



Measuring the Attitudes of Construction Companies towards Using Project Management Tools and Techniques

Mohamed Abbas Musa and Mawia Abdel Latif Mohammed

Sudan university of science and technology, college of business studies,
Dal Property Development, project management department.

المستخلص :

هدفت هذه الدراسة الي تسليط الضوء على مدى إستخدام أساليب وتقنيات إداره المشاريع وأثرها على فاعليه المشروع ، تكون مبحوثي الدراسة من مستوى مدراء المشاريع والإدارات التشغيليه بشركات الإنشاءات بالقطاع الخاص بولاية الخرطوم كعينه المجتمع. إستخدمت الدراسة العينه العشوائيه البسيطه ممثله 62 مبحوث بنسبه 20% من مجتمع الدراسة. وزعت الدراسة 70 إستبيان لجمع بيانات الدراسة وشكلت نسبه الإستجابه 88.6%. إعتمادا على البيانات المتحصل عليها قامت الدراسة بإتباع المنهج الوصفي والتحليلي وإستخدام معامل كرونباخ الفا وإختبار كا² وأختبار الإرتباط لإختبار فرضيات الدراسة. من تحليل البيانات التي تم جمعها وجد أن إستخدام أساليب وتقنيات إداره المشاريع يساهم بشكل واضح في فاعليه المشروع كرضا العميل وتطوير فاعليه أداء المشروع ، وعلى الرغم من وجود علاقه إيجابيه بين إستخدام أساليب وتقنيات إداره المشاريع ومقاييس فاعليه المشروع إلا ان الدراسة وجدت أن 54.8% من الشركات لا تستخدمها وليس لديهم وعى كافي بمناهج إداره المشاريع وتطبيقاتها. إضافة إلى ذلك ان مستخدمى أساليب وتقنيات إداره المشاريع لا يستخدمونها بطريقه صحيحه ، كما يستخدمونها بدون معرفة أثرها على فاعليه المشروع.

ABSTRACT:

The study aimed at highlighting the extent of using project management tools and techniques and their impact on project effectiveness. The study samples comprising of both project managers and operation management levels in Khartoum State private construction firms. The study used the simple random sample, which consisted of 62 respondents (20% of the study population). The study distributed 70 questionnaires to gather its data; whereas the response rate was 88.6%. Based on data gathered, the study adopted the descriptive and the analytical methods using Alpha Cronbach coefficient, Chi-square test, and correlation tests for testing the study hypotheses. From the analysis conducted on the gathered data, it was found that using project management tools and techniques significantly contributes to project effectiveness in terms of customer satisfaction and improving project performance effectiveness. Furthermore, although there is a positive relationship between using project management tools and techniques and project effectiveness, but the study found that 54.8% of organizations do not use them; besides lacking adequate awareness of the project management methodologies and its practices. Also, those organizations, which use them, either do not use them properly, or use them without knowing their impact on the effectiveness of their projects.

Keywords: Project management tools and techniques, Project management practice, Project effectiveness, Customer satisfaction, Project performance

Introduction

Project management has gained its reputation in recent years as a management practice that helps an organization to achieve its business results. It helps the organization reduce product development time to market, utilize limited resources, handle technological complexity, respond to stakeholder satisfaction and increase global market competition (Ghattas, and McKee, 2003, pp.4-5). To do so, project managers and project team members typically use several tools and techniques to help them execute activities along a project life cycle. They should determine which are the appropriate project tools and techniques should be used to lead their projects to better performance, and when they should use such tools and techniques. According to (Matheen, 2009, p.22) the project management tools may include cost benefit analysis, risk and sensitivity analysis, work breakdown structure, project execution plan, project responsibility matrix, bar charts, line of balance, network diagram, life cycle curves, progress management techniques, performance monitoring techniques, updating, reviewing and reporting techniques, value engineering, productivity budgeting techniques, cost work breakdown structure, control tools, and information system.

Objectives of the Study:

The main objectives of this study are to study the project management practice and investigate the impact of using project management tools and techniques on project effectiveness. Moreover, it quantifies the need for appropriate and correct project management tools, and techniques to achieve higher quality results in projects for Sudanese private construction companies.

The Importance of the Study:

The importance of this study can be related to the the use of project management tools and techniques that provides advantages, such as:

1. Increasing effectiveness.
2. Achieving customer satisfaction.
3. Better control of project financial, physical, and human resources.
4. Higher quality and increased reliability.
5. Improving stakeholders' relations.

Problem Statement:

Although the concept of project management has developed in the construction industry for many years, the maturity and attitude of construction industry in Sudan towards project management knowledge and practice is still of a concern. Also, many project delayed, completed over budget and with customer dissatisfaction. Based on all mentioned factors the study formed the following questions:

1. What is the maturity level of project management methodology in construction companies?
2. Do construction organizations use project management tools & techniques to manage their projects, and if they do so, do these practices affect the project effectiveness?
3. How can they improve their project outputs using project management tools and techniques?

Study Hypotheses

To solve the study problems, the study aimed to test the following hypotheses:

1. There is a relationship between using project management tools and techniques and achieving customer satisfaction.
2. There is a relationship between using project management tools and techniques and improving project performance effectiveness.

Review of Related Studies:

Using project management tools and techniques to manage the projects is not a stranger to the project management community. There are many authors investigated in the application of different project management tools and techniques and their impact on the firm's performance and the project's effectiveness in different industries. For example (Ayman Babiker khider, 2011) studied the implementation of project management techniques to Baleela new airport project. The study aimed to examine the level of implementation of management techniques in order to compare and confirm the outcomes. The results found that the levels of recent management and planning techniques application were poor to fair and sometime not satisfactory in surveyed companies, and some companies showed poor background of management concepts. Also, it showed lack of project planning which is considered as one of the main causes of delay in construction projects especially in small sized companies due to the weak knowledge of recent planning techniques like primavera and MS project. The results found that the most used project management tools and techniques were bar chart and critical path method. Other study by Brian Hobbs (2011, pp.3-16) studied the contribution of project management to organizational performance. The study aimed to study the contribution that the project management can make to organizational performance. In addition, it studied particularly the project management office role within the organization, and evaluated its contribution to organizational performance. The study found that while most project managers do recognize the important of the project management office's contribution in the human relations and rational goals criteria they do not recognize that the internal processes are as important. On other hand, human resource manager does not attribute that much importance to the project management offices contribution to human resource performance. Also, the study showed that the project management office could make a significant contribution to organizational performance regarding human resources. Study by Dragan Milosevic, Lane Inman and Ozay (2001, pp.16-33) explored the impact of project management standardization on Project effectiveness. The aim of the paper was to identify the overlap between the definition of the project and project management and discuss how the confusion between the two may affect their relationship. It identified different individuals involved on the project and project management, together with their objectives, expectations and influence. It demonstrated how a better application of the distinction between the two would bring a higher possibility of project success. It outlined the factors that affect project management and project success. The results of the study showed that organization with higher levels of certain types of project management standardization including project management culture, and structure gain higher project effectiveness. Patanakul (2010, pp.41-65) studied the impact of using project management tools and techniques across project life cycle on project success. The aim of the research was to investigate the use of project management tools and techniques across project life cycle and their using impact on project success. The findings indicated that there are statistically significant differences in the use of project management tools and techniques across project phases. In other word, a specific project management tools and techniques is used in specific phase. In addition, the findings showed that many project

management tools and techniques are significantly used in more than one phase but none of them are significantly used throughout all the four phases of the project life cycle. For the conceptual phase, ten frequently used project management tools and techniques were selected. For planning, execution, and termination phases twenty-three, twenty-three, and fourteen frequently used project management tools and techniques were selected respectively. The results also indicated that there are statistically significant correlations between the use of project management tools and techniques and different project success measures in different phases of the project life cycle. Other study by A.K. Munns and B.F. Bjeirmi (1996, pp.81-87) identified the overlap between definition of the project and project management. It demonstrated how a better application of project management would bring a higher possibility of project success. It outlined the factors that affect project management and project success. It found that for successful project and to enhance project success there must be improved application of the role of the project management within projects, client should be attributed actively in the planning and execution processes, using project management techniques, while some of the causes for project management failure factors were lack of using project management techniques, and management techniques misused.

The most project management tools and techniques were studied in previous studies were: Work Breakdown Structure, Earned Value Management, project selection methods, project charter, cost estimating techniques, benefit/cost analysis, flowcharting, cause-and-effect diagrams, cost of quality, Pareto diagrams, control charts, critical path method, Gantt charts, simulation, schedule crashing, milestone charts, SWOT analysis, stakeholder analysis, responsibility matrix, and contract type selection...etc.

This study fill the gap from the previous studies by studying the most frequently used project management tools and techniques in construction organization from the contractors conception. In addition, it focused on the impact of using project management tools and techniques on new measures of project effectiveness which were improving project performance effectiveness and customer satisfaction

Study Methodology

For the purpose of this study and to reach its findings the descriptive analytical approach has been adapted and quantitative method has been used through using Statistical Program of Social Science (SPSS) for data analysis. In addition, comparative analysis and quantitative methods such as graphs, tables, and correlation analysis were used in this analysis with utilizing the information gathered from previous related studies about using of project management tools and techniques that affect the effectiveness of construction project performance. The research was conducted using semi-structured interviews to have set questions, observations and survey research methods to test the study's hypothesis. In particular, a questionnaire was developed for data gathering and some statistical methods were used for data analysis. In addition, interviews with experts in project management were conducted to assist in questionnaire development and to validate the research results, and finally observations were used during construction projects executions to give more detail information about project management practices. Questionnaire consisted of descriptive information about participants and firm such as type of organization, and experiences. Then specific questions about the importance level of attributes and sub attributes of project management have been asked.

After collecting all data, they have been analyzed using quantitative approach to determine the relative importance of the variables listed and type of relationship between them. After establishing the relationship between different variables, the study discussed each relationship on

the knowledge gained from early part of literature review and answers received from respondents. Finally, a conclusion has been drawn to give an overall idea on using project management tools and techniques and their impact on project effectiveness and recommendations for future studies.

To measure the reliability of the questionnaire reliability test was done for independent variables calculating the coefficient of reliability that based on the average correlation of items within a scaled test.

Cronbach's alpha coefficient was used to test the reliability that varies from zero to one and the closer the coefficient is to one, the more reliable the scale.

Two criteria were included in the study measuring the effectiveness of the project as dependent variables. They were customer's satisfaction, and improvement of project performance. On the other side, the independent Variables were the most 24 project management tools and techniques used to manage the project as shown in Table (1).

Table (1): Project tools and techniques List

Project Charter	Critical path Methodology (CPM)	Conflict Resolving Techniques
Project Schedule	Quality Checklists	Risk Register
Work Breakdown Structure (WBS)	stakeholder register	Project Management Information System PMIS
Activity List	Project selection methods	Earned value Technique (EVT)
Project Statement of Work	Work Authorization System	Lessons Learned Records
Claim Administration	fast tracking techniques	Performance measurement baseline
Flowcharting	Change control System	Gantt chart
Proposal evaluation techniques	Responsibility Assignment Matrix (RAM)	SWOT Analysis

Two hypotheses have been proposed for this study to construct the theoretical framework. The framework that is clear in Figure (1) formed the relationship between dependent variables and independent variables.

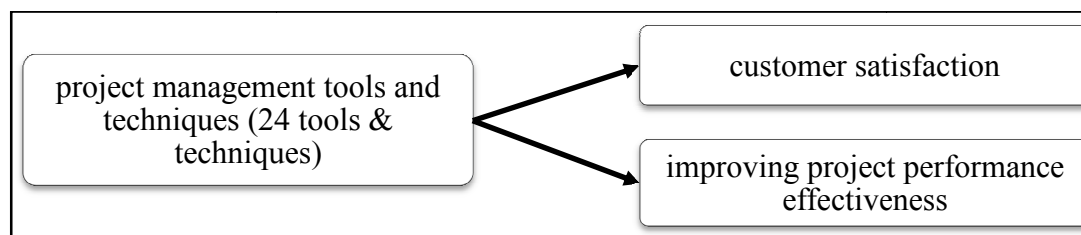


Figure 1: Study theoretical framework

Source: Researchers study 2014

Two statistical methods were used for hypothesis testing. First, Chi square test was used to test whether or not there are statistically significant differences in the use of project management tools and techniques. If it is found that the uses of project management tools and techniques are not significantly different, pursuing the hypothesis testing is irrelevant. Once it was found that

the uses of project management tools and techniques were significant different, Stepwise correlation analyses were performed to test the hypothesis.

In this study, Construction firms in Khartoum state were selected for investigation due to the state's position as the center of construction firms in Sudan. The sample was restricted to construction companies in Khartoum state. Based on approximately three hundred active construction companies registered in Sudanese Contractor Association directory one hundred construction companies were selected randomly. A total of seventy questionnaires were distributed personally and through emails after calling the participant about the study objectives. Sixty-two samples were returned and analyzed. The sampling was randomly selected to participate in this study.

Results and Discussion

Respondents' demographic profile:

From the total of 70 questionnaires distributed, 62 questionnaires were returned on time for analysis. This represents an average response rate of 89%. As shown in Table (2) the majority of the respondents were bachelor degree holders that represent 61.3%, followed by master degree holders with 37.1% and finally Ph D degree holders with 1.6%.

Table (2): Respondents' qualifications

Qualification	Frequency	Percent	Valid Percent	Cumulative Percent
Bachelor	38	61.3	61.3	61.3
Masters	23	37.1	37.1	98.4
Doctorate	1	1.6	1.6	100.0
Total	62	100.0	100.0	

Source: Researchers study 2014

Table (3) shows that the majority of the respondents joined their companies during the last five years that present 41.9%, followed by whom joined the company more than 10 years with 32.3% and finally whom joined the company between 5 to 10 years with 25.8%.

Table (3): Years of joining the company

Years of joining the company	Frequency	Percent	Valid Percent	Cumulative Percent
less than 5 years	26	41.9	41.9	41.9
5 – 10	16	25.8	25.8	67.7
10 – more	20	32.3	32.3	100.0
Total	62	100.0	100.0	

Source: Researchers study 2014

Table (4) shows the position held by respondents in their company classified into three main roles. These positions included project managers, engineers, and others. Most of the respondents are project managers 80.6%, followed by engineers with 14.5% and other with 4.8%.

Table (4): Respondents' current role in their organization

Current role	Frequency	Percent	Valid Percent	Cumulative Percent
Project Manger	50	80.6	80.6	80.6
Engineer	9	14.5	14.5	95.2
Other	3	4.8	4.8	100.0
Total	62	100.0	100.0	

Source: Researcher study 2014

Experience in construction field of respondents are shown in Table (5) it ranged from less than 5 to more than 10 years. The majority of the respondents have more than 10 years' experience in construction field with 50%, followed by 25.8% have experience less than 5 years, and 24.2% between 5 to 10 years.

Table (5): Respondents' experience years in construction field

Experience year in construction field	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 5	16	25.8	25.8	25.8
5 – 10	15	24.2	24.2	50.0
More than 10 years	31	50.0	50.0	100.0
Total	62	100.0	100.0	

Source: Researchers study 2014

Table (6) shows the experience in project management field of respondents that ranged from less than five to more than 10 years. Most of them have less than 5 years' experience in project management with 38.7%, 33.9% more than 10 years and 27.4% between 5 to 10 years.

Table (6): Respondents' experience years in project management field

Years of experience in project management	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 5	24	38.7	38.7	38.7
5 - 10	17	27.4	27.4	66.1
More than 10 years	21	33.9	33.9	100.0
Total	62	100.0	100.0	

source: Researchers study 2014

The majority of respondents did not take any training courses in project management during the past five years with scored ratio 51.6%. While only 48.4% of them did. This described in Table (7) below, and as indicated in and due to the high ratio of those have not been trained within the last five years in the table. That means the majority of respondents need more continuous training in project management knowledge.

Table (7): Respondent profile (Training course)

Receiving training courses within the last 5 years in project management	Frequency	Percent	Valid Percent	Cumulative Percent
No	32	51.6	51.6	51.6
Yes	30	48.4	48.4	100.0
Total	62	100.0	100.0	

Source: Researchers study 2014

40.3% of whom that took training courses in project management took it in PMP, 6.5% in FIDIC and 1.6% in risk management. These data are shown in Table (8). From the table it is clear that there are many courses available for whom interested in project management field that increases the awareness of project management applications in spite of decreasing of participant numbers in training courses.

Table (8): Training Course Name

Receiving course name	Frequency	Percent	Valid Percent	Cumulative Percent
PMP	25	40.3	83.3	83.3
Risk management	1	1.6	3.3	86.7
FIDIC	4	6.5	13.3	100.0
Total	30	48.4	100.0	
System	32	51.6		
Total	62	100.0		

Source: Researchers study 2014

Most of respondents did not have approved certificate in project management with scored ratio 71%. While only 29% of respondents have as shown in Table (9) .

Table (9): No. of respondents holding project management certificate

Respondents hold project management certificate	Frequency	Percent	Valid Percent	Cumulative Percent
No	44	71.0	71.0	71.0
Yes	18	29.0	29.0	100.0
Total	62	100.0	100.0	

Source: Researchers study 2014

The majority of whom hold project management certificate was in project management proficiently (PMP) with ratio 21% as shown in Table (10) .

Table (10): Type of project management certificate hold by respondents

Name of project management certificate	Frequency	Percent	Valid Percent	Cumulative Percent
(PMP) Project Management Proficianal	13	21.0	72.2	72.2
(CAPM) Certified Associate Project Management	1	1.6	5.6	77.8
(PRINCE2) Project in Control Environment	1	1.6	5.6	83.3
(CPM) Certified Project Manager	1	1.6	5.6	88.9
others	1	1.6	5.6	94.4
doctorate in PM	1	1.6	5.6	100.0
Total	18	29.0	100.0	
System	44	71.0		
Total	62	100.0		

Source: Researchers study 2014

Project management tools and techniques related factors:

To measure the level of project management maturity and at which level project management method is used in respondents' organization, participants have been asked if they use any of project management methods in their organizations such as project management institute (PMI) model, international project management association (IPMA) model or international standard organization (ISO) model and if they do which period of time they use with. In addition, they have been asked if project management tools and techniques have an impact on project effectiveness.

Table (11) below indicates to how many organizations are using project management model. They show that only 45.2% of respondents' organizations are using project management models while 54.8% are not. That means there is a lack of using project management models in construction companies in Sudan.

Table (11): Extent of using level of project management model

	Frequency	Percent	Valid Percent	Cumulative Percent
No	34	54.8	54.8	54.8
Yes	28	45.2	45.2	100.0
Total	62	100.0	100.0	

Source: Researchers study 2014

The majority of respondent use Project Management Institute models with ratio 60.7%, followed by International Standard Organization with 25.0% as shown in Table (12). That means the most project management models are used in construction company is Project Management Body of Knowledge.

Table (12): Type of project management model used in organization

	Frequency	Percent	Valid Percent	Cumulative Percent
Project Management Body of knowledge PMBOK	17	27.4	60.7	60.7
Project In Control Environment PRINCE2	2	3.2	7.1	67.9
International Standard Organization ISO 9000	7	11.3	25.0	92.9
Other	2	3.2	7.1	100.0
Total	28	45.2	100.0	
System	34	54.8		
Total	62	100.0		

Source: Researchers study 2014

It is clear from the Table (13) most of the study sample agreed that using project management tools and techniques often leads to achieve customer's satisfaction and improve project performance effectiveness with means 1.95 and 1.82 with standard deviation .845 and .866 respectively.

Table 13: relationship between using PMTT & study dependent variables

Sort. No.	Statement	N	Mean	Std. Deviation	Approval
1	Using project management tools and techniques leads to achieve customer's satisfaction	61	1.95	.845	Often
2	Using project management tools leads to improve project performance effectiveness	61	1.82	.866	Often

Source: Researchers study 2014

The respondents were asked to rate the extent of using project management tools and techniques on a scale of five, where five was never present and one was always present. After the factor analysis, the score of each of the phrase was computed by taking out the mean of the items falling under each factor. The mean, standard deviation and the extent of using level of each of the tools and techniques are shown in Tables 14, 15, and 16 respectively below.

Table (14): Mean, Std Deviation for Project Management Tools and Techniques

Project Management Tools & techniques Name	N	Mean	Std. Deviation	Approval
Project Charter	62	2.6	1.684	Often
Project Schedule	61	2.05	1.431	Often
Work Breakdown Structure (WBS)	62	2.42	1.574	Often
Activity List	62	2.44	1.616	Often

Source: Researchers study 2014

Table (15): Mean, Std Deviation for Project Management Tools and Techniques

Project Management Tools & techniques Name	N	Mean	Std. Deviation	
Project Statement of Work	62	2.9	1.647	Sometimes
Claim Administration	61	2.93	1.721	Sometimes
Flow charting	62	2.97	1.659	Sometimes
Proposal evaluation techniques	60	2.97	1.646	Sometimes
Critical path Methodology (CPM)	62	3.05	1.644	Sometimes
Quality Checklists	62	3.11	1.7	Sometimes
stakeholder register	62	3.24	1.586	Sometimes
Project selection methods	62	3.31	1.574	Sometimes
Work Authorization System	62	3.37	1.591	Sometimes

Source: Researchers study 2014

Table (16): Mean, Std Deviation for Project Management Tools and Techniques

Project Management Tools & techniques Name	N	Mean	Std. Deviation	
Fast tracking techniques	62	3.42	1.574	Rarely
Change control System	61	3.46	1.608	Rarely
Responsibility Assignment Matrix (RAM)	61	3.54	1.598	Rarely
Conflict Resolving Techniques	62	3.56	1.616	Rarely
Risk Register	61	3.56	1.511	Rarely
Project Management Information System PMIS	61	3.57	1.477	Rarely
Earned value Technique (EVT)	62	3.6	1.541	Rarely
Lessons Learned Records	61	3.62	1.474	Rarely
Performance measurement baseline	61	3.64	1.581	Rarely
Gantt chart	62	3.65	1.559	Rarely
SWOT Analysis	61	3.74	1.493	Rarely

Source: Researchers study 2014

Research hypotheses

H1: There is a relationship between using project management tools and techniques and achieving customer satisfaction.

Table (17) shows the impact of using project management tools and techniques on achieving customer's satisfaction. For example, it shows that 77.05% of the respondents agreed that using project schedule could lead to achieve customer's satisfaction that was the highest rate of agreement while 14.75% not agree and 8.2% do not have any idea about using the tool. That means the majority of respondents have a knowledge about the project schedule and its benefits to customer satisfaction.

Table (17): influence of using project management tools & techniques on achieving customer's satisfaction

PMTT Name		Can lead to achieve customer satisfaction			Total
		Yes	No	I have no idea	
Project Schedule	count	47	9	5	61
	%	77.05%	14.75%	8.2%	100.0%
Proposal Evaluation Techniques	count	42	9	9	60
	%	70.0%	15.0%	15.0%	100.00%
Quality Checklist	count	42	14	5	61
	%	68.9%	23.0%	8.2%	100.0%
Project Charter	count	42	16	4	62
	%	67.74%	25.81%	6.45%	100.0%
Conflict Resolving Technique	count	40	16	5	61
	%	65.6%	26.2%	8.2%	100.00%
Activity List	count	40	17	5	62
	%	64.52%	27.42%	8.06%	100.0%
Risk Register	count	39	15	7	61
	%	63.9%	24.6%	11.5%	100.00%
Project Management Information System	count	38	13	9	60
	%	63.3%	21.7%	15.0%	100.00%
Project Flowcharting	count	39	15	8	62
	%	62.9%	24.19%	12.9%	100.0%
Performance Measurement Baseline	count	37	13	10	60
	%	61.7%	21.7%	16.7%	100.00%
Work Breakdown Structure	count	38	19	5	62
	%	61.29%	30.65%	8.06%	100.0%
Critical Path Method	count	38	16	8	62
	%	61.29%	5.81%	12.9%	100.0%
Change Control System	count	37	15	9	61
	%	60.7%	24.6%	14.8%	100.00%
Earned Value Technique	count	37	13	12	62
	%	59.7%	21.0%	19.4%	100.00%
Claim Administration	count	36	18	7	61
	%	59.0%	29.5%	11.5%	100.00%
Project Selection Methods	count	35	23	4	62
	%	56.45%	37.1%	6.45%	100.0%
Project Statement of Work	count	35	23	4	62
	%	56.45%	37.1%	6.45%	100.0%
Responsibility Assignment matrix	count	32	21	7	60
	%	53.3%	35.0%	11.7%	100.00%
Work Authorization System	count	33	22	7	62
	%	53.22%	35.48%	11.29%	100.0%
Stakeholder Register	count	32	26	4	62
	%	51.61%	41.94%	6.45%	100.0%
Lessons Learned Records	count	30	24	6	60
	%	50.0%	40.0%	10.0%	100.00%
Gantt Chart	count	30	18	13	61
	%	49.18%	29.51%	21.31%	100.0%
SWOT Analysis	count	29	24	7	60
	%	48.3%	40.0%	11.7%	100.00%
Fast Tracking Technique	count	28	26	8	62
	%	45.16%	41.94%	12.9%	100.0%

Source: Researchers study 2014

According to Table (18) the value of P associated with statistically Spearman Correlation is less than 0.05 for all project management tools and techniques mentioned, therefore, the null hypothesis has been rejected and the alternative hypothesis has been accepted for the 5% level of significance that means there is correlation between the tools and achieving customer's objectives. For example, the P value for project charter is less than 0.05 and Spearman correlation value is equal to 0.815 and is near to one that means there is strong correlation between project charter and achieving customer's satisfaction.

Table (18): Symmetric Measures for Customer Satisfaction

PMTT Name		Value	symp. Std. Error ^a	Approx. T ^b	Approx. Sig. ^c	
Project Schedule	Ordinal by Ordinal	Spearman Correlation	.582	.104	5.500	.000 ^c
	N of Valid Cases		61			
	Ordinal by Ordinal	Spearman Correlation	.788	.055	9.903	.000 ^c
Activity List	N of Valid Cases		62			
	Ordinal by Ordinal	Spearman Correlation	.815	.044	10.892	.000 ^c
	N of Valid Cases		62			
Project Charter	Ordinal by Ordinal	Spearman Correlation	.719	.058	7.877	.000 ^c
	N of Valid Cases		60			
	Ordinal by Ordinal	Spearman Correlation	.774	.053	9.479	.000 ^c
Proposal Evaluation Techniques	N of Valid Cases		62			
	Ordinal by Ordinal	Spearman Correlation	.711	.074	7.826	.000 ^c
	N of Valid Cases		62			
Work Breakdown Structure	Ordinal by Ordinal	Spearman Correlation	.690	.057	7.332	.000 ^c
	N of Valid Cases		61			
	Ordinal by Ordinal	Spearman Correlation	.608	.076	5.828	.000 ^c
Project Management Information System	N of Valid Cases		60			
	Ordinal by Ordinal	Spearman Correlation	.650	.076	6.617	.000 ^c
	N of Valid Cases		62			
Project Flowcharting	Ordinal by Ordinal	Spearman Correlation	.660	.066	6.749	.000 ^c
	N of Valid Cases		61			
	Ordinal by Ordinal	Spearman Correlation	.698	.059	7.485	.000 ^c
Risk Register	N of Valid Cases		61			
	Ordinal by Ordinal	Spearman Correlation	.744	.062	8.613	.000 ^c
	N of Valid Cases		62			
Quality Checklist	Ordinal by Ordinal	Spearman Correlation	.718	.075	7.920	.000 ^c
	N of Valid Cases		61			
	Ordinal by Ordinal	Spearman Correlation	.665	.060	6.788	.000 ^c
Project Selection Methods	N of Valid Cases		60			
	Ordinal by Ordinal	Spearman Correlation				
	N of Valid Cases					
Claim Administration	Ordinal by Ordinal	Spearman Correlation				
	N of Valid Cases					
	Ordinal by Ordinal	Spearman Correlation				
Performance Measurement Baseline	N of Valid Cases					

Lessons Learned Records	Ordinal by	Spearman	.652	.078	6.544	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		60			
Change Control System	Ordinal by	Spearman	.714	.057	7.843	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		61			
Critical Path Method	Ordinal by	Spearman	.791	.046	10.024	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		62			
Earned Value Technique	Ordinal by	Spearman	.668	.075	6.955	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		62			
Stakeholder Register	Ordinal by	Spearman	.727	.068	8.203	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		62			
Responsibility Assignment matrix	Ordinal by	Spearman	.742	.059	8.438	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		60			
SWOT Analysis	Ordinal by	Spearman	.737	.061	8.301	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		60			
Work Authorization System	Ordinal by	Spearman	.693	.067	7.439	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		62			
Gantt Chart	Ordinal by	Spearman	.625	.085	6.152	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		61			
Fast Tracking Technique	Ordinal by	Spearman	.707	.066	7.734	.000 ^c
	Ordinal	Correlation				
	N of Valid Cases		62			

Source: Researchers study 2014

H2: There is a relationship between using project management tools and techniques and improving project performance effectiveness.

Table (19) shows the impact of using PMTT on improving project performance effectiveness. For example, it shows that 81.97% of the respondents agreed that using project schedule could improve project performance effectiveness that was the highest rate of agreement while 11.48% did not, and 6.56% do not have any idea about the impact of using the tool on project performance. The second tool followed project schedule is activity list with ratio 75.81% of agreement, then Project Charter with ratio 74.19% of agreement.

Table (19): influence of using project management tools & techniques on improving project performance effectiveness

PMTT Name		Can lead to improve project performance effectiveness			Total
		Yes	No	I have no idea	
Project Schedule	count	50	7	4	61
	%	81.97%	11.48%	6.56%	100.00%
Activity List	count	47	11	4	62
	%	75.81%	17.74%	6.45%	100.00%
Project Charter	count	46	12	4	62
	%	74.19%	19.35%	6.45%	100.00%
Proposal Evaluation Techniques	count	44	8	8	60
	%	73.33%	13.33%	13.33%	100.00%
Work Breakdown Structure	count	45	13	4	62
	%	72.58%	20.97%	6.45%	100.00%
Project Statement of Work	count	44	12	6	62
	%	70.96%	19.35%	9.67%	100.00%
Conflict Resolving Technique	count	43	12	6	61
	%	70.49%	19.67%	9.84%	100.00%
Project Management Information System	count	42	10	8	60
	%	70.00%	16.67%	13.33%	100.00%
Project Flowcharting	count	43	10	9	62
	%	69.35%	16.13%	14.52%	100.00%
Risk Register	count	43	11	8	62
	%	69.35%	17.74%	12.90%	100.00%
Quality Checklist	count	42	14	5	61
	%	68.85%	22.95%	8.20%	100.00%
Project Selection Methods	count	41	17	4	62
	%	66.13%	27.42%	6.45%	100.00%
Claim Administration	count	39	16	6	61
	%	63.93%	26.23%	9.84%	100.00%
Performance Measurement Baseline	count	38	13	9	60
	%	63.33%	21.67%	15.00%	100.00%
Lessons Learned Records	count	38	16	6	60
	%	63.33%	26.67%	10.00%	100.00%
Change Control System	count	38	14	9	61
	%	62.30%	22.95%	14.75%	100.00%
Critical Path Method	count	38	16	8	62
	%	61.29%	25.81%	12.90%	100.00%
Earned Value Technique	count	36	11	15	62
	%	58.06%	17.74%	24.19%	100.00%
Stakeholder Register	count	36	22	4	62
	%	58.06%	35.48%	6.45%	100.00%
Responsibility Assignment matrix	count	35	19	7	61
	%	57.38%	31.15%	11.48%	100.00%
SWOT Analysis	count	34	19	7	60
	%	56.67%	31.67%	11.67%	100.00%
Work Authorization System	count	32	22	8	62
	%	51.61%	35.48%	12.90%	100.00%
Gantt Chart	count	28	18	15	61
	%	45.90%	29.51%	24.59%	100.00%
Fast Tracking Technique	count	28	25	9	62
	%	45.16%	40.32%	14.52%	100.00%

Source: Researchers study 2014

According to Table (20) the value of P associated with statistically Spearman Correlation is less than 0.05 for the most tools, therefore, the null hypothesis has been rejected and the alternative hypothesis has been accepted for the 5% level of significance that means there is correlation between using project management tools and techniques and achieving customer's objectives.

For example, the P value for project schedule is less than 0.05 and Spearman correlation value is equal to 0.487 and is near to one that means there is correlation between project schedule and improving project performance effectiveness.

Table (20): Symmetric Measures for improving project performance effectiveness

PMTT Name			Value	symp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Project Schedule	Ordinal by Ordinal	Spearman Correlation	.487	.121	4.288	.000 ^c
	N of Valid Cases		61			
Activity List	Ordinal by Ordinal	Spearman Correlation	.689	.083	7.368	.000 ^c
	N of Valid Cases		62			
Project Charter	Ordinal by Ordinal	Spearman Correlation	.756	.056	8.939	.000 ^c
	N of Valid Cases					
Proposal Evaluation Techniques	Ordinal by Ordinal	Spearman Correlation	.688	.060	7.217	.000 ^c
	N of Valid Cases		60			
Work Breakdown Structure	Ordinal by Ordinal	Spearman Correlation	.699	.080	7.565	.000 ^c
	N of Valid Cases		62			
Project Statement of Work	Ordinal by Ordinal	Spearman Correlation	.715	.058	7.921	.000 ^c
	N of Valid Cases		62			
Conflict Resolving Technique	Ordinal by Ordinal	Spearman Correlation	.410	.124	3.454	.001 ^c
	N of Valid Cases		61			
Project Management Information System	Ordinal by Ordinal	Spearman Correlation	.503	.097	4.427	.000 ^c
	N of Valid Cases		60			
Project Flowcharting	Ordinal by Ordinal	Spearman Correlation	.733	.053	8.336	.000 ^c
	N of Valid Cases		62			
Risk Register	Ordinal by Ordinal	Spearman Correlation	.404	.124	3.416	.001 ^c
	N of Valid Cases		62			
Quality Checklist	Ordinal by Ordinal	Spearman Correlation	.626	.097	6.160	.000 ^c
	N of Valid Cases		61			
Project Selection Methods	Ordinal by Ordinal	Spearman Correlation	.763	.051	9.156	.000 ^c
	N of Valid Cases		62			
Claim Administration	Ordinal by Ordinal	Spearman Correlation	.614	.098	5.979	.000 ^c
	N of Valid Cases		61			
Performance Measurement Baseline	Ordinal by Ordinal	Spearman Correlation	.572	.080	5.305	.000 ^c
	N of Valid Cases		60			
Lessons Learned Records	Ordinal by Ordinal	Spearman Correlation	.654	.072	6.579	.000 ^c
	N of Valid Cases		60			
Change Control System	Ordinal by Ordinal	Spearman Correlation	.612	.087	5.949	.000 ^c
	N of Valid Cases		61			
Critical Path Method	Ordinal by Ordinal	Spearman Correlation	.694	.078	7.467	.000 ^c
	N of Valid Cases		62			
Earned Value Technique	Ordinal by Ordinal	Spearman Correlation	.680	.083	7.184	.000 ^c
	N of Valid Cases		62			

Stakeholder Register	Ordinal by Ordinal	Spearman Correlation	.727	.075	8.207	.000 ^c
	N of Valid Cases		62			
Responsibility Assignment matrix	Ordinal by Ordinal	Spearman Correlation	.581	.092	5.487	.000 ^c
	N of Valid Cases		61			
SWOT Analysis	Ordinal by Ordinal	Spearman Correlation	.493	.109	4.319	.000 ^c
	N of Valid Cases		60			
Work Authorization System	Ordinal by Ordinal	Spearman Correlation	.568	.088	5.346	.000 ^c
	N of Valid Cases		62			
Gantt Chart	Ordinal by Ordinal	Spearman Correlation	.623	.085	6.118	.000 ^c
	N of Valid Cases		61			
Fast Tracking Technique	Ordinal by Ordinal	Spearman Correlation	.666	.099	6.921	.000 ^c
	N of Valid Cases		62			

Source: Researchers study 2014

Conclusion

This study provides important aspects relating to project management in order to identify the usefulness of using project management tools and techniques to manage the project. The research identified two significant findings that are unique contributions to the literature in terms of the contingent use of project management tools and techniques. First, it confirmed that the use of project management tools and techniques in construction project in Khartoum is needed more attention from all stakeholders to increase the awareness of using project management tools and techniques in a professional way. In addition, the study identifies and presents the score of project management tools and techniques used in the construction organizations. Second, this study denoted the project management tools and techniques that contribute to project effectiveness measures. Thus, in order to manage projects successfully, project managers should consider utilizing the project management tools and techniques that are significant contributors to success measures of the project. The 24 project management tools and techniques in this study do not represent every project management tools and techniques available to project managers. It can be assumed that the respondents who responded to the survey are knowledgeable in the use of project management tools and techniques and can use them well.

In future research, studies can be conducted to investigate the impact of using project management tools and techniques on other project effectiveness dimensions such as financial benefits, market competition, and organization strategic objectives.

REFERENCES:

1. Aubry, Monique and Hobbs, Brian. (2011). A Fresh Look at the Contribution of Project Management to Organizational Performance. *Project Management Journal*, 42 (1), 3-16.
2. Clements, J. P., & Gido, J. (2006). *Effective Project Management*. Delhi, India: Thomson Learning, Inc. p. 4
3. Ghattas, R. G., & McKee, S. L. (2003). *Practical Project Management* (3rd ed.). Delhi: Pearson Education, Inc. pp. 4-5.
4. Gido, Jack and James P. Clements. (2009). *Successful Project Management* (4th ed.). Mason: South-Western Cengage Learning. p.96.
5. Larson, E. W., & Gray, C. F. (2011). *Project Management the Managerial Process* (Fifth ed.). New York: Mc Graw-Hill Co. Inc. p.13
6. Mantel, Samuel J. and others. (2008). *Project Management in Practice* (3rd ed.). New Jersey: John Wiley & Sons, Inc. p.63.

7. Matheen, A. (2009). *Project Management* (2nd ed.). New Delhi: Laxmi Publications Pvt.Ltd. p.22.
8. Milosevic, Dragan; Irman, Lane; Ozbay, And. (2001). Impact of project management standardization on project effectiveness. *Engineering Management Journal* , 13 (4), 16-33.
9. Munns, A. K.; Bjeirmi, B., F. (1996). The role of project management in achieving project success. *International Journal of Project Management* , 14 (2), 81-87.
10. Patanakul, Peerasit; L., Boonkiat; Milosevic, Dragan. (2010). An empirical study on the use of project management tools and techniques across project life cycle and their impact on project success. *Journal of General Management* , 35 (3), 41-65.
11. Pinto, J. K. (2007). *Project Management Achieving Competitive Advantage*. New Jersey: Pearson Education, Inc. p. 3
12. Schwalbe, K. (2009). *Introduction to Project Management* (2nd ed.). Boston: Course Technology Cengage Learning. p. 114