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Value re-engineering awareness framework for the construction industry in Nigeria

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Abstract
Customers are dissatisfied with the product output due to the Nigerian Construction Industry's (NCI) sub-optimal awareness and lack of implementation of Value Re-Engineering (VRE). The study thus aimed to create a framework to enhance the level of awareness regarding VRE adoption by the NCI. Consequently, a mixed method of qualitative and quantitative research was adopted using face-to-face in-depth interviews in association with a tick box of questions marked/ticked by the researcher during the interviews and later translated to percentage. From the research findings, firms were very much aware that planning and organization factors contribute more than technical factors towards the awareness of VRE implementation. Inadequate employee training and lack of capacity and experience for change within the organization are major hindrances fostering a supportive environment for VRE implementation in planning and organisational factor. Technical factors such as the quality standards of contractors' work is crucial to the influence of planning and organisational elements. The research concludes by creating a framework to enhance industry awareness regarding the effective implementation of VRE and thereby recommends that the construction industry should broaden its awareness of VRE by forming synergies to develop optimal methods for adopting new techniques that would improve the outcome of the construction process through participation in conferences, seminars, workshops, and training organized by professional bodies and scholars to advance new ideas in the construction sector.

Keywords: Awareness, design, framework, implementation, Customer Value, Service Quality and Value Re-Engineering

Introduction
The success of a Construction Industry (CI) is dependent on the techniques and technologies adopted in executing construction projects. Value Re-Engineering (VRE) is considered a critical analysis and radical redesign of existing construction processes to achieve breakthrough improvements in construction project performance measures such as cost, quality, service, and speed (Ekanayake and Sandanayake, 2017; Jibrin, 2021). According to Harini and Widyarti (2018), the problem of implementing new innovative techniques remains a constraint in both planning and implementing construction project processes. Yahaya (2020) attributed some of these

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problems to a lack of awareness, fear of new innovations, and no interest in exploring the benefits of new techniques in the CI.

Abdul-Samad and Kulandaisamy (2022) reveals that most of the VRE techniques around the globe are in a challenged state, especially in terms of awareness and implementation. Shakantu (2012) Expressed that management of construction organizations need to be responsive and dynamic in meeting the needs of its customers through new innovative techniques. However, influence of learning and experimentation in an organization that creates a dynamic change in the construction sector can only survive with the reduced challenges of organizational management and the societal pressure that pave way for the development of innovations and technological breakthroughs (Soares, 2013).

However, according to Madane and Joshi (2018) the drivers of change in Construction organizations requires an innovation that gives the composition and functionality of materials and products used in VRE adoption in the CI. Shakantu *et al*. (2022) opined that the adoption of VRE could result in a breakthrough solution in resolving the challenges of customer dissatisfaction in the industry, thus giving way for the continuous improvement on the new techniques that offers the customer satisfaction which are meant to be implemented for the industry development and improvement. To raise VRE awareness in the CI, Ding *et al*. (2017) and Jibrin *et al*. (2023) argued that integrating digital construction processes throughout the whole lifetime of a project using BIM and Lean technologies to solve the challenging problems in the sector would reduce low productivity in the industry thereby enhancing customer value. Therefore, creating VRE awareness framework for the CI would aid in restructuring the construction companies to provide the best value and produce advantages for the customers. The Gap in knowledge is to investigate the optimal level of awareness and attention given to the implementation of Value Re-Engineering by the Construction Industry in Nigeria.

Literature Review

Value re-engineering awareness implementation

Achieving awareness of VRE implementation encompasses several key dimensions of planning, technical factors, organizational considerations, as well as the impact on both value and customer satisfaction (Alghamdi *et al*., 2014; Jibrin and Aminu, 2023). Awareness of VRE implementation in construction organizations is pivotal for fostering a culture of innovation, efficiency, and customer-centricity thereby enhancing the competitive advantage of such organizations (Omidi and Khoshtinat, 2016). Dachyar and Sanjiwo (2018) maintain that VRE awareness is a valuable tool for improving employee happiness, service quality, and achieving organisational strategic goals.

Influencing factors of the VRE awareness implementation

VRE awareness process fails because of the mistakes made under pressure during planning to produce quick results, and top management reluctance to commit the necessary funds for the VRE implementation (Puruhita, 2018; Fasna and Gunatilake, 2019). Lack of robust awareness plan to educate and align stakeholders on the value proposition of VRE systems implementation makes it difficult to provide necessary support for successful implementation as required. (Hussain *et al.*, 2014). Fasna and Gunatilake (2019) stressed that technical awareness factors affecting VRE

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implementation include technologies and processes such as materials selection, construction methods, and design processes. According to Hussain *et al*. (2014); Puruhita (2018), the construction industry's resistance to adopting new technologies or methodologies complicate the awareness of VRE implementation and insufficient technical knowledge and skills among project teams can limit the thoroughness and effectiveness of value analysis, undermining the potential benefits of VRE implementation. The implementation of VRE awareness in organizations is affected by the company culture and company environment (Puruhita, 2018). Organizational culture factors that hinder VRE implementation and awareness in the CI include resistance to change, staff behaviour and stability, and a lack of customer-centric focus (Puruhita, 2018). Fasna and Gunatilake (2019) stated that resistance from senior management or frontline staff who perceive VRE as disruptive and the lack of management determination to persevere through setbacks and obstacles can undermine long-term commitment to VRE. Therefore, for effective adoption and implementation of VRE processes in the CI in Nigeria, staff need to be inform and make aware of VRE's potential to improve efficiency, reduce costs, and enhance customer satisfaction in construction projects (Egwunatum and Oboreh, 2022). Akinradewo *et al.* (2022) posit that there should be a strong understanding between the implementers of VRE awareness in the CI regarding the adherence to these standards. Shakantu *et al*. (2022) understanding the challenges facing the VRE implementation process and knowing the optimal benefit it offers to the customer allows for innovative visualisation, knowledge support, and natural interaction in changing the profession to one that is more driven by collaboration and more competitive, productive, and creative.

Creating awareness for VRE implementation processes

Once the organization has determined that a process needs to be redesigned, a correct approach must be decided (Bibi *et al*., 2014). Fasna and Gunatilake (2019) emphasis that VRE implementation processes can be incrementally adopted in three phases, namely: pre-VRE implementation phase; VRE implementation phase; and post VRE implementation phase. Effective VRE implementation processes are influenced by the impact of environmental changes; understanding consumer expectations; developing senior consensus on the need of reengineering; the strength of communication throughout the business; and the production of a cross-functional team (Dachyar and Sanjiwo, 2018; Madane and Joshi, 2018; Omidi and Khoshtinat, 2016). Creating awareness for the incremental adoption of VRE implementation requires careful planning, stakeholder engagement, and systematic execution across pre-implementation, implementation, and post-implementation phases.

Optimal value offering benefits of VRE implementation

Optimal value offering in VRE awareness centers on the benefits it brings to industries like construction and is achieved through the enhancement of the Customer Value (CV) based on the perspective of the quality delivered by the service provider. According to Thomas (2017) achievement of Value Added Perspective (VAP) during CV offering optimization in creating VRE awareness, the improvement on design cost effectiveness; and waste reduction plays a major influencing. According to Stylidis *et al.* (2015), VRE awareness is developed by minimizing the number of design modifications in construction sector in order to provide the customer VAP

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Value benefits of the construction industry

In the construction industry, Customer Value (CV), and Service Quality (SQ) emerge as pivotal variables in shaping the outcomes of a project and the satisfaction of all stakeholders (Thomas, 2017). Habib (2013) is of the view that construction companies
need to consider new variables such as CV to enhance the predictive power of SQ, the relationship of CV with price, perceptions of performance, SQ, Customer Service (CS), and Service Value (SV) in their intentions to reconstruct and redesign to achieve strategic and operational success (Chen, 2019). Figure 1 shows the drivers of customer value and satisfaction in relation to service quality.

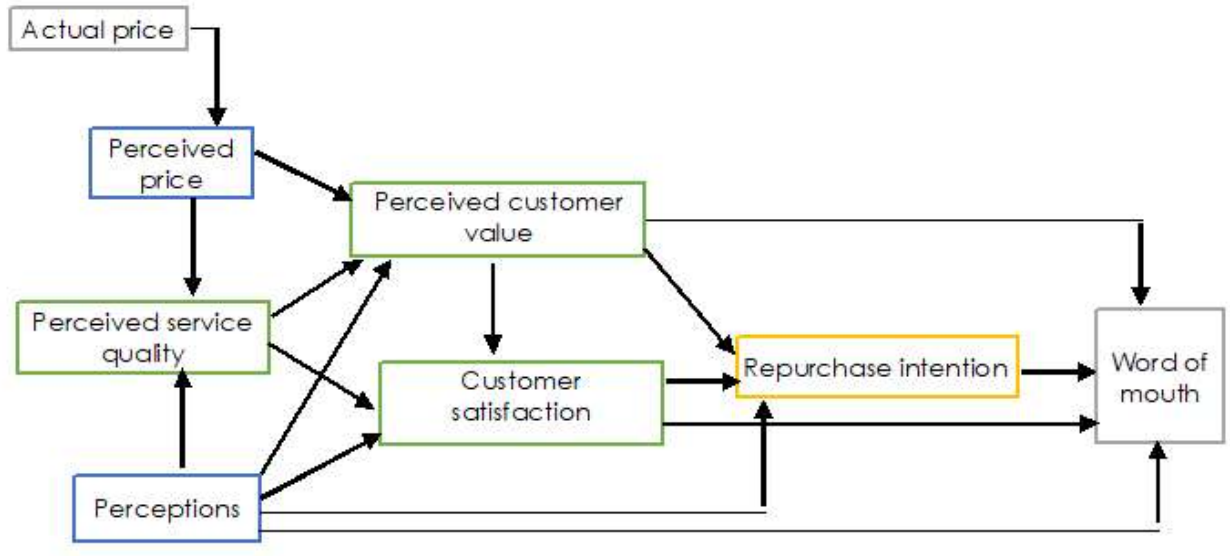

Figure 1: Drivers of customer value and satisfaction
Source: Adapted from (Haemoon, 1999)

Service quality (SQ) in Figure 1 depicts the notion of Word-of-Mouth (WoM) communication intention as a direct, coupled function of perceptions, value, satisfaction, and repurchase intention of customers. To gain a competitive advantage, organizations must first understand how customers evaluate and value a service or product. Customer satisfaction (CS) in the construction sector, has gotten a lot of interest because it appears to reflect how much a customer believes that owning a service creates happy sensations (Ogbo *et al*., 2015). Expectancy-disconfirmation theory according to Akam *et al*. (2018) is the representation of customers' derived satisfaction with a targeted product

or service given as a result of subjective comparisons between expectations and perceptions. Ashworth (2012) on the other hand posits that subjective disconfirmation is a direct function of the expectancy-disconfirmation model of CS. Customers are thought to be neither satisfied nor dissatisfied when "confirmation" happens (Akam *et al*., 2018). This indicates that if price and quality have an impact on customer satisfaction and perceived value, as shown in Figure 1, then repurchase intention cannot be implied. This is because perceived price and quality correspond to

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disconfirmation theory which posits that expectations, coupled with perceived performance, lead to post-purchase satisfaction.

Service value (SV) is an exploratory investigation of the value construct which identifies four unique definitions of (SQ, CV, CS and SV) upon which consumers appear to base their evaluations of service exchanges. Perceived value is the consumers' overall assessment of the utility of a product based on perceptions of what is received and what is given. Repurchase intention (RI) are linked to a service provider's ability to persuade customers to praise them, refer them to others, stay loyal to them, spend more money on them, and pay higher prices. Increased customer retention is a key factor in a service provider's capacity to earn profits. For the CI, a favourable RI means customers have the perception of achieving satisfaction through a perceived value with price and quality delivered to them. This perception indicates the characteristics of what the actual price means to the customer as a change in price would make the customer move away without been satisfied with the service rendered. This price is the link between the customer and service provider and the benefits provided to the customer in purchasing the service and informing other customers of the value of the service in the industry.

Derived benefits of customer value

In the words of Ferrada and Serpell (2013) derived benefits of CV in achieving optimal satisfaction are: customer value and focus on end user needs, quality design, whole life cycle of the project, and health and safety. These serve as the primary influence and provide value in the CI to raise customer awareness. Jibrin *et al*. (2023) view CV as being derived from modern methods, attitudes and awareness, information technology, lean and BIM technology. Olanrewaju (2013) argues that though derived benefits according to customers during construction are numerous, the effects of integration and collaborative working, predictability, continuous and business performance may be insignificant to the customer due to their minor influence on customer value. Hence, a set of parameters are identified for construction management and control in adapting to the changing need of the built environment for future development of VRE awareness implementation and these are driven by factors militating against VRE implementation, incremental adoption of VRE and optimal customer value satisfaction (Jibrin and Shakantu, 2021; Datti *et al.*, 2022).

Research Methodology

Following the phenomenological paradigm, the study used both qualitative and quantitative research approaches. This approach allows the use of structured interviews, that enabled the researchers to generalise their findings from a sample of a population chosen and during the interviews, a tick-box questionnaire was used to collect data on the level of awareness of VRE implementation. The research adopted face to face interview approach during which responses were ticked by the research personnel. In this study, the frequencies of answers were used to calculate percentages of the agreement level on VRE implementation. Hence, the results were used to develop the VRE awareness implementation framework.

The population of the study include both private and public construction practitioners in the industry in Abuja, using purposive sampling, 30 construction organisation with a capital base of 1.8 billion Naira and above were selected on the premise that they execute building and civil engineering work Purposive sampling enables the researcher to select participants (stakeholders) from 10-15 different construction firms based on perceived experience and survival in business

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for investigation that is likely to give the ideal information on VRE awareness implementation as a result of their experience, 34 key stakeholders, including seven directors, nine project managers, nine quantity surveyors and nine engineers, were identified as the sample to participate in the study. According to Leedy and Ormrod (2015), the typical research sample size of the phenomenological study ranges between five and 25 participants in structured interviews.

The interviews took place mainly at the interviewee's offices and lasted from 45 to 75 minutes. To assess the awareness level of implementation of VRE in the NCI, the interviewees were requested to indicate which of the items were considered in their firms. All the items considered were ticked off on the interview guide list. The tick-box data was given a numerical score, on a 5-point Likert scale, so that the data could be rated quantitatively, based on cut-off points. For this study, the cut-off points, expressed in frequencies, are further converted to percentages to calculate the awareness level of VRE implementation. Therefore, for the purposes of analysis (see Table 1), it is important to note that the following scale measurement were used regarding cut-off point percentages, where 1 = unaware (1% to 29%); 2 = less aware (30% to 49%); 3 = fairly aware (50% to 69%); 4 = much aware (70% to 89%), and 5 = very much aware (90% to 100%).

Table 1: Cut-off points for VRE implementation awareness

S/no	*Cut-off (1 to 5)*	*Cut-off in % (1 to 100)*	*Decision rule*
1	less than 1.50	1 to 29	Unaware
2	1.50 to 2.49	30 to 49	Less aware
3	2.50 to 3.49	50 to 69	Fairly aware
4	3.50 to 4.49	70 to 89	Much aware
5	4.50 to 5.00	90 to 100	Very much aware

Results and Discussion

Factors affecting the awareness of VRE implementation

Table 2 shows that firms are very much aware of planning and organization factors contributing more than technical factors towards the awareness of VRE implementation. Planning factors include inadequate employee training (with 91%), and difficulty in matching technology with redesigned processes (85%) presents a significant challenge, as does the fear of job losses due to new techniques (amazing 82% response). Organizational factors like staff behaviour and stability, grounded in fundamental ideals (with 85%), and the capacity and experience for change within the organization (having 94%) are essential for fostering a supportive environment for VRE implementation. While technical factors, that is the quality standards of contractors' work (at 88% response) are crucial. However, these factors are sub-divided into process planning, human related, operational process, process change and management, customer perspective, appointment of contractors, risk sharing and design evaluation, culture and environment. Considering the rating, above 90%, respondents are very much aware that having the capacity and experience for change (at 94% response), and inadequate employee training to implement the technique (with 91%), are factors affecting VRE implementation.

Respondents are much aware (with70% to 89% of the respondents), that organizational culture and environment play a significant role in implementing VRE, as the stability and behaviour of staff rooted in fundamental values (at 85%) are crucial for successful implementation. A lack of consensus among employees about seeing the process through (at 85% response) and fear of job loss due to new techniques (with 82%), can hinder progress. Effective process planning must

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address these concerns while ensuring alignment with quality standards and core design parameters (opined by 88% respondents). The appointment of contractors is pivotal; their work quality and adherence to design standards (amassing 88%) are essential for a smooth transition. Firms must also navigate risk-sharing strategies to manage potential challenges. The ability to match technology with redesigned processes (at 85% reponse) are noted to be often difficult, reflecting a need for continuous improvement in understanding implementation requirements (i.e. 76% response) and enhancing customer value (at 79%). Management styles and leadership (71%) impact the implementation process as well. Lack of leadership in facing confrontations and managing substantial business risks (73% response) can undermine efforts. Furthermore, the influence of time, cost, and quality (74% response) must be carefully balanced. However, the result is not in line with the outcome of the works of Fasna and Gunatilake (2019) where it is reiterated that there is a vital need to pay sufficient attention towards factors of implementation like management support, technological competency, process delineation, project planning, change management, and project management to ensure the success of VRE. This indicates lack of sufficient management commitment and attention to the implementation process of VRE with technical expertise that will drive the process.

Furthermore, the respondents are aware that human-related factors are pivotal, with continuous growth and acceptance of change within the organization (represent 68%), creating opportunities for organizational change and enhancing contractor productivity (with 68%), employees must engage in ongoing learning (at 62%) to adapt to new technologies, while top management commitment to the new technique is (59% response) this is crucial for driving a change. Process and change management also address obsolete processes by redesigning them (with 56%) to fit the new technology, a collaborative work environment among participants (having 56%) supports smoother transitions and fosters collective problem-solving. Firms should ensure that their process planning incorporates the site-specific conditions when adopting design features (amazing 65% response) to maximize effectiveness, customer perspective, meeting customer requirements (with 50%) is essential for maintaining satisfaction and relevance. Process planning should not focus solely on new technologies but also on the value process (with 53% response) to ensure that innovations contribute to overall goals, changes in management operational systems (50% response) must be carefully managed to avoid disruption. These results are validated by Bibi *et al*. (2014) and Safa *et al*. (2015) as there is need for the workers or employees to be properly trained and also have the capacity and experience to make a change as lack of end user involvement, inadequate funding, lack of process reengineering, insufficient planning time, improper technical support and insufficient training are factors experienced in the VRE awareness implementation.

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Table 2: Factors affecting the awareness of VRE implementation

Category	No	Statement	Frequency (n=34)	%
		Planning factors		
Process planning	1	Redesigning the processes that are obsolete	19	56
	2	Difficulty in matching the best technology with the new process redesigned	29	85
	3	Focusing on a new technology instead of the value process	18	53
	4	Lack of understanding the implementation requirements	26	76
	5	Inadequate employee training to implement VRE	31	91
Human	6	Workers' having the fear of job loss with the new technique	28	82
	7	Collaborative work environment of the participants	19	56
	8	Top management commitment to the new technique	20	59
	9	Changes in the management operational system	17	50
Process operational	10	VRE was much larger than anticipated	12	35
	11	Trying to change too much too quickly	8	24
	12	Making value mistakes under pressure to get a quick solution has an effect.	9	26
	13	Lower employee morale	11	32
		Technical factors		
Process and change management	14	Creating a new view of the organizational system for the VRE operation	20	59
	15	Impact of management styles and leadership	24	71
	16	Encourage employees to learn	21	62
	17	Continuous growth and acceptance of change in the organization	23	68
	18	Creating the conditions and opportunities to make organizational change advance further	23	68
Customer perspective	19	Incorporation of the client during the design phase to reduce the likelihood of changes and time delays.	30	59
	20	Client requirement should be understood during brief development by the designer	17	50
Appointment of contractors	21	Considering the past performance of the contractor	14	41
	22	Quality standards of contractor's work	30	88
	23	Financial stability of the contractor	20	59
Risk sharing and design evaluation	24	Difficulties in design evaluation	7	21
	25	Any formal approach to design evaluation	6	18
	26	Considering the core design parameters like time, cost and quality	25	74
	27	Allowing review design by the contractor to eliminate problem	14	41
	28	Tracking the ease of construction by the contractor	16	47
	29	Adopting the design features to site conditions	22	65
	30	Enhancement of contractor's productivity	23	68
	31	Having the ability to substitute materials, components and systems	15	44
		Organisation factors		
Culture	32	Staff behaviour and stability are based on fundamental ideals.	29	85
	33	Mindful of their mistakes by the customers	20	58
	34	Having the capacity and experience for change	32	94
	35	Continually improving the organization's ability to value customers	27	79
Environment	36	Company environment not conducive to reengineering	13	38
	37	Lack of leadership to face confrontations and major business risk	25	73
	38	Lack of senior management enthusiasm	13	38
	39	Lack of employee consensus to see it through	29	85
	40	Lack of management determination to stay on course as problems show	15	44

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Value offering optimization benefits of VRE

Table 3 shows that respondents were very much aware of the benefits of the value addition and customer satisfaction derive for the VRE awareness. In value adding perspective, improved design cost effectively (having 100% response) and from a customer satisfaction perspective, value for money (having 100%) reduced waste (at 94% response) and on time delivery (at 91% response), are considered to be the best benefits derived from VRE awareness implementation. While improving the use of high technology for both design and construction (at 88%) and benefits of satisfactory durability (at 88%), improving the education and training of operatives (with 85%), reasonable running costs (with 79% response), quality, design, and whole life projects (with 76%) pleasing to look (at 71%) and health & safety (at 71% response) are viewed much aware for value adding and customer satisfaction perspective respectively. These results collaborate the findings of Thomas (2017) and Abdellatif *et al.* (2018).

Table 3: Optimal value benefits of VRE

Category	No	Statement	Frequency (n=34)	%
Value adding perspective	1	Reducing the rate of changes to the design	10	29
	2	Optimizing the specification	21	62
	3	Improve design cost effectiveness	34	100
	4	Appropriate risk efficiently	15	44
	5	Improve productivity	17	50
	6	Reduce waste	32	94
	7	Examine cost efficient procurement arrangements	17	50
	8	Improve the use of high technology for both design and construction	30	88
	9	Develop more off- site activities	16	47
	10	Improve the education and training of operatives	29	85
	11	Better use of mechanisation	20	59
Customer satisfaction	12	Value for money	34	100
	13	Pleasing to look at	24	71
	14	Free from defects upon completion	18	53
	15	Delivered on time	31	91
	16	Fitness for purpose	18	53
	17	Reasonable running costs	27	79
	18	Satisfactory durability	30	88
Derived benefits for customers	19	Collaborative working (CW)	14	41
	20	Integration and CW	10	29
	21	Integration	8	24
	22	Quality, design, whole life	26	76
	23	Health and Safety	24	71
	24	Skills, people, site	16	47
	25	Attitude, awareness	20	59
	26	Sustainability, waste	17	50
	27	Lean	19	56
	28	IT	20	59

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VRE Awareness Framework for the CI

In creating a framework for implementing VRE awareness in the construction business, the factors militating against VRE implementation in the CI, as well as incremental adoption of VRE and optimal value offering, can best be assessed by using a theoretical framework, which is a conceptual model that makes a logical sense of relationships among elements that have already been identified as an important problem (Hussain *et al.*, 2014). Hence, Bibi *et al.*(2014) belief that the development of the framework should be based on the major challenges identified that help in creating a model of awareness for the industry growth.

This research has developed a framework aimed at increasing awareness of VRE implementation in the CI. The framework, depicted in Figure 2, identifies the key factors that hinder VRE adoption, including planning, technical, and organizational factors that must be addressed to achieve effective implementation. The framework also outlines a step-by-step approach for incremental VRE adoption, including Preparing the organization for full VRE implementation; Beginning with full change; VRE measurement; VRE improvement process; Building the new organization. The framework demonstrates that optimal value can be achieved through various approaches, including VAP; CV offering and Customer-derived benefits.

The proposed framework for VRE awareness will be achieved through information and communication channels, as well as brainstorming sessions organized through seminars and conferences/workshops on VRE techniques and implementation. The goal is to create cost reduction benefits, quality products within a specific timeframe that meet customer satisfaction requirements, and dramatic improvements to achieve performance measures through radical redesign processes. Additionally, awareness will be achieved through the application of innovative technologies such as BIM implementation, lean construction, supply chain management, value engineering/management, and concurrent engineering processes in construction.

The broken line arrows in the framework indicate that the purple ink: linking groups from one to another leading to VRE implementation; green: is the single link factor from one group to another group factor; while red: is the single link to multiple group factors connected to other groups leading to VRE implementation in the CI; blue: group link connecting to a single factor in the group. The framework provides a comprehensive understanding of the factors that influence VRE adoption and implementation in the CI.

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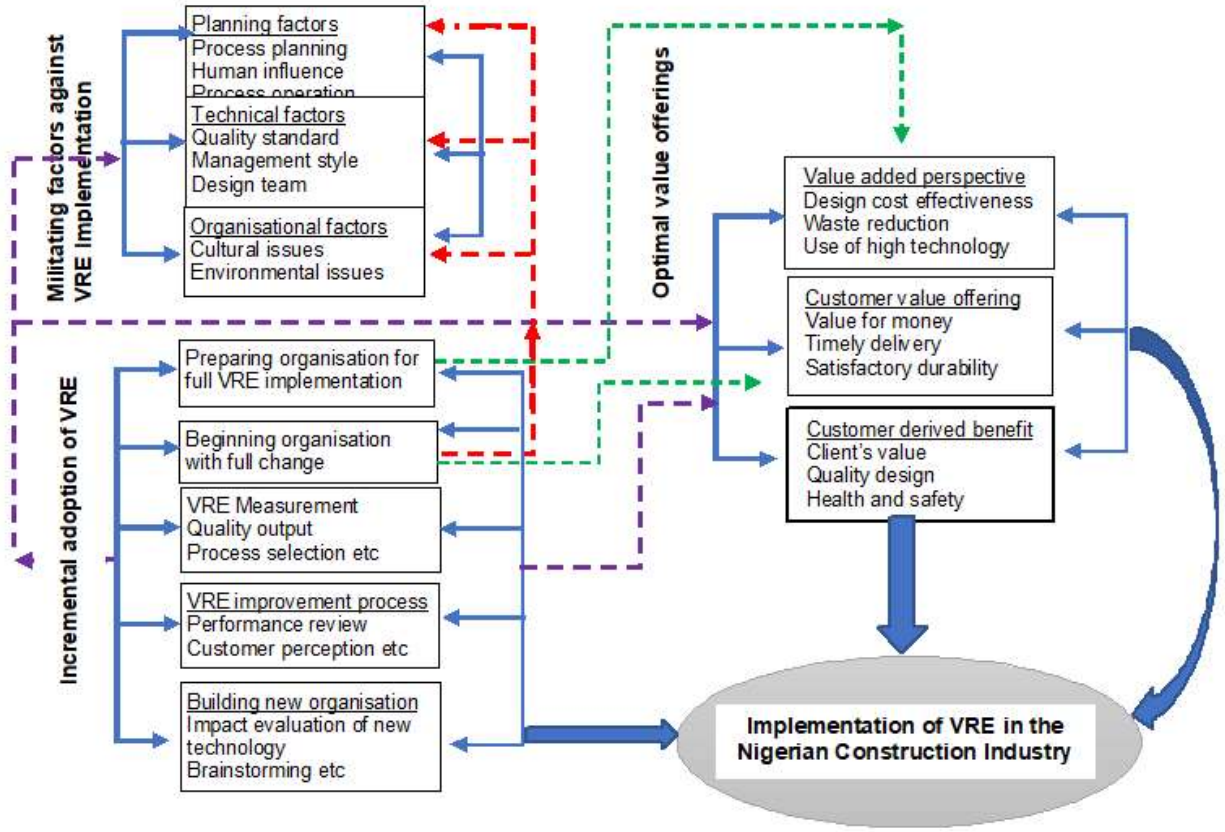

Figure 2: Value Reengineering Awareness Framework for the Construction Industry

Conclusion

Based on the research, the following conclusions are drawn:

i. There is a pressing need for the Nigerian Construction Industry (NCI) operators to revamp their operational systems to address customer dissatisfaction.
ii. VRE has not received sufficient attention by the NCI, which is crucial for delivering the desired level of customer satisfaction required to achieve global competitiveness.
iii. Equally, imperative that industry players become aware of the benefits of VRE and its application in the CI.
iv. The research recommends the use of this framework for effective

VRE implementation in developing countries like Nigeria, in creating awareness and enable the larger population to gain the advantages of VRE usage in all construction sectors.

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