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EARLY VIEW

Information Technology as Catalyst for Value Re-Engineering Implementation in the Nigerian Construction Industry

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Abstract

Technological development has placed pressure on Construction Industry (CI). Reviewing its activities due to increase in a globally competitive market has manifested from the changing need of the construction environment in meeting customer satisfaction. These pose challenges to many construction industries in the developing countries to improve on the quality of the product produced in meeting the customer need. The study aims to examine the impact of Information Technology (IT) application on Value Re-engineering (VRE) implementation that gives rise to customer Value Addition (VA), through enhanced profitability performance and cost reduction for the CI to offer benefit for customers to achieve satisfaction. The subjectivist methodology was utilised to establish critical success factors in forty purposefully sampled building construction operators within Abuja using purposive sampling techniques. The result further revealed that quality design and Collaborative Working (CW) among the VRE practitioners help the customer to derive the benefit of waste reduction by achieving value-added perspective through the use of high technology that influences both design and construction operations for the project. Early dissemination of information and design adequacy reduces pressure on both materials and labour scarcity. Finally, there is a significant need for the construction process to be re-engineered through the utility of change enablers, and the introduction of assistive technologies like IT as drivers of VRE implementation on VA that give rise to customer-derived benefits.

Keywords

Value Re-engineering, Construction Industry, Information Technology, and Value Addition

1. INTRODUCTION

Globalization of Information Technology (IT) that transform customer's needs, choices, awareness, preference are all affected through the perceived value (Bashar and Sirong, 2018). Abdul-samad and Kulandaisamy (2022) reveals that most of the Value techniques around the globe are in a challenging state, especially in terms of IT application and implementation. Therefore, the concept of reengineering emphasis the radically rethinking and redesigning of the process

by which value is created for customers (Madane and Joshi, 2018). Construction Industry (CI) required Value Re-engineering (VRE) processes to improve the efficiency of their operations in meeting the customer's needs (Jibrin & Shakantu, 2021). The CI decides to improve its efficiency in gaining investments opportunity through the implements of IT (Bashar & Sirong, 2018). However, Alumbugu, Shakantu, and Tsado (2020) stress that efficient construction IT are of crucial importance for customer satisfaction in achieving VRE. Anand et al. (2013) equally advocated that to achieve higher efficiency in the CI, value of IT will be required.

Although the problem with the Nigerian Construction Industry (NCI) is that customers really get value for their products which results in failure, sometimes total collapse of the product. Adoption of VRE therefore, can be seen as a breakthrough that would overcome the challenges of dissatisfaction of the customers. Shakantu et al. (2022) posit that the adoption of VRE could result in a breakthrough solution in resolving the challenges of customer dissatisfaction in the industry, with the improvements on new techniques that will give customer satisfaction. Hence, the paper aim in looking at the influence of IT by the NCI and how it acts as a catalyst in VRE implementation in meeting the needs of the dissatisfied customers. IT plays a crucial role in VRE adoption in CI by identifying the mechanisms which add value to the customer (Harini and Widyarti, 2018). Emuze et al. (2014) opine that construction activities can impact project performance negatively in the form of cost and time overruns as a result of Non-Value Adding Activities (NVAAAs) that are prevalent. Egwunatum and Oboreh (2022) equally believed that good performance of IT application, especially in the area of time, cost, quality and safety is hinged on the rigidity and inflexibility of the adoption of modern management techniques like VRE, hence the need to understanding the relationship between IT and VRE in redesigning processes.

The CI, state of art IT is part of the reengineering effort, as an essential enabler that permits the CI to re-engineer their customer value needed. Ding et al. (2017) however, express that digital integration of IT application awareness for the CI, on projects delivery would resolve the challenging issues that would enhance customer value in the sector. However, after the global recession of the early 1980s, many construction industries across the world made attempts to rejuvenate their performances (Mlay, Zlotnikova and Watundu, 2013). Hence, the extent to which these reforms provided the changes needed, remained difficult to determine. Berawi (2013) emphasises that performing analysis functions to achieve the best value of a customer, is to define the functions required to achieve the target value that must be desired by the operators in the industry. Kembuan (2016) expresses that it is necessary to have a value so that the value of the cost of the project can be reduced without reducing the functionality and quality of the product.

Dramatic improvements and radical redesigns in the performance process in IT have led to a competitive market facing the CI today. Therefore, the influence of

IT on the CI has drastically changed over the past decade from supporting roles to building and shaping new strategies to uphold the value desired to achieve. Construction industries seek to be more agile in the developments of IT such that it can be implemented to produce better services to its customers. It is found that almost 46% of all capital investment in the US economy is being made in the improvement of organisational efficiency through IT (Anand, Wamba and Gnanzou, 2013).

Vast majority of construction industries seeking to get better construction value utilisation using IT, as IT continues to penetrate and impact the operational and management process of the construction industries. once this is achieved, it automatically changes the business value of IT and also increase its efficiencies simultaneously in the industry. Chandra (2014) believes that aspect of an improvement is through redesigning the processes which often results in the betterment of organisational structures, resulting in enhanced services and efficiency provided to the industries. Therefore, the industries should continuously redefine construction value using IT. Application of IT is clearly showing that IT is acting as a tool/catalyst for VRE implementation in the CI. Shakantu (2012) stated that change catalyst could be from a cost-related issue where 30 percent of construction costs goes to finance inefficiency and waste, and another catalyst of change is in the area of Health and Safety (H&S).

VRE implementation in construction activities became much easier with the integration of IT in the system (Puruhita, 2018). However, the main drivers of change that shift CI from tradition into project integration are the advent of the design-build concept, the development of the Building Information Modelling (BIM) concept, and the need to incorporate more value and less waste into construction projects known as a lean concept (Zahrizan et al., 2013; Soares, 2013). IT holds a key integral factor in developing data integration strategies in various construction operation systems and technology frameworks (Rahali et al., 2008).

According to Marlon et al. (2017), customer's satisfaction is the necessity of the VRE conditioned by the advanced dynamism of the contemporary world. After VRE implementation, the enterprise becomes the object of permanent transformations (Suzanne, 2018). Asif, Syful, & Khayer (2010) argue that to achieve VRE success, a fresh perspective and approach is required for the CI to develop and optimise the process of creating satisfied customers' needs. Ding et al. (2017) reiterate that VRE in construction-related activities and processes is by which the CI that exists today is retired and the optimal version of the new one is constructed to satisfy customers' needs.

“Value Reengineering (VRE) can be defined as the fundamental rethinking and radical redesign of construction processes to achieve dramatic improvements in critical, contemporary measures of performance, such as

cost, quality, health and safety, service, and speed in construction operations”(Jibrin, 2021).

2. REVIEW LITERATURE

2.1 Impact of Information Systems on CI

The introduction of software systems on CI activities will change people's perceptions as well as their behaviour, and when such systems are implemented in a networked structure, it will have a far-reaching impact on the fundamental behaviour of construction industries as shown in Figure 1.

Although the perceptions of the construction industries and the relationships between IT and industries may be different, depending on which model is used. Budiono & Loice (2012) state that the three metaphors for construction industries to achieve VRE implementation in construction firms are: machines, organisms, and processes, which represent three waves of industry theory. The first wave, to perceive an industry as a *machine*, suggests that IT can be seen as a controllable resource (the tool for management use) that is not part of the industry and is used to achieve certain objectives. The introduction of IT does not affect the organisational structure but only the relationship between management and workers. The second wave, when an industry is seen as an *organism*, regards IT as more integrated and less controllable, that is, IT is an element of the industry and also a determinant of organisational structure which cannot be predictable like a resource. The ownership of it is with the workers rather than the management. The third wave perceives an industry as a *process* and IT as a behavioural phenomenon. IT is managed by the users and determines the perceptions of human beings and thus affects their behaviour.

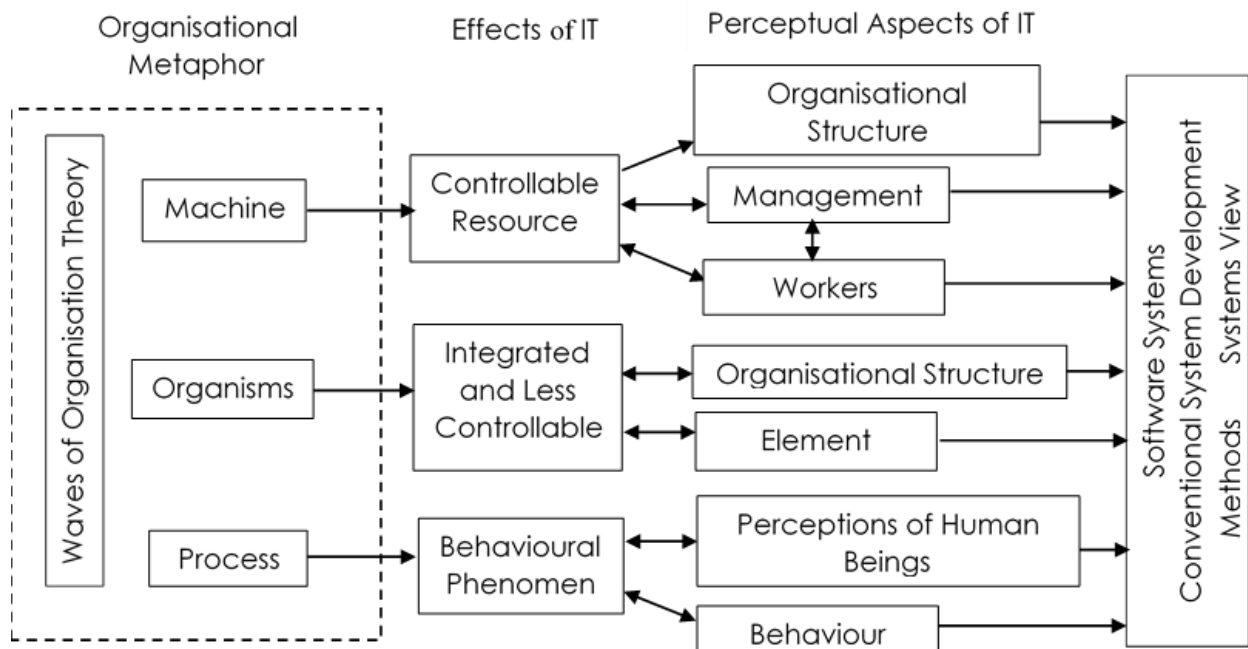


Figure 1: Impact of IT on construction industries

Conventional systems developed a method, as a reductionist approach, considering an industry as a machine, whose behaviour is merely determined by the behaviour of individuals within the industry. This tends to ignore the perceptual aspects of IT and concentrate only on its physical parts (i.e. the system itself) because it is hard to cope with abstract things such as the perception and interaction of human beings. Such methods are not suitable for the analysis of VRE because they only reflect the situations before and after the implementation of the systems, but do not emphasize the change of people's behaviour affected by it.

Thus, from a system view, an industry has more meaning as a whole than just as a sum of parts. One cannot find the characteristics of industry merely by identifying its components. Today the essential resource of industries is the skill and knowledge of people. Individual knowledge and technology are not only on their own but also part of the industry. Thus, the behaviour of industries can be regarded as a pattern of interactions between people. After the introduction of software systems into industries, the behaviour can further be understood as a pattern of interactions between people, between people and software systems, and between software applications.

Therefore, changes in the industry will have an impact on people's perception of the industry if analysing VRE, and one finds that people interact with each other within the process and are also influenced by that process. Today IT plays an important role in the CI because people use their systems to interact with others and the environment. Hence, any changes in IT may cause changes in organisational structure. Shakantu (2012) opines that key drivers of change might produce a high technology industry with systems, technology, people, products, and levels of performance that today's construction management cannot handle. He further reiterated that the winds of change is blowing over the industry, thus construction management faces challenges that are likely to be urgent, exciting, and risky but very rewarding.

2.2 IT Application as Drivers of VRE in the CI

During the VRE implementation process, IT plays a major role, and today without IT, VRE cannot work properly, since IT is one of the most important drivers of VRE. Madane and Joshi (2018) argue that drivers of change require innovation in the composition and functionality of IT products used in VRE adoption in the CI. However, this doesn't mean that using IT alone can be as useful as VRE. Nelson et al. (2014) express that IT is the principal driver that distinguishes factors between process reengineering and automation of the tasks and functions. IT is the base

of the methodology for redesigning and even evaluating the processes (Demirkesen and Ozorhon, 2017). IT systems used at the CI level are mainly related to construction programming, data processing on construction finances, procurements processes, design integration, communication strategies, and investments decisions (Abanda et al., 2013; Mark & Mordechai, 2011).

Yahuza (2012) and Huzaimi et al. (2016) express that IT systems deployed at the construction industry level include geographical information systems, expert systems, inter-organisational information sharing, and communication systems. Other areas of IT systems application at the project site level shown in Table 1 include those that encompass project or site planning, scheduling, cost-benefit, project management, construction methods, and human resource management (Ozorhon et al., 2010). Adriaanse et al. (2010) argue that areas of IT in construction include web-based tendering processes and web-based construction monitoring. Ting et al. (2007); Chen et al. (2016) however emphasis IT application on e-procurement processes while Crotty (2012) reiterates IT application on Building Information Modelling (BIM). Parka and Ryoo (2013) express that the deployment of IT at industry levels recorded several empirical impacts on the industry performances.

Table 1: IT Application Areas in Construction Projects (sites)

Primary activities	Application
Construction Planning	Planning system, Decision Support System (DSS), Bidding Strategy and Integrating simulation with expert systems
Engineering Design	Planning and Scheduling of works, Cost Estimation, Quality control and Safety in the workplace, CAD systems and Building Information Modelling (BIM)
Procurement	Construction Material Information, Material specifications, Delivery and Expediting, E-sourcing and Electronic Data Interchange (EDI), Web-based and e-procurement
Construction and Commissioning	Reinforcement Bar-coding, Radio Frequency Identification (RFID), and CAD systems
Maintenance and Operation	Electronic Data Interchange (EDI), Maintenance History RFID Tags
Project (site) Management	Project or Site Monitoring, Cost Estimation, and Data communication

2.2.1 IT Drivers

According to Hammer (1990), IT is considered the key driver of VRE in construction operations which was viewed as "radical change". Value needs increases the demands for amplified capabilities of IT applications to enable VRE

implementation in construction a success. Datti *et al.* (2022) therefore, challenge researchers in the built environment to come up with a robust VRE awareness framework to be implemented by the CI that would enhance the efficiency exponentially. Davenport and Short (1990) attribute lack of appreciation of the deeper issues of IT, major stress influencing the awareness of the capabilities of IT on VRE implementation in the CI in achieving value redesign process through its impacts as shown in Table 2. Chen (2001) argues that IT may sometimes have a negative impact merely automating the existing processes, but it could also have a positive impact if deployed correctly in appropriate industry arrangements. Budiono & Loice (2012) further stress that IT is the enabler to reengineer or to improve value process in the construction sector, and this form an important driving force for value redesign transformation. The cyclic improvement process as designed by Hammer in 1996 is demonstrated in Figure 2.

Table 2: IT Capabilities awareness and the organizational impact

Capability	Organizational Impact
Transactional	The unstructured stock control and procurement could be transformed into the process of a routinized transaction IT can be used in inventory management in making the list of items running out and the number of stocks to be ordered as the input for the purchase process
Automation	IT can be used to make a sales note and automatically calculate the amount that should be paid by customers could help the process of supplier selection
Analytical Informational	The search process of a spare part price can be faster than the manual search. IT could provide information on stock availability, product substitution, and storage location
Sequential Knowledge Management	IT can enable changes in the sequence of tasks in the sales process
Tracking	IT allows the capture and dissemination of product knowledge from experienced labor to minimize error and improve overall service quality IT allows the detailed tracking of task status, inputs, and outputs in the sales and service process.

Source: Budiono & Loice (2012)

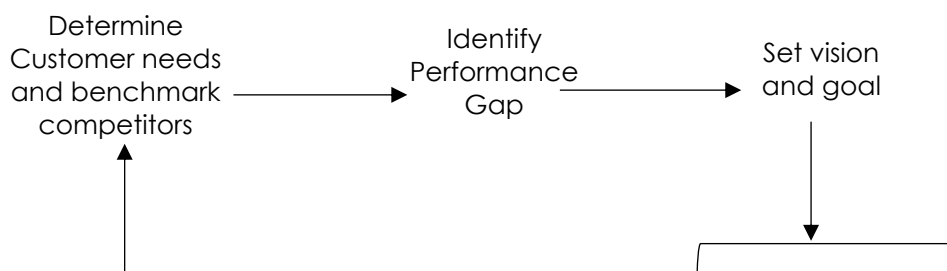


Figure 2: Process improvement cycle (Hammer 1996) adopted by Budiono & Loice (2012)

Moreover, increasingly advanced IT is being utilised in more and more sophisticated ways to enable value to survive in the current competitive environment. Furthermore to this IT plays an important facilitating role. IT has evolved from its traditional orientation of administrative support role toward a more strategic role within an organisation and more specifically within the CI. Akinradewo et al. (2022) posit that there should be a strong understanding between the implementers of VRE and IT managers in the CI to increase the level of compliance that would enhance adequate monitoring as well as cross checking the unethical practices by the operators. IT enabler involves five important operations which include;

2.2.1.1 Automation:

Automation implies the strengthening of the structure of value processes or the entire replacement of manual labour with computerised machinery (Petrovic and Zsifkovits, 1994). The enabling factor of automation is effective in two areas of the redesign of value processes. Firstly, an IT-based process is more likely to be less time-consuming and less costly for the industry. The time and cost reduction can bring dramatic cost savings to a firm. Secondly, the structure of the value processes is modified so they can be standardised and, therefore, easily automated. As a result, errors can be minimised, routine duties can be avoided, training of new employees is easier, and internal and/or external communication is facilitated.

2.2.1.2 Enhancing the information

Another enabling factor is the use of IT to increase information about individual value needs, to enhance the information potential of employees, and to provide

access to knowledge and experience (Zuboff, 1988). The automation of value processes leads to increased information about these processes.

2.2.1.3 Time and location

A further enabling factor of IT is the reduction of time and location limitations. Individual tasks can be performed at different times and places and therefore the number of potential partnerships is expanded beyond the physical location of the industry. Subsequently, the response to customer or partner demand is easier and faster mainly through electronic integration which is based on electronic data interchange.

2.2.1.4 Parallelisation

Parallelisation is a very important factor that enables tasks previously handled sequentially to be carried out simultaneously. The condor approach is a justification of this use of IT since it promotes information and document sharing by various actors collaborating concurrently on projects.

2.2.1.5 Integration

Finally, the increased information, the reduction of time and location limitation, and the parallelisation lead to the fifth enabling factor which is the integration with effects on both internal and external processes. Through access to information without time or location limitation and a better understanding of the entire business process, cooperation and communication within and between industries are enabled.

2.3 Benefits and Use of IT on Construction VRE to Customers

The rapid changes in the economy, and increasing competition has placed importance and demand on increased efficiency, effectiveness, and value for money over the past few decades (Oke, Aghimien and Olatunji, 2015). Ferrada & Serpell (2013) emphasis that derived benefits of customer value in achieving optimal satisfaction is client value and focus end, quality design and whole life, and health and safety. These form the main influence while offering value in the CI. However, Nawi et al. (2014) view customer value as being derived from modern methods, attitudes and awareness, information technology, lean, and sustainability wastes. Olanrewaju (2013) argues that though derived benefits according to customers during construction are numerous, the effects of integration and collaborative working, continuous and business performance may be insignificant to the customer due to minor influence. The first benefit of IT applications in the CI is related to cost savings. IT applications save the costs of paper and space if everything is stored electronically. The second source of benefits is the reduction in the number of people employed which is the major cost in the industry. The third major benefits are the potential to enhance an industries' effectiveness in terms of quantity or quality of work. The possibilities for

using IT applications to aid, support, or facilitate are numerous. IT can also be used to improve access to valuable information to support decision-making.

2.3.1 Customer Value-Added Perspectives in the CI

A customer-based perspective on the quality that is used by services, construction, and public sector organisations involves the concept of value (Thomas, 2017). Habib (2013) contends that construction marketers need to consider new variables such as customer value to enhance the predictive power of Service Quality (SQ), the relationship of Customer Value (CV) with price, perceptions of performance, Most nations grow through high performance, achieving excellent work, minimising the cost of services and products, and adding value to the customer through a good understanding of their requirements (Abdellatif, Salah and Saeed, 2018). Hence, in doing so they need to be efficiently and continually be redesigning in a world of new technology, changes, and strong competitors. And redesign to actualise strategic and operational success is important if the construction business is to continue (Chen, 2019).

Wu et al. (2014) posit that the perceived value perspective primarily focuses on the provision of relational benefits through value-inducing features in construction, while the Transaction Cost Economics (TCE) perspective focuses on the requirement of transaction cost that occurs in the risky electronic environment like electronic order of construction materials by contractors. According to Styliadis et al. (2015), perceived quality is one of the most important factors underlying the success of construction manufacturing today. Furthermore, it is believed that if the functional quality perspective as given by Thomas (2017) is strictly adhered to from the conception of the project, it should drive the industry to global competitiveness in reengineering, thereby creating value addition.

3. RELATIONSHIP BETWEEN IT AND VRE

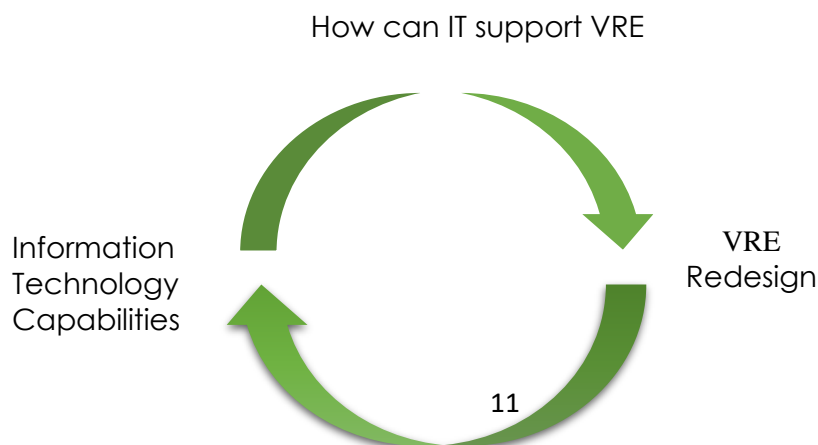
Hammer (1990) advocates the use of IT to challenge the assumption inherent in the work processes that have existed since long before the advent of modern computer and communication technology. He further contends that the heart of reengineering is the notion of discontinuous and breaking away from the outdated rules and fundamental assumptions about technology, people, and the firm's objectives that no longer hold. Akingbade (2014) argue that information technology (IT) is a strategic resource that facilitates major changes in industry operation, needs, and customer satisfactions. Because of these, IT enables a firm to achieve competitive advantages.

According to Davenport and Short (1990), VRE requires taking a broader view of both IT and value activity and the relationships between them. IT should be

viewed as more than an automating or mechanizing force to fundamentally reshape the way value is achieved. IT and VRE have a recursive relationship as illustrated in Figure 3. Davenport and Short (1990) further refer to this broadened, recursive view of IT and VRE as the new industrial engineering value process that represents a new approach to coordination across the firm. Given the growing dominance of services, their recursive relationship requires further analysis and redesign. IT promises and its ultimate impact is to be the most powerful tool for reducing the cost of coordination.

IT has evolved from its traditional orientation of administrative support role toward a more strategic role within an organisation and more specifically within the CI. Combining, VRE and IT have the potential to create more flexible, team-oriented, coordinative, and communication-based work capability (Ringim et al., 2011). In leading-edge practices, IT makes VRE possible and worthwhile. VRE and IT are natural partners, yet their relationships have not been fully explored (Mao & Zhang, 2008; Ringim et al., 2012).

IT has the potential to enhance industry efficiency and effectiveness by eliminating delay, administrative intermediaries, and errors by providing better access to information (Teng et al., 1994). Davenport & Short (1990) argue that VRE and IT are related and each is the key to thinking about the other. VRE should be considered in terms of the capabilities that IT can provide and IT capabilities should support value process and value should be in terms of the capabilities IT can provide. On the other hand, IT should be considered in terms of how it supports new or redesigned processes rather than other value functions.



How can the VRE process be transformed using IT

Figure 3: The Recursive Relationship between IT Capabilities and VRE Redesign,
Source: Adapted from Davenport and Short, 1990

4. RESEARCH METHODOLOGY

The study adopted a mix method of both qualitative and quantitative technique to examine the impact of IT application as a catalyst for VRE implementation on the CI. The interviews were conducted on key professionals (10 Architects, 10 Project managers, 10 Quantity surveyors, and 10 Engineers) totalling 40 participants using semi-structured interviews through the qualitative method. The typical research sample size of the phenomenological study ranges between 5 and 25 participants in unstructured interviews (Leedy and Ormrod, 2015). Hence, 40 participants' interview is adequate for the study. Based on the nature of this research, the study adopted the phenomenological paradigm as it is the most appropriate approach for the study.

Data for this research was collected from an interview in connection with a tick-box questionnaire. An interview guide and a tick-box questionnaire were developed on separate documents. As interviews were conducted with the respondents, the researcher ticks the factors highlighted in the questionnaire, to assess the rate of occurrence of these factors. Therefore, the results of the tick-box questionnaire are presented and analysed in section 5 of this article. Interviews were mostly at the interviewees' offices; and these last from 45 to 75 minutes or more.

Ten (10) different construction firms that have a capital base of about 4.6 million USD (1.8 billion Naira) and above were purposively selected among the firms engaging in both building and civil works. The selection of the construction firms is based on the listed firms in the Federation of Construction Industry (FOCI) and licensed by the Corporate Affairs Commission (CAC) to operate in the Nigerian built environment under the Companies and Allied Matters Act 1990, (NBS, 2019). However, the rationale behind the selection of purposive sampling technique was employed, to enable the researcher to select participants (operators) from different construction firms based on the perceived experience and survival in business that is likely to give the ideal information on the relevance of IT application as a driver of VRE implementation in the CI. The CI domicile in Abuja north-central Nigeria are selected because of huge and a lot of construction activities taking place in the new national capital city, and these firms are

expected to be aware of VRE implementation and how IT aid the activities of the various CI in achieving the global competitive market with IT drive for VRE implementation process.

Primary and secondary sources of data collection methods are employed in the study. The type of primary data generated in this research was interview recorded by the researcher through unstructured and in-depth interviews with participants. However, the secondary data for this study were sourced through published and unpublished books, dissertations and thesis, texts, local and international academic journals, articles, and conference papers.

The interview data were analysed using the deductive method. The recorded, transcribed and interpreted interview data were analysed using deductive approach, and the quantitative data was analysed using the descriptive method which includes percentiles. Data generated in this research were interpreted and presented through descriptive and narrative analysis, hence, analyses of data are done by qualitative data from the interview results obtained into quantitative data.

4.1 Limitations of the Research

The study is limited to the IT as catalyst for driving VRE implementation in construction, and specifically targeted on the practicing professionals, in other to explore the level of application technique as tool that aid the VRE implementation in the industry. Despite the assurance of anonymity and confidentiality, the researcher was refused entrance to some organisations within the study area. Other organisations did not respond to the researcher's requests for participation; it was explained to him that information in their organisations are confidential. This came to a head during the research process as it adopted the in-depth face-to-face interview approach which makes respondents nervous. In some cases, where access was allowed, tracking the targeted respondent for the interviews and other related information were major challenges for the study. Moreover, some of the confirmed and booked appointments for interviews were cancelled on the arrival of the researcher at the interview premise.

5. FINDINGS AND DISCUSSION

5.1 Impact of IT Application in CI Performance

The percentage was used to access the level of impact of IT application in the CI performance by respondents in the construction organizations in Abuja. The outcome of the results in Table 3 indicates that all the respondents interviewed were emphatically optimistic about how IT improves the construction industry performance and competitive position. IT is considered the key driver of VRE in any construction organization in meeting the customer satisfaction. The result further elucidates that 85% of the respondents believed the advantage granted

by IT is short-lived because such advantages are easily replicated by rivals. While 80% of the respondents however view theoretical and empirical evidence as an indication that construction industries implementing IT-enabled strategy can gain a competitive advantage over their direct competitors. This is the reason, why the vast majority of the people interviewed considered IT as short-lived, that it is easily replicated by rivals in the industry.

However, 65% of the respondents observed that sustained competitive advantage through barriers to entry, switching costs, and mobility barriers are another critical factors they believe affect the performance of IT applications in most of the CI. These support the result of Mandířcák *et al.* (2021) on high significant impact the information and communication technology has on a sustainable chain and cost reducing of waste management on various construction works and this is what create the rivals in the industry. Both sustained competitive advantage that would require bundling IT with tangible or human resources and IT-dependent strategic initiatives that contribute to sustained competitive advantage are viewed by the respondents to be 60% respectively.

Similarly, 45% of the professionals interviewed stress that improving the CI market share and profitability through innovative use of IT, sustained competitive advantage that would require bundling IT with differences in the value chain and IT which bring competitive advantage to industries within an entire supply chain has less impact on IT application in CI performance. These results were further supported by Mandířcák *et al.* (2021) by minimizing the consumption of materials, costs, and optimally setting up the supply chain and logistics, using materials and funds efficiently and optimizing waste management. Furthermore, 30% of the respondents believed that possible role in creating sustained competitive advantages for the CI as well as achieving competitive advantage through the application of IT has less impact on industry performance concerning VRE. These results were argued by Mesároř *et al.* (2017) as the impact of IT exploitation on performance of construction industry through the use of appropriate techniques or tools like BIM tools, ERP systems and controlling system on cost and profit enhances the competitive advantage in the industry.

The competitive advantage of the CI is a major challenge been faced as a result of IT application in the industry. This has made the multinational organisations to take advantage over the indigenous firm operating in the same environment. The possibility of creating a sustainable competitive advantage was also depressed due to deficiencies in IT application in new techniques adopted for competitive advantage. These were suggested by Afzal *et al.* (2021) that the impact of 4D models can be used to anticipate safety hazards and the assignment and allocation of project resources and construction-related machinery to the

value addition. 85% of respondents, however, stated that constructability design produced by the design team for the client also offered customer value addition on construction. Also 80% of the respondents reiterate that the use of appropriate available equipment that reduces delays in transportation also added value to the customer. This is achieved through price reduction on construction. 75% equally believed that appropriate risk efficient measures that may result, due to inadequate Health and Safety (H & S) practices are considered important factors that add value to customers. These results were argued by Afzal et al. (2021) that the impact of 4D models can be used to anticipate safety hazards and the assignment and allocation of project resources and construction-related machinery to the worksite, as well as for constructability reviews for achieving competitive advantage in the construction industry.

Moreover, 70% of respondents observed that proper management practices to reduce waste are considered to be a value-added perspective to the customer with less effect, since cost overrun is being curtailed with waste management. Moderately considered important by the respondents are; increasing the moral that encourages cooperation among the workers thereby creating the team spirit among the workers that improve productivity by 65%. While improving the control of material specifications to reduce error, unnecessary design revision that improves design cost-effectiveness and examine cost-efficient procurement arrangements for the realistic project execution plan were viewed by the respondents to be 60% respectively.

Furthermore, 55% of interviewees stress that proper planning of site layout for construction, reduces more off-site activities, and appropriate use of construction methodology that reduces contradiction in design documents are viewed by the professionals in the industry as unimportant factors. Whereas 50% of respondents believed that clarity in design with complete drawings/ details, leading to repetitive revisions and changes reduces the rate of changes to the design added value perspective to customer satisfaction in a construction project. It is however believed by 45% of the respondents that better use of mechanization which enables the elimination of unspecified poor material interface for quick response to Requests For Information (RFI) and adequate control and inspection of document system to prevent over/under ordering of materials has less influence on value-added perspective to customer satisfaction. Only 40% of respondents believe that the influence of government policies through the right decision-making abilities on bureaucracy by good leadership add value to customers. These results corroborate the findings of (Abdellatif, Salah and Saeed, 2018; Chen, 2019 and Thomas, 2017).

achieve breakthrough performance and long-term strategy for customer relation. Industries often fail to achieve reengineering objectives because they trivialize the concept. Reengineering require creative thinking. It requires a new perspective on the part of implementer of the technique with even a new philosophy. Hence, these can only be achieved through the application of IT on VRE implementation in any CI trying to redesign its value processes in meeting the customer satisfaction.

RECOMMENDATIONS

The development of IT and its decreasing costs creates prospects to the changing need by improving the way the CI conduct its activities. IT is the most effective enabling technology for VRE to operate. IT application in VRE implementation play an integral role in achieving this success of reengineering. IT is clearly an enabler of reengineering.

In view of these the paper, therefore, recommends that for the CI to meet the sustainable competitive advantage, the enabling roles should be created in achieving it. Other recommendation is that to achieve the competitive advantage in the industry the application of IT must be given utmost priority. Finally, managers or leaders who influences policies on decision making abilities should be mindful of the bureaucracy in the industry, as only good leadership succeed in this aspect.

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