

THE LEVEL OF AWARENESS AND USE OF ICT IN SUPPLY CHAIN MANAGEMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

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Abstract

There is a need to improve supply chain management in the Nigerian construction industry, in order to improve the contracting process, avoid rampant abandonment of projects, and subsequently to improve contractor's profit margins. Desk and field studies of a multi-national construction company and a paint manufacturer's ICT based procurement operations were conducted using questionnaires, in-depth interviews, and observation techniques. Results show the need for, and significance of, Information and Communication Technology (ICT) based homogenous standard mediums of exchanging information at all stages of construction procurement to maximize the advantage of synergy among procurement professionals. The depth of ICT experiences, in the case studies, show the flaws inherent in construction procurement exercises and the inter-dependant planning nature caused by low level of ICT mediums of communication. The ICT medium enhances the process of exchanging/sharing information through intranet/extranet/internet or enterprise resource planning (ERP) depending on the nature of information to be shared. The study serves as a potential tool for improving efficiency in the supply chain and in contractor's profit margins, and reduces rampant abandonment of buildings through the use of ICT.

Keywords: Nigeria; ICT; Supply Chain Management; Information Sharing; Intranet; Extranet; Internet.

Introduction

The Nigerian construction industry is characterised by several incomplete and abandoned major capital projects, mostly owned by the government agencies and public corporations alike. This is caused by a lack of continuity in government policy, poor strategic corporate plans, and inefficient use of ICT communication systems, especially at procurement planning stages. This menace was one of the priorities of President Obasanjo's democratically elected federal government of Nigeria in 1999. He established a commission of enquiry into failed contracts and abandoned projects nationwide. Of the major procurement routes, Design-Bid-Build (conventional) and Packaged Deal (Turnkey/Integrated) are preferred by both public corporations and private organisations respectively. According to Oyegoke (2004), these preferred routes allow for inter-relationships among interdependent task organizations. This enables them to establish links among themselves to form the project team: owner management, legal, and contractual parameters that guide their inter-relationships. The team's medium of exchange of information during procurement planning and execution stages becomes the most important item which determines success or failure of any procurement system.

The basic information shared is mainly drawings and other contract documents. This medium of exchange, in modern practice, is a network of computers within an office connected, by using Intranet or an Internet, to other organizations located elsewhere. Procurement information can only be shared efficiently if data generated is both in transferable and in an understandable format, also the organizations involved in the supply chain must be willing to share critical and confidential information. For data to be transferable, a standard must be agreed upon either by the supply chain members or by key industry leaders, in this case the construction industry professionals or bodies.

The aim of the paper is to examine the effect of poor use of ICT among stakeholders in the Nigerian construction industry

Research Objectives:

- To identify mediums and standards used in the production of procurement inputs, the information constraints, with a view to adapting a supply chain management standard format.
- To identify and study the contribution of low level use of ICT in the construction industry with regards to contractor profitability and the frequent abandonment of capital projects in Nigeria between 1980 and 2007, during which about 65% of respondents did not use the medium

Literature Review

Procurement Planning

A key part of planning any project is to consider the best method for procuring the goods and services required for its delivery. Makarand and Sya (2005) observed that a construction project will require the followings:

- Technical services for surveys,
- Design (Architecture and Engineering),
- Cost consultancy, and
- Other essential construction services for the supply of materials, etc to carry out construction work on site.

Effective procurement systems thus require a strategy for sourcing both technical and construction services, and its implementation, so that all the services required for the project are identified.

To manage project information from a diverse number of firms and construction work activities, Oyegoke (2004), agreed that procurement strategies are used as a contractual framework to manage/coordinate inter-firm activities. Construction procurement can be classified as integrated or fragmented depending on the nature of the contractual and functional relationships that exist among the players. The design and build route is referred to as integrated because it allows for a single point of responsibility for design and construction. The contracting processes of design-bid-build, otherwise known as traditional method, and management routes allow for separate responsibility and risk between the players, thus are referred to as fragmented. According to Bresnen and Marshall (2002), vertical integration will diminish; as it relates to traditional procurement planning where design teams (namely, Architects, Structural and Services

Engineers, and Quantity Surveyors) exchange information in successive order. While horizontal integration, often achieved by alliances and partnership, will flourish.

Yeo and Ning (2002) stated that efficient supply chain mechanisms are pivoted by three components, namely:

- Information system management,
- Strategic material management, and
- Managing supply chain relationships.

These mechanisms include mainly: real time information sharing, coordinated procurement processes in the whole chain, and collaborative attitudes among all of the chain members.

Kashiwagi and Byfield (2002) observed that construction professionals have been struggling to reduce bureaucracy associated with the administration of design and construction, increase staff productivity, and increase the value of construction procured for the tax payer. The challenges, therefore, were to lower management costs using a device called Performance Information Procurement System (PIPS), an information procurement system with an artificial intelligence (AI) processor, to minimize subjectivity and make the selections. Naim and Barlow (2003) quoted Barlow (1998, 1999) that while house builders were making efforts to re-organize their supplier relationships, many of the key features of lean characteristics have barely penetrated the industry. Naim and Barlow (2003) further observed the perception amongst the house builders that the logistics of house building make it hard to organize just-in-time delivery of materials and its impact on profitability was unclear. Also, that the transfer of risk down the production chain to subcontractors reduced the incentive to introduce leaner supply models for house building, while the house builders tended to rely on subcontractors to act to reduce waste. Lloyd, et al. (2001) and Wong (2001) postulated that the project information management system (PIMS) provides greater collaboration and improved communication on major construction works. The duo stated that a specialist could be outsourced from an independent application service provider (ASP) in order to achieve cost-savings and allow the construction companies to focus on their core business areas. An IT management system enables effective coordination and improves cooperation among the players.

Research methods

Desk and field studies were conducted of a multi-national construction company and a paint manufacturer's ICT based procurement operations using questionnaires, in-depth interviews, and observation techniques, subsequent upon the general respondents of the 50 stakeholders. The targeted population were professionals in the construction industry namely clients, consultants, contractors, subcontractors, building material manufacturers, and construction academia. The sample size of 50 well established respondents though seemingly small is a true representation of the particular population of the industry based on the local factors, and nature and complexity of construction within Abuja, the base of the research. The main focus is the measurement of levels of adaptation of the ICT medium of exchange in construction procurement input/information among the respondents. The major procurement routes adopted are traditional/conventional, Design and Build (with outsourced consultants), and Design and Build (with in-house professionals): Management Contracting: Agency Construction Management: and At-risk Construction Management systems, respectively.

The assessment of the effects of inefficiencies in the routes was based on the practices as follows: the level of transparency, ICT usage, and introduction of internet environment as a tool for all factors and chain members. The problems identified and information gathered in the

questionnaires prompted the need for two case studies that were carried out on very experienced stakeholders. The case studies involve a construction company (Julius Berger Nig. Plc) and a building material manufacturing company (Berger Paints Nigeria Plc).

Results of the questionnaire survey show the following:

- i The need to shortening information interchange protocols, to make the supply chain more efficient with respect to ICT.
- ii The need to create stakeholders' awareness, in essence to continue professional development through conferences, workshops, and seminars to develop expertise in the use of ICT based supply chain management in the Nigerian construction industry.
- iii The need to standardize the development and use of common software that can be used by all chain members.
- iv The use of internet as an efficient medium as in the exchange of procurement information in the manufacturing sector and could be adapted in project procurement planning.
- v. The ICT based procurement route should be modelled to include all the relevant construction professionals.

Case studies

*Cases study No 1: Julius Berger Nigeria Plc (www.julius-berger.com)
Company's brief supplied the following information*

In 1890, Julius Berger incorporated his construction company, named after himself, in Germany and came to Nigeria in 1965. Julius Berger AG's first contract in Nigeria was the construction of the Eko Bridge, Lagos, in August 1965.

The Company, which meets international standards and is certified to implement and maintain Quality Systems to international standard organization (ISO) 9001, operates independently its own quarries, mixing plants, repair and recondition workshops, source basic materials which are obtained from its Abuja Headquarters or from their subsidiaries and sister organizations. Julius Berger's reputation is based on its capability to plan, design, construct and maintain a variety of civil engineering and building projects. The company offers innovative and cost effective solutions to clients, including conceptual ideas, engineering design, procurement, construction, and long term maintenance. Also, they aim at the followings: to sustain their reputation for extremely short construction schedules and quality performance in accordance with international standards achieved by a continuously trained and skilled Nigerian workforce, and a fleet of modern construction and marine equipment; executing work based on partnership with communities, clients, suppliers, and individuals.

Use of ICT based supply chain in construction procurement

The survey and extensive interviews with the construction company officials show that, the company has a very versatile and effective supply chain based on the concept of intranet whereby all the activities of each respective division maintain an online intranet communication for all their sites, the division head, the inter division, the main head office both in Nigerian and in their Germany Head office. Electronic data interchange is adopted for use among all the company's subsidiaries both locally and internationally for ordering, tracking, and delivery of their basic construction material inputs.

The system adopted here is intranet, while the internet is open to the public to view the company's corporate profile showing their services, capability, the past jobs, etc. This system is

adaptable to all construction supply chain members and other authorized persons' requiring access to any specific project.

Inherent advantages

The company has a very big network of work stations/site establishments or cost operating centres. Each centre has its own supply chain network and sub-networks. Ordinarily, effective management of all these chain links would attract higher over-head costs to cope with all the resources involved, both human and material. To overcome this, Julius Berger introduced an efficient intranet (for internal) and internet (for external) interrelationship among the supply chain members. The system operates as a typical computer network within a site set up where information saved on one computer desktop could be accessed from another desktop, possibly from another office within the site. This network is used to send routine reports, access head office stock and inventory, data, etc. The company uses internet dishes/antennae to provide internet servers facilities to the information communication devices.

However, it is worth noting that having information displayed on the internet does not make it mandatory to require internet connection in one's office. It could be established and managed by others on retainer basis, except that for the owner to access, send, or operate with data there must be internet access from any point. The intranet could be linked to that of their allied or/and vice versa, regular suppliers, subcontractors, consultants, etc with the arrangement.

Case study No 2: Berger Paints Nigeria Plc (www.bergerpaints.com)

Company's brief supplied the following information

Berger Paints Nigeria Plc started from a background of a quality paint manufacturing company incorporated on 9th January 1959 as British Paints (West Africa) Limited. It commenced business on 15th March 1961 by importing paints from its Newcastle Headquarters of British Paints in the United Kingdom. During this period, distribution of imported paints by the company, in Nigeria, was done through the outlets of Patterson Zochonis (PZ) and Brossette, mainly because of their strong distribution network across the country. Local market for paints was gradually developed and this built up the confidence of the expatriate owners to venture into paint manufacturing after critically looking into the potential of Nigerian market.

With the acquisition of 6.5 acres of property and construction of a small factory, as well as employment of forty Nigerians plus five expatriates, local paint manufacturing commenced in March 1962 at the premises of British Paints (West Africa) on Oba Akran Avenue, Ikeja – Lagos, Nigeria.

Use of supply chain

The company maintained a high level of quality and adopted a high level information database. It shares information among all its depots and nationwide offices using most recent Enterprise Resource Planning (ERP) software called Sage Line 5. The software enables instantaneous monitoring of stock, sales, product movement, as well as automatically and simultaneously access from all their depots and the head office located in Lagos.

The same software is capable of sharing construction project information simultaneously among all the chain members with an access code for protection and confidentiality. The various depots and outlets are given passwords to input sales details such as bank deposit slips, amounts deposited, and the volume of sales paid for, name of the customers and sales person/depot, etc. However, the access to some other classified information is restricted to higher levels of officers for prevention of fraud, security and confidentiality purposes.

Inherent Advantages

The software used by this company is an enterprises resource planning (ERP) software called Sage Line 5. It is accounting software capable of operating data base inputs with certain restrictions. It is operated based on an internet environment; here the software must be installed on computer that is connected online to an internet service provider. Berger paints operates several depots and its sale outlets are all linked to the head office via the internet. At each cost centre or depot the computer operator can view the inventory level of stock in both other depots and head office/factory anytime.

The depots make requisition for stock, lodge payment of money received from customers with such details as the bank name, teller no, amount paid, paid by which customer/distributor, specific product and quantity, etc. The depot operators have their own access code to log-on to the network, which is limited. Restricted zones could be accessed in the network, such as confidential financial data, transfer, etc. Such classified data may be coded strictly for the top echelons of management. The system makes fraudulent practices very difficult if not impossible. Notably this network is linked to their major distributors' and allied supplier chains network, with restrictions and vice – versa.

The Challenges

Inclement weather or fault from internet providers may render the network inaccessible at an urgent time, rendering the whole related work force redundant. Although, the software might be relatively expensive for a small firm, several firms could share the overhead cost. It is difficult to use where there is no provision made for computer on site, and where there is no power supply to power both the system and the air conditioned office from where it could be used.

Research Questions

- Can ICT be used as a medium of sharing information, simultaneously around the world by construction professionals and stakeholders?

Research results

- Today's construction clients' taste and demands are increasingly selective, thereby challenging the efficiency and profitability of today's construction business.
- Construction products have become more complex and competitive in terms of alternative or substitute component materials, which depend upon an increasing range of technologies and competencies to enhance a specific choice.
- The viability of the vertically integrated corporation and the sustainability of the inter-relationship among the horizontally integrated companies are called into question.

Discussion and conclusions

The awareness about the use of ICT based supply chain management to construction businesses is minute and where it exists, mostly among manufacturing sub-sectors of the industry, it is perceived as a very expensive and laborious concept. Procurement of project information/input among the construction chain members are mostly carried out using manual or hard copy/paper formats as the medium of exchange.

The software adopted by respective professional chain members and stakeholders are all different. There is little knowledge in the use of each other's relevant software. This result is a lack of homogenous software that could, presently, be adopted among chain members for sharing all the construction information/inputs, as such there is currently no standardized medium. All the professional chain members are usually not simultaneously involved at early stages, consequently their inputs are belated preventing their worthwhile contributions.

Key Lessons Learned:

- The use of ICT in the management of interrelationships and interdependence on each others' information/input among the procurement chain members proves vital in this research.
- Considering the fact that 65% of respondents do not use electronic medium to exchange information among each other shows a very poor level of ICT use in construction industry in Nigeria.
- The construction costs in Nigeria could be greatly reduced if the economic time lost during procurement planning stages due to these inefficiencies, is eliminated.
- The level of abandoned and collapsing of construction structures that litter Nigeria are becoming more rampant, but ICT could help end these failed projects.

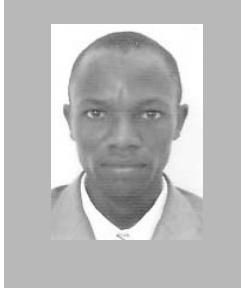
References

- Berger Paints Nigeria Plc. (2006) Cases study No 2. Production and Distribution Planning, www.bergerpaints.com.
- Bresnen and Marshall (2000) Bresnen, M and Maarshall, N (2002). Partnering in construction: a critical review of issue problems and dilemmas, construction management and economics, Volume 18, pages 229-237.
- Julius Berger Nigeria Plc. (2006) Cases study No 1, *Operation and procurement strategy*, www.julius-berger.com.
- Kashiwagi, D.T and Byfield, R. (2002) *Testing of minimization of subjectivity in best value procurement by using Artificial intelligence systems I state of Utah Procurement intelligence systems in state of the Utah Procurement, Journal of construction engineering and management*, Nov/Dec. 2002ed. PP 496 –502.
- Lloyd, R.H., Boughton, G.S and Siu, K.C. (2001) *A project information management system, providing greater collaboration and improved communications on major construction works, proceeding of 2001 International conference on construction in Hong Kong*, pages 484- 495.
- Makarand, H. and Sya, M.(2005) *"Building process optimization with supply chain management in the manufactured housing industry"* haskake@eco.purdue.edu and syalm@egr.mus.edu.
- Naim, M and Barlow, T. (2003) *"An innovative supply chain strategy for customized housing, Journal of Construction Management and Economic*, Vol. 21 September, 2003 ed., PP 593 – 602.

Oyegoke, A.S. (2004) The importance of management systems over points of responsibilities in construction procurement, *The Quantity Surveyor: Journal of the Nigerian Institute of Quantity Surveyors* Vol. 48 ISSN: 116 –915 X, July–September, 2004, PP 18-19, 22–23.

Yeo, K.T. and Ning, J.H. (2002) Supply chain management and construction procurement, *International Journal of Project Management*, vol., 20, pages 253-262.

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