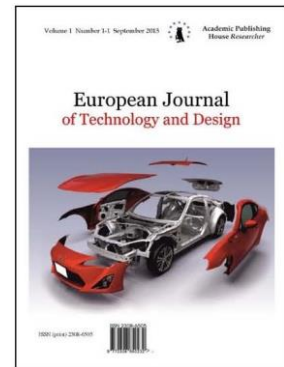


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## Appraisal of Planning and Control as Management Tool for Optimum Productivity on Construction Sites

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### Abstract

An appraisal of planning and control as management tool for optimum productivity on construction sites was assessed with the view of finding the various ways to establish the best alternative planning and control techniques for some particular kinds of projects. Questionnaires were distributed to professionals. Not all construction firms have a separate planning department, this means that they integrate the planning job into other department, and out of the 43 respondents, none had PhD, while majority had M.Sc. A minimum level of planning tools and procedure use is important but what kind of tools is of no importance. However, the most used planning technique for building projects is the Bar chart/Gantt chart and it was discovered that its choice was due to the reasons being that they are simple and easy to handle and manipulate, flexible and it graphically presents the activities with their start time and dates along with links and overlaps. It is suitable for all kinds of project irrespective of its size and nature. Planning tools like progress curve, line of balance, project evaluation and review techniques (PERT) are almost non-existence. The major challenge encountered on site when implementing the plan is delay in completion of the works and dispute does arise between the construction team. Most planners nowadays use computer Aided software to prepare and design their plan, and the major software used is Microsoft project among others. Furthermore, it encourages project managers to believe that although planning does not guarantee project success, lack of planning will probably guarantee failure. Finally, it was revealed from this research that planning is never an easy undertaking but it requires attention since it helps to achieve success. Similarly, Planning is considered a central element of modern project management, the assumption behind the position is that planning reduces uncertainty and increases the likelihood of project success.

**Keywords:** planning, control techniques, project evaluation, tools, disputes.

### 1. Introduction

For a construction project to be successful it is essential to have a plan. As it is normally acknowledged that to fail to plan, is to plan to fail, in other words, the upshot of failure to plan has led to quite a number of projects being abandoned before anticipated completion dates over the years. There is a fact that once a project has been planned there is need for accurate control so that the anticipated plan is achieved and monitored. Control in a broad knowledge is all management actions required to try to ensure strict adherence to plan so it do not affect the successful completion of the project (Tarigan, 2013).

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Considering millions of naira spent on construction projects by both private and government agencies, the daily development brought by technology in construction industry and the various sizes of firms, there is therefore need to examine planning and control as an effective tool for project management in building industries (Ugochukwu et al., 2014).

Construction project may be considered as a step unknown fraught with risk and uncertainty (Ogunberu et al., 2018). No two projects are ever alike and even a repeated project will defer from its predecessor in one or more commercial, administrative and physical aspect. However, without planning it is difficult to envisage the successful control of time, money or resources (Wang et al., 2017).

The basic function of project planning is to provide realistic plans, which become management tools to use as the basis for control action. Planning is also essential in order to deal with construction risks and devise safe working methods. This is true throughout all stages of the project from inception through the design, tendering, construction and commissioning stages of a project (Ugochukwu et al., 2014).

Finally, construction projects possess characteristic, which make the individual planning of each project essential, hence, there is therefore need for total project planning which has to be controlled within cost limits, schedule time with desired quality for successful project execution (Sinesilassie et al., 2017).

Consequently, the failure to effectively plan a project has led to a number of projects discarded, hideous and even belated completions (Wong et al., 2017).

## **2. Materials and methods**

### **Population and study area**

In view of this research topic and aim, the potential survey population in this study primarily includes professionals in the building industry, within Kaduna metropolis where a number of construction projects exist which makes the research a worthwhile venture. The target population of this study is completed and on-going projects within Kaduna and Zaria, and consultancy and contracting firms within Kaduna state were the area of the study.

### **Data collection and distribution**

This section deals with approach to the study. The investigation was carried out through the use of multiple questionnaires administered to various construction sites and firms and also consultancy firms within Kaduna/Zaria metropolis.

### **Nature of the questions**

The questionnaire was well designed to attain its objectives mentioned in chapter one of this research study. To facilitate easy response and analyses, the structured questionnaire was divided into two (2) sections A, B. Section A contains general information about the respondent, and his/her firm, while section B, contains questions about the use of planning and control techniques. These questions are also of different types, which are closed ended (restricted) questions with multiple answers for respondents to select as applicable. In addition, the open-ended (non-restricted) questions were included to allow respondents supply other answer where the ones on the body of the questionnaire were sufficient.

However, questions were asked to find the true situation existing planning in the techniques as state in the literature review and how often they were used to execute. Hence, each planning technique was design with open-ended question to know the reason why it is being preferred to the other techniques for a particular project at a point in time.

### **Statistical tool for data analysis**

In order to test for the most widely used planning technique for a particular project with its effectiveness and control method applied, it is necessary to carry out the analysis of the various information collected from the questionnaire in a statistical manner. The type of statistical tool employed for analyzing the data and information gathered is the descriptive analysis; percentile method, frequencies, statistical summary by using, Statistical package for social science (SPSS).

### 3. Results

**Table 1.** Administered Questionnaires

QUESTIONNAIRE	NUMBERS	PERCENTAGES (%)
Administered copies	60	100
Returned	43	71.7
Not returned	17	28.3

The [Table 1](#) shows that, a total number of 60 questionnaires were administered to different professional in construction firms and construction site. 43 copies which amount to 71.7 % was returned while 17 copies (28.3 %) were not retrieved giving 100 %.

Presentation and analysis of demographic variables

**Table 2.** Years of respondents in service

YEARS	FREQUENCY	PERCENTAGES (%)
0-5	12	27.9
6-10	13	30.3
11-15	13	30.3
16 and above	5	11.5
total	43	100

The [Table 2](#) shows that the respondents within the years of service 6-10 years and 11-15 years have the highest frequency with 13 (i.e. 30.3 %), followed by those that falls within 0-5 years accounting 12 (27.9 %), while those within 16 and above are the least with 11.5 %.

**Table 3.** Area of specialization

SPECIALIZATION	FREQUENCY	PERCENTAGES (%)
Architect	14	32.5
Quantity Surveyor	17	39.5
Builder	10	23.3
Other (Engineer)	2	4.7
Total	43	100

The above [Table 3](#) shows the total respondents specializations owing that out of the 43 respondents, 39.5 % were Quantity Surveyors, followed by 32.5 % who are Architects, and 23.3 % were builders while 4.7 % are engineers.

**Table 4.** Type of firm operated

TYPE OF FIRM	FREQUENCY	PERCENTAGES (%)
Consultants	17	39.5
Contracting	19	44.2
Both	6	14.0
No response	1	2.3
Total	43	100

From the above tabulation, it was shown that most respondents were operating contracting firms with a total of 19 (44.2 %), followed by 39.4 % who are consulting firms with 17, meanwhile,

6 (14.0 %) were operating both contracting and consulting at the same time. But among the respondents, 1 amounting to 2.3 % did not respond to this question giving a total of 100 %.

**Table 5.** Qualifications of respondents

QUALIFICATION	FREQUENCY	PERCENTAGE (%)
PhD	0	0
M.SC	20	46.5
B.SC/HND/B.TECH	22	51.2
OND	1	2.3
Total	43	100

It was shown above that the respondents with B.SC/HND/B.TECH degree were 22 amounting to 51.2 %, followed by M.SC degree holders with 46.5 % and 2.3 % were OND degree holder. However, it was shown that none of the respondents had PhD as a degree.

**Table 6.** Separate planning department

OPTIONS	FREQUENCY	PERCENTAGE (%)
Yes	27	62.8
No	16	37.2
Total	43	100

During this research study, the [Table 6](#) shows the information giving by the construction firms and sites, it shows that 27 out of the 43 respondents i.e. 62.8 % of them do have a planning department were all there planning is being carried out, while 37.2 % of the 43 amounting to 16 do not have a planning department. However, this shows that not all construction firms have a separate planning department. They therefore believe planning works may be integrated into some other departments.

**Table 5.** Residential building projects

OPTIONS	FREQUENCY	PERCENTAGE (%)
Yes	42	97.7
No	1	2.3
Total	43	100

Most of the respondents have handled building projects meaning that 97.7 % with 42 said yes while only one had not handled a building project before.

**Table 6.** Commercial building projects

OPTIONS	FREQUENCY	PERCENTAGE (%)
Yes	38	88.4
No	5	11.6
Total	43	100

It was shown that 38 (88.4 %) of the respondents have handled commercial building, while 5 (11.6 %) are yet to handle any commercial building projects.

**Table 7.** Educational building projects

OPTION	FREQUENCY	PERCENTAGE (%)
Yes	35	81.4
No	8	18.6
Total	43	100

It was shown above that 35 (81.4 %) of the respondents have handled educational building projects while 8 respondents amounting to (18.6 %) respondents hadn't handled an educational building project before.

**Table 8.** Hospital (medical) building projects

OPTION	FREQUENCY	PERCENTAGE (%)
Yes	25	58.1
No	18	41.9
Total	43	100

The [Table 8](#) shows that 25 (58.1 %) of the respondents have been involved in medical building projects and total number of 18 (41.9 %) have not handled medical building projects before.

**Table 9.** Recreational building projects

OPTIONS	FREQUENCY	PERCENTAGE (%)
Yes	19	44.2
No	24	55.8
Total	43	100

The above tabulated data shows that only 19 (44.2 %) of the respondents have handled recreational projects and most of the respondents have not handled this kind of building project before, this amount to 24 (55.8 %) out of the total 43 respondents.

**Table 10.** Type of building project affecting the choice of planning tool

OPTIONS	FREQUENCY	PERCENTAGE (%)
Yes	40	93.0
No	3	7.0
Total	43	100

The [Table 10](#) depicts that 40 (93 %) of the respondents agreed that a building project type affect the choice of planning tool which whereby can be negative of positive, while only 7.0 % disagreed to the notion.

In addressing the first objective, the various planning control techniques were tabulated along the types of building projects they are used for. Among the various techniques were the Bar charts, Critical Path Method (CPM), Line of Balance (LOB) and the Programme Evaluation and Review Technique (PERT).

**Table 11.** Opinions of the respondents on the techniques they used for the various building projects

TYPES OF BUILDING PROJECTS	BAR CHARTS		CRITICAL PATH METHOD		LINE OF BALANCE		PROGRAMME EVALUATION AND REVIEW TECHNIQUE		NO RESPONSE	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Residential	36	83.7	2	4.7	0	0	4	9.3	1	2.3
Educational	25	58.1	8	18.6	1	2.3	4	9.3	5	11.6
Commercial	23	53.5	8	18.6	2	4.7	3	7.0	7	16.2
Hospital	12	27.9	8	18.6	2	4.7	3	7.0	18	41.8
Recreational	9	20.9	5	11.6	2	4.7	5	11.6	22	51.1

From the [Table 11](#), for the residential buildings tools discovered to be commonly applied were the Bar charts. In this survey 36 out of the 43 or 83.7 % of the total respondents made use of Bar chart for residential building projects. The use of CPM was relatively low and accounted for only 4.7 % of the respondents. PERT was a little but higher than the CPM as tool for residential buildings. The respondents never used LOB at all for the residential building project.

In the case of educational building projects, the Bar charts was also the dominant tool used by the respondents with 25 or 58.1 % and accounted by the CPM was relatively higher with 18.6 % of the respondents using the tool for these type of project. PERT was used as a tool by 9.3 % of the respondents, and LOB was the least used tool and accounted for only 2.3 % of the respondents.

For commercial building projects, bar chart was revealed as the highest planning tool used and it accounted to 53.5 % of the total response. CMP again came behind with 18.6 % while LOB and PERT came least with 4.7 % and 7.0 % respectively.

As tool for hospital building projects, Bar charts still ranked the highest with 12 or 27.9 %, while CPM was ranked second with 18.6 %. PERT and LOB were scored 7.0 % and 4.7 % respectively. Hence, 41.8 % have not been involved in this project.

As for tools for recreational building projects, Bar Chart still scored the highest with 20.9 %, CPM and PERT were at par for 11.6 % each. LOB was the least used tool with only 4.7 % by the respondents. Hence, 58.1 % have not been involved in this project.

The [Table 12](#) below also throws more light and the response is summarized below.

**Table 12.** Planning tool used for the various kinds of building projects

PROJECT TYPES	BAR CHART		CRITICAL PATH METHOD		LINE OF BALANCE		PERT		NO RESPONSE	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Large scale	17	39.5	14	32.6	1	2.3	7	16.3	4	9.3
Medium scale	30	69.8	6	14.0	1	2.3	4	9.3	2	4.7
Small scale	37	86.0	2	4.7	0	0	2	4.7	2	4.7

The [Table 12](#) shows that about 39.5 % of those who undertook large scale projects made use of bar chart which is the highest followed by 32.6 % of the respondents who use CPM. While 16.3 % of them used PERT and 2.3 % used LOB which came last on the hierarchy, significantly, 9.3 % of the respondents had not been involved in large scale projects.

For the medium scale project types, bar chart still came top as the most used planning technique with 69.8 % of the response and 14.0 % followed for those who uses CPM, while PERT and LOB came behind with 9.3 % and 2.3 % respectively. It is also observed that LOB was still



ranked the rarely used planning technique while bar chart is the highly used technique. Also 4.7 % of the respondents did not give response.

For those who undertake small scale building projects, bar chart was still the most preferred planning technique, and 86.0 % of the total respondents chose bar chart, while CPM and PERT were at par with 4.7 % each, and it was obvious that none of the respondents in this case chose LOB.

Notwithstanding, from the summary of the above table, bar chart is dominantly used for all the different scales of project irrespective of size, and CPM and PERT followed respectively while LOB is still rarely used.

The [Table 13](#) below shows the responses of the 43 respondents' opinions.

**Table 13.** Challenges encountered when implementing the plan on site

CHALLENGES	YES		NO	
	Frequency	%	Frequency	%
There was dispute	15	34.9	28	65.1
There was cost overruns	8	18.6	35	81.4
Total abandonment of the project	5	11.6	38	88.4
There was delay in completion	31	72.1	12	27.9
Project does not meet clients satisfaction	1	2.3	42	97.7
Others	2	4.7	41	95.3

From the above table it was deduced that most of the respondents were of the opinion that delay in completion was the major challenge they had while implementing the plan on site which is followed by there was dispute and there was cost overruns came 3<sup>rd</sup> on the list while other challenges followed with least percentages. Meanwhile, the reverse is the case for those who disagreed to this notion, meaning that a high percentage disagree that project does not meet clients satisfaction was a challenge, and total abandonment of the project was neither a challenge on site during the execution of the plan on site. Generally, the major challenge encountered by contractors in trying to implement the plan on site was delay in completion, while other alarming challenge was dispute on site.

**Table 14.** Projects with success (early completion) recorded

PROJECTS	FREQUENCY	PERCENTAGE (%)
0-15 %	3	7.0
16-30 %	5	11.6
31-50 %	7	16.3
51-70 %	25	58.1
70 % and above	3	7.0
Total	43	100

The research question above aims to see how many of the projects they completed early or as scheduled, and from the above table it was revealed that 25 (58.1 %) of the respondents said the projects they completed to time were between 51-70 % the above table is obvious that the highest is 51-70 % while the least was 0-15 % and 70 % and above respectively. In other words, the presentation shows that those who properly plan their projects in a separate planning department achieve success to an extent.

**Table 15.** Projects with success (within budget) recorded

PROJECTS	FREQUENCY	PERCENTAGE (%)
0-15 %	5	11.6
16-30 %	6	13.9
31-50 %	10	23.3
51-70 %	20	46.5
70 % and above	2	4.7
Total	43	100

Similarly, the [Table 15](#) still shows the frequencies of the response on project success but as regards budget. 20 out of the 43 respondents said that they completed 51-70 % projects within project due to accurate planning and this accounts to 46.5 %, while those of 31-50 % came 2<sup>nd</sup> with 23.3 % and the least still remains 0-15 % and 70 % and above respectively. This table above revealed that there has never being a total project success irrespective of cost or time.

**Table 16.** Planning techniques suitable to use

TECHNIQUES	FREQUENCY	PERCENTAGE (%)
Bar chart	28	65.1
Critical path method	7	16.3
Line of balance	2	4.7
Pert	6	14.0
Total	43	100

The above question was asked to find out which of the planning techniques the respondents find suitable to use irrespective of the type of project and size of project. And from all above table the presentation shows that 28 respondents out of the 43 respondents chose bar chart which amounts to 65.5 % and the other techniques were nowhere to be compared to bar chart, but CPM was chosen next by 7 (16.3 %), while PERT and LOB followed with 14.0 % and 4.7 % respectively. It was noted that LOB is the most rarely used planning technique because it always come last on all ranking.

**Table 17.** Duration used by firm to prepare the plan using the planning techniques

TIME (IN WEEKS)	FREQUENCY	PERCENTAGE (%)
1-2	32	74.4
2-4	9	21.0
4-6	1	2.3
6 and above	1	2.3
Total	43	100.0

From the [Table 17](#) it is obviously shown that 32 respondents out of the total 43 respondents amounting to 74.4 % takes one to two weeks to prepare their project plan, except the project is complex which will take them about 2-4 weeks, and they followed up with 21.0 %. It was observed that this above result is mostly for those who have a separate planning department.

It is shown from the [Table 18](#) that accuracy of project planning depends on a large extent upon the ability of the planner to handle the tool properly follow up was the determinant, nature and size of the project.



**Table 18.** Determinants of the accuracy of project planning

DETERMINANTS	YES		NO	
	Frequency	%	Frequency	%
Availability of time	13	30.2	30	69.8
Ability of the planner to handle the tool properly	32	74.4	11	25.6
Nature of and size of the project	18	41.9	25	58.1
Accuracy/success of the project	14	32.6	29	67.4
Others	6	14.0	37	86.0

**Table 19.** Project manager could achieve a good degree of control on the project plan

CONTROL STRATEGIES	YES		NO	
	Frequency	%	Frequency	%
Threaten workers with punishment	0	0	43	100
Motivate workers with incentives	37	86.0	6	14.0
Move freely and frequently amongst those working on project site	13	30.2	30	69.8
Shows less concern about the workers working on the project site	0	0	43	100
Others	5	11.6	38	88.4

From the [Table 19](#) it was shown that 37 respondents agreed that motivating workers with incentives would achieve a good degree of control on the project plan, and it followed by the manager moving freely and frequently amongst the workers on project site. In other words, none of the respondents agreed that to control the project plan managers should threaten his workers or show less concern about them.

**Table 20.** Planning does not guarantee project success but lack of planning will probably guarantee failure

OPTIONS	FREQUENCY	PERCENTAGE (%)
Yes	37	86.0
No	6	14.0
Total	43	100.0

The [Table 20](#) shows that 86.0 % of the respondents agreed that planning does not give guarantee to project success while 6(14.0 %) of them disagreed to the notion.

**Table 21.** Methods used when designing the project plan

METHODS	FREQUENCY	PERCENTAGES (%)
Computer base software	28	65.1
Manually (by hand)	15	34.9
Total	43	100.0

The [Table 21](#) presents the response of professional when designing their project plan. 28 (65.1 %) of the respondents uses computer aided software to prepare their plan, while 15 (34.9 %) still prefer manual preparation using their hand to draw on cardboard.

#### 4. Conclusion

Having critically analyzed all data that are involved in carrying out effective planning and its control towards the timely and successful completion of project in the construction industry and having statistically analyzed the primary data with the aid of aforementioned statistical tool i.e. frequency, percentile and pie and bar charts through the help of statistical package for social science (SPSS).

The followings are the conclusions drawn after the completion of this research.

Bar Chart is the most effective planning technique generally accepted in construction firms because of the fact that its product result as fast as possible at an acceptable cost, also it can easily be applied and manipulated, and its flexibility makes it easier to adjust, above all it is easily interpreted by most managers and understood by workers on site, hence the reason for its frequent use is that it shows all programme of work with start and finish time and dates respectively. However, Line of Balance is rarely used simple because it is mainly used for repetitive projects and most respondents were not involved in that operation.

However, CPM is equally a technique that is used by few contractors and planners because they said it is too theoretically based, and the other techniques are rarely used due to their unique nature.

Also an effective laid down plan which is strictly adhered to encourages timely completion of project thereby reducing the number of claims presented such as liquidated and ascertained damages as a result of project not completed on time. Regular supply of necessary information to planning department is very essential for an effective planning as it reduces the number of time spent on planning.

The educational background of people who are directly involved with the planning for the construction firm greatly affect the effectiveness of planning. Accuracy of the project planning depends upon the accuracy of input information and on large extent the ability of the planner to handle the tool properly. However, planning is a function of management, which should be done by the top executive or managers because it requires experience.

In addition, short-term planning could serve as check resources in order to keep the master programme under constant review to achieve completion of project by planned date.

The assumption behind this position is that planning reduces uncertainty and increase the likelihood of project success. Although planning does not guarantee project success, but lack of planning will probably guarantee project failure.

In addition, with the growing technology and advancement in computerized planning tools techniques, most plans are prepared via the use of computer and the most used software package today is Microsoft project.

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