An Evaluation of The Effects of Project Planning and Programming on Construction Project Delivery

Audu, I. Tiamiyu.[1, *], Chirdum, B. Lohya[2] , Samaila, Isa S[3]
[1,3]Building Department, School of Environmental Technology,
Abubakar Tatari Ali Polytechnic, Bauchi State.
[2]Graduating student, Department of Building Technology
Abubakar Tatari Ali Polytechnic, Bauchi State.
*Corresponding author: alnurniy4u@gmail.com

Abstract

Project plans are used in all economic and non-economic fields as mean of organizing project activity, aiming the achievement of desired objectives. The study was to determine the effects of project planning and programming on construction project delivery. Specifically, the study is designed to determine the components of project planning/programming, the effectiveness of planning and programming tool in project delivery and increased profitability and methods of project planning/programing the population comprised of the professionals in the construction industry (Engineers, Builders, Quantity Surveyor, Architects, etc). A structured questionnaire was used to obtain data and descriptive statistical analysis including summary of findings as mean and standard deviation of items on the questionnaire and ranked based on their Relative Importance Index (RII). The results revealed that Risk management plan, as the topmost must have feature of a project plan having a mean of 1.67 and RII of 0.233. Alongside this, is Scope and Mission Statement (1.44, 0.287), Duration of Project (1.42, 0.284), Work Breakdown Structure (1.2, 0.255), Objectives and Deliverables (1.22, 0.244), Needed Resources (1.22, 0.244), etc. Also, with an average mean of 1.27 and standard deviation from cluster of statements on the effectiveness of project planning and programming, it was established that project planning and programming is effective in ensuring timely project delivery and increase profitability in the execution of construction project with Precedence network diagram as the most commonly used tool/method of project programming by professionals in the construction industry having a mean od 1.11 and RII of 0.222. The study recommends the use of well-organized planning processes, with the

involvement of professionals in the industry such as project managers (Builders), engineers, architects for better realization of construction projects.

1. Introduction

Project planning and programming is the business of creating a unique product, service or result. A project is made up of a group of interrelated work activities constrained by a specific scope, budget, and schedules to deliver capital assets needed to achieve the strategic goals of an agency (Kam, 2012). Project planning and program undergo progressive elaboration by developing in steps and predictable increment that are tied to benchmarks, milestones and completion dates.

Programming involves the identification and analysis of what people and organization need and want. Some considerations include function, form, space, cost, quality, time, flexibility regulations and standards, risk management, energy conservation and sustainability, health and safety, security, productivity, comfort, convenience, aesthetics and countless technical requirements (Richard, 2012). Project planning and programming had been introduced centuries ago, to guide construction activities on how time, resources and human factors are employed towards project delivery. The level of development now made it easy for project program to be done using computer software as a scientific approach to project delivery processes. This development saves time and human resources involved in preparing it manually.

Most projects seem to be unplanned or un-programmed, due to inability of the project managers and supervisors to handle the activities of the project well. These may lead to abandoning the projects, as a result of bankruptcy of the project manager, inability to meet the time requirements, lack of monitoring the activities of the projects etc. the primary challenges of project management are to achieve all the goals of the project charter while adhering to the three classic project constraints; sometimes referred as "triple constraints", that is scope, time and cost.

A lot of literature has developed in the field of effective contract planning and management within construction contexts. The degree of application of contract planning and management techniques by contractors especially, was found to differ in various construction

industries across the globe. Most countries in the middle east and some part of Africa do not utilize project planning and management techniques in the delivery of construction projects. Borrows its content from general project management theory (Winch, 2010) and includes portfolio management, program management, project planning, and scheduling (Wysocki, 2012). In construction context a program is often translated to a multi-environment where several projects should be managed and coordinated. Wysocki (2012) gives a business perspective on portfolio management by defining it as all projects managed by company. The strategic plan and demand forecast are input to portfolio planning to identify suitable projects to run or tender on. The project portfolio yields a long-term resource plan and input in planning of a certain project. Portfolio planning sets the boundaries for the project planning. It is therefore necessary to have information about available resources and what materials are needed and when.

2. Methodology

2.1 Materials

Descriptive survey design was used which provides a clear presentation of the variables under study. According to Sikurani (2008) in Nsidai (2016); a descriptive study is undertaken in order to ascertain and be able to describe the characteristics of variable of interest in the study. The design was suitable to establish the components, tools and methods commonly adopted in project planning and programming in the construction industry.

A questionnaire with a likert scale and interviews were used as research instruments for the data collection with a targeted population which comprises of three groups of major participants in the construction industry comprising of the client (private and public), contractors and consultants (Engineers, Quantity Surveyor, Architects, etc). One hundred and twenty (120) members of the group of major participants in the construction industry administered the structured questionnaire with thirty (30) respondents in each group in Jos, Plateau State.

A Random sampling technique was adopted in the administration of the structured questionnaire in each group. A descriptive statistical technique including a summary of findings in form of charts, tables and graphs from coded numbers and percentages were used.

A relationship was also established between the selected variables using T-test analysis on SPSS software.

The validity of the research instrument was conducted using Pearson's product moment correlation. While the reliability test was carried out using Cronbach's Alpha.

3. Results and discussion

The question what must a project plan and program consist of was answered using the mean and standard deviation of the information provided by the respondents. Decision rule was whether to accept or reject an item is based on the criterion mean obtained as 3.00 (sum of lickert weights divided by number of lickert item).

Mean < 3.00:   Accept
Mean > 3.00:   Reject

Summary of Mean responses to must have features of project plan.

What project plan must consist of	Mean	Std. D.	RII	Remark	Rank
Problem (Scope) and Mission Statement.	1.44	.501	0.287	Accept	2
Objectives and Deliverables	1.22	.417	0.244	Accept	5
Specifications and Quality Standards.	1.11	.369	0.222	Accept	10
Work Breakdown Structure	1.27	.489	0.255	Accept	4
Needed Resources.	1.22	.417	0.244	Accept	5
Work Schedule.	1.22	.417	0.244	Accept	5
Procurement plan	1.20	.487	0.240	Accept	8
Risk management planning	1.67	.546	0.335	Accept	1
communications plan	1.16	.373	0.233	Accept	9
Duration of Project	1.42	.498	0.284	Accept	3
Average	**1.29**	**.451**			

The above table shows the summary of mean responses of must have features of project plan with all the mean responses ranging between 1.11-1.67 which are all less the than the criterion means of 3.00. From the results, risk management planning ranks top with a mean of 1.67; as one of the must have features of a project plan. This is followed by problem (Scope) and Mission Statement. (1.44), with specifications and quality Standards ranked least (1.11). The standard deviation for all the listed items ranged between 0.366-0.546 indicating that there was a high degree of unanimity of response among the respondents towards the accepted mean.

The average mean of the responses was at 1.30 with a standard deviation of 0.54. Going by this, it is acceptable to state that the respondents unanimously agree to the identified features that makes a project plan

The question on how effective is the project planning and programming in timely project delivery and increase profitability? This was answered using the mean and standard deviation of the information provided by the respondents of the research instrument of data collection. Decision rule was also whether to accept or reject an item is based on the criterion mean obtained as 3 (sum of Lickert weights divided by number of Lickert item).

Mean < 3.00: Accept
Mean > 3.00: Reject

Rank is obtained based on Relative Importance Index (RII). The results are as shown in the table below.

Summary of Mean responses to effectiveness of project planning and programming in timely project delivery and increased profitability.

Effectiveness of project planning/programming	Mean	Std. D.	RII	Remark	Rank
Minimize/eliminate scope creep in a project and in turn reduce cost over a project lifecycle.	1.16	.373	0.233	Accept	6
Deciding on change requests, i.e., whether corrective or preventive action is needed	1.18	.475	0.236	Accept	5
Determining the cause, effect and degree of the changes to project plan deliverables.	1.33	.474	0.265	Accept	2
Tracking productivity, measured against time and resources	1.20	.404	0.240	Accept	4
Appropriate resource allocation	1.42	.498	0.284	Accept	1
Improved team collaboration, reducing conflicts through effective internal & external communication	1.33	.474	0.265	Accept	2
Average	**1.27**	**.450**		**Accept**	

the summary of mean responses to effectiveness of project planning and programming in timely project delivery and increased profitability. All the mean responses were found to be range between 1.16-1.42 which are all less the than the criterion mean of 3.00. the results revealed that appropriate allocation of result is the topmost benefit/ effectiveness of project planning and programming in the timely delivery of project and increased profitability with a mean of 1.42. Others include aiding in determining the cause, effect and degree of the changes to project plan deliverables, improved team collaboration by reducing conflicts through effective internal & external communication and tracking productivity, measured against time and resources ranked least.

The standard deviation for all the listed items ranged between 0.498-0.373 indicating that there was a high degree of unanimity of response among the respondents towards the accepted mean.

The average mean of the responses was at 1.27 with a standard deviation of 0.450. by implication, project planning and programming is effective in ensuring timely project delivery and increase profitability from the execution of the project

The methods/tools used in project planning/programming was answered using the mean and standard deviation of the information provided from the data collected. Decision rule was whether to accept or reject an item is based on the criterion mean obtained as 3 (sum of lickert weights divided by number of lickert item).

Mean < 3.00:   Accept

Mean > 3.00:   Reject

Rank is obtained based on Relative Importance Index (RII). The results are as shown.

Summary of Mean responses to the most common methods/tools used by professionals in project planning/programming tools/methods.

Project Planning/programming tools/methods	Mean	Std. D.	RII	Remark	Rank
Bar chart and linked bar chart	1.11	.369	0.222	Accept	6
Resource aggregation chart	1.16	.373	0.233	Accept	5
Critical path method (CPM)	1.20	.404	0.240	Accept	4
Progress (or project) evaluation and review techniques (PERT)	1.25	.440	0.251	Accept	3
Graphical evaluation and review techniques (GERT)	1.27	.525	0.255	Accept	2
Precedence network diagram	1.57	.572	0.309	Accept	1
Average	**1.26**	**.447**		**Accept**	

The summary of mean responses to commonly used project planning/programming tools/methods. Precedence network diagram was ranked as the most commonly adopted tool/method of project programming with a of 1.57 and standard deviation of 0.572. this is followed by Graphical Evaluation and Review Techniques (GERT) with a mean of 1.27 and standard deviation of 0.525. All of the other tools/methods such as Progress (or project)

Evaluation and Review Techniques (PERT), Critical Path Method (CPM) and Resource Aggregation Chart. Bar Chart and Linked Bar Chart was ranked least as the common tool/method adopted by professional in project programming. All of their respective mean were found to be less than the criterion means of 3.00 and standard deviation ranging between 0.369-0.572, indicating that there was a high degree of unanimity of response among the respondents towards the acceptance of the identified tools and methods being useful in project programing

The average mean of the responses was at 1.26 with a standard deviation of 0.447 and by this, it can conclusively state that the listed tools and methods of project planning and programming is used by professionals in the preparation of projects.

4. Summary of findings

The followings are the summary of the results obtained from the analysis of data obtained on the effects of project planning and programming on construction project delivery in accordance to the objective earlier stated.

i. Risk management plan, Scope and Mission Statement, Duration of Project, Work Breakdown Structure, Objectives and Deliverables, Needed Resources, Work Schedule, etc are features that must be captured in a project plan with Risk management plan as the topmost must have feature and Specifications and Quality Standards as the least.

ii. With the average mean of the responses from the respondents on the effectiveness of project planning and programming at 1.27 and a standard deviation of 0.450; it can be stated that project planning and programming is effective in ensuring timely project delivery and increase profitability in the execution of construction project

iii. Precedence network diagram is the most commonly used tool/method of project programming by professionals in the construction industry. this is followed by Graphical Evaluation and Review Techniques (GERT), Progress (or project) Evaluation and Review Techniques (PERT), Critical Path Method (CPM) and Resource Aggregation Chart. Bar Chart and Linked Bar Chart was ranked least as the common tool/method adopted by professional in project programming. The average mean of the responses was at 1.26 with a standard deviation of 0.447 and can be

conclusively state that the listed tools and methods of project planning and programming is used by professionals in the preparation of projects.

5. Conclusion

The research work set out to determine the effects of project planning and programming on construction project delivery and from the relevant review of literature, analysis of collected data, it can be conclusively stated that project planning and programming have positive effect in construction project delivery with some the effects including minimizing/eliminating scope creep in a project, in turn reduce cost over a project lifecycle, deciding on change requests, i.e., whether corrective or preventive action is needed, determining the cause, effect and degree of the changes to project plan deliverables, tracking productivity, measured against time and resources, appropriate resource allocation, Improved team collaboration and reducing conflicts through effective internal & external communication

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