Impact of Information Management System on Service Quality of Construction Firms in Nigeria

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ABSTRACT
Information management system has been defined as a computer management technique that integrates all processes and data of the business. Hence, information and computer technology represents a paradigm shift with respect to transfer and management of information; this shift has devilled the construction industry with great difficulties in sharing information among its participants. Therefore, the study assesses the effect of information technology on the quality of service and provides implementation guide for construction firms. The study evaluates the adoption of information technology strategy by construction firms in Nigeria with a view to assess the relationship between information management system and quality of service rendered by Nigerian construction firms. The study adopted questionnaire survey on the population of contracting firms operating in Lagos and Federal Capital, Abuja under the umbrella of Federation of Construction Industry (FOCI). The questionnaire was structured on the rubric of the strategies of information management system in-use and the effects of information management system on the service delivery of construction firms using simple random sampling techniques. The questionnaires were analyzed using both descriptive and inferential statistical tools. The study revealed the effects of information management on service delivery are fast job/service and enhancement of financial returns to the firms and also recommends that integrated information device should be adopted in managing information.

Keywords: *Information management, information technology, service delivery, construction firms*

1.0 INTRODUCTION

Rivard (2000) noted that computers have revolutionised the way documents are generated. Similarly, information technology has revolutionised the way people exchange information and documents. The study defined Information technology (IT) as "the use of electronic machines

and programs for the processing, storage, transfer and presentation of information". IT encompasses many technologies such as computers, software, networks and even telephones and fax machines. The purpose of IT is to facilitate the exchange and management of information and has a lot of potentials for the information process component of the construction industry.

Also, Lee, Strong, Kahn and Wang (2002) buttressed this assertion that Information technology (IT) has become a critical concern of organizations and an active area of Management research. The study noted that the growth of data warehouses and the direct access of information from various sources by managers and information users have increased the need for, and awareness of high quality information in organizations.

In the context of the construction industry, Zeng Lou and Vivan (2007) defined information management system as a computer-based business management system that integrates all processes and data of the business, including engineering/design, planning, procurement, construction and maintenance/operations. As such, the level of integration has been seen as the primary goal of construction organisation systems. The study used the term Construction Enterprise Information System (CEIS) to denote any type of information management system that is aimed to fulfil seamless system integration in construction firms.

Furthermore, Tatari (2009) supported this view that increased system integration resulting from information technology implementation is expected to lead to numerous benefits. These benefits encompass information technology infrastructure as well as strategic, operational, organisational, and managerial aspects of the firm. Therefore by adopting IT, firms seek tangible and intangible benefits such as cost reduction, improved productivity, enhanced efficiency, and business growth. However, with the challenge of integrating various business functions within the firm, certain factors become critical for achieving higher levels of integration.

A survey undertaken by Tau and Foo (1999) on IT assessment identified six categories commonly employed in MIS. Over the last decade, information quality research activities have increased significantly to meet the needs of organizations attempting to measure and improve the quality of information.

In construction industry, service quality has been rated regularly as a top concern in data warehousing projects (Tau and Foo, 1999). Despite a decade of research and practice, only piece-meal, ad hoc techniques are available for measuring, analysing, and improving service quality in organisations. As a result, organizations are unable to develop comprehensive measures of the quality of their service and to benchmark their efforts against that of other competitors in the business market.

The aim of the study is to evaluate the adoption of information technology strategy by construction firms in Nigeria while the specific objective is to identify and assess the strategy of information management system in-use in Nigerian construction industry,

2.0 LITERATURE REVIEW

2.1 Information Management in Construction Industry

Tatari (2009) noted that the construction industry is unique in its work environment and the distributed nature of stakeholders. Although it shares many similarities with the manufacturing industry with regards to production processes and systems, its output is usually one-of-a-kind, prototype-like products. Also, the construction industry is centred on project-based operations

that are carried out by many different parties which may be geographically dispersed. As diverse organizational entities, each of the project participants has different goals to accomplish in the project.

Furthermore, Helms (2003) noted that the success of information management system in manufacturing enterprises resulted in its adoption by some large construction companies. Yet, because of the differences in manufacturing and construction processes, information management system adoption in these companies was restricted to the integration of financial management processes only; while the amount of information and its time-sensitiveness in the construction industry renders many management challenges.

Zeng *et al* (2000) noted that there are numbers of definitions on information. For example, Checkland and Howlell (1998) suggested that information could be defined as some data selected for a specific purpose. Information about a construction project quality is communicated to whoever needs it, whenever they need it, in whatever form they need it so that they meet their objectives for quality management and improvement (Ndekugri and McCaffer, 1988). It has been stated that quality information management is concerned with communication and covers its acquisition, generation, preparation, organization and dissemination, evaluation and management of information resources (Jaggar *et al.*, 2001). Although, many researchers have studied the characteristics of information management and the coordination form within an organization (Austin *et al.*, 1994; Barua and Ravindran, 1996). Information management are typically characterized by evaluating the number of messages and information processing activities that occur in firms. Thus, the uncertainty and equivocality of information result in the complexity of research on information system (Jehiel, 1999).

2.2 Information Management in Construction Organisation

As ERP systems become more widely implemented, software applications are developed to help business managers implement ERP in diverse business activities such as project planning and management, subcontracting, material tracking, service, finance and human resources. Currently, SAP™ and Oracle™ offer C-ERP solutions. The functionality of C-ERP covers the entire construction project lifecycle. The scope of C-ERP systems is depicted in Figure 2.1, and the implications for the project lifecycle are described below.

(i) Project bidding and marketing: C-ERP automates the procedure of proposal preparation, bidding and reviewing bids, marketing campaign management, customer databases and competitor analysis.

(ii) Project planning: C-ERP automates activities related to cost estimation, project budgeting, activity and resource planning, and detailed scheduling. All
of these are realized in single software, which eliminates duplicate data entrance, especially between preliminary estimation and detailed planning.

(iii) Design and engineering: With C-ERP, preparation of detailed specifications and requirements are automated. C-ERP maintains all specifications and drawings with the aid of its document management system. CAD integration is realised to avoid duplicate generation of drawings and specifications during the project life cycle; and collaboration tools are used to facilitate them communication needs of project participants.

(iv) Procurement: C-ERP streamlines procurement of required materials, equipment and services. It automates the processes of identifying potential suppliers, supplier evaluation, price negotiation, contract management, awarding purchase orders to the supplier, and supplier billing.

Supply chain management of materials is managed through this function. It also automates maintenance scheduling and service operations data for more efficient
equipment management.

(v) Construction project control: Through integrated information visibility from other functions, many challenges of project execution are eliminated for the project manager. Also, project billing and project costing is integrated in real-time, which allow the main office to keep track of projects. C-ERP also automates the change order management which is a seriously time consuming activity during project execution.

(vi) Workforce management: C-ERP handles employee and payroll related activities of the construction firm. Complete employee database is maintained including contact information, salary details, attendance, performance evaluation and promotion of all employees. Also, this function is integrated with the knowledge management system to optimally utilise the expertise of all employees within the firm.

(vii) Finance and accounting: As one of its core functions, C-ERP streamlines financial operations of the enterprise as well as the projects, collects financial data from all departments, and generates all financial reports, such as balance sheets, general ledger, accounts payable, accounts receivable, and quarterly financial statements.

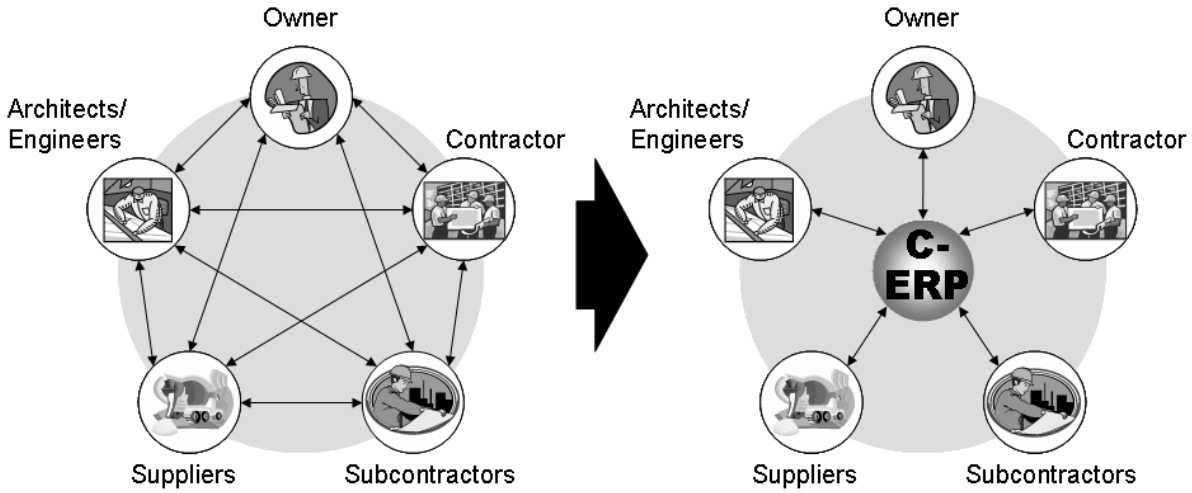

Figure 2.1 Streamlining Corporate and Project Communications with C-ERP
Source: Tatari (2009)

With C-ERP, it is possible to share and exchange information in digital format throughout the project life cycle. Thus, information is stored only once and all project participants are able to access this information in real-time. Data integration can be realized through a centralized database system in the core of C-ERP. All data is entered only once, and is visible throughout the entire project lifecycle. Process integration is realized by utilizing a single integrated information system for the whole project life cycle, instead of using several stand-alone applications. By streamlining and connecting all business functions, business processes can be executed without interruption. Lastly, linking project participants is made possible by online access to project information by all participants. Participants can view project information with varying levels of access authorization, and enter or revise information related to the functions they are responsible from.

2.3 Information System and Service Quality

Tau and Foo (1999) noted that many studies have concluded that quality service has quantifiable impact on customer retention; market share and profitability in the commercial world while Landrum *et al* (2009) opined that as the importance and size of the service sector of the global economy grows, the quality of services and innovation are becoming increasingly important. Services are distributed regionally, nationally, and globally and are increasingly becoming a larger portion of many organisations' revenue streams; knowledge intensive business services aimed at enhancing performance require reliable methods of measurement, assessment, and improvement. With the aim of sustaining long term relationships with their customers, many businesses have changed their strategic focus to emphasize customer retention (Peng and Wang, 2006). Preserving this long-term customer relationships requires that these businesses both measure and appropriately adjust the quality of their service.

Service quality is a major influence on customer satisfaction as customers buy products or services and on whether they continue to do so. As a result, accurate and reliable instruments that assess service quality are of interest to companies whose revenues come in whole or part from service delivery. Currently the most popular and ubiquitous service quality instrument is SERVQUAL.SERVQUAL is based on the proposition that service quality can be measured as the gap between the service that customers expect and the performance they perceive to have received. Respondents rate their expectations of service from an excellent organization, and then rate the performance they perceive they received from a specific organization. Service quality is calculated as the difference in the two scores where better service quality results in a smaller gap (Landrum, Prybutok, Kappelman and Zhang, 2008). Although service quality can be evaluated and measured using SERVQUAL, which measures seven service quality dimensions, it also can be measured by its SERVPERF subset, which employs a performance only approach with five dimensions of customers' perceptions of service provider performance.

2.4 Quality Improvement in Construction

Zeng *et al* (2000) were of the opinion that the construction industry has always been bedevilled with great difficulties in sharing information among its participants. Although many construction firms have claimed to be ISO 9000-certified, there is still missing an effective channel of information flow for quality management. There are information asymmetries in quality management from internal and external organizations. Internally, information asymmetry exists between contractor, subcontractors and suppliers; and externally, there is no information sharing mechanism between project departments; information feedback is more difficult than information transferring in a construction firm.

Albino *et al.*, (2002) noted that it is almost a commonplace to describe the current business environmental setting as turbulent. The marketplace has become more global and service oriented and clients' tastes have become more demanding and sophisticated. Under this circumstance, many firms have found it is increasing difficulties to compete. Hence, it is necessary to look for ways to improve quality and productivity in order to enhance their competitive edges (Tan *et al.*, 2003).

3.0 Research methodology

The study adopted questionnaire survey on the targeted population of indigenous contractors operating in Lagos State and Federal Capital, Abuja; being the commercial nerve in terms of construction firm's location and project activities.Data collected for this study were obtained

from structured questionnaire designed on the basis of research questions to gather primary data from the respondents. This questionnaires was structured on the rubric of each of the research question and were administered on the respondents by the researcher.
The study adopted both descriptive and inferential statistical tools. The descriptive statistics include the use of tables, percentages and frequency. The inferential statistics entails mean scores, relative importance index and ANOVA analysis. The firms involved in the survey have been classified into three groups small, medium and high based on the frequency of the firm as a measure of size. Results were obtained from the data generated through the structured questionnaires that were administered from the research work. 80 questionnaires were distributed while 48 were completed and returned, representing 60% of response rate.

4.0 DATA PRESENTATION AND ANALYSIS

Table: 4.1 Size of firm / Organisation

Size of firm / organization	Frequency	Percentage %
Small	17	35.40
Medium	15	31.30
Large	16	33.30
Total	48	100.00

The Table 4.1 above reveals the size of organisation in which each respondent were working, where 35.40% represent those respondents that were operating in a small firm, 31.30% medium firm and 33.30% of large firm. This implies that larger percentage of respondents that administered the questionnaires was operating under small organisation.

Table: 4.2. Nature of project undertaken

Nature of projects	**Frequency**	**Percentage %**
Building works (Construction of new works)	2	4.20
Building work refurbishment	12	25.00
Civil engineering works (Road construction)	1	2.10
Building, civil engineering and Heavy engineering works	13	27.10
Building and civil engineering works	18	37.10
civil and Heavy Engineering works	1	2.10
0thers specify	1	2.10
Total	48	100.00

The Table 4.2 above shows the nature of project undertaken by the respondent organisation whereby 37.10% represent Building and Civil engineering works being undertaken by that firm, 27.10% is for Building, civil engineering and Heavy engineering work, 25.00 % represent Building work refurbishment works that the firm is handling, while the 4.20 %, 2.10%, 2.10 %

represent Building construction work(construction of new work), Civil and heavy engineering works, civil engineering works (Road construction) and others respectfully. This implies that in Building and civil engineering firm that has largest percentage (37.10 %) formed majority of respondent that gave necessary information in the questionnaire administered.

Table: 4.3 working experience of respondents

Year of experience	Frequency	Percentage %
1 - 10 years	30	62.50
11 - 15 years	10	20.80
16 - 20 years	7	14.60
21 - 25 years	0	0.00
26 - 30 years	1	2.10
Total	**48**	**100.00**
	Mean =	**9.35**

Table: 4.4 Strategy/policy of managing information

S/N	Category of information/ Strategy	Manual records keeping		Computer storage devices		Integrated devices	information
		Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**percentage**
A	**Project bidding & marketing**						
1	Marketing planning	2	4.2	20	41.7	26	54.2
2	Bid database	1	2.1	9	19.1	37	78.7
3	Proposal preparation	1	1.9	13	24.6	34	70.8
4	Project planning	4	8.3	4	8.3	40	83.3
5	Cost estimation	3	6.4	5	10.6	39	83.0
6	Project budgeting	2	4.2	27	50.9	19	41.7
7	Activity & resource planning	9	18.8	17	35.4	22	45.8
8	Risk management	8	16.7	4	8.3	36	75.0
9	Detail scheduling	5	10.9	6	13.0	35	76.1
10	Quantity take-off	9	19.1	3	6.4	35	74.5
	Total	**44**	**92.6%**	**108**	**218.3%**	**323**	**682.3%**
B	**Engineering &design**						
11	Document & drawings management	4	8.5	15	31.9	28	59.6
12	Specification; manual documents development	7	15.6	11	24.4	27	60.0
13	CAD integration	3	6.5	8	17.4	35	76.1
14	Constructability review	7	14.9	5	10.6	35	74.5
15	Collaboration	6	12.5	4	8.3	38	79.2
	Total	**27**	**58%**	**43**	**92.6%**	**163**	**349.4%**
C	**Procurement**						
16	Resource management	3	6.4	2	4.3	42	89.4
17	Request for quotation & award	3	6.4	3	6.4	41	87.2
18	Sub-contracting & purchase order	4	8.3	2	4.2	42	87.5
19	Equipment management	4	8.3	3	6.8	41	85.4
20	Equipment maintenance	6	13.0	1	2.2	39	84.8
21	Material management	7	14.9	2	4.3	38	80.9

	Total	**27**	**57.3%**	**12**	**28.2%**	**243**	**428%**
D	**Construction project control**						
22	Site management	8	16.7	3	6.3	37	77.1
23	Claims/change management	7	14.6	4	8.3	37	77.1
24	Quality management	5	10.9	5	10.9	37	78.3
25	Construction operation & execution plan	5	10.4	2	4.2	41	85.4
25	Project billing & costing	6	12.8	1	2.1	30	63.8
27	Change order management	6	12.5	4	8.3	38	79.2
	Total	**37**	**77.9%**	**19**	**40.1%**	**220**	**460.9%**
E	**Closing & operation**						
28	Commissioning	6	12.8	3	6.4	38	80.9
29	Hand over	20	42.5	13	27.6	15	31.9
30	Maintenance & operation	27	57.4	16	34.1	4	8.5
31	Service operation	16	30.0	13	27.1	29	60.4
	Total	**69**	**142.7%**	**45**	**95.2%**	**86**	**181.7%**

Table 4.4 reveals the policy/strategy that an organizations or firms adopt in managing their information system. It includes the categories of information management right from the project bidding stage to closing and operation stage. The group of the categories was (a) project bidding and marketing, (b) engineering and design (c) procurement (d) construction project control and (e) closing and operation.

(a) Under project bidding and marketing it has ten items of information(shown with their frequency and percentage) which were either managed neither by manually records keeping nor computer storage device or integrated of both devices and method. It shows that under project bidding and marketing 682.30% of respondent were making used of integrated information devices, 218.30% were using Computer storage devices in managing their information and 96.20% of the respondent were making use of manual record keeping. This indicated that integrated information devices were often used in managing the information at the Project Bidding Stage.

(b) Engineering and design contains (b) five items (shown with their frequency and percentage): Document and drawings management has 8.50%, 39.10% & 59.60% level of information management system through the adoption method of manually record keeping, computer storage device and integrated device respectively. Likewise, Specification manual document development (15.60%, 24.40 and 60.00%), CAD integration (6.50%, 17.50% and 76.50%), Constructability review (14.90%, 10.60%, and 75.40%) and Collaboration with (12.50 %, 8.30% and 8.30%). These imply that integrated information device is still adopted under engineering design.

(c) Procurement: - this contains six items which includes: Resource management (6.45%, 4.30% and 89.40%), Request for quotation and award (6.40%,6.40% and 87.40%), Sub-contracting and Purchasing order (8.30% 4.30% and 87.50%), Equipment management (83.40% 6.80% and 85.40%), Equipment maintenance (13.20%, 2.20% and 84.8%) and Materials management (14.90%, 4.30% and 80.90%). This item are associated with the procurement and shows the total accumulated percentage of 187.60% of respondents that agreed that integrated information device is commonly used at the procurement stage of the contract in managing their information system.

(d) Construction project control:- These also contained six item with their corresponding percentage of information management strategy/policy ranging from Site management(16.40%, 6.30%, and 77.10%), Claim/change management (14.60%, 8.30%, and 77.1%), Quality management (10.90%, 10.90% and 78.30%) ,Construction operation and execution plan (10.40%, 4.20% and 85.50%), Project billing and costing (12.80%, 2.1% and 63.8%), and change order management (12.50%, 8.30%, and 97.20%)

(e) Closing & operation:- This contains four items which includes Commissioning (12.80%, 6.40% and 80.90%), Hand over (42.50%, 27.20% and 31.90%), Maintenance operation(57.40%, 34.10% and 8.10%) and Service operation (30.00%, 27.10% and 60.40%).

The result indicates that all the respondent was of the general view that integrated information device were majorly adopted with the leading total cumulative percentage of 2102.30% from all the categories of information management. The Computer storage device was second in the order by having total cumulative percentage of 474.40% as percentage of response, while the manually record keeping have the least cumulative percentage value of 428.50% as least in the method of information management policy usually adopted in their various organizations/firms.

Findings

The research work assessed the level of impact of information management system on service quality of construction firm in Nigeria. The finding includes the reveal of demography of respondent which provide valid source of information of respondent, reveal of the adoption policy on information management system in a various construction firms by concluding that an integrated information devices are the most commonly method usually adopted in keeping records of information with the highest cumulative frequency of 2102.3% with the ranking rate of 1st while the least is manually record keeping with 428.5% cumulative frequency as well.

It was also discovered that Fasted job/service and Enhancement of financial returns to the firm and service provider are the top leading significant level of information management among the investigated organization in the Nigeria construction industries.

Conclusion and Recommendations

Based on the analysis made from the field survey; it is evident that all of the respondents surveyed were from private organizational sector while larger percentage of respondents that administered the questionnaires operated under small-scale contracting organization. The study also shows that Building and civil engineering firm that has largest percentage among the construction firms surveyed. The study revealed that the effects of information management on service delivery are faster job/service and enhancement of financial returns to the firms while integrated information device were majorly adopted and the manually record keeping was the least among the categories of information management. Therefore the study concluded that integrated information device should be adopted in managing information.

The use of integrated information device should be encourage as it is generally accepted by majority of construction professional in keeping all items of categories of information such as project bidding and marketing stage, Engineering and design stage, procuring stage, Construction stage as well as Closing and Operation stage so that real-time visibility of the project and organization could be archived on time and for the better reliability, dependability and accessibility archive data and information.

References

Albino, Pontrandlfo, P. & Scozzi, B. (2002), Analysis of information flows to enhance the coordination of production processes, *International Journal of Production Economics*, **75** (12), 7-19.

Cohen, L.; Manion, L. & Morrison, K. (2011). *Research methods in education*, Routledge, New York, 7th Edition.

Fok, L. Y. Fok, W. M. & Hartman, S. J. (2001), Exploring the relationship between quality management and information systems development, *Information & Management*, **38** (6), 335-371.

Lari, A. (2002), An integrated information system for quality management, *Business Process Management Journal*, **8** (2), 169-182.

Landrum, H.; Prybutok, V.; Zhang, X. & Peak, D. (2009) Measuring IS system service quality with SERVIQUAL: User's perceptions of relative importance of the five SERVPERF dimension, *International Journal of an Emerging Trade Discipline*, **12**, 1-19.

Lee, Y. W.; Strong, D. M.; Kahn, B. K. & Wang, R. Y. (2002) AIMQ: A methodology for information quality assessment, *Information & Management* **40**, 133-146.

Martinez, J. (2002), *Assessing quality, outcome and performance management*, Workshop on global health workforce strategy, organised by the Institute for Health Sector Development, London at Annecy, France, 9- 12 December.

McCabe, D; Rosenbaum, M. S & Yurchisin, J (2007). Perceived service quality and shopping motivations : A dynamic relationship, *Service Marketing Quarterly*, **29** (1), 1-21.

Phoya, S & Kikwasi, G (2008). *Continuing professional development (CPD) for quality services in the Tanzanian construction sector*, A paper delivered at the third built environment conference, Bellville, South Africa.

Polgar, S. & Thomas, S. A. (2013). *Introduction to research in the health sciences*, Churchill Livingstone, Elsevier Limited, 6th Edition, China.

Rezaei, A. R.; Celik, T. & Baalousha, Y. (2011), Performance measurement in a quality management system, *Scientia Iranica*, **18** (3), 743-752.

Rivard, H. (2000), *A survey on the impact of information technology on the Canadian architecture, engineering and construction industry*, Ed: Bjork, B., Available at http://alcor.concordian.ca/rivard/, Accessed on 9th of May, 2015.

Tam, C. M. (1999), Use of the internet to enhance construction communication: Total information transfer system, *International Journal of Project Management*, **17** (2), 107-111.