

Evaluation of Network Analysis Application to Project Management in Southwest Nigeria

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Abstract— Evaluation of network analysis application to project management was studied in southwest Nigeria. This was with a view to determining the level of application of project management tools and techniques especially network analysis in achieving project success. The study covered 129 large value construction projects in tertiary institutions in southwest Nigeria. The research instrument used was questionnaire. It elicited information on the issues such as project management tools and techniques applied, project duration and benefits of applying network analysis. The data collected were analysed using descriptive statistics. The results showed that 23.3% of the project supervisors applied network analysis while 100% applied work breakdown structure and monthly progress technical reports. Thus, the application of network analysis in project management in southwest Nigeria is very low. The study recommended among others that on the job professional project management training should be introduced to the project managers/project supervisors. This will assist them in acquiring knowledge and industrial skills in the latest project management tools and techniques available and practical application of network analysis.

Index Terms – Evaluation, network analysis, application, project management, tools, techniques.

1. INTRODUCTION

PROJECT had been defined by different authors, according to their professions and areas of specialization. Architects, Engineers, Social Scientists, Project Managers and so on have their own definitions gotten from their professional experiences. However, a project can be considered to be the achievement of a specific objective, which involves a series of activities and tasks which consume resources [1]. Also, a project is a set of activities with a defined start point and a defined end state, which pursues a defined goal and uses a defined set of resources [2]. Project management can be explained as the application of knowledge, skills, tools and techniques to project activities to meet requirements [3]. By meeting the requirements of a project, such a project should be within the budget, be delivered on time, within the scope and of good quality to meet the customer's requirements.

Timely delivery projects require application of tools and techniques of project management. Among these tools and techniques is the network analysis. The term network analysis is a generic term covering all the network techniques used for planning, scheduling and controlling of projects [4]. The network, techniques include Programme Evaluation

and Review Technique (PERT), Critical Path Method (CPM) and Precedence Network Analysis (CPM). These three techniques

have common features of using the network model for depicting the time plan of the project; determining project duration; identifying critical activities and; controlling the project-time objectives [4].
A project plan is a formal document designed to guide the execution and control of a project [5]. The project plan is implemented stage by stage until the project is closed. During the creation of the project plan, after reviewing of the project initiation, the network analysis would be drawn. In the network diagramme, all the activities to be performed from the beginning to the end and the relationship between these activities would be identified. Furthermore, the activities would be broken down into manageable structures (WBS). Time and cost would be allocated to the structures, the structures sequence, which comes first, which comes last, which is dependent on another, which is a predecessor and which is a successor [6]. Network analysis chart serves as a guide during the execution of baseline project plan..

In Nigeria, some building and road projects take longer time before completion due to inadequate planning, execution, monitoring and control. Some abandoned and unsuccessful [7]. If network analysis is applied as a tool in managing the project, such problems might have been averted.

Furthermore, another problem is the imposition of deadline delivery dates of projects on project managers by the project sponsors or the users of the deliverables. This usually happens where the project is a public one and the head of such organization or establishment is about completing his tenure. In addition, he would like to

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commission the project(s) awarded during his tenure before leaving the office so that his name would appear on the project. Consequently, this leads to commissioning before delivery of the project. If the project manager and his team apply network analysis during the project planning, scheduling, execution and control phases, rushing the completion time or delay might have been avoided. Therefore, this paper aims at evaluating the network analysis application to project management with a view of recommending appropriate actions.

2. MATERIALS AND METHODS

The study was carried out in southwest Nigeria, comprising Lagos, Ogun, Oyo, Osun, Ondo and Ekiti states. The whole of the area is located within the region known as lowland humid tropical rainforest. It is characterized by wet and dry seasons [8].

The scope of coverage of this study was limited to large value projects of over one billion naira (US\$6.25m) to evaluate the extent of application of network analysis to project management. The restriction to large value projects was due to the fact that network analysis is used to manage large and complex projects. Also it estimates the time taken for completion of each activity if possible on crash basis, normal basis and worst-scenario basis.

For the purpose of this study, purposive sampling method was used from the states and federal institutions of higher learning in southwest Nigeria. In all, there were 195 projects under construction. Primary data was obtained using structured and unstructured questionnaires, interviews and site visits. One hundred and fifty-five (155) questionnaires were administered to the project managers/project supervisors who had knowledge of the benefits of network analysis application to project management.

The reliability and validity of the questionnaire was based on the use of rating scale. The questionnaire was subjected to content validity. A total of one hundred and twenty-nine (129) questionnaires were returned and found useful which amounts to a return rate of 83.0%. The data collected were analysed with the use of simple descriptive statistics. Perceived benefits of network analysis to project management were measured on a 5 point rating scale with 1-Very Low, 2-Low, 3-Moderate, 4-High and 5-Very High.

3. RESULTS AND DISCUSSION

Table 1 covered professional characteristics of the respondents, such as educational qualification and work experience. The data from the table shows that respondents with bachelor's degree rank highest with 53.5% followed by Higher National Diploma holders with 34.9%, Masters' degree holders with 7.8% while the remaining 3.9% are City and Guilds (Full Technological Certificate) holders. As revealed by

the table, all the respondents are professionally educated in building and civil construction, therefore this provides a concrete base for knowledge, better usage and application of network analysis to project management. Further observation of the table revealed that all the respondents (100.0%) have worked for more than five years in firms under study, this means that they are well experienced in the supervision of construction projects.

TABLE 1
PROFESSIONAL CHARACTERISTICS OF THE RESPONDENTS

Variable	Frequency	%
Education		
HND	45	34.9
B.Sc.	69	53.5
M.Sc.	10	7.8
*C & G. (FTC)	5	3.9
Total	129	100.0
Work Experience (Years)		
0.5	-	-
6-10	29	22.5
11-15	24	18.6
16-20	31	24.0
Above 21	45	34.9
Total	129	100.0

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Table 2 shows project management tools and techniques being applied in the sampled construction firms in southwestern Nigeria. The respondents were presented with only 6 options and were asked to indicate which had been used in their firms. The options included in the list were those found in professional standard textbooks on construction and project management. The analysis of the table shows that work breakdown structure and monthly progress technical reports are the most frequently used tools by all respondents with 100.0%, followed by monthly cost reports 76.7%, and Gantt Chart/Bar Chart 47.3%, while programme evaluation review technique/critical path method (23.3%) and project management software (3.1%) are rarely used tools by the project managers/supervisors. Thus, the application of network analysis is too low. This agrees with the study conducted in Lagos, Nigeria on the practice of project management by the public institutions that Project Sensitivity Analysis, PRINCE 2, PERT, CPM and GERT are some of the rarely used or not employed tools by the agencies [9]. Whereas, network analysis is a vital technique in project management. It enables us to take a

systematic qualitative structured approach to the problem of managing a project through to successful completion [10].

TABLE 2
PROJECT MANAGEMENT TOOLS AND TECHNIQUES APPLIED IN THE RESPONDENTS' FIRMS

Tools/techniques	Frequency	%
Work breakdown structure	129	100.0
Monthly progress technical report	129	100.0
Monthly cost reports	99	76.7
Gantt Cart/Bar Chart	61	47.3
Programme Evaluation Review Technique/Critical Path Method	30	23.3
Project Management Software	4	3.1

Table 3 presents the projects duration. Eighty-eight percent (88%) of the projects had 4 years as estimated project duration while 12% had 3½ years as their estimated duration. However, the projects duration extension were between 6 months (34%) and 1 year (54%). Thus, low level of network analysis application in the firms studied affects the project duration, all other resources being equal. Programme Evaluation Review Technique (PERT) is a planning and control tool used for defining and controlling the tasks necessary to complete a project [11].

TABLE 3
PROJECTS DURATION

Firms Freq.	%	Estimated Time (Yrs)	Time Already Spent (Yrs)	Expected closing time (Yrs)	Extension Time (Yr/mths)
14	11.0	4	3	1½	6 months
30	23.0	4	3½	1	6 months
70	54.0	4	3	2	1 year
15	12.0	3½	3	½	-
129	100.0				

Perceived benefits of applying network analysis to project management by the respondents were shown in Table 4. The mean value of respondents' perception of the benefits varies from 4.96 to 4.24. Thus, all the respondents have positive perception of the significance of network analysis in project management. However, the mean values show that all the perceived benefits were rated highly. Network analysis, assists in scheduling, monitoring and control of projects (4.96), network analysis identifies events signaling either the

beginning or ending of activities (4.95), network analysis identifies critical path to know the existence of slack time in any activity (4.93). Furthermore, network analysis identifies slack for efficient resources (4.91). It estimates time taken for completion of each activity if possible on crash basis, normal basis and worst-scenario basis (4.77). Others include identification of interdependence, if any, of activities (4.74), positive influence on time success when technical risk is high (4.74), serves as the core technique available for planning and controlling of projects (4.55), determines economics of crashing of activities (4.47) and identifies discrete activities and sub-activities (4.24). One of the advantages that result from using network analysis is the establishing realistic construction project duration(s) and controlling documents, manage, and monitor job site progress [12].

TABLE 4
PERCEIVED BENEFITS OF APPLYING NETWORK ANALYSIS TO PROJECT MANAGEMENT

Perceived benefits	Mean	Std. Deviation
Network analysis: assists in scheduling, monitoring, and control of projects	4.96	.194
identifies events signaling either the beginning or ending of activities	4.95	.227
identifies critical path to know the existence of slack time in any activity	4.93	.256
identifies slack for efficient resource allocation	4.91	.317
estimates time taken for completion of each activity if possible on crash basis, normal basis and worst-scenario basis	4.77	.508
identifies interdependence, if any, of activities	4.74	.476
has positive influence on time success when technical risk is high	4.74	.523
serves as the core technique available for planning and controlling of projects	4.55	.625
determines economics of crashing of activities	4.47	.820
identifies discrete activities and sub-	4.24	.891

activities

4. CONCLUSION

Network analysis was designed to assist project managers plan complex project that have multiple inter-related tasks. There is no project either simple or complex, small, medium or large without any risk or changes during execution, monitoring and control. Project managers and project supervisors should apply network analysis to effect a change in any inputs such as technology, manpower, finance or materials during execution.

With the level of educational qualifications of the respondents as revealed in the study, the application of network analysis was very low. Therefore, the authors recommended that on the job Project Management Training (PMT) should be introduced to the project managers/project supervisors. This will assist them in acquiring in-depth knowledge and skills in project management tools and techniques and various aspects of project management. Lastly, it will enable them to become project management professionals.

References

- [1] A. K. Munns and B. F. Bjeirmi, "The role of project management in achieving project success," *International Journal of Project Management*, vol. 14, no. 2, pp 81-87, 1996. [https://notenolur.hi.is/...](https://notenolur.hi.is/) The role of project management in achieving.... (Accessed: 24 October, 2013).
- [2] N. Slack, S. Chambers and R. Johnson, "Operations Management," 6th edition, Pearson Educational Limited, England, 636 Pp, 2010.
- [3] K. Schwalbe, "Information Technology Project Management," 4th edition, Cengage Learning India Private Limited, New Delhi, 496 Pp, 2008.
- [4] K. K. Chitkara, "Construction Project Management, Planning, Scheduling and Controlling," Tata McGraw Hill Education Private Limited, New Delhi, 558 Pp, 2009.
- [5] Techopedia-project plan – Not dated. [www.techopedia.com/definition/24775/project plan](http://www.techopedia.com/definition/24775/project-plan) (Accessed: 24 August, 2013).
- [6] B. Patel, "Project Management: Financial Evaluation with Strategic Planning, Networking and Control." 2nd edition, VIKAS Publishing house PVT Limited, New Delhi, 761 Pp, 2008.
- [7] G. Enogholase, "Edo youths give Niger Delta Development Commission, (NDDC), ultimatum on abandoned projects", Report on abandoned Projects-iwatchLive. Blog.iwatchlive.org/2012/04/report-on-abandoned-projects/2012 (Accessed: 24 October, 2013).
- [8] O. Y. Balogun, "Senior Secondary Atlas, 2nd edition, Longman Nigeria Plc., Lagos, 161 Pp, 2005.
- [9] O. I. Olateju, I. A. Abdul-Azeez and S. A. Alamutu, "Project management in Nigeria Public Sector – An Empirical Study", *Australian Journal of Business and Management Research*", vol. 1, no. 8, pp. 01-07, 2011. www.ajmr.com/articlepdf/AJBMR-17-26i1n8a.1.pdf (Accessed: 24 October, 2013).
- [10] J. E. Beasley, "OR-Notes," Network analysis, not dated. [People brunel.ac.uk/---mastjjb/jeb/or/netanal.html](http://People.brunel.ac.uk/~mastjjb/jeb/or/netanal.html):5Pp. (Accessed: 21 August 2013).
- [11] S. Maserang, "Project Management: Tools & Techniques," MSIS 488: Systems Analysis & Design, Fall 2002. [www.ums.edu/-sauterv/analysis/488-fo2-papers/ProjMgmt.html](http://www.ums.edu/~sauterv/analysis/488-fo2-papers/ProjMgmt.html) (Accessed: 27 July, 2013).
- [12] United States Department of Veteram Affairs – Network analysis/critical Path Method. www.ctm.va.gov/consulting/cpm.asp (Accessed: 22 September, 2013).