The Impact of Project Management Methodologies on Project Success: A Case Study of the Oil and Gas Industry in the Kingdom of Bahrain[1]

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ABSTRACT

This study assessed the impact of Project Management Methodologies (PMMs) on project success in the oil and gas industry in the Kingdom of Bahrain. It also explored the different project methodologies used along with their strengths and weaknesses. Pragmatism paradigm, using mixed research methods, was adopted to achieve the objectives of this research. A total of 95 survey responses were received and 17 interviews were conducted.

This study revealed that comprehensive and applied PMMs have significant impact on project success whereas supplemented PMMs have insignificant relationship with project success. The analysis showed that one-unit change in the application of relevant PMM elements throughout the project life cycle has 32.3% impact on project success whereas one-unit change in the application of comprehensive PMM elements has 27% impact on project success.

Projects in the oil and gas industry are more about safety than speed and hence, the use of comprehensive methodologies and applying the relevant methodology elements are important for oil and gas projects. Furthermore, the companies in the oil and gas industry in Bahrain have to pay more attention to their project management methodologies and get it evolved and improved over time to achieve higher project success rates.

Keywords: Project success, Project management methodologies, oil and gas, Kingdom of Bahrain.

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1.0 Introduction

Organizations convert the arising business and technological opportunities into projects in order to grow and achieve their strategic goals. Project success is the ultimate objective of all organizations and stakeholders and hence, achieving project success is an obsession of every organization. Despite the research in this field and the increased knowledge associated with project success and failure, projects continue to fail in satisfying the needs of different stakeholders (Cooke-Davies, 2002; Joslin and Muller, 2015). The Standish Group (2010) conducted a study that revealed only 32% of the investigated projects were successful against 44% challenged and 24% failed.

PMI (2017) defines project management as "the applications of the relevant knowledge, tools, skills and techniques to project activities to meet the project objectives", and adhering to Project Management Methodologies (PMMs) reduces the risk, cuts the costs and improves the success rates (PMI, 2010). That's why different PMMs have been employed by different organizations in order to increase the efficiency and effectiveness of their projects. However, Wells (2012) conducted a study that revealed 47.9% of project managers do not get what they expect from applying project methodologies. On the contrary, Joslin and Muller (2015) showed that PMMs contribute 22.3% to project success which supports Berssaneti and Carvalho (2015) in that adopting well established methodologies improve project performance.

Furthermore, cost overruns and schedule delays are the common themes in the oil and gas projects which impact the project's efficiency (Halari, 2010). Since proper project management contributes to the success of projects, this study will explore the project management methodologies in the major oil and gas companies in Bahrain. The oil and gas industry in the Kingdom of Bahrain was selected for this study as it is the most vital sector in Bahrain. Currently, and as a result of the sharp drop in the oil and gas prices locally and internationally, there is a greater need to achieve project success by timely completion of activities, adhering to approved budgets, delivering the agreed specifications and satisfying the different stakeholders.

The aim of this cross-sectional study is to assess the impact of PMMs on project success in the oil and gas industry in Bahrain and to explore the different methodologies including their weaknesses and strength points. Consequently, the following research questions were developed:

1. What is the impact of PMMs on project success in the oil and gas industry in Bahrain?
2. What are the different PMMs used in the oil and gas industry in Bahrain?
3. What are the strengths and weaknesses of each methodology?

As there is a little literature about project success in the oil and gas industry, this study will contribute to the literature of project success and project management practices in the oil and gas industry in general and particularly in Bahrain. Furthermore, it will provide more insights to practitioners by exploring the PMMs that are used in the oil and gas industry in Bahrain. It will also improve the understanding of the impact of PMMs on project success. Additionally, it will provide insights to decision makers, project managers and other project stakeholders into which methodology is more effective for achieving project success.

This paper is organized in five sequential sections. It starts with literature review followed by methodology section. Then, it will touch on results analysis, discussion and conclusion.

2.0 Literature Review

The Literature review and the key concepts used in this research are discussed in this section. It discusses the project success factors followed by a discussion of project management methodologies (PMMs).

2.1 Project Success Factors

Project success has objective and subjective angles. The subjectivity depends on the perspective of the person who measures it and should address the diversity of stakeholders' interests (Rolstadas et al., 2014; Jha and Iyer, 2006; Melosovis and Panatakul, 2005). According to Menches et al. (2006), the concept of subjectivity depends mainly on how the different team members define and perceive success. Different stakeholders will have different needs and priorities and hence, the definition will vary according to the level of their satisfaction. Furthermore, no agreement exists between researchers regarding the success criteria. This confirms the findings of Toor and Ogunlana (2010) that the success criteria differ from a project to another. According to Cooke-Davies (2002), projects results continue to disappoint stakeholders although there is extensive research in project management, long-earned experience and growth in the number of memberships with professional bodies.

The iron triangle's vertices (cost, time and scope) are still considered central objective measures of project success although they are often criticized (Papke-Shields et al., 2010). However, Jugdev and Muller (2005) found that project success can't be limited to the iron triangle. The triangle accounts only for 60% of project success (Serrador and Turner, 2015). Project success is a multidimensional construct which includes short-term project management success (efficiency) as well as the long-term goals of the project (effectiveness). This is supported by Serrador and Turner (2015) where they defined project efficiency as meeting cost, time and scope goals whereas project effectiveness is meeting the corporate objectives defined by the stakeholders. Berssaneti and Carvalho (2015) divided the quality part of the iron triangle into two parts; meeting technical specifications and meeting customers' demand.

Milosevic and Patanakul (2005) defined critical success factors (CSFs) as variables that can have a significant impact on the project success when the project is well-managed. They also grouped the project success measures as internal and external measures. They consider the iron triangle vertices as the internal measures whereas external measures are organizational benefits, profitability index and customer satisfaction. An extensive literature review conducted by Fortune and White (2006) revealed 27 CSFs in which the most cited were the support of top management and a project manager dedicated to the project. However, a list of top management activities that could help the project to succeed is not provided in the literature (Berssaneti and Carvalho 2015).

Moreover, Cooke-Davies (2002) identified 12 critical success factors to project management success, individual project success and consistent project success. Delivering project success is

more difficult than delivering project management success. When projects succeed, this contributes to the corporate success.

The following table summarizes the 12 factors identified by Cooke-Davies (2002):

No.	Category	Critical success factors
1	Project management success	1. Education of risk management concepts 2. Proper assigning of risk ownership 3. Maintaining a risk register 4. Updated risk management plan 5. Documentation of responsibilities on projects 6. Shortening projects duration 7. Control on scope changes 8. Integrity of Performance measurement baseline
2	Individual project success	9. Effective benefit delivery to the organization
3	Consistent project success	10. Fulfilling the resources requirements for projects 11. Metrics that provide performance feedbacks 12. Lessons learned and post-project experience

Table 1: Summary of the 12 CSFs identified by Cooke-Davies (2002)

On the other hand, Khan et al. (2013) identified 32 project success criteria variables from reviewing the relevant literature of the past 40 years. Additional two factors were added after interviewing a group of project managers to arrive at a total of 34 variables used in his study. Afterwards, Khan et al. (2013) conducted factors analysis which revealed five project success criteria dimensions with 25 variables as shown in table 2:

No.	Success dimension	Items
1	Project efficiency	1. Finished on time 2. Finished within budget 3. Minimum number of scope changes 4. Activities carried out as scheduled 5. Met planned quality standards 6. Complied with environmental regulations 7. Met safety standards 8. Cost effectiveness of work
2	Organizational benefits	9. Learned from project

No.	Success dimension	Items
		10. Compliance with procedures 11. End product used as planned 12. Users' needs are satisfied 13. New understanding/knowledge gained
3	Project impact	14. Impacts on beneficiaries are visible 15. Purpose achived 16. End-user satisfaction 17. Project has good reputation
4	Future potential	18. Enabling of other project work in future 19. Motivated for future projects 20. Improvement in organizational capability 21. Resources used as planned
5	Stakeholder satisfaction	22. Sponsor satisfaction 23. Steering group satisfaction 24. Met client's requirement 25. Met organizational objectives

Table 2: The five-dimensional project success factors by Khan et al. (2013)

2.2 Project Management Methodologies (PMMs)

Josiln and Muller (2015) differentiated between a method and a methodology and stated that "a method is what is applied in a particular situation whereas methodology is the sum of all methods and the related understanding of them". Charvat (2003) defined PMMs as a set of procedural guidelines that can be tailored to a specific need and applied to accomplish an end and deliver a product, service or solution. PMMs were developed to assist project managers to accomplish project success by efficiently and effectively delivering the project. They are means for control and monitoring providing guidance and support for the project managers. PMMs vary from one organization to another in terms of completeness and appropriateness. The key determents of the type of PMM to be used in an organization are the project type, size, complexity, and duration (Wells, 2012; McHugh and Hogan, 2011).

Guangshe et al., (2008) mentioned that in order for the organizations to translate their strategies into workable components, standard tools for project management are required. On the contrary, Wells (2012) stated that effective implementation of PMMs does not guarantee positive project results, also, weak performance does not necessarily arise from weak PMMs implementation. Despite the popularity of some methodologies, limitations associated with them are reported. Well (2012) showed that 47.9% of the project petitioners in her study disagreed that PMMs fulfilled their expectations for effective project management. This is in agreement with Charvat (2003), in which many PMMs used today are either the wrong methodologies or not applied fully, although

the use of methodologies in a business strategy allows companies to maximize the project's value to the organization.

Furthermore, the literature is not clear whether customizing or standardizing the PMMs leads to a higher success rate (Joslin and Muller, 2015). Standardization is implementing project management processes uniformly and consistently (PMI, 2014). According to Milosevic and Panatakul (2005), organizations tend to standardize their project management processes to a certain level while maintaining a level of flexibility in order to minimize the variation in how projects are executed. This could lead to improving speed, quality and leading to a lower cost because of less rework.

Their study revealed three important factors that could influence project success, namely, standardized tools, standardized project leadership skills and standardized processes. This is consistent with PMI's 2014 Pules of the Profession Study which found that more projects are meeting their goals and business intent as a result of standardizing project management processes.

Furthermore, they suggested that it is the project manager's responsibility to veer off the standardized PMM in a given situation. However, if standardized PMM is not offered, new and less experienced project managers will not have the resources and expertise to promptly select a proper set of project management tools. In a study conducted by McHugh and Hogan (2011), one interviewee suggested that implementing and consistently using a standard PMM across the organization would save money in the long term by completing projects on budget and to the schedule. It is sometimes the customers' requirement to have a standardized PMM within the organizations that provide services to them.

On the other hand, customization is the appropriate tailoring of a methodology to fit a project context for successful delivery of the outcomes. However, some project managers tend to informally tailor the methodologies depending on their tacit knowledge and intuitions (Wells, 2012). In their study, Hong et al. (2010) found that 80% of the respondents were satisfied that customized methodologies are helpful for scheduling and quality and that customization uses resources more efficiently and enables on time delivery of the product.

On the other hand, McHugh and Hogan (2011) suggested that customizing a methodology requires additional time and money to allow staff to receive the appropriate training on that methodology which could lead to a longer implementation period. They found that project managers tend to scale down the organization's methodology in order to use it for smaller size projects.

In order to study the effects that PMMs have on project success, the building blocks (elements) of a methodology need to be defined. Joslin and Muller (2015) distinguished between methodology elements and success factors. For example, Work Breakdown Structure (WBS) is a methodology element whereas a comprehensive and detailed WBS is a success factor. The use of inappropriate elements will lead organizations to mismanage projects (Copper, 2006).

Joslin and Muller (2015) identified five elements for a methodology namely, processes, tools, techniques, capability profiles and knowledge areas. The definition of each element is shown in the table below:

No.	Element	Definition
1	Processes	A process is a systematic series of activities directed towards causing an end result such that one or more inputs will be acted upon to create one or more output. A process can utilize any number of tools and techniques.
2	Tools	A tool is tangible, such as templates or software programs, used in performing an activity to produce a product or result. Examples include: scheduling tools, project management information systems, surveys, project estimating tools, time reporting systems.
3	Techniques	A technique is applied to a particular endeavor and requires skill and experience so as to effect a desired result. Examples include: communication techniques, expert judgment, three-point estimates, conflict management and quantitative risk analysis.
4	Capability profiles	A capability profile is a description of attributes including personal, technical and business that are required to complete a set of tasks and/or to perform a project role.
5	Knowledge areas	A Knowledge area is an identified area of project management such as time management, cost management, procurement management, stakeholder management and others.

Table 3: Definitions of methodology elements by Joslin and Muller (2015)

The constructs of PMMs used in this study, which are adopted from the same source, have three dimensions. The first dimension, comprehensive set of methodology elements, represents a comprehensive PMM that can be applied to a project without the need of supplementation. The second dimension, supplemented methodology elements, refers to an organization's methodology that needs to be supplemented with the missing elements during the different phases of a project's life cycle. The third dimension, applied relevant methodology elements, determines whether the relevant PMM elements were used and applied to achieve project success irrespective of whether the elements were supplemented or not.

According to Joslin and Muller (2015), it is not clear in the literature whether comprehensive or supplemented PMMs lead to a greater project success. As there is a little research about project success in the oil and gas industry, the following hypotheses where adopted from Joslin and Muller (2015) to test it in the oil and gas industry in the Kingdom of Bahrain.

H1: There is a relationship between comprehensive set of PMM elements and project success.

H2: There is a relationship between supplementing missing PMM elements and project success.

H3: There is a relationship between applying relevant PMM elements and project success.

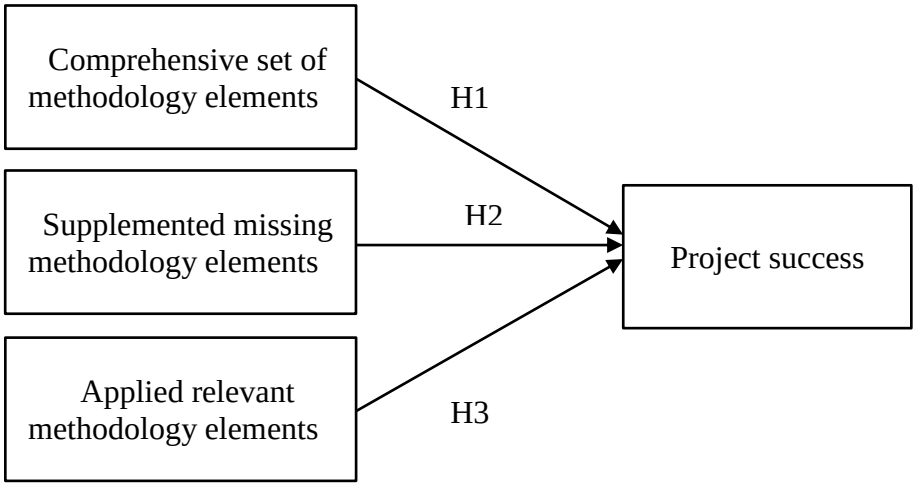

Figure 1: Research model (Adopted from: Joslin and Muller, 2015)

3.0 Research Methodology

The aim of this study is to assess the project management methodologies that are used in the oil and gas industry in the Kingdom of Bahrain including their weaknesses and strengths. Also, this study aims to assess the impact of PMMs on project success. To achieve these goals, pragmatism philosophical paradigm was adopted. Pragmatists use mixed research methods to achieve the research objectives (Saunders et al., 2012). The quantitative part of this study used a cross-sectional questionnaire whereas the qualitative part used semi-structured interviews to gain greater depth knowledge about PMMs and associated weaknesses and strengths.

3.1 Operationalizing of the independent and dependent variables

Operationalization is the process of measuring concepts and constructs by converting them into variables that can be tested and measured using scales (Zikmund et al., 2009; Coopers and Schindler, 2014).

The independent variable (IV) in this research is the project management methodologies (PMMs) whereas the dependent variable is the project success. The independent variable (PMMs) has three dimensions namely, comprehensive, supplemented and applied. Each dimension is measured on 5-point Likert scale by 5 questions related to processes, tools, techniques, capability profiles and knowledge areas. According to Joslin and Muller (2015), the term comprehensive set of methodology elements is used to indicate "PMMs appropriateness and completeness for an organizational environment". The term supplemented missing methodology elements is used to mean "the organization's PMM has been supplemented by the project manager because the PMM is incomplete or inadequate". The phrase applied relevant methodology elements indicates that "the project manager has applied the relevant PMM elements to achieve the expected outcomes irrespective of whether he has supplemented any missing PMM elements".

The dependent variable (DV) in this research is the project success. The project success questionnaire revolves around five dimensions. The dimensions are shown in table 4 below which summarizes the research variables and their dimensions:

No.	Variable	Type	Dimensions	Scale	Source
1	PMMs	Independent variable (IV)	1. Comprehensive 2. Supplemented 3. Applied	5-point Likert scale	Joslin and Muller (2015)
2	Project success	Dependent variable (DV)	1. project efficiency 2. organizational benefits 3. project impact 4. future potential 5. stakeholder satisfaction	5-point Likert scale	Khan et al. (2013)

Table 4: Dependent and independent variables

3.2 Instruments for data collection

To accomplish the objectives of this study two research instruments, adopted from the literature, were used. The first instrument was the questionnaire which is the most common quantitative data collection instrument in business research (Coopers and Schindler, 2014) and the second instrument was the semi-structured interviews for qualitative data collection. Figure 2 below shows the research instruments:

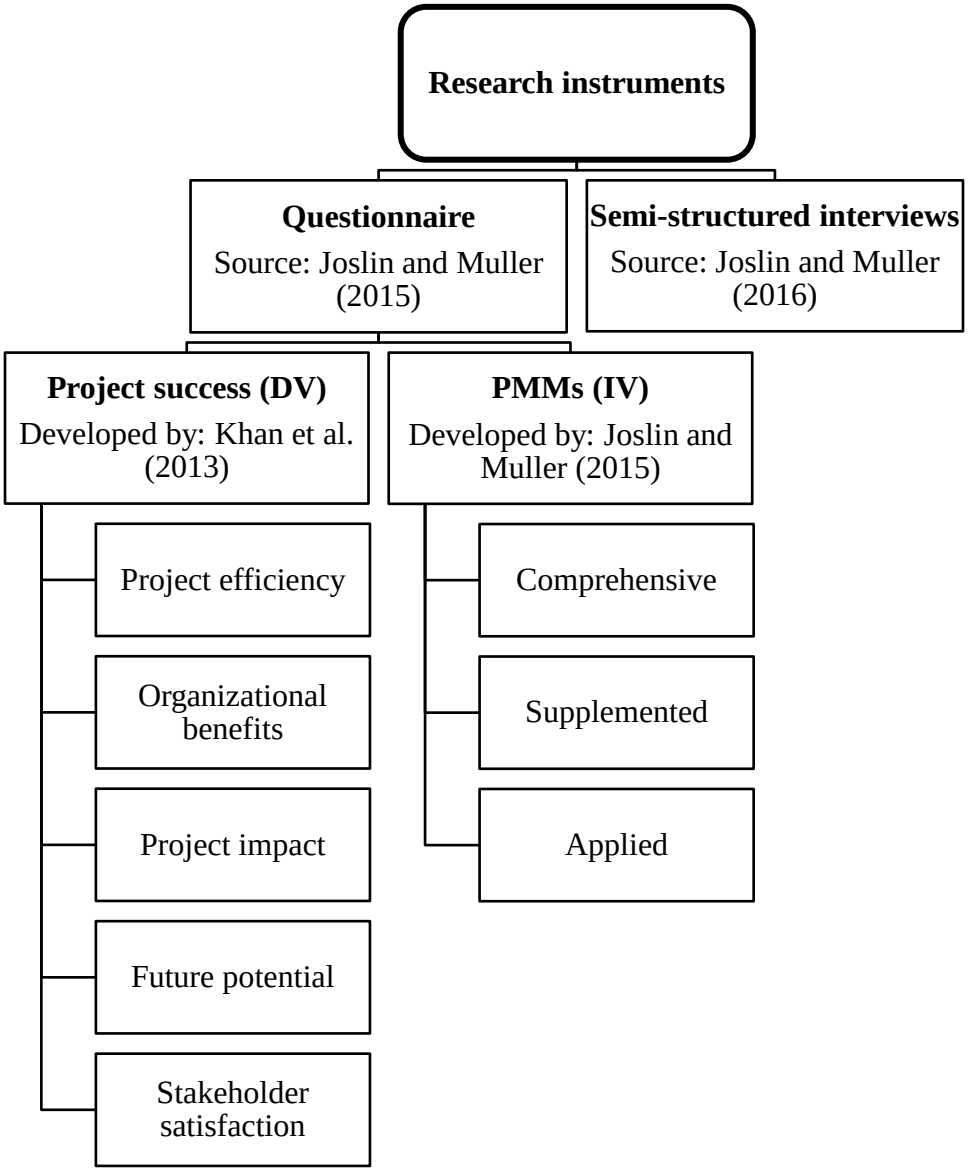

Figure 2: Research instruments

The primary source of data for this research was the information collected from project professionals by questionnaire and interviews, whereas the secondary source of data were the peer-reviewed journals, books and conference proceedings.

3.2.1 The quantitative approach

The quantitative approach represented in a questionnaire used to test the research hypotheses. The questionnaire, adopted from Joslin and Muller (2015), was used to examine the relationship between project management methodologies and project success in the oil and gas industry in

Bahrain. It has four sets of questions: demographics, project information, project success (DV) and project management methodologies (IV).

The questions of the dependent variable, project success, were developed by Khan et al. (2013) based on an extensive review of the latest literature from well-known researchers in the field of project success and have five dimensions as shown in figure 2.

The questions of the independent variables, PMMs, were developed by Joslin and Muller (2015) based on a prior qualitative research to gain in-depth knowledge about PMMs and have three dimensions: comprehensive, supplemented and applied.

The questionnaires were distributed by hand and through emails. Two weeks were allowed to obtain responses. The filled questionnaires were collected using the same methods.

3.2.2 The qualitative approach

In order to support the quantitative study and to obtain qualitative data from project professionals in the major oil and gas companies in Bahrain, semi-structured interviews were conducted. The questions were adopted from Joslin and Muller (2016) with four sets of questions. The first set was related to the nature of the organization and the types of projects. The second set was related to the organizational PMMs, its development, strengths and weaknesses. Then, the third set was about the definition of project success at the organizational and the individual project levels and finally about the impact of PMMs on project success.

The semi-structured interviews allow for more flexibility in modifying, rephrasing and changing the order of the questions in order to achieve the purpose of the interview. They were used to gain in-depth knowledge about the different PMMs, their strengths and weaknesses, how PMMs evolve and how they impact the project success. The interviews lasted between 20 and 30 minutes. In addition to the hand notes, the interviews were recorded.

3.3 Target population

The target population for this study was 172 professionals having roles as project managers, project engineers and project support engineers in the major oil and gas companies in Bahrain.

Coopers and Schindler (2014) defines nonprobability sampling as “a technique in which the sample is selected based on judgment or convenience”. Purposive sampling is a type of nonprobability sampling in which the researcher selects his sample based on certain characteristics or criteria such as experience, knowledge and professionalism (Saunders et al., 2012).

In order to achieve the objectives of this research and to have proper responses to the questionnaire, judgmental purposive sampling was used to select participants with the best knowledge in project management, and professionals who have the long-earned experience in handling engineering projects. Those are project managers, project engineers and project support engineers.

To find the sample size from the total population considered for this study, 95% confidence level and 5% confidence interval were used. Table 5 below shows the total number of project professionals and the corresponding number of samples from each company:

No.	Company	Target population	Sample size
1	Company A	84	59
2	Company B	16	11
3	Company C	55	39
4	Company D	17	12
Total		**172**	**121**

Table 5: Total population and the corresponding number of sample

The total population for this study was 172 leading to a sample size of 121 participants which equals to 70% of the total population.

As for the interviews, the numbers were 6, 3, 4 and 4 participants for companies A, B, C and D respectively. It is worth mentioning that the sample size of the qualitative study was dependent on the research time constraints as well as the accessibility to the targeted organizations.

3.4 Methods for data analysis

Quantitative data was coded and analyzed using IBM Statistical Package for Social Science (SPSS) version 23. Descriptive statistics in terms of summarizing and measuring the data was performed. Furthermore, liner regression analysis to test the research hypotheses was conducted.

Validity was ensured by using published scales. Scale from Joslin and Muller (2015) was adopted for the PMMs whereas the scale for the project success was used from Khan et al. (2013). Furthermore, Cronbach's Alpha test was used to check internal consistency. Cronbach's Alpha value has a range between 0 (no consistency) and 1 (complete consistency). A scale is said to have a very good reliability if Alpha is between 0.80 and 0.95, and a good reliability in the range of 0.7 and 0.8, and a fair reliability if Alpha is between 0.6 and 0.7. If Cronbach Alpha is below 0.6, the scale is said to have a poor reliability (Hair et al., 2010).

On the other hand, the qualitative data from the interviews was recorded and noted. Interviews were transcribed to gain in depth familiarization with the information provided by the interviewees.

4.0 Data Analysis

As described in section 3, quantitative approach with the support of interviews was used to achieve the objectives of this research. The quantitative data, collected through questionnaires, were analyzed using IBM SPSS version 23 whereas the qualitative data, collected through semi-structured interviews, were summarized and interpreted.

The samples size of the quantitative study was 121 participants; however, only 95 responses were obtained which equals to 78.5% response rate.

4.1 Descriptive statistics

Table 6 shows the demographics of the 95 respondents. Due to the large number of its project professionals, company A constituted the majority of the sample size with 62.1% against 20% for company C, 11.6% for B and 6.3% for D.

The majority of the respondents were project engineers (48.4%) and then project managers came in the second place with a percentage of 20%. The average work experience was 21 years and the average project-related work experience was 16 years.

On the other hand, table 7 shows the information of last project as provided by the respondents in which 90.5% of the projects were categorized as engineering/construction projects against 10% for the other types such as research and development, information technology and maintenance projects.

From the provided responses, it is clear that the projects in the oil and gas industry in Bahrain can be categorized to have medium to high levels of complexity, urgency and technology. More than 50% of the respondents mentioned that their projects had medium technology level, medium complexity and high level of urgency. On the contrary, only 4.2% of the projects had low urgency level, 10.5% were of low complexity and 11.6% were low technology projects.

Furthermore, 62.1% of the projects were above 1 million dollars and 65.3% were executed in functional organization against 11.6% in projectized organization.

Title	N	%	**Cont. education**	N	%
Project manager	19	20	Other education	2	2.1
Project engineer	46	48.4	Total	95	100
Department manager	2	2.1	Missing	0	0
Team member	9	9.5			
Technical stakeholder	0	0	**Nationality**		
Plant owner	0	0	Bahraini	39	41.1
Others	16	16.8	Indian	49	51.6
Total	92	96.8	Others	7	7.3
Missing	3	3.2	Total	95	100
			Missing	0	0
Gender					
Male	88	92.6	**Total work experience**		
Female	7	7.7	1 to 5 years	14	14.7
Total	95	100	6 to 10 years	4	4.2
Missing	0	0	11 to 15 years	12	12.6
			16 to 20 years	14	14.7
Participants' Company			Above 20 years	51	53.7
Company A	59	62.1	Total	95	100
Company B	11	11.6	Missing	0	0
Company C	19	20			
Company D	6	6.3	**Project work experience**		
Total	95	100	1 to 5 years	19	20
Missing	0	0	6 to 10 years	17	17.9
			11 to 15 years	15	15.8
Education			16 to 20 years	14	14.7
PhD / Doctorate	1	1.1	Above 20 years	27	28.4
Masters	22	23.2	Total	92	96.8
Bachelors	70	73.7	Missing	3	3.2

Table 6: Demographics of the participants

Field of last project	N	%	**Cont. technology level**	N	%
Research and development	1	1.1	Missing	0	0
Engineering / construction	86	90.5			
Information technology	1	1.1	**Project value**		
Maintenance	2	2.1	Under $ 100,000	6	6.3
Other	4	4.2	$100,000 to $999,999	30	31.6
Total	94	98.9	$1,000,000 to $9,999,999	36	37.9
Missing	1	1.1	$10,000,000 to $49,999,999	14	14.7
			Above $50,000,000	9	9.5
Complexity			Total	95	100
Low	10	10.5	Missing	0	0
Medium	57	60			
High	28	29.5	**Project Duration**		
Total	95	100	Under 6 months	11	11.6
Missing	0	0	6 months to less than 1 year	13	13.7
			1 to 2 years	44	46.3
Urgency			Above 2 years	26	27.4
Low	4	4.2	Total	94	98.9
Medium	40	42.1	Missing	1	1.1
High	51	53.7			
Total	95	100	**Project organization**		
Missing	0	0	Projectized	11	11.6
			Functional	62	65.3
Technology level			Matrix	17	17.9
Low tech	11	11.6	Others	1	1.1
Medium tech	57	60	Total	91	95.8
High tech	26	27.4	Missing	4	4.2
Others	1	1.1			
Total	95	100			

Table 7: Information of last project

4.2 Validity and normality

Valid published measurements were used for each of the dependent and independent variables. Also, the questionnaire was pilot tested with three project engineers; however, the results of the pilot testing were not included in the study. Furthermore, normality test was carried out to check the data for normal distribution within the range of [-2, 2] for Skewness score and [-3, 3] for Kurtosis score. Data was approximately normally distributed.

4.3 Reliability

Cronbach's Alpha for the dependent and independent variables was calculated. The levels of reliabilities were discussed in section 3.4. Cronbach's Alpha for the dependent variable, project success, was 0.905. As for the independent variables, it was 0.768, 0.914 and 0.865 for the

comprehensive, supplemented and applied PMMs respectively. All values confirm the reliability of the measures.

4.4 Regression analysis

Regression analysis is used to investigate the relationship between response (dependent) variable and explanatory (independent) variables (Moore et al., 2009). It tests the hypotheses of a research by examining how changes in one variable affect the other variable (Zikmund et al., 2009).

Table 8 shows the results of running the regression analysis in the SPSS:

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.095	0.393		5.335	0.000
Comprehensive PMM	0.222	0.083	0.270	2.680	0.009
Supplemented PMM	-0.006	0.043	-0.014	-0.147	0.884
Applied relevant PMM	0.281	0.090	0.323	3.116	0.002

Table 8: Results of the regression analysis

From the above table, the significance levels between project success from one side and comprehensive and applied PMMs are 0.009 and 0.002 indicating a significant relationship between the variables. On the contrary, the significance level is 0.884 for the supplemented PMMs which indicate that there is no relationship between them.

4.5 Analysis of the qualitative part

The qualitative approach was used to support the quantitative study and to gain in-depth knowledge about the project management practices in the major oil and gas companies in Bahrain and how they run their engineering projects from inception to completion. The interview questions fell under four categories. Firstly, questions related to nature of the organization and its projects. Secondly, the organizational project management methodology (PMM). The third category was related to the definition of project success. Finally, the fourth category was the impact of PMMs on project success. Table 9 shows the schedule of the interviews:

Organization	Interviewee title	Experience (years)	Length (min.)
Company A	Section superintendent	20	23
	Department manager	30	19
	Senior engineer	27	26
	Senior engineer	26	13
	Senior engineer	20	17
	Senior engineer	32	22
Company B	Senior engineer	30	25
	Senior engineer	17	22
	Projects engineer	15	42
Company C	Head of gas projects	33	26
	Head of site projects	25	24
	Engineering advisor	35	26
	Senior engineer	26	24
Company D	Senior engineer	26	35
	Senior engineer	38	27
	Head of constructions	48	21
	Department manager	38	36

Table 9: Schedule of the interviews

Furthermore, table 10 maps the four categories with the different companies to summarize the results of the qualitative interviews:

Category / Company	Nature of the company and its projects	Project Management Methodology (PMM)	Definition of Project Success	Impact of PMMs on project success
Company A	The company's core business is oil refining. It carries out improvement projects such as profitable, replacement, safety and environmental projects.	Adopted Chevron Project Development and Execution Process (CPDEP). This is a phase-gate methodology developed by Chevron Corporation. In this PMM, the project undergoes five sequential phases: identify and assess opportunities, generate and select alternatives, develop preferred alternative, execute and operate.	For the individual projects, success is defined by meeting scope, time, budget, safety aspects and customer satisfaction. At the organizational level, the project is successful when it is aligned with the company's strategic goals.	The PMM allows for clarity of scope, regular team & peer reviews, Front End Loading and Value Improving Practices which contributes to project success.
Company B	A petrochemical industry that carries out replacement, upgradation and CAPEX projects	In-house developed PMM that has a sequential manner starting from receiving a change request from plant's owners until successful commissioning.	For individual projects, success is defined by completing the project on time, on budget and meeting customer needs. At the organizational level, project success is defined by successful implementation of the projects and the accomplishment of the agreed number of requests for change every year.	The PMM allows for a clear workflow and a sequential pattern that leads to proper planning and clear definition of the project scope.
Company C	Oil and gas production to develop Bahrain field. The aim of the projects is to improve and increase the oil and gas production in the Kingdom of Bahrain.	In-house developed PMM thats not embarked on an international standard but it is more to the concept of the PMBOK. Based on the internal or external opportunities, a team is formed to handle the project in a sequential manner.	For the individual projects, the vertices of the iron triangle define success. Also, safety and customer satisfaction were mentioned. At the organizational level, meeting the government requirements and satisfaction of the team members.	Early engagement of different stakeholders, early identification of risks through the project development rating index and documenting lessons learned are all contributors to project success.

Company D	The company produces and transports gas to customers. Its projects involve building new infrastructure facilities, enhancement and modernization of existing units.	The PMM can be described as an ad-hoc system with a classical way in handling projects. There are no written guidelines for the methodology.	In addition to meeting the vertices of the iron triangle, success is defined by minimizing the variation orders. At the organizational level, success is defined by meeting the governmental requirements, generating profits and building extra capacity for future demand.	The methodology allows for direct communications with top management. It involves different departments in a collaborative manner. It also incorporates requirements for performance testing to ensure products' quality.

Table 10: Summary of the interviews

5.0 Discussion

This section discusses and summarizes the results of the research. The results of hypotheses testing and the similarities and differences of the qualitative study will be discussed and compared with other studies.

5.1 Hypotheses testing of the quantitative study

The three hypotheses of the quantitative study were tested through regression analysis using SPSS. Table 10 in the previous section showed the significance level (p-values) of each hypothesis. The p-value was 0.009 for comprehensive PMMs and 0.002 for applied PMMs. Both of them were less than p-value of 0.05 which indicates a significant relationship between project success on one side and comprehensive and applied PMMs on the other side.

This indicates that the companies in the oil and gas industry in Bahrain are more towards the use of comprehensive and applied PMMs. The correct choice of the project management methodology including its elements highly impacts the success of projects.

On the other hand, the p-value of the supplemented PMMs was as high as 0.884 which indicates insignificant relationship with project success. The project managers and project engineers rarely supplement their methodology with missing elements as they believe that their methodology includes the required tools and techniques to complete a project successfully.

Hence, the results of the hypotheses testing are:

H1: There is a significant relationship between comprehensive set of PMM elements and project success.

H2: There is no significant relationship between supplementing missing PMM elements and project success.

H3: There is a significant relationship between applying relevant PMM elements and project success.

The above results are in line with what Joslin and Muller (2015) found except for the supplemented PMMs in which this study found that there is no significant relationship with project success. Also, Joslin and Muller (2015) found that "22.3% of project success can be explained by applying the relevant PMM elements throughout the project life cycle" whereas this study, according to the regression analysis, revealed that 28.1% of project success can be explained by applying the relevant PMM elements. That is, one-unit change in applied relevant PMMs has 32.3% impact on project success. Also, the study showed that one-unit change in comprehensive PMMs has 27% impact on project success. Furthermore, the results support the findings of Wells (2012) in which the experience of the project professionals in selecting and applying the relevant PMMs contributes to the management of projects.

Projects are always risky and with PMMs, the companies try to minimize the gaps and increase the likelihood of being successful. PMMs are well accepted all over the industries, however, projects fail because of the wrong application of the methodology elements or because the elements are being applied out of the context. Furthermore, the use of partial or incomplete PMMs and also putting too much focus on the execution phase could lower the likelihood of success. It is crucial to put more emphasis on the early stages of the project to increase the success rate. This is supported by Flyvbjerg (2013) in that the front-end is very important stage in the project life cycle.

5.2 Similarities and differences in the qualitative study

All companies in this study are involved in the oil and gas sector and handle almost the same nature of projects ranging from replacements and modifications, production enhancement, environmental project to CAPEX projects. An obvious common factor between all methodologies is the sequence of activities. Despite the differences in the terminologies that describe the methodologies, the process was in line with PMI (2013) in which the project is initiated by stakeholders, planning takes place, the project is then executed, monitored and controlled and finally closed.

All methodologies integrate the "what to build" with the "how to build" something. The "what to build" is captured through a proper definition of the scope of work which sets the boundaries of the project and is properly framed in the project documentation. On the other hand, the "what to build" is detailed during the advanced engineering phases and documented in the project execution plans.

In addition, the methodologies evolve with time leading to improved versions that meet the organizational requirements. This supports the findings of Joslin and Muller (2016) in which all methodologies should evolve to ensure the fitness within the project environment. The evolvement in all methodologies took the form of incorporating new tools and techniques such as planning and scheduling software and risk management measures.

Moreover, it is clear that multidisciplinary teams are major building blocks of the project methodologies. Also, the companies put high emphasis in the application of best tools and practices and focus on key business drivers to achieve the projects' objectives. A key success factor is the proper communication channels with the top management to get issues resolves as soon as they arise. This is supported by the study conducted by Berssaneti and Carvalho (2015). On the other hand, the outcomes of this study revealed that all methodologies have some sort of bureaucracy and hence, they are cumbersome and time consuming. This result is consistent with the findings of Terlizzi et al. (2016) who showed that some methodologies are very bureaucratic with huge volume of documentations and steps that hinder the timely delivery of the project.

As for the project success definition, it can be said that the companies have an awareness of the efficiency and effectiveness parts of the concept of project success. A project is said to be efficient if it is completed to specifications, on time and within budget; and an effective project is the one that fits the purpose and meets the customer requirements. These concepts are in line with the definitions provided by Serrador and Turner (2015).

Coming to the differences, all companies used in-house developed methodologies except one which is using an adopted methodology. Company A has been using CPDEP because it is a proven methodology and drives successful results. It has been successful in the oil and gas industry over the years due to its systematic approach in managing complex projects. This fact is also supported by Dumrongthai and Puta (2015). Furthermore, McHugh and Hogan (2011) showed that the adaptation of an internationally recognized methodology assures that an organization is using what is considered to be a best practice which is inconsistent with the finding of this research.

6.0 Conclusion and Recommendations

6.1 Conclusion

A quantitative approach, through questionnaire, was used to assess the impact of project management methodologies (PMMs) on project success. Total of 95 responses were obtained for the quantitative study which were used for the analysis. The regression analysis revealed that the comprehensive and applied PMMs have significant relationships with project success. On the contrary, the relationship between supplemented PMMs and project success is insignificant.

The analysis showed that one-unit change in the application of relevant PMM elements throughout the project life cycle has 32.3% impact on project success whereas one-unit change in the application of comprehensive PMM elements has 27% impact on project success. The results showed that both applied PMM elements and comprehensive PMM elements are linked to project success, however, applying the relevant PMMs will lead to a higher success rate. When an

experienced project manager is capable of selecting the relevant elements among a pool of tools, techniques, processes, capability profiles and knowledge areas for a certain project, this would increase the chance of a higher success rate. Such well-established methodologies would lead to a systematic process that avoids rush and disturbance during the different stages of the project. The use of comprehensive methodologies and applying the relevant tools are important for the critical nature of the oil and gas projects as considerable attention must be paid for safety aspects.

In contrast, supplemented PMMs are not correlated to project success as project managers could supplement and use methodology elements that are not appropriate for the project activities at hand. Supplementing a methodology with missing elements is based on subjectivity and the judgment of the project manager which requires considerable professional experience to carry out such exercise.

With the support of qualitative interviews, an in-depth knowledge about the PMMs of each organization including their strengths and weaknesses was obtained. The study showed that all of the methodologies follow the same sequential process in handling the different projects in the oil and gas industry. Three of the investigated organizations use in-house developed methodologies which evolved over time. The project managers and other project stakeholders such as team members, support engineers and plants owners play a key role in evolving the organization's project methodology. The evolvement could be in the form of adding new processes, tools and techniques. Only one of the four organizations uses an adopted phase-gate methodology that has a well-established guideline and provides a clear and concise explanation of how various elements of the methodology work together and how they should be used by the project managers. It provides the project managers with the relevant processes, best practices, tools, procedures and templates. Overall, none of the investigated organizations use any of the popular well-known methodologies such as PRINCE2 or PMBOK guide.

Furthermore, the major strength point among the investigated methodologies was the establishment of an integrated and coordinated multidisciplinary team throughout the project life cycle. A well-aligned team with experienced discipline engineers working in an integrated manner would improve the project performance. The project managers are held responsible for this alignment and integration. Additionally, all methodologies showed the ability to clearly capture the project requirements and to properly frame the project scope of work. Clear and proper project definition will lead to a higher success rate.

On the other hand, the major weaknesses were the bureaucratic and lengthy procedures which make the methodologies time consuming and cumbersome. The nature of oil and gas projects is risky and also involves multiple tasks throughout the project life cycle. The multiple phases, meetings and processes consume a considerable amount of time that could lead to schedule delays if not managed properly.

6.2 Contribution of the study

The literature lacks the availability of project management researches that look at the oil and gas industries in general. This research focused on the oil and gas industry in the Kingdom of Bahrain in particular and explored the existing project management methodologies. Also, this research contributed to knowledge by showing that comprehensive and applied PMMs have greater impact

on project success. Due to the complex nature of the projects in the oil and gas industry, comprehensive methodologies should be applied during the project life cycle in order to achieve efficient and effective results.

As for practitioners, this research highlighted the strengths and weaknesses of each company's methodology which provides the opportunity for the concerned professionals to look again at their methodology for further improvements. It also guides the practitioners to select and apply the proper and relevant project methodology elements in order to achieve higher success rates.

6.3 Recommendations

Based on the findings of this research, a set of recommendations are provided. The bureaucracy of the methodologies could be reduced and the time could be optimized by combining different phases of a project as and when required. In this case, customization of methodologies could be considered. Furthermore, project managers are encouraged to possess professional project management certifications and to apply comprehensive set of project management methodology including its tools, techniques, capabilities, processes and knowledge areas for a greater project success. Moreover, the companies could establish a project management office (PMO) to standardize the project related processes and facilitate the sharing of resources and knowledge across the organization.

As for future studies, research could be extended to investigate the impact of PMMs on project success in the oil and gas industry of other countries. Also, it could be considered for industries other than oil and gas sector. Another suggestion for a future study is to explore the project success factors across the different phases of the project. Furthermore, a study to create an index to quantify the project success could be pursued.

Conflict of interest

There is no Conflict of interest.

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