of them were not familiar with some processes of project management in 47 processes. (Zwikael, 2009) explore the importance of the PMBOK® guide's nine knowledge area during project planning. This study aims at showing the impact of the nine knowledge

areas presented by PMP of project management on the project success. One of the most important results of such a study was that the most influential knowledge areas on the project success are schedule, risk, scope, resources, and integration management respectively. While the results showed that both cost and procurement management have contributed less to project success, and both quality and communication management have contributed moderately to the project success. Chauhan and Srovastava, (2014) identified the project management knowledge areas such as communications, human resources management, risk management, and clarifying the roles of those standards in the success of the pharmaceutical industry projects. The study concluded that 70% of the pharmaceutical industry companies apply PMBOK® guide, and 88% of the pharmaceuticals stated that the application of the proper project management methods leads to project success, while 12% of them stated that the application of knowledge areas has a marginal and moderate impact on the project success. Chou, & Yang, (2012) investigated the effect of project management knowledge areas on the success of engineering and infrastructure construction projects. Data was collected through a questionnaire and distributed to a sample of 127 of construction engineers, team members, and stakeholders. The study has shown that there is a moderate correlation between the management of (procurement, cost, communication, human resources, risk, quality, schedule, and scope) and project success. It has also shown that only procurement and communication management have a statistically significant effect on project success by 0.405 and 0.223 respectively. Therefore, this study will contribute to PMBOK® implication, by examining the effects of certain factors on PMBOK® implication but unlike the previous papers.

On the other hand, other studies have attempted to examine the application project management methodology in general. Musa Mohammed, (2014) aims at identifying the impact of project management methodology on the effectiveness of construction projects in Sudan, the study has used interviews with project management experts. The result showed that the use of project tools, methods and management have an impact on the effectiveness of the project and might be crucial such as ethical practice, administrative and environmental factors. Moreover, Al-Zwainy et al., (2016) investigate the impact of applying project management methodology in the Iraqi construction sector. They found that the main reason behind the absence of a project management methodology in the company is that the senior management has no conviction and interest in the project management methodology. Al-Samadoni, et al., (2016) examine the impact of applying project management to the pre-construction processes of real estate projects in Saudi Arabia. The study concludes that the application of project management to real estate projects to manage the pre-construction suffers from some shortcomings, and therefore it needs a formulation and new procedures to ensure a high level of application to keep pace up with its counterparts in the developed countries.

Yimam, (2011) examined the awareness of project management in the construction industry of developing countries, where the researcher has identified two main gaps in the current awareness model, and he proposed the PM model to address the gaps and adapt them to the context of developing countries. By using such a model, the contractors' awareness was assessed in Ethiopia, and the results showed a low level of PM perception (informal practices of basic processes). Furthermore, the study found that awareness of contractors who are accredited to ISO about project management is higher than those who are not. Abbasi & Al-Mharmah (2000) examined the use of the project management tools and techniques by the Jordanian public sector using sample of 50 industrial public firms. They found that the low use of project management tools and techniques among the public sector companies, but when practiced efficiently would result in tangible benefit in all aspects of planning, scheduling and monitoring the time, cost and specifications of projects.

This study is also distinct from previous studies in its exploration of the factors and constraints affecting the PMBOK® application, in addition to knowing the extent to which such a knowledgeable guide is applied in construction projects. Also, this study dealt with the factors affecting the PMBOK® guide application in construction projects. Most of the studies were conducted in Arab and foreign countries, while this study was undertaken in the governorate of Aden, it examines the extent, factors, and constraints of the PMBOK® application, and that what lies in its distinction. This study also focused on a certain sample of engineers of the Social Fund in the governorate of Aden.

3. Methodology

3.1. Sample of Study

The population of the study included the engineers and contractors with governmental construction projects in Yemen while the target population was all 120 engineers, active registered with The Social Fund for Development (SFD) in the governorate of Aden, Yemen. SFD in the governorate of Aden provided a representative sample of the population. The SFD is a non-profit organization working in Yemen responsible in implementing governmental programmes and projects to combat national poverty and reinforce the limited existing social safety net (Al-Iryani, de Janvry, & Sadoulet, 2015). Due to the small number of the total population, the study targets the total population. However, only 76 respondents were satisfactorily completed the survey and used in this study, with response rate of 63%.

3.2. The Instrument of the Study

The study instrument is considered as one of the primary sources to collect data concerning the phenomenon, and in

the current study the researcher has depended on the instrument of a questionnaire for collecting data. The questionnaire is one of the study instruments widely used in data collection, it consists of a set of interrelated vocabularies to address a specific subject and obtain information concerning the subject of study. It focusses on polling views and attitudes through the questions it contains. It is recognized that the questionnaire is used extensively in prospective studies and surveys as an essential instrument to collect required information and data.

It needs accuracy to be prepared and designed to achieve the intended goal of its use in conformity with what the researcher intends to measure or address (Hafez, and Others,2009,159). Questionnaire was developed base on PMBOK® Guide 6th and divided into three parts, namely: the first part concerning the demographic characteristics of the sample, the second part relates to the extent of The PMBOK application. The contents of the questionnaire can be clarified as follows:

First Part: General Information of the study's sample (Primary Data). This section has included the primary data describing the demographic characteristics of the study sample, which are independent variables that may have an impact on the estimates of the study sample, in the event that there are variations, they can be attributed to these variables. Therefore, the first section of the questionnaire has involved the general information of the study sample.

Second Section: Application of the Project Management Body of Knowledge Guide. It used measure the level of the PMBOK® guide application and contain 49 items developed according to the five processes group of project management: (initiation, planning, execution, monitoring & control, and closure), and it included 49 items and also, according to the ten knowledge areas of project management: (integration, scope, schedule, cost, quality, resources, communication, risks, procurement, and stakeholder management), and it includes 49 items.

3.3. Data Analysis

Descriptive statistics are employed to determine the level of PMBOK® guide application. Descriptive statistics method had been widely used in the previous research (Abbasi & Al-Mharmah, 2000; Gamil, & Abdul Rahman, 2020). Also the study employed multiple regressions, in order to identified factors affecting the level of PMBOK® guide application.

4. Results

4.1. The Descriptive of the Respondents

This study targeted the employed and contractual engineers of Social Fund for Development of in their various jobs of construction projects in the governorate of Aden, and of all their age groups, qualifications, and experience years, since the descriptive analysis was conducted to distribute the sample by demographic characteristics.

Table 1. Descriptive Statistics of the of the Respondents

Variable	Category	Frequency	%
Gender:			
	Male	61	80.3
	Female	15	19.7
Age:			
	Less than 25	3	3.9
	25-35	41	53.9
	36-45	25	32.9
	45 years and above	7	9.2
Qualification:			
	Diploma	2	2.6
	Bachelor	62	81.6
	Postgraduate Studies	12	15.8
Job Title:			
	Project Manager	15	19.7
	Consulting Engineer	47	61.8
	Resident Technician	7	9.2
	Other	7	9.2
Years of Experience:			
	Less than 5 Years	31	40.8
	6-9	22	28.9
	10-14	16	21.1
	15 and above	7	9.2
Specialization:			
	Civil Engineering	31	40.8
	Project Management	22	28.9
	Architectural engineering	16	21.1
	Construction Project Management	7	9.2
Number of Projects:			
	Less than 5	50	65.8
	6-9	12	15.8
	10-14	4	5.3
	15 and above	10	13.2
Type of Funding:			
	local	18	23.7
	International	58	76.3

As can be seen from Table 1 above, majority 80.3% of the respondents are males. This this result is not surprising because construction career in conservative country like Yemen is not preferable by females. 53.9%. of the respondents were in the 25-35 age range and 32.9% in the 36-45 age range. In terms of qualification, the majority of respondents 81.6% had a university degree. The working experiences question showed that a majority of respondents were in the Less than 5 years range. Also in Table 1 above, shows that the vast majority of respondents were with civil engineering and project management specialization. Final

two questions were regarding the information about the projects that the respondent works with. majority 65.8% of the respondents worked with less than 5 projects and 76.3% of these projects were international funded projects.

4.2. Descriptive Analysis of the Application of Process Group

To obtain an insight into the extent of PMBOK® guide application in the governorate of Aden, a descriptive analysis was used through calculating frequencies, percentages, arithmetic averages, standard deviations, and ranks of the study individuals' responses to the statements of project management processes group according to PMBOK® guide division. Where this part of the questionnaire contained 49 items distributed to five groups, and the result was as follows.

Table 2. Descriptive Statistics of Process Group

Process Group	Rank	Mean	Std. D
Initiating Process Group	3	3.72	1.003
Planning Process Group	4	3.61	0.974
Executing Process Group	3	3.72	0.922
Monitoring and controlling Process Group	2	3.79	0.880
Closing Process Group	1	4.0	0.879

The results in Table 2 show overwhelmingly positive application towards the five process groups. The means of the respondents' assessment of process groups application provide a ranking of these five process groups. The highest means is calculated for Closing Process Group (4.0), followed by Monitoring and controlling Process Group (3.79) only ranked slightly higher than the Executing Process Group and Initiating Process Group (3.72) and lowest means is for Planning Process Group (3.61).

4.3. Descriptive Analysis of the Application of Knowledge Areas

Table 3. Descriptive Statistics of Knowledge Areas

Knowledge Areas	Rank	Mean	Std. D
Project Integration Management	3	3.84	0.897
Project Scope Management	5	3.72	0.895
Project Schedule Management	6	3.66	0.982
Project Cost Management	4	3.75	0.90
Project Quality Management	1	3.86	0.90
Project Resource Management	7	3.65	0.89
Project Communications Management	9	3.57	0.94
Project Risk Management	10	3.50	1.02
Project Procurement Management	2	3.85	0.97
Project Stakeholder Management	8	3.62	0.96

To obtain an insight into the level of applying PMBOK® guide according to the knowledge areas, descriptive analysis was adopted through calculating means, standard deviations, and ranks of the study individuals' responses to processes group statements according to the knowledge areas.

A 5 Likert Scale was used for PMBOK® guide application and evaluation level of the application divided into three levels, where cut degree was calculated by divided the difference between the higher value of scale (5) and the lowest value (1) into three levels, i.e. cut degree was (1-5 / 3 = 1.33).

It is obvious from the above table that the respondents apply the all knowledge areas processes in Yemen. The highest application was applied to Project quality Management followed by Project Procurement Management (3.86 and 3.85 respectively). On the other hand, the application of project risk management processes ranked last with mean score (3.50).

4.4. Regression Analysis

To identify the factors affecting PMBOK® application in construction projects in Aden governorate, multiple regression and variance analysis have been used to verify the impact of demographic data on the extent of PMBOK® guide application. The results were as follows:

Table 4. Result of OLS Regression Analysis

Variable	PMBOK guide application	
	β	Sig
Qualification	.5460	.000
Job Title	0.398	.574
Years of Experience	-0.063	.040
Specification	-0.251	.563
Number of Projects	0.063	.240
Type of Funding	0.139	.665
Statistical Values		
R	0.493	
R^2	.2430	
Adjusted R^2	.1770	
F -value	3.692 (sig=0.003)**	

The previous table clearly shows that the R^2 is (0.243), which indicates that the variables in this model can explain that (24.3%) of variation in the level of PMBOK® application. As for the remaining percentage of (75.7%) is related to other factors such as random error, which reflects that the proposed model has a linear relationship of the proposed model. This is similar to the findings of Zwikael (2009) who found PMBOK® level has influence on a project's success.

It is further shown in table (4) with following-up test values of (β) that the independent variables related to (educational qualification and years of experience) have an impact on the level of PMBOK® guide application to construction projects in Aden governorate, where the calculated value of (β) was (-0.063, 0.546), and such value is significant at a lower significance level (0.05). The results

indicated that the other demographic variables have on effect on PMBOK® guide application to construction projects in Aden governorate, where the calculated value of (β) was (0.139, 0.063, 0.251-, 0.398), and such value is non-significant at a lower significance level (0.05).

5. Conclusions

The main objective of this study is to examine the application of project management knowledge guide PMBOK® in Yemen and to identify possible factors that affect PMBOK® application in construction projects using regression. Such study was conducted in order to overcome the problem of a lack of grounded study in the application of project management knowledge guide PMBOK® in general and in identifying local context variables.

The findings of this study on PMBOK® guide application according to processes group indicate that within the group of processes in the PMBOK® guide, it was established in the study that from the five processes in it, the most critical ones according to the respondents working in construction projects of Social Fund for Development in the governorate of Aden is closing. This process serves an important purpose for the organization and helps it put the it from realizing the anticipated benefits from the deliverables of the project, result in significant losses to the organization, and undermine the project manager and project management team's credibility (Aziz, 2015).

Analysing the application of PMBOK® guide according to knowledge areas indicated that project quality management ranked first. This result may stem from idea that quality is very important and the importance of performing work to the expected quality level has been recognized since ancient times (Jha, & Iyer, 2006) and also this result in line with Al-Sabahi et al. (2014) study in Yemen, who found that quality is the most project success criteria in Yemen.

Ordinary least squares regression is used to examine the factors affecting the level of PMBOK® guide application. The result showed that the independent variables related to (educational qualification) had an effect on the level of PMBOK guide application to construction projects in Aden Governorate. These finding is expected as qualification provides a solid base for better utilization and application of PM tools and techniques (Olateju, et al., 2011) and also because higher qualification gives theoretical ability related to project implementation, and is able to apply the knowledge acquired in the real field (Huda, & Maliki, 2019). However, the results indicated that other demographic variables have no effect on the level of PMBOK® guide application.

The PMBOK® guide has become the parameters in enhancing the performance of project. It can be concluded that the projects' management can be effectively performing their jobs if they utilise and applied PMBOK® guide in a proper way when they are aware of the benefits as well as added value that PMBOK® guide.

Literature review shows that there is a lack of literature that PMBOK® guide application and the factors that effect this application in construction projects within the Yemeni context, and this study attempts to fill this gap. This study has implications to the current PMBOK® guide application literature. The result of the effect of qualification on PMBOK® guide application is similar to results of previous studies (Olateju, et al., 2011). This implies that PMBOK® guide application in least developed countries like Yemen is following the trend of international PMBOK® guide application.

5.1. Recommendations

Based on the above results, the key recommendations of the current study are as followed. Firstly, there is need for the construction projects' management and projects managers in Yemen to be exposed to PMBOK® guide and how it could be applied in their construction projects. It is also necessary for more efforts to be made by regulators to convince the constructions' managements in Yemen of the benefits of PMBOK® guide application and its impact on improving constructions' projects performance which in turn would lead to the eradication of projects critical failure; regulators also should conduct a workshops about the importance of PMBOK® guide for constructions projects to increase the level of PMBOK® guide application as it's only 75%. It also encourages regulators to act more responsibly by considering introducing PMBOK® guide as a mandatory component in construction management courses. Finally, Qualification of the projects managers need to be considered so as to enhance the PMBOK® guide application.

5.2. Limitations and Future Studies

This study has certain limitations. Firstly, the scope of the study was limited to The Social Fund for Development (SFD) in the governorate of Aden. Therefore, future researchers can expand the study by using a larger sample of constructions projects. In addition, the current study used only demographic factors; we feel that the results from the current study are very encouraging. If future studies one can get data on other factors it should be possible to look at numerous other factors, both from project and organizational. Finally, the current study examines the application of PMBOK® guide only. Therefore, it would be interesting to move beyond just the application of PMBOK® guide and examine the impact of the application of PMBOK® guide on the performance of construction projects.

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