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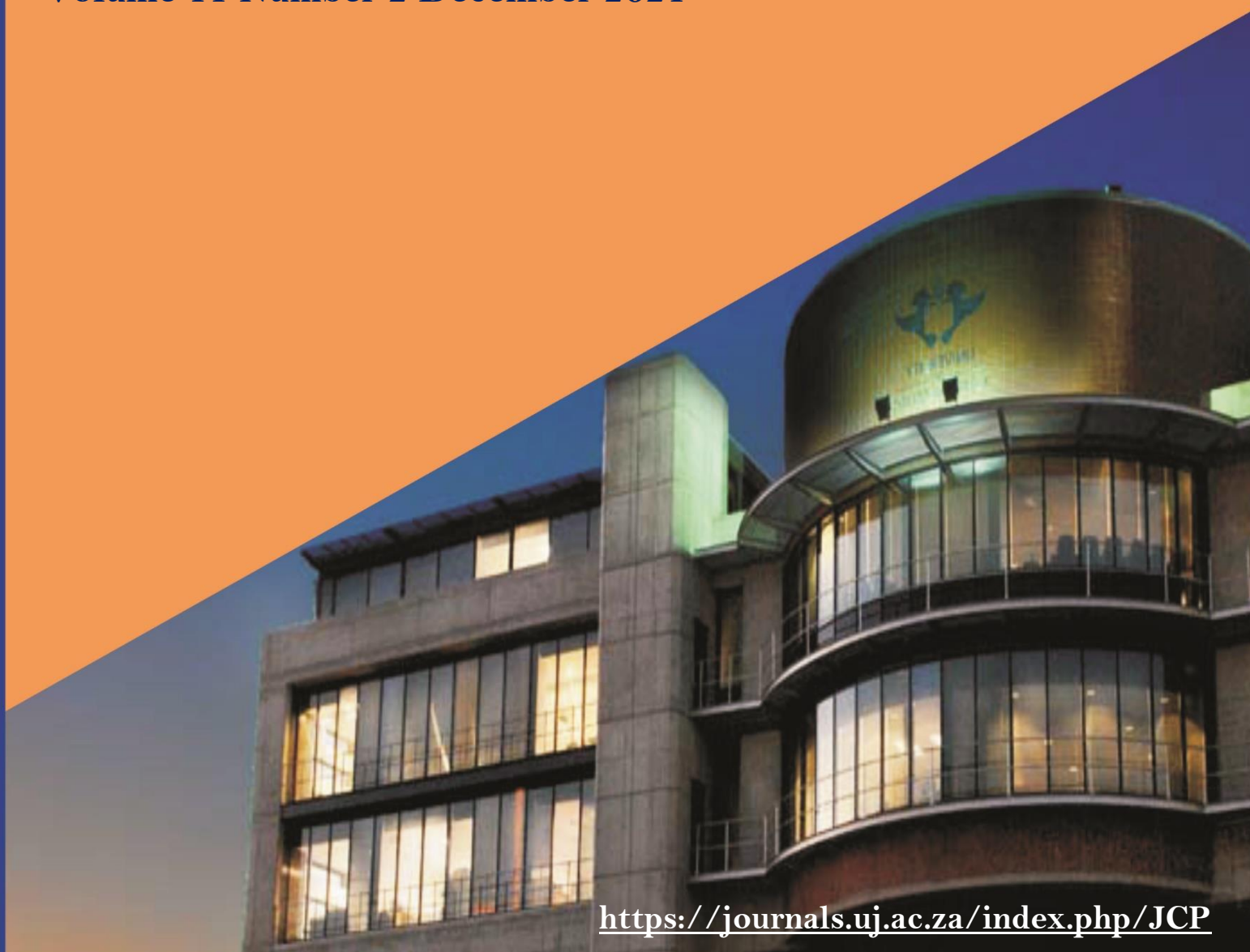

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Examples:

Aigbavboa (2012), Aigbavboa et al. (2012), (Thwala, 2000), (Aigbavboa and Thwala, 2012), (Aigbavboa, 2008; Lesito, 2007a, b; Aigbavboa, 2010, 2011), (Thwala et al., 2001)

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ARTICLES

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CRITICAL FACTORS AFFECTING QUALITY OF BUILDING PROJECTS: PROFESSIONALS SERVICE PROVIDERS' PERSPECTIVES

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ABSTRACT

Professional service providers play critical roles in achieving building project goals. They manage every complexity during construction activities to enhance competitiveness and sustainability in the construction industry. Notwithstanding, previous studies lacked in-depth explorations of professional service providers' views on critical factors affecting the quality of building projects. Consequently, this paper evaluates critical factors that affect the quality of building projects from the professional service providers' views. A cross-sectional survey was conducted using a structured questionnaire as an instrument of data collection. Various factors that can affect the quality of building projects garnered from extant literature were used to elicit the opinions of Architects, Structural Engineers, Mechanical/Electrical Engineers and Quantity Surveyors who were employed in specific clients' projects. Severity and frequency responses of each factor were used to determine the importance index, and the ranking of factors among the professionals was determined. Percentage Rank Agreement Factor (PRAF) was used to measure the agreement of the importance ranking. One sample t-test and correlation analysis were used to determine the significance of each factor and the degree of relationships among the professionals. The findings from the research analysis revealed 30 significant factors affecting the quality of building projects. The top five most critical factors are 'previous relationship with the client', 'client's involvement in design process', 'client's financial position', 'ability to choose the right design team' and 'new methods for service leverage'. The t-test showed that all the factors are significant towards ensuring quality building projects. A strong correlation exists between Architects and Quantity Surveyors, and between Architects and Structural Engineer. The Architects and M&E Engineers exhibited low correlation. Likewise, the correlation between the Structural Engineers and M&E Engineers was low. This study presents useful insight into the totality of quality from all stakeholders in the industry. It highlights factors that are key to achieving the desired quality of building projects.

Keywords: Building projects, Client, Professional service providers, Quality standard

1. INTRODUCTION

Building projects have the uniqueness of incorporating professional service providers as a team at different stages of building project activities. The selection of the professional team and the quality of their services have a significant impact on the quality and the end-product

of the building projects (Olatunde, Ogunsemi and Oke, 2017). In construction, quality occupies a unique position as one of the three most important objectives of project management. It is achieved when the building project conforms to the desired specifications and fulfil the needs and expectations of the clients. To achieve the desired quality goals on a building project, the professional service providers adopt an interdisciplinary collaboration approach to manage every complexity during construction activities (Aluko, Idoro and Mewomo, 2020). Their services range from Architectural, Engineering and Quantity Surveying whose expertize forms the fundamentals of operations of each project (Jewell, Flanagan and Anac, 2010). They provide expert advice on various aspects of building structure from inception to completion of construction projects to ensure quality and attain an acceptable level of performance from construction activities (Aluko, Idoro and Mewomo, 2020).

Lau, Li, Tang and Chau (2016) addressed Total Quality Management (TQM) in Hong Kong, and suggested that organization learning and people management are the two major principles required by engineering consultants for performance and sustainability in the market place. The study of Abdel-Razek (1998) concluded that the goal of service providers should be a quality improvement from time to time. Gholamreza (2012) emphasized the quality of construction from the perspectives of the contractor. In most of the studies, there are few that relates to the quality of projects arising from the perspectives of the professional service providers. Therefore, a need for an extensive study in this regard is vital in Nigeria. Lau et al. (2016) defined this concept of TQM as a philosophy and management practice whose primary aim is to harness its material and human resources effectively in order to achieve the goals of the organization. In building projects, the objective of the professional service providers is to see to the performance of the projects in such a way to meet the needs and expectations of the client.

According to Oyedele et al. (2015), quality issues in developing countries still rely on inherited traditions of Western nations. Abdel-Razek (1998) emphasized that improving quality in developing countries should be seen from each country background. Oyedele, et al., (2015) further stated that construction quality from the viewpoints of professional service providers remains an essential step towards the improvement of quality in Nigeria and other African nations. It has equally been confirmed that the realisation of the level of project performance depends strongly on the quality of service of the professional service providers. Though there is a considerable variation in the delivery of services by these professionals, however, overlap occurs in the process of service delivery, and the quality of the services exerts a lot of influence on the quality of building projects (Jewell et al.,. 2010)

In view of the above, this study is aimed at identifying and evaluating critical factors affecting the quality of building projects from the perspectives of professional service providers. This is to address the problem of poor performance of building projects in order to enhance competitiveness and sustainability in the industry. These service providers in the context of standard building projects' contracts in Nigeria are Architects, Structural Engineers, Mechanical and Electrical Engineers, and Quantity Surveyors. Their services are normally provided as a team for a specified building project.

2. FACTORS AFFECTING QUALITY OF BUILDING PROJECTS

Factors that can influence activities in construction settings are very important and have been highlighted by different researchers (Ejohwomu, Oshodi and Lam, 2017). The knowledge of these factors is necessary in order to be competitive and, most importantly, in meeting the needs and expectations of the client (Zhao et al., 2012; Lau et al., 2016). Several factors affecting the quality of building projects abound in literature, but it is important to distinguish which of them are critical and related to the professional service providers. Critical factors are the elements that are necessary for an organisation or a project to achieve

its mission (Ali, Amin and Husin, 2019). The factors that affect the services of professionals have been categorized into seven, namely: staff development, innovation, information and communication technology, construction materials, regulatory framework, client factors and professional fees (Aluko and Idoro, 2018). Ling, Ibbs and Hoo (2006) emphasize that keeping up with these factors remains significant risk faced by architectural and engineering design firms.

Oyedele et al. (2015) emphasize that most cost setbacks in construction can be attributable to poor management, while defects in quality are mostly due to defects in materials, inadequate planning and coordination. According to Zhao et al. (2012), a sound regulatory framework has a lot of implications on professional staff registration and licensing, requirements of procurement Acts for tender, and requirements for collaborations with foreign firms. The regulations for codes and standards equally affect quality depending on the level of quality management considerations. The development of knowledge and expertise in the industry drives the human capital and plays a major role in engineering, procurement and construction projects in the industry. This leads to a better relationship that galvanises a competitive advantage for firms (Nguyen and Hadikusumo, 2017). As a result of the strong dependency on experts, the commitment and loyalty of employees are important and should possess the characteristics of human relations for the image of the professional service organizations (Razavi et al., 2012). To retain qualified staff and avoid unnecessary staff turnover, firms should attract good staff with salary, social welfare, remuneration package and benefits package (Zhao et al. 2012).

The issue of innovation was emphasized by Kamal, Yusof and Iranmanesh (2016). This is in respect of building the capacity of firms for innovation in order to remain competitive in an ever-dynamic environment. Other scholars (Roxas, Battisti and Deakins, 2013; Moohammad, Yusof and Kamal, 2014) observe that larger firms have the capacity to innovate than smaller firms because of access to resources. In contrast, Yusof and Mohd (2011) note that smaller firms have the tendency to innovate because of flexibility.

The unrealistic constraints of time and cost often imposed by clients equally remain an albatross in achieving the desired quality in building projects. The clients often require a quick return on investment. This often results in poor workmanship. The requirements of the procurement regulations that place emphasis on project award to the lowest bidder are equally a challenge of quality (Low and Than, 1996). The decision-making process by clients, particularly the lack of comprehensive briefs, affects the services of consulting firms significantly (Yu et al., 2010). This is because professional services involve a lot of client interactions (Cheng and Proverbs, 2004). Such decision ranges from development scale, revenue targets for the project, procurement routes, and occurrence of design changes as a result of changes in client requirements affecting the services of consulting firms. The ability of the client to assemble a competent design team for project implementation and the involvement of the client in the design process are equally very significant in determining the quality of building projects (Zhao et al., 2012; Lohiya, 2012).

The design team requires information about different types of building materials in order to evaluate and specify building materials during the design process and is crucial for the successful implementation of any design concept (Tas, Yaman and Tanacan, 2008). This is, of course, subject to the availability of these materials in the market. The issue of accessing up-to-date information about the materials, the sources and how they are obtained remain a topical issue in the industry. The demand for construction materials in the industry will continue to create demands in the industry (Ling et al., 2006). Therefore, availability and prices are critical factors in project viability. The specification and usage of materials are equally important to arrive at an affordable cost for the client, which influences the integrity and innovation of designs. Hoxha, Haugen and Bjorberg (2017) emphasise energy efficiency and durability as critical considerations to choose sustainable building materials. Therefore, the use of these materials, availability and integration of these materials with others during

design detailing and execution on the construction site is very crucial. It is important, however, that building material information bank, classification systems for these materials, preferably using information technology, will give practitioners easy access to reliable, timely, up-to-date and accurate technical information.

The adoption of Information and Communication Technology (ICT) has become a standard practice in the design process by professional service firms. Russell (2007) observes that the development of Computer-Aided- Design (CAD) programmes have assisted firms in no small measure, it leads to an easier distribution of the service product more efficiently. Technological development has shortened the geographical sphere of operations rapidly, and this has enhanced productivity. Ling, Ibbs and Kumaraswamy (2005) found out this had encouraged field specialisation, technical expertise and the ability to handle complex projects. Firms that give attention to research and development (R&D) get new knowledge that can be applied in practice to achieve better practice (Ling et al., 2006). Scholars, particularly from technology and science-based disciplines, emphasised investment in R&D to be very critical for a successful professional service (Czarnitzki and Thorwarth, 2012; Filippetti and Archibugi, 2011; Zhao and Ordonez de Pablos, 2011).

The introduction of Building Information Technology (BIM) facilitated smooth communication and reduction in design inconsistencies that can lead to rework and assists firms to remain competitive (Sverlinger, 2000). Knowledge management is also used in the research literature as a component of ICT. Fong and Choi (2009) reiterate that there is a general lack of specially assigned staff for knowledge acquisition and management in the Professional Service Firms (PSFs). This was confirmed by Massaro et al. (2016). The findings of the study revealed that knowledge management research in small and medium enterprises like professional service firms is fragmented and uncoordinated. The impact of ICT in day-to-day activities is immense, PSFs that will remain competitive will invest in it continuously. Effective communication enhances the time, cost and quality performance of building projects. Meaningful resolution of problems in construction settings requires effective communication among the stakeholders.

The performance of individual groups within the team of construction settings is very crucial. This often determines the overall project performance. Oyedele and Tham (2007) noted that the commitment of management to continuous quality improvement is critical to achieving quality in building projects. Other factors of quality include levels of commitment of participants, a conducive atmosphere of operations, levels of co-operations among participants and the client's involvement in the process. Lau et al. (2015) revealed specifically that areas of improvement in the service of professionals that are related to the quality of building projects include improvement of buildability, timeliness in respect of design and construction, management of input of different disciplines within the team.

Others are a better understanding of client and user's requirements, better communication within the team during design and construction, and effective communication with clients, including timely reports and design issues. Frodell, Josephson and Lindahl (2008) equally emphasized that three main factors of project success as the client's ability to make decisions committed construction management workforce and competency within the workforce. Equally seen as important is the dissemination of project goals among the team. The overall objective of the professional service providers is to manage both human and material resources in order to satisfy the client both with the tangible design product and the service delivery processes. Stakeholders' commitment is vital in achieving this laudable goal in a project environment.

3. RESEARCH METHOD

This study adopted survey approach using questionnaire to collect the needed data on the factors identified in the literature affecting quality of building projects. A pilot set of the

questionnaire was sent to ten selected professionals to test the relevance of the survey. This was followed by an interview discussion with the selected professionals to determine the effectiveness and level of understanding of the questions. Based on their comments, the questionnaire was refined before it was finally adopted. The population of the study consists of Architects, Structural Engineers, Mechanical and Electrical (M&E) Engineers, and Quantity Surveyors who are involved in 120 building projects selected using purposive sampling. From the sampling, a population of four hundred and eighty was established. In order to arrive at an acceptable sample distribution, the minimum sample size was calculated using the following formula as posited by Udofia (2011):

$$n = \frac{N}{1 + N(e^2)}$$

Where n = minimum sample size, 1 = Unity; e = Level of significance = 0.05; N = Universe or Population = 480

$$n = \frac{480}{1 + 480(0.05^2)} = 218$$

With an addition of 50% (109) to the minimum sample size (218) calculated, a sample size of three hundred and twenty-seven (327) is used for the study. Therefore, the number of the questionnaire distributed was 327, of which 270 were received and used for the analysis (Table 1). The first section of the questionnaire consists of the personal characteristics of the respondents. Such characteristics include respondents' gender, academic qualification, professional affiliation, cadre and years of experience. The second section consists of the variables of the study as contained in the questionnaire, and was in two parts. They were measured using a 5-point Likert scale. In the first part, respondents were expected to rate the frequency of the factors using 1=Not frequent, 2=Frequent, 3=Average, 4=Very frequent and 5= Extremely frequent. In the second part, the severity of the factors were also expected to be rated using 1=Not severe, 2=Severe, 3=Average, 4=Very severe and 5= Extremely severe.

The importance of each factor was computed by multiplying the severity and frequency of each factor. This is expressed as follows:

Importance (I) = Severity (S) x Frequency (F) …….. (i)

The comparison of ranking among professionals was done using severity, frequency and importance indexes as follows:

$$\text{Severity Index (SI)} = \left(\frac{\Sigma(s)}{NS}\right) \text{ X } 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{ (ii)}$$

$$\text{Frequency Index (FI)} = \left(\frac{\Sigma(f)}{NS}\right) \text{ X } 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{ (iii)}$$

$$\text{Importance Index (II)} = \left(\frac{\Sigma(sf)}{NSF}\right) \text{ X } 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{ (iv)}$$

In the above equations, s and f are severity and frequency ratings and ranges between 1 and 5.

S and F are the highest severity and frequency ratings of 5, and N is the total number of responses for that particular factor. To determine the general agreement in the ranking of

all factors, the rank agreement factor (RAF) and percentage rank agreement factors (PRAF) was used to measure the agreement in the importance ranking among the professionals. This is expressed as follows:

$$PRAF = \frac{RAFmax - RAFi}{RAFmax} \times 100\% \quad \text{.....} \quad (v)$$

$$RAF = \frac{\Sigma ASMQ}{N} \quad \text{.....} \quad (vi)$$

In the above, RAFmax = maximum RAF, RAFi = RAF for each factor, N= number of variable factors ranked, and ΣASMQ =sum of the order of rankings by Architects, Structural Engineers, M & E Engineers and Quantity Surveyors. All of the above are from formulae derived by Tam et al. (2000). Statistical Package for Social Sciences (SPSS) 23 was used to conduct one sample t-test to discover a significant difference between the mean difference of each factor and the hypothesised average value. Spearman Rank Correlation analysis was used to measure the degree of correlation among the professional service providers in the ranking of the factors that contribute to the quality of building projects.

4. RESULTS AND DISCUSSION

4.1 Respondents' characteristics

The features of the respondents of this study were investigated for an understanding of persons who supplied the data used for the study. For the investigation, five features, namely, respondents' gender, academic qualification, professional affiliation, cadre and experience, were selected. In addition, the type of client, namely public or private, was investigated for the building projects. The results are presented as follows.

Table 1: Descriptive results of the bio-data of the Respondents

Variable	Frequency	Percentage
Gender		
Male	198	73.3
Female	72	26.7
Total	270	100.0
Highest Academic Qualification		
HND	60	22.2
B.Sc	44	16.3
PGD	85	31.5
MSc	75	27.8
PhD	6	2.2
Total	270	100.0
Professional Affiliation		
MNIA	70	25.9
MNSE (Structural)	68	25.2
MNSE (M &E)	67	24.8
MNIQS	65	24.1
Total	270	100
Professional Cadre		
Graduate	142	52.6
Corporate	88	32.6
Fellow	40	14.8
Total	270	100

Variable	Frequency	Percentage
Professional Experience		
1-10 years	130	48.1
11-20 years	73	27
Above 20 years	67	24.9
Total	270	100.0

Table 1 revealed that the majority of the respondents (73.3%) are male, while 26.7% of the respondents are female. This implies the predominance of male practitioners in the industry than their female counterparts. The result also shows that 16.3% of the respondents in Consultancy firms had B. Sc, 27.8% had a Master's degree, and 22.2% had Higher National Diploma as their highest academic qualifications. Also, 31.5% had PGD as their highest qualification while 2.2% had a PhD. The results indicated that the respondents in the client organization had an adequate academic qualification with HND as a minimum qualification.

The results further revealed that (25.9%) of the respondents in client organizations are members of the Nigerian Institute Architects, 25.2% are members of NSE (Structural Engineering division), 24.8% are members of NSE (M & E division), while 24.1% are members of NIQS. The results indicated that the four professionals who are involved in providing consultancy services in building projects are evenly represented in the respondents. The analysis of the cadre of membership of professional bodies shows 52.6% are in the graduate cadre, 32.6% in corporate cadre and 14.8% are in fellowship cadre in their professions. The results also revealed that 48.1% had 1-10 years of experience on the job, 27.0% had 11-20 years' experience, while 24.8% had more than 20 years of experience on the job. The results imply that a greater percentage of respondents are of moderate experience.

4.2 Comparison of indexes and rankings of the factors among professionals

The indexes for the factors in respect of importance (I), severity (S) and frequency (F) were calculated and ranked appropriately for Architects, Structural Engineers, M & E Engineers and Quantity Surveyors. The results in Table 2 shows the indexes and rankings for Architects, Table 3 for Structural Engineers, Table 4 for M&E Engineers and Table 5 for Quantity Surveyors.

Table 2: Indexes and Rankings of Architect's Response

Factors	FI	FR	SI	SR	II	IR
The use of modern hardware and software	74.43	6	81.14	1	59.54	6
Commitment of members staff	80.64	2	78.29	2	64.51	2
Ability to choose the right design team	71.40	8	74.86	6	57.14	8
Client's financial position	76.90	4	76.86	4	61.54	4
Staff education and training	79.50	3	77.43	3	63.60	3
Previous relationship with the client	89.90	1	70.86	11	71.94	1
Authority for design team effective performance	72.00	7	73.43	8	57.60	7
Availability of materials for design	67.71	13	75.71	5	54.17	13
Supply and price of construction materials	68.86	10	74.86	6	55.09	10
Adoption of building information modelling	57.50	29	71.43	10	46.00	28
Effects of sub-standard materials	64.78	17	70.86	11	51.83	16
Client's involvement in design process	76.29	5	68.57	18	61.03	5
Internet communication link among employees	61.79	21	64.00	26	49.43	20
Level of commitment by participants	63.00	20	54.86	29	50.40	19
New methods for service leverage	67.43	14	69.14	15	55.03	11
New activities for knowledge of employees	69.36	9	67.14	21	55.49	9
Salary and social welfare structure	67.43	14	72.29	9	53.94	14

Improvement of buildability	56.43	29	69.14	15	45.14	29
New internal administration and operation	63.86	19	66.00	23	51.09	18
Capacity of the local materials industry	59.93	26	69.42	14	47.94	26
ICT link to all relevant external information	61.29	22	68.85	17	49.03	21
Levels of cooperation among participants	60.43	24	68.57	18	48.34	24
Communication within the team during and construction	68.00	12	69.43	13	54.40	12
Management of input of different team members	61.14	23	66.57	22	48.91	22
Availability of created new line of services	64.00	18	67.71	20	51.20	17
Allocation of resources to R&D in ICT	57.86	28	64.86	24	46.29	27
Available government regulatory framework	66.79	16	64.00	26	53.43	15
Policy framework for tech staff registration	51.57	30	63.43	25	41.26	30
Procurement Acts for professionals	59.00	27	60.57	28	48.91	23
Frequency of changes in regulation	60.43	24	54.00	30	48.34	25

Table 2 above shows that in severity scale 'the use of modern hardware and software', was ranked first, 'commitment of members of staff' was ranked second while 'staff education and training' was ranked third by Architects, while 'frequency of changes in regulation' was ranked least. In the frequency of the factors, 'previous relationship with client' was ranked first, commitment of members of staff was ranked second while staff education and training was ranked third. This shows some level of consistency with respect to the perceptions of Architect with respect to achieving expected quality of building projects by the clients.

Table 3: Indexes and Rankings of Structural Engineer's Response

Factors	FI	FR	SI	SR	II	IR
The use of modern hardware and software	68.00	24	77.85	1	54.40	24
Commitment of members staff	74.62	13	77.54	2	59.69	13
Ability to choose the right design team	75.62	11	76.00	5	60.49	9
Client's financial position	75.38	10	75.08	6	60.31	11
Staff education and training	66.92	26	76.62	4	53.54	26
Previous relationship with the client	75.46	9	77.23	3	60.37	10
Authority for design team effective perform	69.77	21	75.08	6	55.82	21
Availability of materials for design	74.46	14	71.08	13	59.56	22
Supply and price of construction materials	65.69	27	68.00	21	52.55	27
Adoption of building information modelling	67.85	25	73.85	9	54.27	25
Effects of sub-standard materials	70.54	18	69.23	19	56.43	18
Client's involvement in design process	75.69	8	72.62	11	60.55	8
Internet communication link among employees	63.62	29	72.92	10	50.89	29
Levels of commitment by participants	71.30	16	57.54	30	57.04	16
New methods for service leverage	70.77	17	70.77	14	56.62	17
New activities for knowledge of employees	89.23	1	74.46	8	71.38	1
Salary and social welfare structure	77.23	6	70.46	16	61.78	6
Improvement of buildability	71.61	15	70.15	17	57.29	15
New internal administration and operation	86.07	2	71.38	12	68.86	2
Capacity of the local materials industry	77.46	5	64.00	27	61.97	5
ICT link to all relevant external information	80.38	4	67.08	22	64.30	4
Levels of cooperation among participants	69.92	20	69.54	18	55.94	20
Communication within the team during design and construction	64.92	28	70.77	14	51.94	28
Management of input of different team members	54.77	30	68.62	20	43.82	30

Availability of created new line of services	69.54	22	66.77	23	55.63	14
Allocation of resources to R&D in ICT	69.38	23	66.77	23	55.50	23
Available government regulatory framework	82.77	3	63.69	28	66.22	3
Policy framework for tech staff registration	70.15	19	64.31	26	56.12	19
Procurement Acts for professionals	76.92	7	66.46	25	61.54	7
Frequency of changes in regulation	75.00	12	60.31	29	60.00	12

Table 3 above shows the evaluation of severity and frequency of factors affecting quality of building projects as provided by the Structural Engineers. From the Table, 'the use of modern hardware and software', was ranked first, 'commitment of members of staff' was ranked second while 'previous relationship with client' was ranked third, while 'levels of commitment by participants. In respect of frequency of factors, 'new activities for knowledge of employees' were ranked first, 'new internal administration and operation' was ranked second 'available government regulatory framework' was ranked third. Unlike Architects' perception, this shows a significant difference in the perceptions of the Structural Engineers.

Table 4: Indices and Rankings of Mechanical and Electrical Engineer's Responses

Factors	FI	FR	SI	SR	II	IR
The use of modern hardware and software	47.07	30	93.43	2	37.66	30
Commitment of members staff	61.43	14	72.29	4	49.14	14
Ability to choose the right design team	58.00	23	74.00	1	46.40	3
Client's financial position	73.93	2	71.71	5	59.14	2
Staff education and training	60.14	17	72.86	3	48.11	17
Previous relationship with the client	67.50	8	70.00	7	54.0	7
Authority for design team effective perform	67.79	6	70.57	6	54.23	6
Availability of materials for design	59.21	20	70.00	7	47.37	21
Supply and price of construction materials	61.21	16	69.43	9	48.97	15
Adoption of building information modelling	55.50	27	67.43	10	44.40	27
Effects of sub-standard materials	67.36	10	67.43	10	53.89	9
Client's involvement in design process	73.78	3	66.00	15	59.03	3
Internet communication link among employees	59.43	18	65.14	19	47.54	18
Levels of commitment by participants	56.00	25	58.57	30	44.8	25
New methods for service leverage	77.50	1	66.00	15	62.00	1
New activities for knowledge of employees	60.57	7	66.29	14	48.46	16
Salary and social welfare structure	71.86	4	62.86	26	57.49	4
Improvement of buildability	57.64	24	67.14	12	46.11	24
New internal administration and operation	67.50	8	64.86	21	54.00	8
Capacity of the local materials industry	59.00	21	66.86	13	47.2	20
ICT link to all relevant external information	58.86	22	65.14	19	47.09	18
Levels of cooperation among participants	54.43	28	65.71	17	43.54	28
Communication within the team during design and construction	55.57	26	64.29	23	44.46	26
Management of input of different team members	63.71	12	64.57	23	44.46	26
Availability of created new line of services	66.00	11	63.14	25	52.80	10
Allocation of resources to R&D in ICT	70.43	5	64.29	23	56.34	5
Available government regulatory framework	62.00	13	65.43	18	49.60	12
Policy framework for tech staff registration	53.36	29	62.00	27	42.69	29

Procurement Acts for professionals	61.43	14	59.14	29	49.14	13
Frequency of changes in regulation	59.29	19	61.71	28	47.43	19

The severity for M&E Engineers in Table 4 above shows that 'ability to choose the right design team' was ranked first, 'the use of modern hardware and software' was ranked second while 'staff education and training' was ranked third. However, 'levels of commitment by participants' was ranked last. On the frequency rating, 'new methods for service leverage' was ranked first, 'client's financial position' was ranked second while client's involvement in design process was ranked third. The evaluation is a reflection of the area of specialization of the respondent. However, some level of agreement can be seen in the evaluation of the severity of the factors.

Table 5: Indices and Rankings of Quantity Surveyor's Responses

Factors	FI	FR	SR	SR	II	IR
The use of modern hardware and software	61.08	26	80.00	1	48.86	26
Commitment of members staff	67.62	16	77.54	3	54.09	16
Ability to choose the right design team	78.12	2	78.46	2	62.89	2
Client's financial position	75.23	5	75.08	7	60.18	4
Staff education and training	70.77	9	73.23	9	56.62	9
Previous relationship with the client	79.08	1	73.85	8	63.26	1
Authority for design team effective perform	70.38	10	76.00	4	56.30	10
Availability of materials for design	68.76	13	75.69	5	55.02	13
Supply and price of construction materials	70.31	11	75.69	5	56.24	11
Adoption of building information modelling	54.77	29	69.84	15	43.87	29
Effects of sub-standard materials	68.46	15	71.38	10	54.77	15
Client's involvement in design process	77.38	3	68.62	19	61.91	3
Internet communication link among employees	67.46	17	69.54	16	53.97	17
Levels of commitment by participants	62.38	25	55.69	30	49.91	25
New methods for service leverage	71.08	8	69.85	13	56.86	8
New activities for knowledge of employees	63.23	24	69.85	13	50.58	24
Salary and social welfare structure	66.77	19	71.08	11	53.42	19
Improvement of buildability	67.15	18	62.15	26	53.72	18
New internal administration and operation	65.00	23	69.54	16	52.00	23
Capacity of the local materials industry	65.54	22	70.76	12	52.43	22
ICT link to all relevant external information	75.24	4	69.23	18	60.18	4
Levels of cooperation among participants	68.62	14	66.46	23	54.89	14
Communication within the team during design and construction	65.77	21	60.92	28	52.62	21
Management of input of different team members	74.46	6	62.15	26	59.57	6
Availability of created new line of services	52.38	30	67.08	21	41.91	30
Allocation of resources to R&D in ICT	72.08	7	66.46	23	57.66	7
Available government regulatory framework	59.23	27	66.77	22	47.38	27
Policy framework for tech staff registration	65.92	20	65.23	25	52.73	20
Procurement Acts for professionals	68.85	12	67.69	20	55.08	12
Frequency of changes in regulation	56.61	28	56.31	29	45.29	28

Table 5 above shows the evaluation of severity and frequency of factors affecting quality of building projects as provided by the Quantity Surveyors. From the Table, 'the use of modern hardware and software', was ranked first, 'ability to choose the right design team' was ranked second and 'commitment of members of staff' was ranked third. On the frequency of factors, 'previous relationship with the client' was ranked first, 'ability to choose the right

design team' was ranked second and 'client's involvement in design process' was ranked third. Critical observation of the evaluation by the professionals shows there are no specific quality assurance guidelines, as each service providers evaluate these factors from the perspective of loyalty to area of specialization. The fragmented nature of the industry plays out continuously, with less integration of diverse information.

4.3 Percentage rank agreement factor

The evaluation of the importance of the factors was carried out using the rank agreement factor (RAF) and percentage rank agreement factor (PRAF). The quantitative measure was among Architects, Structural Engineers, M&E Engineers and Quantity Surveyors. The RAF can either be < 1 or > 1. A higher factor indicates a higher level of disagreement (Elinwa and Joshua, 2001). A RAF value of 0.00 implies a perfect agreement. Table 6 below shows the highest RAF value to be 3.63 and the least value of 0.63. The one sample t-test results for the thirty factors are also shown in Table 6 using a significant p-value of < 0.05 as a basis at 95% confidence value. The result shows that all the thirty factors have a p-value of < 0.05. This means that all the factors are statistically significant in affecting the quality of building projects.

Table 6: Percentage Rank Agreement Factor and Level of Significance

Factors	ARC	SE	M&E	QS	Sum of Ranking **ΣASMQ**	RAF	PRAF	Ranking order	t-test (p-value)
Previous relationship with the client	1	10	7	1	19	0.63	82.64	1	0.001* *
Client's involvement in design process	5	8	3	3	19	0.63	82.64	1	0.001* *
Client's financial position	4	1	2	4	21	0.70	80.72	3	0.001* *
Ability to choose the right design team	8	9	3	2	22	0.73	78.89	4	0.001* *
New methods for service leverage	11	17	1	8	37	1.23	66.12	5	0.001* *
Salary and social welfare structure	14	6	4	19	43	1.43	60.61	6	0.001* *
Authority for design team effective performance	7	21	6	10	44	1.47	59.50	7	0.001* *
Commitment of members staff	2	13	14	16	45	1.50	58.68	8	0.001* *
ICT link to all relevant external information	21	4	18	4	47	1.57	56.75	9	0.001* *
New activities for knowledge of employees	9	1	16	24	50	1.67	53.99	10	0.001* *
New internal administration and operation	18	2	8	23	51	1.70	53.17	11	0.001* *
Staff education and training	3	26	17	9	55	1.83	49.59	12	0.001* *
Procurement Acts for professionals	23	7	13	12	55	1.83	49.59	12	0.001* *
Government regulatory framework	15	3	12	27	57	1.90	47.66	14	0.001* *
Supply and price of construction materials	10	27	15	11	58	1.93	46.83	14	0.001* *
Effects of sub-standard materials	16	18	9	15	58	1.93	46.83	16	0.001* *
Allocation of resources to R&D in ICT	27	23	5	7	62	2.07	42.98	17	0.001* *
Management of input of different team members	22	30	11	6	69	2.30	36.44	18	0.001* *
Availability of materials for design	13	22	21	13	69	2.30	36.44	18	0.001* *
Availability of created new line of services	17	14	10	30	71	2.37	34.71	20	0.001* *
Capacity of the local	26	5	20	22	73	2.43	33.06	21	0.001* *

materials industry									
Internet for communication link among employees	20	29	18	17	84	2.80	22.87	22	0.001* *
Frequency of changes in regulation	25	12	19	28	84	2.80	22.87	22	0.001* *
Levels of commitment by participants	19	16	25	25	85	2.83	22.04	24	0.001* *
The use of modern hardware and software	6	24	30	26	86	2.86	21.21	25	0.001* *
Improvement of buildability	29	15	24	18	86	2.87	20.94	26	0.001* *
Levels of cooperation among participants	24	20	28	14	86	2.87	20.94	26	0.001* *
Communication among team during design and construction	12	28	26	21	87	2.90	20.11	28	0.001* *
Policy framework for technical staff registration	30	19	29	20	98	3.27	9.92	29	0.001* *
Adoption of building information modelling	28	25	27	29	109	3.63	0.00	30	0.001* *

* *Significant factors @0.01 (95%) confidence interval

Table 6 shows that the most important are 'previous relationship with the client', 'client's involvement in the design process' and 'client's financial position'. Others are 'ability to choose the right design team' and 'new methods for service leverage'. The least are 'building information modelling', 'policy framework for technical staff registration' and 'communication within the team during and construction'.

The issue of clients as exemplified here brings to the fore the fundamental position and responsibility in achieving quality building projects. These findings are consistent with the position of earlier researchers in the field of construction management. Frodell et al. (2008) established that the client's ability to make decisions remains a major factor having a substantial effect on construction projects in Sweden. This position is equally in tandem with the ability to choose the right design team. The choice of the right team influences enhances quality thinking and the competence of the workforce. Kama and Junnonen (2017) noted that design team work in order to provide solutions to clearly specified requirements. As such, the client has a duty to make an informed decision which is expected to influence the quality of the building project.

Previous relationship with the client is equally an important feature in the context of the performance of professional service providers. This is consistent with the findings of Grierson and Brennan (2017). The study emphasized that previous relationships with clients can influence client referral behaviour which is important for business success. Kumar, Petersen and Leone (2010) equally stated earlier that referral is an outcome of a transaction occurring within a newly established service provider-client relationship. According to Olatunde, Ogunsemi and Oke (2017), the composition of the team members has a significant effect on both the quality and the completion time of construction projects. Therefore, effort should be made in establishing roles of team members when they are appointed in order to work as a team for a common goal of achieving the expectation of the client.

The issue of communication within the team during and construction' in this study is however in contrast with Kama and Junnonen (2017). In the findings of Kama and Junnonen (2017), improvement in the quality of service and project is found in internal communication and collaboration within the design teams. This emphasized further that the success rate of project is always party specific. Stakeholders are therefore expected to focus more on client-oriented strategies to achieve the project goal and objectives. It is equally important for the design team to appreciate that communications channels help the stakeholders in a project to understand work processes, improve buildability and find solutions to problems during design and construction as they arise.

The importance of Building Information Modelling (BIM) in this study surprisingly is in contrast with the position of contemporary researches. This is because BIM had been seen

as a ready tool to address the fragmentation and low performance in Architecture, Engineering and Construction (AEC) industry. Collaboration and communication have been enhanced through BIM with a major benefit of better cost estimation and control, efficient construction planning and management, and improvement in design and project quality (Chan, Olawumi, and Ho, 2019). Even at the design stage, BIM shas been adopted as an effective tool to facilitate efforts at improving safety performance (Teo, Ofori, Tjandra and Kim, 2016). BIM reduces fragmentation in the industry, allows accurate updating of changes, improves communication within the project team. It enhances project efficiency and productivity, facilitates the selection of sustainable materials and ensuring the real-time sustainable design and multi-design alternatives (Olawumi and Chan, 2019).

4.4 Correlation Analysis

Spearman rank correlation from SPSS 23 was used for the correlation. This was to measure the degree of correlation among Architects, Structural Engineer, M&E Engineers and Quantity Surveyors in ranking the factors that affect the quality of building projects. Table 7 below shows the result of the correlation analysis. The result shows a strong correlation (0.73) between Architects and Quantity Surveyors and between Architects and Structural Engineer (0.41). The Architects and M&E Engineers exhibited low correlation (0.39), that of Structural Engineers and M&E Engineers was equally low (0.18). The low correlation might be a result of the nature of the line of teamwork among the professionals. However, a negative correlation (-0.19) was recorded between Quantity Surveyors and Structural Engineers. The explanation is because of the importance of communication within the team during design and construction. These drawbacks should be addressed by the professionals in the team. This is because the performance of one group in a team is also dependent on the performance of others in the team.

Table 7: Spearman rank correlation coefficients of professionals' importance of factor

Professionals	ARC importance	SE importance	M&E Engineer's importance	QS importance
Architect's importance	1			
Structural Engineer's importance	0.41**	1		
Mechanical & Electrical Engineer's importance	0.39**	0.18**	1	
Quantity Surveyor's importance	0.73**	-0.19**	0.41**	1

**Correlation significant at 0.01 (95%) confidence interval (2-tailed)

5. IMPLICATIONS AND CONCLUSION

This study examined thirty factors that affect the quality of building projects within the services of professional service providers. The service providers who provided information for the study are Architects, Structural Engineers, M & E Engineers and Quantity Surveyors. The importance of the factors was quantitatively computed through severity and frequency indexes. Rank agreement factor (RAF) used for comparison among the service providers, while percentage rank agreement factor (PRAF) was used to measure the agreement in the importance rankings. T-test was used to test the significance of each factor to the quality of the building project. Spearman correlation analysis was also used to measure the degree of correlation among the professionals.

The most important as established in the study are 'previous relationship with the client', 'client's involvement in the design process' and 'client's financial position', 'ability to

choose the right design team' and 'new methods for service leverage'. The least are 'building information modelling', 'policy framework for technical staff registration' and 'communication within the team during and construction'. The study contributed to the field of project success in that there is a need to measure the importance that various participants assign to various success factors of projects.

The factors that are rated the most important affecting quality of building projects in this study are client-related issues. The implication of this is that practitioners need to focus a higher emphasis on human relationships and attitudinal challenges. This suggests the need to inculcate this in the quality standard and quality assurance processes. Professional service providers should consider this as a metric in the performance measurement. Researchers have established the vantage position of clients in the industry. Meeting the needs and expectations of clients remain vital for both financial performance and sustainability in the industry. Professionals should place emphasis on client-oriented practices in order to serve the clients better. The clients, on the other hand, need to open communication with service providers, making their requirements known in a clear term.

The industry requires innovation both at the design and construction stage, which will enhance the quality of processes. Most importantly is the present lopsided and poor integration of BIM in both at design and construction stages of building projects. BIM as a tool creates, manage and adopts virtual representation of a facility from the design to the operational life cycle of a project. Stakeholders should advocate for legislation in integrating BIM into every stage of the construction stage. This is because BIM has been seen in several countries as a viable tool to address the fragmentation in the industry. It enhances communication, effective site planning, avoidance of design errors, coordination of drawings and services and collaboration for overall performance in the industry. It enhances the quality of process and product of infrastructures. It integrates all the participants together with a focus on delivering the project as represented by the BIM.

The findings have established that the right content of design documents, timely delivery of designs, effective communication within the team, management of inputs from the different stakeholders in the team and up-to-date investment in ICT affect the quality of the construction process. The technical and functional quality of the building is related to how the completed facility meets the specification in the design documents. It is the sum total of the performance of all the participants in the project. The overall quality of the project determines how the needs and aspirations of the client have been met. It is also a determinant of future engagement of the service providers, which is equally an opportunity for continuous development.

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A Delphi Study of Socio-Cognitive Predictors of Career Choice Behaviour in the Construction Industry in South Africa

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ABSTRACT

This paper presents findings of a Delphi study which sought to identify the key factors that influence and determine the career choices of women in the construction industry in the South African context. Adopting the Socio-Cognitive Career Theory (SCCT) as the study's conceptual framework, a two-round iteration was performed to obtain the opinion of 14 experts actively involved in the South African construction industry. Consensus was achieved on ten predictors and 53 elements that influenced women's decisions to undertake a career in the construction profession. Findings from the study revealed women's career choices were influenced by gender, self-efficacy, socio-economic status, outcome expectations, goal representations, learning experiences, interests, social supports, perceived barriers and access to opportunity structures. Ethnicity was found to have insignificant importance and impact on their career choices. The implication of the research is that results from the study provides insight into the factors that could conceivably increase the participation of women who want to enter and remain in the construction work.

Keywords: Career choice; Construction industry; Gender; Socio-cognitive career theory, South Africa; Women

1. INTRODUCTION

Making a career choice in the construction industry has not been a common decision by women in South Africa (Ozumba & Ozumba, 2012). Haupt & Fester (2012) revealed in their study on women-owned construction enterprises that the decision of some women to pursue a career in construction was opportunistic and coincidental rather than a deliberate option and choice. Lack of knowledge and understanding of the career opportunities available in the industry, as well as the discriminatory environment, are some of the main obstacles identified as negatively influencing the career choices of women in construction (English & Hay, 2015; Oyewobi et al., 2020). Findings from a study conducted by Chileshe & Haupt (2010) on the factors impacting career decisions in the South African construction industry revealed that out of 491 female high school students, 424 of them reported that they had not even considered a career in construction or building. The study further revealed that parents, teachers, and students believed construction only involved jobs such as carpentry, bricklaying, and painting. Clearly, the construction industry needs to improve and enhance its image to counter these common stereotypes. Therefore, research concerning this issue should be continually conducted until sustainable improvements are made.

Although there have been numerous studies on gendered experiences in the construction industry (Chileshe & Haupt, 2010; English & Hay, 2015; Madikizela, 2008;

Ahuja & Kumari, 2012; Rosa et al., 2017; Vainikolo, 2017; Bennett et al., 2015 ; Akinlolu & Haupt, 2019; Oo et al., 2020), few studies have attempted to view these experiences from a theoretical perspective to give a larger meaning to career choices and development. Likewise, although numerous researchers have suggested a convergence of major career development theories (Eccles, 1984; Eccles et al., 1985; Hackett et al., 1991; Krumboltz et al., 1976; Lent et al., 1994), most recognize that this convergence has still not been achieved. The lack of empirical research in this area suggests that more in-depth exploration of this issue is required.

Many of the career theories that have been developed over time have focused on individual constructs such as self-efficacy, goal representations, interests, and outcome expectations (Bandura, 1989; Lent et al., 1994). The application of these career theories to different cultures and contexts has received limited attention (Ali & Saunders, 2006; Hunt et al., 2017; Saifuddin et al., 2013). Similarly, despite the significance of culture and the social context, issues of diversity and inclusion are mostly viewed through a Western lens (Syed & Özbilgin, 2009). Although an increasing amount of research focusing on gender inequality and career decisions have been conducted, the different dynamics in ethnicity and culture has been consistently neglected (Shapiro et al., 2009; Wells et al., 2010).

Through a Delphi study of construction industry experts, this study aims to determine the key socio-cognitive and contextual factors that influence career choices in construction. In the development of the Delphi instrument, the main research question was split into two sections that measured importance and impact respectively, namely;

a. What are the major factors that are perceived to be extremely important in predicting women's career choice in the South African Construction industry?
b. What are the major factors that are perceived to have a major impact on predicting women's career choice in the South African Construction industry?

This study contributes to research on gendered career choice in male-dominated environments in non-Western cultures. Research trends on gender in male-dominated work suggest that contextual and environmental factors may play a major role in shaping the attitudes, motivations, and career choices of a person (Ceci et al., 2009; Saifuddin et al., 2013). Numerous studies aimed to examine the declining participation in the South African construction industry may not fully capture the dynamics of career choices for individuals aspiring to undertake careers in construction (Sangweni, 2015; Akinlolu & Haupt, 2019). Therefore, the study attempts to expand the Socio-Cognitive Career Theory (SCCT) beyond its individualistic roots to incorporate more social and environmental factors.

2. THE SOCIO-COGNITIVE CAREER THEORY

This study was framed by the Social Cognitive Career Theory (SCCT) as it relates to the career decisions of women in the construction industry. The SCCT, conceptualized by Lent et al. (1994) and derived from Bandura's social cognitive theory, is founded from the social cognitive theory, which argues that a person is not entirely controlled by their environments, nor are they able to apply complete free will. Instead, a person's behaviour and thoughts influence the environment and are likewise influenced by personal factors and the social environment (Bandura, 1986; Charity-Leeke, 2012). Bandura (1986) referred to the relationship between three factors, namely person factors, external behaviour, and the environment, as "triadic reciprocity" (p. 18). Further, neither the person nor the environment is static (Kelly, 2009). Bandura noted that the three factors have different strengths, depending on the situation. Since there is a dependence on the person and contextual variables, along with the assertion that the person and environment are not static, Bandura's social cognitive theory has proven to be reasonable from upon which to develop a theory of career development, as done by Lent et al. (1994) with SCCT.

SCCT elaborates exclusively on the educational interest formation, career development, performance, and persistence of individuals in their career endeavours. Lent et al. (1994) attempted to combine elements of various theories developed and modified by several other theorists such as person-environment correspondence (Dawis & Lofquist, 1984), personality typology (Walsh & Holland, 1992), social learning (Krumboltz et al., 1976), life-span, life-space (Super, 1980), and developmental theory (Vondracek & Schulenberg, 1986). Therefore, an inclusive and comprehensive individual career choice model was produced (Lent et al., 2001). Processes whereby individuals' educational and professional interests are developed; the influence of interests and other socio-cognitive mechanisms on career choices, and the attainment of different levels of career performance and persistence are outlined in the SCCT (Lent et al., 1994; Ali &McWhirter, 2006).

SCCT focuses on the role of cognitive factors such as self-concept, self-efficacy, goal representations, interests, outcomes and expectations in the career development of an individual and how these factors interact with internal and individual variables such as gender, ethnicity, belief systems and social supports to influence the career behaviour of adolescents (Lent et al., 2000; Lent et al., 2008; Ali and Saunders, 2006; Kelly, 2009; Saifuddin et al., 2013). Biological, situational, and contextual factors such as race, sex, intelligence, culture, and gender role socialization are moderators of the formulation of choice goals and significantly influence career development (Ali & McWhirter, 2006; Kelly, 2009).

Table 1: Core constructs of the SCCT identified from the literature

SCCT Constructs	
Self- Efficacy	Saiffudin et al. (2013) Hunt et al. (2017), Ali et al. (2006), Daniels (2012), Chronister et al. (2003), Kelly (2009), Lent et al. (2008), Patton and Creed (2007)
Outcome Expectations	Lent et al. (2008), Patton and Creed. (2007)
Goal representations	Saiffudin et al. (2013) Chronister et al. (2003) Kelly (2009)
Social supports	Saiffudin et al. (2013) Hunt et al. (2017) Lent et al. (2008)
Learning Experience	Saiffudin et al. (2013) Hunt et al. (2017) Ali et al. (2006)
Interest	Chronister et al. (2003) Lent et al. (2008)
Self-concept	Kelly (2009)

Table I shows a comparison of existing literature regarding the basic constructs of the Social Cognitive Career Theory (SCCT) as applied to the career decision and development process. The predominant elements are related to self-efficacy, outcome expectations, goal representations, social supports, interest, and learning experience.

Self-efficacy has been found to play a crucial role in the career choices of individuals (Charity-Leeke, 2012; Hackett & Betz, 1981; Sawtelle et al., 2012). Self-efficacy belief, which is the core construct of SCCT and typically influences a person's academic and professional aspirations, is influenced by learning experiences (Saifuddin et al., 2013). In the context of SCCT, outcome expectations are anticipations of possible consequences from chosen actions and work-related behaviours (Lent et al., 2008; Kelly, 2009). Goal representations are achievement-related choices (Lent & Brown, 2006). All these factors, in combination with background factors and personal inputs such as gender, race and ethnicity, are the most prevailing predictors of career decision making as they are also suggested to influence learning experiences (Kelly, 2009; Charity-Leeke, 2012). From the SCCT perspective, learning experiences are verbal encouragement, supports and modelling from significant others used to maximise the performance accomplishment of a person (Flores et al., 2010). Lent et al. (1994) theorized that self-efficacy and outcome expectations lead to the formation of career interest, which results in the intention of getting involved in corresponding

activities with those interests. Interests are hypothesized to result in actual engagement in activities that lead to performance outcomes (Kelly, 2009).

Previous studies have demonstrated the function of the SCCT in the career outcomes of a person (Ali and McWhirter, 2006; Saifuddin et al.,2013; Hunt et al., 2017). These studies have shown that SCCT can be adapted to encapsulate the cultural characteristics of diverse environments, and therefore provide an ideal framework for understanding the social and cultural factors that influence the occupational choices, interests and aspirations of girls and women (Mau et al., 2000; Saifuddin et al., 2013). For example, through a path analysis and choice model, Lent et al. (2008) examined the relationship between self-efficacy, outcome expectations, intentions and interests of engineering students. Rogers et al. (2008) extended the SCCT career choice model to investigate the role of personality, self-efficacy, social supports, outcome expectations and intentions in the career readiness and planning of students. Rajabi et al. (2012) investigated the factors that influence the career choice intentions of Iranian agriculture students based on SCCT, using an artificial neural network. Jin et al. (2009) examined the influence of self-efficacy beliefs and personality traits such as extraversion, openness, agreeableness, and conscientiousness on the career decisions of Chinese postgraduate students. Kelly (2009) examined the extent to which self-efficacy, outcome expectations, self-and environment exploration, overall life satisfaction, and socioeconomic status (SES) would determine a student's adaptive transformation from school to the workplace. Ochs & Roessler (2004) examined the career exploration intentions of students and found that outcome expectation and self-efficacy beliefs play a significant role in the explanation of student's career intentions.

Although numerous studies examining SCCT have emphasized individual cognitive factors, little attention has been given to environmental factors. Therefore, this study sought to explore the key environmental variables in addition to the cognitive factors, which are perceived to have a greater influence on career decisions and focuses specifically on career decisions in undertaking work in construction-related disciplines as a significant outcome in construction careers. This study builds upon the framework of SCCT's model of career choice developed by Lent et al. (1994) and integrates both environmental and individual cognitive variables. The model of career choice incorporates personal factors such as, for example, gender, ethnicity, socio-economic status and contextual variables such as barriers such as example, work-life conflict, sexual harassment, glass ceiling, and the gender wage gap, opportunity structures, support structures, socialization process, gender role stereotypes, and predicts that each of the selected variables may determine the career behaviour of individuals undertaking careers in construction.

3. THE DELPHI METHOD IN CONSTRUCTION RESEARCH

The Delphi technique was used in this study, first as a tool to achieve consensus on the key factors that influence career choice behaviour in the South African construction industry. The technique was also used to obtain experts' views on the extent to which these socio-cognitive factors/attributes influence and impact women's career choice behaviour in construction in South Africa. The Delphi technique has been defined as a multi-staged survey that seeks ultimately to achieve consensus on an important issue (McKenna, 1994; Linstone & Turoff, 2002; Brill et al.,2006).

Over the past two decades, the Delphi technique has been extensively adopted in Construction Management research (Agumba & Musonda, 2013; Perrenoud,2020). Because construction data is often highly sensitive, the Delphi method allows researchers to collect more reliable data from selected experts who have collected knowledge and experience in each area (Hallowell & Gambatese, 2010; Fellows and Liu, 2015). Yeung et al. (2009); Yik et al. (2012); Ameyaw et al. (2016); Tengan & Aigbavboa (2021) have validated the use of the

Delphi technique in construction research. This study adopted steps and procedures as prescribed in similar Delphi studies.

4. MATERIALS AND METHODS

Given the need to explore new and existing concepts within and outside the field of career decision and development process body of knowledge, within the context of construction, the flexible, effective, and efficient research technique of Delphi was deemed to be appropriate to be used in this study to determine which of the constructs identified in the review of the literature, influence, and impact career choice behaviour in the South African construction industry. As previously stated, the Delphi technique has been widely used in construction research, and therefore, the approach is not novel or unique.

4.1 The Delphi Study

Selecting the Panel of Experts

The Delphi technique adopted the non-probabilistic purposive sampling technique to select participants that meet a list of identified criteria (Okoli and Pawlowski , 2004; Turoff & Linstone, 2002). Identifying and choosing panel members for this study involved consideration of the following criteria, namely;

a. Academic qualification: A minimum of a Master's degree in construction, engineering, and management-related field.
b. Experience: The participants must have a minimum of 5 years of relevant industry or research experience.
c. Knowledge and Specialization: Each member must have sufficient knowledge of construction, management, engineering, and social sciences.
d. Research and Authorship: The participant must be actively engaged in research and is an author or co-author of peer-reviewed publications in a field related to the research topic.
e. Willingness: Panellists must be interested and willing to participate throughout all the iterations.

Adopting these criteria helped to ensure quality contributions from the panellists. Table 2 provides detailed information on the characteristics of the panel members who all had PhDs as their highest qualifications, with most being specialists in higher education and training and at least 1-15 years relevant experience.

Table 2: Demographic Information of Delphi Panel

Category	Number of participants	Percentage of Sample
Gender		
Man	8	57.1%
Woman	6	42.9%
Highest Qualification of experts		
Doctorate (PhD)	14	100.0%
Participants' field of specialization		
Engineering and Construction	6	42.9%
Higher Education and Training	8	57.1%
Years of experience		
1-15 years	7	50.0%
16 – 30 years	5	35.7%
Above 31 years	2	14.3%

The experts were identified from published articles in research databases and industry experts and were recruited via email, which provided a brief overview of the study, and the

objectives were explicitly stated in the invitation letter. To achieve the required consensus in this study, two rounds of the Delphi questionnaire were administered to panel members via email in two rounds from April to June 2020. Figure 1 presents the Delphi research flow chart.

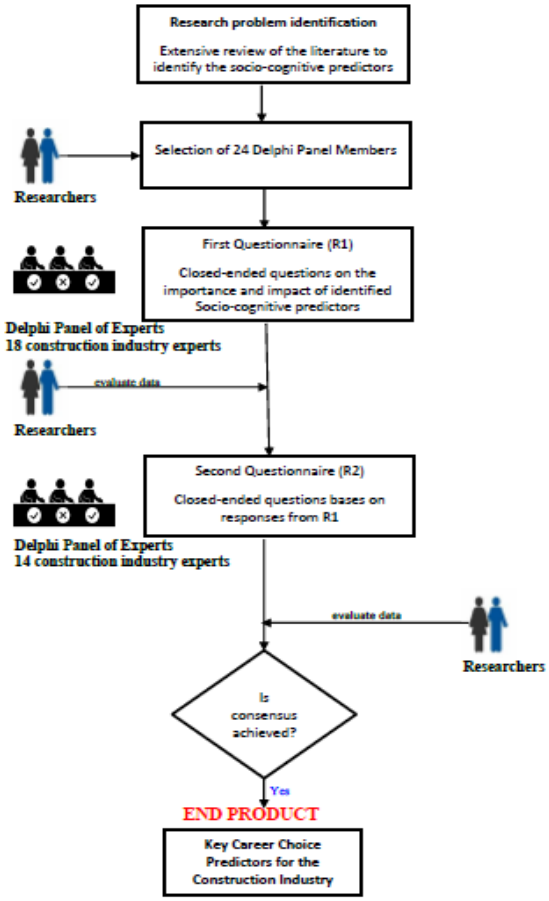

Figure 1: Flow Chart of the Delphi Study

Determining the number of panel members

While numerous studies have argued that although there is no prescribed number for a Delphi panel, there are recommended minimum numbers (Skulmoski et al., 2007). Since there is no recommended consensus as to the acceptable number of panellists in a Delphi study, 14 expert panel members were deemed an acceptable size for the panel, and 24 experts were invited to participate in the current study.

Computation of data from the Delphi study

Data computation was done using a spreadsheet software programme (Microsoft Office Excel). At the initial stage of the computational process, analysis of respondents' perceptions in achieving consensus regarding factors and attributes that influence career choice behaviour in construction are presented in the questionnaire. The study used group median responses for each item in the questionnaire. After the second round of Delphi, the absolute deviations (denoted as Di) of the group median ⌈represented as m(X)⌋ of each rating for only the pertinent questions were calculated using the following equation:

$$Di = \lceil xi - m(X) \rfloor \qquad (1)$$

Where Di = Absolute deviation
Xi = Panelist rating
m(X) = The measure of central tendency

The group median values for each round of response were computed as a measure of central tendency to determine the degree of consensus. In addition, the group median value was used as a measure of central tendency to reduce the effects of potentially biased individuals and to summarize the variableness of data.

Determination of Consensus
In a Delphi study, it is required that consensus should be reached on all questions asked. Depending on the nature of the study, a lack of consensus on a few questions could also be instructive. Some authors suggest consensus is assumed to be reached on a given question when a certain number of respondents fall within a pre-determined range of mean, median or standard deviation value, indicating a central tendency of the group response (Giannarou and Zervas, 2014). Christie and Barela (2005) suggested that for consensus to be reached, at least 75% of the respondents should rank the item two marks above and below the group mean on a 10-point scale.

Consequently, in this study, consensus on the key factors that influence career choice that would be incorporated in the refined conceptual model was reached when

- The item had a median of 7, 8, 9, 10, and at least 50% of the respondents ranked the element from 7 to 10 on an important scale.
- The item had a median of 7, 8, 9, 10, and at least 50% of the respondents ranked the element from 7 to 10 on the impact scale.

4.2 Demographic Information of the Delphi Experts

While 24 panellists were invited, only 18 participated in the first iteration. The details of the non-responsive 6 panellists were not included in Table II. As indicated in Table II, eight (8) of the panellists were men. All fourteen (14) of the experts held a Doctorate (PhD). The experts were from different sectors of the construction industry. Six (6) of the experts were involved in engineering and construction work, while eight (8) were academics in higher learning institutions.

There were three (3) architects on the panel, three (3) construction managers, two (2) quantity surveyors, one (1) building contractor, two (2) civil engineers, one (1) quarryman and two (2) project management experts.

More than half of the experts had between 1 – 15 years (9 persons) or 16-30 years (6 persons) of work experience. The average number of years of the experts was about 19 years, while the median was 20 years. This finding is indicative that the Delphi panel possessed sufficient experience and knowledge to participate in the study.

5. RESULTS AND DISCUSSION

5.1 Round One of the Delphi

In the first round, questionnaires were sent to 24-panel members, and 18 questionnaires were returned, representing a 75% response rate. Panel members were provided with two main questions, with a set of career choice influencing factors to be rated using a 10-point Likert scale. Panel members were required to rate these factors based on their importance and impact. Table III presents a summary of responses from the first round of the Delphi study. Responses were analysed, the statistical median and percentage responses. To measure consensus and to identify the main factors that influence career choice behaviour that would be included in the conceptual model, two criteria were considered;

a. Importance scale: Median of 7 and above on a 10-point Likert scale rating, and at least 50% of the respondents rating the factor from 7-10.
b. Impact scale: Median of 7 and above on a 10-point Likert scale rating, and at least 50% of the respondents rating the factor from 7-10.

As indicated in Table 3, the experts did not reach a consensus on ethnicity and family approval of choice. However, based on the pre-set criteria, the group median of these factors was less than seven and less than 50% of the respondents rated their importance and impact below 7 on a 10-point Likert scale.

First-round responses were analysed, and the second-round survey instrument was sent out to the 18 respondents with summarized group response results of the first round.

Table 3: Round-1 Delphi results summary

	Importance			Impact		
	Median	% Response (7-10)	Consensus Achieved	Median	% Response (7-10)	Consensus Achieved
Social Cognitive Factors						
Self- Efficacy	8	72.22	Yes	8	77.78	Yes
Outcome Expectations	8	66.67	Yes	9	83.33	Yes
Goal Representations	9	88.89	Yes	8	83.33	Yes
Learning Experiences	8	72.22	Yes	8	66.67	Yes
Social Supports	7	50.00	Yes	9	72.22	Yes
Interests	10	88.89	Yes	10	83.33	Yes
Person and Contextual Factors						
Gender	7	77.78	Yes	7	55.55	Yes
Ethnicity	5	33.33	No	6	44.44	No
Socio-economic status	7	55.56	Yes	7	50.00	Yes
Access to opportunity structures	10	88.89	Yes	8	88.89	Yes
Perceived Barriers	7	55.56	Yes	8	66.67	Yes
Self-Efficacy						
Accurate Self-Appraisal (Identify resources, constraints, and personal characteristics that might influence career choices)	8	83.33	Yes	8	83.33	Yes
Gathering Occupational Information (collect information on training and employment opportunities and manage them effectively)	8	88.89	Yes	8	83.33	Yes
Goal Selection (develop lists of priorities on the effective actions to successfully manage their professional development)	8	83.33	Yes	8	88.89	Yes
Planning (plan the steps needed to realize a vocational project)	8	77.78	Yes	8	72.22	Yes
Problem Solving (address difficulties related to their career)	8	88.89	Yes	8	72.22	Yes
Outcome Expectations						
Favourable income/wages	9	83.33	Yes	9	83.33	Yes
Job opportunities	9	83.33	Yes	9	88.89	Yes
Promotion and professional development	8	61.11	Yes	9	72.22	Yes
Favourable work conditions	8	77.78	Yes	9	88.89	Yes
Job security	9	88.89	Yes	9	88.89	Yes
Stable career and guaranteed employment	9	88.89	Yes	9	88.89	Yes
Family approval of career choice	6	44.48	No	7	55.55	Yes
Respected image and status in society	8	66.67	Yes	8	66.67	Yes
Satisfying lifestyle	8	77.78	Yes	9	83.33	Yes
Happy future	9	88.89	Yes	9	88.89	Yes
Job satisfaction	9	94.44	Yes	9	88.89	Yes
Achievement of career goals	9	88.89	Yes	9	88.89	Yes
Use of skills and talents	9	88.89	Yes	9	94.44	Yes

Attainment of career success	9	88.89	Yes	9	88.89	Yes
Goal Representations						
Technical/functional skills	8	72.22	Yes	8	72.22	Yes
Opportunities for training and development	8	77.78	Yes	9	88.89	Yes
Opportunities for interesting work	9	88.89	Yes	8	88.89	Yes
Financial Success	8	83.33	Yes	9	94.44	Yes
Leadership position	8	61.11	Yes	8	66.67	Yes
High social status	8	72.22	Yes	8	66.67	Yes
Career success	9	88.89	Yes	9	88.89	Yes
Social Supports						
Parental Support	8	72.22	Yes	8	94.44	Yes
Teacher Support	8	88.89	Yes	8	77.78	Yes
Family Support	8	77.78	Yes	8	72.22	Yes
Peer-group Support	8	88.33	Yes	8	72.22	Yes
Mother's support	8	94.44	Yes	8	72.22	Yes
Father's support	8	94.44	Yes	8	72.22	Yes
Support from significant other	7	66.66	Yes	8	61.11	Yes
Learning Experiences						
Verbal encouragements	8	83.33	Yes	9	72.22	Yes
Vicarious learning	8	77.78	Yes	8	77.78	Yes
Emotional arousal	8	77.78	Yes	8	72.22	Yes
Performance accomplishment	8	100	Yes	9	83.33	Yes
Interests						
Personal interest	10	100	Yes	10	94.44	Yes
Financial interest	9	88.89	Yes	9	94.44	Yes
Social interests	8	88.89	Yes	8	77.78	Yes
Perceived Barriers						
Discriminatory attitudes	9	88.89	Yes	9	72.22	Yes
Work-life conflict	9	83.33	Yes	8	77.78	Yes
Wage gap	8	77.78	Yes	8	61.11	Yes
Masculine workplace culture	9	66.67	Yes	8	68.67	Yes
Lack of access to opportunities	8	77.78	Yes	8	83.33	Yes
Challenges in career progression	8	72.22	Yes	8	61.11	Yes
Poor working conditions	7	72.22	Yes	8	72.22	Yes
Long work hours	8	72.22	Yes	7	61.11	Yes
Glass ceiling	8	66.67	Yes	7	66.67	Yes
Gender stereotypes	9	72.22	Yes	8	61.11	Yes
Lack of knowledge and career information	7	55.55	Yes	8	61.11	Yes
Lack of role models	7	61.11	Yes	8	66.67	Yes
Lack of education and training	8	61.11	Yes	8	72.22	Yes
Lack of opportunities	8	61.11	Yes	8	83.33	Yes

5.2 Round Two of the Delphi

In the survey instrument for the second round, respondents were provided with their responses and the group median from the first round so they would have an overview of the central tendency of the group response. The panellists were required to review their responses from the first round based on the group median as they deemed fit. In instances when respondents significantly deviated from the round 1 group median, they were asked to provide explanations for the deviations. Table 4 presents a summary of responses from the second round. Of the 18 panel members who participated in the first round, only 14 responded to the second survey request. The 4 non-responsive panel members were dropped from the panel as at least 2 iterations of responses were required from each panel member.

As indicated in Table 4, 1 factor did not satisfy the previously stated two consensus criteria and was eliminated. The results of the second-round survey showed that the 14 remaining panellists reached consensus by satisfying the requisite consensus criteria, which were stated earlier. Since consensus was reached, "ethnicity" was eliminated from the list, and the conceptual model for the study was developed based on the constructs retained in the Delphi study.

Table 4: Round-2 Delphi results summary

	Importance			Impact		
	Median	% Response (7-10)	Consensus Achieved	Median	% Response (7-10)	Consensus Achieved
Social Cognitive Factors						
Self- Efficacy	8	92.86	Yes	8	85.71	Yes
Outcome Expectations	9	64.29	Yes	9	92.86	Yes
Goal Representations	9	92.86	Yes	8	92.86	Yes
Learning Experiences	9	71.42	Yes	8	71.43	Yes
Social Supports	7	50.00	Yes	9	78.57	Yes
Interests	10	92.86	Yes	10	92.86	Yes
Person and Contextual Factors						
Gender	8	92.86	Yes	7	64.29	Yes
Ethnicity	5	42.85	No	6	50	No
Socio-economic status	7	57.14	Yes	7	64.29	Yes
Access to opportunity structures	10	85.71	Yes	9	92.86	Yes
Perceived Barriers	8	71.43	Yes	8	85.71	Yes
Self-Efficacy						
Accurate Self-Appraisal (Identify resources, constraints, and personal characteristics that might influence career choices)	8	85.71	Yes	8	92.86	Yes
Gathering Occupational Information (collect information on training and employment opportunities and manage them effectively)	8	92.86	Yes	9	92.86	Yes
Goal Selection (develop lists of priorities on the effective actions to successfully manage their professional development)	8	92.86	Yes	8	100	Yes
Planning (plan the steps needed to realize a vocational project)	9	78.57	Yes	8	85.71	Yes
Problem Solving (address difficulties related to their career)	8	92.86	Yes	8	78.57	Yes
Outcome Expectations						
Favourable income/wages	10	92.86	Yes	9	92.86	Yes
Job opportunities	9	92.86	Yes	9	92.86	Yes
Promotion and professional development	9	71.42	Yes	9	78.57	Yes
Favourable work conditions	9	85.71	Yes	9	100	Yes
Job security	10	92.86	Yes	9	92.86	Yes
Stable career and guaranteed employment	9	85.71	Yes	9	92.86	Yes
Family approval of career choice	7	50.00	Yes	7	57.14	Yes
Respected image and status in society	8	85.71	Yes	8	71.42	Yes
Satisfying lifestyle	9	85.71	Yes	9	85.71	Yes
Happy future	9	92.86	Yes	9	92.86	Yes
Job satisfaction	9	92.86	Yes	9	92.86	Yes
Achievement of career goals	9	92.86	Yes	9	92.86	Yes
Use of skills and talents	9	92.86	Yes	9	100	Yes
Attainment of career success	9	100	Yes	9	92.86	Yes
Goal Representations						
Technical/functional skills	8	92.86	Yes	8	78.57	Yes
Opportunities for training and development	9	85.71	Yes	9	100	Yes
Opportunities for interesting work	9	92.86	Yes	8	100	Yes
Financial Success	9	85.71	Yes	9	100	Yes
Leadership position	8	64.29	Yes	8	85.71	Yes
High social status	8	71.42	Yes	8	78.57	Yes
Career success	9	92.86	Yes	9	100	Yes
Social Supports						
Parental Support	9	78.57	Yes	8	78.57	Yes
Teacher Support	8	85.71	Yes	8	78.57	Yes
Family Support	8	71.42	Yes	7	71.45	Yes
Peer-group Support	7	78.57	Yes	8	78.57	Yes
Mother's support	8	92.86	Yes	8	78.57	Yes
Father's support	8	92.86	Yes	8	78.57	Yes

Support from significant other	7	64.29	Yes	8	64.29	Yes
Learning Experiences						
Verbal encouragements	8	78.57	Yes	9	78.57	Yes
Vicarious learning	8	71.42	Yes	8	85.71	Yes
Emotional arousal	7	71.42	Yes	7	71.43	Yes
Performance accomplishment	8	100	Yes	8	85.71	Yes
Interests						
Personal interest	10	100	Yes	10	100	Yes
Financial interest	9	92.86	Yes	9	100	Yes
Social interests	8	71.42	Yes	8	85.71	Yes
Perceived Barriers						
Discriminatory attitudes	9	92.86	Yes	9	78.57	Yes
Work-life conflict	9	85.74	Yes	8	78.57	Yes
Wage gap	8	78.57	Yes	8	64.29	Yes
Masculine workplace culture	9	71.42	Yes	8	78.57	Yes
Lack of access to opportunities	8	85.71	Yes	8	85.71	Yes
Challenges in career progression	8	85.71	Yes	8	78.57	Yes
Poor working conditions	8	92.86	Yes	8	85.71	Yes
Long work hours	8	85.71	Yes	8	78.57	Yes
Glass ceiling	8	57.14	Yes	7	71.43	Yes
Gender stereotypes	9	71.42	Yes	9	78.57	Yes
Lack of knowledge and career information	8	64.28	Yes	8	78.57	Yes
Lack of role models	8	78.57	Yes	8	78.57	Yes
Lack of education and training	8	64.28	Yes	8	71.43	Yes
Lack of opportunities	8	71.43	Yes	9	78.57	Yes

6. CONSENSUS OF RESPONDENTS

6.1 Social Cognitive Factors

All the six variables included in the Delphi study under social cognitive factors, as shown in Table 4 were retained. The socio-cognitive theory highlights the influential role of social cognitive factors on career choice. According to Bandura (1989), the formation of academic interests, career development, performance, and persistence of individuals in their career endeavours are predicted by a range of social cognitive factors. The social-cognitive factors may provide reasons as to why women are underrepresented in male-dominated professions and provide insights into how targeted strategies to increase their participation may mitigate the problem of under-representation (Aguilar et al., 2014).

6.2 Person and Contextual Factors

Situational and contextual factors such as ethnicity, sex, intelligence, and culture and gender role socialization are moderators of the formulation of choice goals and have a great influence on career choice (Ali & McWhirter, 2006; Kelly, 2009; Saifuddin et al., 2013). Of the eight constructs included in the Delphi survey under the person and contextual factors, all except one were retained. The Delphi panellists did not reach a consensus on ethnicity; therefore, it was eliminated. Although existing literature argued that ethnicity is a socially constructed aspect of the experience that helps to shape the career choice process of individuals (Hackett & Betz, 1981; Hackett & Lent, 1992), the Delphi panel concurred that ethnicity has no significant importance and impact on the career choice of individuals.

Gender

Gender has been identified to play a significant role in determining educational and career choices (Adamuti-Trache, 2004). By viewing gender as a socially constructed aspect of the experience, it may be emphasized that it is a major sociocultural agent that helps shape career choices (Adamuti-Trache, 2004; Saifuddin et al., 2013).

Socio-economic status (SES)

Socio-economic status (SES) is the position of a person based on their access to wealth, power, and prestige (Ali & McWhirter, 2006; Taylor & Yu, 2009). SES is also conceived with regards to a family or a person's income, occupation, level of education and social rank (Bécares & Priest, 2015; Xin et al., 2020).

In South Africa, the hierarchical structure of society, including access to wealth, prestige, and power, was constructed to be based on ethnicity through decades and even centuries of institutionalized inequality (Ali & Saunders, 2006; Taylor & Yu, 2009). The restriction was placed on the type of education people had to access to, where people could live, and the kind of work they could engage in (Taylor & Yu, 2009).

Subsequent research has widened the consensus regarding SES as a strong predictor of educational and career outcomes in South Africa- a highly unequal society (Taylor & Yu, 2009). Compared to those from higher SES backgrounds, students from lower SES backgrounds may have limited access to information, career guidance, and financial resources, which could limit their choice of careers (Hunt et al., 2017).

6.3 Self-Efficacy

Self-efficacy has been found to play a crucial role in the career choices of individuals and is a major predictor of choice of career choice behaviour (Hackett and Betz 1981; Charity-Leeke, 2012; Lent & Sheu, 2010; Lent et al., 2008; Saifuddin et al., 2013; Sawtelle et al., 2012). Five measures of self-efficacy were presented to the Delphi panel members, and all of them were retained. The Delphi survey showed that all the self-efficacy factors listed had significant importance and impact on career choice.

From the social-cognitive perspective, self-efficacy is a set of beliefs concerned with specific performance domains and interact complexly with external and contextual factors (Shumba & Naong, 2012). These beliefs help to determine the choice of activities, environments, persistence, and emotional reactions to certain events (Malach-Pines & Kaspi-Baruch, 2008). Elements of self-efficacy are perceived to assist a person in determining their choice of activities, degree of persistence, and emotional reaction to situations (Peña- Calvo et al., 2016).

6.4 Outcome Expectations

It argued that career decisions are significantly dependent on the likelihood that a particular action will yield a certain outcome based on the value a person places on those outcomes (Locke et al., 1986; Wanous et al., 1983). Outcome expectations have been identified as one of the most salient predictors of a career choice as individuals have positive expectations from engaging in the behaviour (Fouad & Guillen, 2006; Kelly, 2009). All fourteen variables included in the Delphi study under outcome expectations were retained.

Career choice behaviour is perceived to be significantly dependent on the subjective likelihood that a particular action will yield a certain outcome as well as the value a person places on those outcomes (Locke et al., 1986; Wanous et al., 1983). According to Bandura (1989), "people act on their judgments of what they can do, as well as on their beliefs with regards to the likely consequences of their actions." Physical outcomes (money), social outcomes (approval), and self-evaluative outcomes were highlighted as the types of outcome expectations (Bandura, 1989). Outcome expectations have been identified as one of the most salient predictors of career choice behaviour as individuals have positive expectations from engaging in the behaviour (Kelly, 2009; Peña-Calvo et al., 2016).

6.5 Goal representations

Numerous studies have suggested that several factors related to goals influence career choice behaviour (Ali & McWhirter, 2006; Peña-Calvo et al., 2016). It is expected that firmly

held goal will more likely influence career entry choice behaviours (Lent et al., 1994). Goals are also perceived to have a strong motivational effect on career choice behaviour to the extent that they are specific and clear, although maybe challenging, are attainable and proximal (Hunt et al., 2017). Goals are considered as an implicit parameter of the career choice and decision-making process (Saifuddin et al., 2013). Career aspirations, choices, and decisions are all significant concepts of goal representations (Kelly, 2009).

6.6 Social support

As documented in the literature, support from parents, teachers, and peers as crucial social supports in the career aspirations, decision making, and persistence of an individual (Mau et al., 2000; Saifuddin et al., 2013). All items presented in the Delphi survey satisfied the consensus criteria, and experts indicated that all the social support constructs were important and had an impact on career choice. Lent et al. (1994); Whittock (2002) highlighted support structures that may influence career choice. Exposure to role models, networking contacts, emotional and financial support from significant others is key support mechanisms that influence the career choices and progress of women in the construction industry (Vainikolo, 2017).

6.7 Learning Experience

The three items presented in the Delphi survey under learning expectations were retained. Previous learning experiences promote future career behaviours, and an accumulation of different kinds of reinforcements are responsible for career choices (Lent et al., 2008; Saifuddin et al., 2013; Adeyemi and Oke, 2020).

Career choice behaviour is guided by an interaction of learning experiences with personal and contextual factors (Hunt et al., 2017). A person experiences and observes other people within their environment performing various vocational activities, exposing them directly and indirectly to diverse activities as well as differently reinforcing their aspirations to pursue certain activities (Kelly, 2009). By repetitively performing certain activities, role models, and feedback from models, people refine their career choices (Lent et al., 1994). Learning experiences produce values that are acquired through socialization and fundamental social learning processes, such as vicarious learning and self-evaluative experiences (Alexander et al., 2011; Kessels & Taconis, 2012). Interactions with family members, teachers, peers, role models, cultural and religious institutions, and media sources influence personal values and standards, which may consequently influence career choice behaviour (Charity-Leeke, 2012).

6.8 Interests

Interests are strongly linked to the selection of a life career (Betz & Voyten, 1997; Bojuwoye & Mbanjwa, 2006; Lent & Sheu, 2010; Gokuladas, 2010; Humayon et al., 2018). A person is more likely to consider their interests when making a career choice (Bojuwoye & Mbanjwa, 2006). Jin et al. (2009) defined career interests as patterns of likes, dislikes, and indifferences with regards to career-related activities and occupations. Interests are skills developed during a person's socialization process and ideally are translated into career choices, although social and environmental factors often influence the level of career aspirations and choices (Bécares & Priest, 2015). Three measures of interest were presented to the Delphi panel members, and all of them were retained. The Delphi survey showed that all the interest variables listed had significant importance and impact on career choice.

6.9 Access to Opportunity Structures

Lack of information on career opportunities may likely influence the career advancement and value individuals place on various educational and career options (Jamenya et al., 2018). Reduced access to educational and vocational job-training opportunities has implications on

opportunities for women to choose careers in construction (Vainikolo, 2017). Emphasis has been made on the unequal access to training and development programs, networking opportunities and educational programs, and as a result, there is unequal awareness of a variety of career options that could broaden the career choices of women, with construction as a viable option (Aulin and Jingmond, 2011; Charity-Leeke, 2012).

6.10 Perceived Barriers

Several studies detailing the status and participation of women in construction have argued that the barriers they encounter primarily influence the decision of women to take up careers in the field (Amaratunga et al., 2006; Ginige et al., 2007; English and Bowen, 2012). This signifies that it is vital to examine negative factors that hinder women's career choices in construction.

The Delphi survey revealed that all the fourteen perceived barriers presented had significant importance and impact on career choice. In addition, studies detailing the status and participation of women in construction have argued that the barriers they encounter primarily influence the decision of women to take up careers in the field (Aulin and Jingmond, 2011; Everhart et al., 1998; Lowe and Woodcroft, 2014; Amaratunga et al., 2006; Sewalk & Nietfeld, 2013).

These barriers include discriminatory attitudes, work-life conflict, the wage gap, workplace culture, lack of access to opportunities, challenges in career progression, poor working conditions, long work hours, glass ceiling, gender stereotypes, lack of knowledge and career information, lack of role models, sexual harassment, lack of education and training and lack of opportunities (Mendez and Crawford, 2002; Fraser et al., 2013; Hoobler et al., 2009; Kaewsri and Tongthong , 2013).

7. CONCLUSION

The objective of the study was to identify the key factors that predict the career choices of women in the construction industry. The study applied the Socio-Cognitive Career Theory (SCCT) to understand the determinants of women's career choices in the construction industry by extending the evaluation of career choice predictors to include the SCCT constructs and to incorporate person and contextual variables such as gender, ethnicity, socio-economic status, perceived barriers, and access to opportunity structures. A Delphi method was adopted for the study. A panel of experts were required to draw from their experiences, which is not limited to practice in the construction industry to identify the major factors that predict the career choices of women in the construction industry. Consequently, 10 predictors and 53 elements were identified to have significant importance and impact on career choice. Further, because the sample in this study was purposively selected, some limitations apply. Since the present sample may be described as unique due to the inclusion of men and women experts in the construction industry, it is uncertain whether these results may not adequately represent the population of interest and be generalized to a general sample.

Findings from this study revealed that the key predictors of women's career choices are; Gender, Socio-Economic Status, Self-Efficacy, Outcome expectations, Goal representations, Learning experiences, Interests, Social Supports, Perceived Barriers and Access to opportunity structures. The results indicate that these factors will significantly influence women's career choices in construction.

The relevance of ethnicity with regards to women and girl's career choices has been identified from the characteristic reactions reproduced from the social and cultural environment as well as the relationship with opportunity structures within which the career choice behaviour is established (Lent et al., 1994; Beacres and Priest, 2015). Contrary to

findings from previous studies, the panel of experts perceived ethnicity to have insignificant importance and impact on career choice in the South African Construction industry.

Although the issue of women career choices in the South African construction industry has been explored, very few studies have attempted to consider predictors of career choices from a theoretical perspective. There is no evidence of a similar study conducted within the South African context. Further research may focus on the development of a model that could give insight into the persistence, academic and career choices of women in construction in South Africa. A potential area for future research may be to conduct comparative studies between South Africa and other countries, applying the SCCT constructs to identify the factors that influence women's career choices in construction and other traditionally masculine occupations.

Given the focus of the South African government to increase the level of representation by women in the construction industry, this study provides insight into those aspects or factors that could conceivably prevent this goal from being successfully achieved unless they and their influence are understood and taken into account. These include gender, socio-economic status, self-efficacy, outcome expectations, goal representations, learning experiences, interests, social supports, perceived barriers and access to opportunity structures. It is important to note that despite the importance placed on ethnicity in South Africa, it does not play a major role in the choice of careers within the context of South Africa.

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Impacts of change management practices on construction project performance in Bauchi State, Nigeria

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ABSTRACT

Changes in construction projects are inevitable. As a result of changes, construction projects experience time and cost overruns, as well as non-conformance to set quality standards leading to poor performance. Despite several studies that have been conducted on project change management systems, not enough has been done to determine its impacts on project performance. The aim of this study is to assess the impacts of change management practices on the performance of construction projects in Bauchi State, Nigeria, with a view to improving construction project delivery in the area. The study opted for an explanatory research design. A questionnaire survey was conducted in which 190 questionnaires were administered to construction professionals using the purposive sampling technique. One hundred and forty-seven (147) were returned completed representing a 77% response rate. The data obtained were analysed by means of descriptive statistics, factor analysis and multiple regression analysis. Findings from the survey revealed that the extent of Change Management (CM) practices in the construction project in the study area was low. In addition, the impacts of CM practices on time and cost performance as well as on end users' satisfaction was positive and significant. Similarly, its impacts on the overall project performance were also positive and significant. The CM activities identified in this study can serve as a framework for effective CMS that can be used by construction professionals in managing changes at project level.

Keywords: Change Management, Construction, Nigeria, Project Management, Project Performance

1. INTRODUCTION

Construction project performance is measured in terms of completing a project on time, within budget, to a specified quality standard, with minimum accidents, and to the satisfaction of end-users (Toor and Ogunlana, 2010; Olateju et al., 2011). However, sometimes, as a result of changes, construction projects experience time and cost overruns as well as non-conformance to specification leading to poor performance of the projects (Abad. and Naeni, 2020; Ansari, 2019; Sun et al. 2006; Hao et al. 2008; Ibbs et al., 2001; Senaratine and Sextone, 2011). Furthermore, it has been reported that changes are inevitable at different stages of construction projects (Hwang and Low, 2012; Ansari, 2019). They are the main causes of inefficiency, delays and cost overrun in those projects (Schonbeck et al., 2020).

It is clear from the above discussions that changes can have negative impacts on project objectives. Nevertheless, it is worth noting that not all changes are detrimental; some are beneficial that increase value, reduce cost, schedule, or degree of difficulty; those changes

should be encouraged (CII, 1994; Hwang and Low, 2012; Moayeri et al., 2015). Hence, before introducing change at any stage of a project, there should be clear communication of the vision, the desired changes, and the advantages that the change will bring.

Change in a construction project is defined as addition, deletion, or modification of original project scope, time, cost and quality (CII, 1994; Sun et al., 2006; Hwang and Low, 2012; Moayeri et al., 2015). To ensure successful project delivery, it is essential to employ an effective change management system (CMS) (Senaratine and Sextone, 2011, Liu et al., 2014; Abad. and Naeni, 2020). CII (1994) asserts that significant savings in overall project cost can be realised by adopting effective change management (CM). Similarly, Hwang and Low, 2012 opined that implementing effective CM in projects can result in cost and time savings and quality improvement. Whereas, if changes are not properly managed, it can lead to cost overruns and failure to meet the client's satisfaction (Liu et al., 2014; Jallow et al., 2013). Zhao et al. (2009) describe CM as one of the project management practices that resolve problems when changes occur in a project or minimise changes that may occur and disrupt the project's progress. Generally, CM seeks to forecast possible changes; identify changes that have already occurred; plan preventive measures; and coordinate changes across the entire project (Senaratine and Sextone, 2011; Hao et al., 2008).

Despite the importance of implementing effective CM in projects, previous studies (Musa et al., 2017; Hwang and Low, 2012) reported a low application of the CM system in construction projects. Generally, it has been observed that proactive CM is rarely applied in project implementation; changes are usually managed reactively (Halou et al., 2019; Serrador & Turner, 2015). This may lead to poor performance of projects. Proactive CM refers to predicting and dealing with change before it occurs (Motawa et al., 2007).

Senaratine and Sextone (2011) suggested that proactive CM practice should be employed during project implementation. These include effective briefing, value management, risk management, effective communication and feedback, and concurrent engineering. Implementation of these in construction projects will reduce required change and help in managing elective change. Thus, CM is a systematic approach that ensures successful project outcomes (Moayeri et al., 2015, Matthews et al., 2018).

To adequately address the main aspects of CM, there is a need to assess its impacts on the project performance (time, cost, quality, end-users" satisfaction). Halou et al. (2019) opine that the impact of CM on construction projects plays an important role in achieving the success of the project. Similarly, Senaratine and Sextone (2011) suggest that an effective CM should have considerable impacts on the project's cost, time, and quality. However, despite the fact that several studies have been conducted on project CMS, not enough has been done to determine its impacts on project performance. Thus, this study aims to assess the impacts of CM on construction project performance in Bauchi State, Nigeria, to promote successful project delivery. The study focuses on unplanned changes that occur at the project level during construction.

Based on the literature review presented in Section 2.0 of this study, it was found that previous studies (CII, 1994; CIRIA, 2001; Motawa, 2005; Hayes, 2014) have focused on the presentation and development of guidelines and models for effective CM of projects. However, they failed to investigate the impacts of CM on project performance (time, cost and quality). In addition, most of the studies on CM were carried out in developed countries which are context-specific. This study is intended to address this gap. The study is essential as it will provide an understanding of the components of CM that have significant impacts on construction project performance and guide construction professionals on an important aspect of managing changes in their projects.

Specifically, this study is set to answer the following research questions:

Q1 - What is the extent of the application of CM system/activities on construction projects in Bauchi State, Nigeria?

Q2 - What are the components of CM that have a significant influence on construction project performance in the study area?
Q3 - What are the impacts of CM practices on time, cost, quality, end users' satisfaction, and overall construction project performance in the study area?

2.0 CHANGE MANAGEMENT APPROACHES

Anyieni et al. (2013) state that CM means planning, initiating, realising, controlling, and stabilising change processes on both corporate and personal levels. Thus, formalised CM system should be used to resolve changes in projects; otherwise, it may lead to disputes among stakeholders or even failure of the project (Senaratine and Sextone, 2011).

Previous studies have proposed guidelines, models and principles for effective CM of projects. Early studies include Lewin (1951) that developed a three-step model for effective change management (planned approach to change): unfreezing current behaviour, moving to the new behaviour, and refreezing the new behaviour.

Unfreezing means that old ideas and practices need to be cast aside so that new ideas can be learned. This means getting rid of old ideas/ practices and accepting new ideas challenges.

Refreezing means that what has been learned is integrated into actual practice. Moving to the new behaviour (changing) is how new ideas and practices are learnt. Kotter (1995) developed an eight-step model for change management; these are: establishing a sense of urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision, empowering employees for broad-based action, generating short-term wins, consolidating gains and producing more change, and anchoring new approaches in the culture.

ADKAR (Awareness, Desire, Knowledge, Ability and Reinforcement)' is a practically oriented model of change, consisting of five consecutive steps (Teczke et al., 2017):

- Awareness of the need for change. The reasons for the change are described at this stage.
- Desire and willingness to change. At this stage, a decision is made to support these or other changes, which are achieved only if understood as necessary.
- Knowledge of how to change. At this stage, knowledge is formed about how exactly it is necessary and should be changed, and it also contains the knowledge and skills necessary for changes.
- Ability to implement change. The stage involves the demonstration of the applicability and attractiveness of changes and the identification of barriers that may prevent change.
- Reinforcement to support the change once it has been made. Here, special attention is paid to efforts to support change. Their stabilisation and adoption are achieved through feedback, reward, performance evaluation and corrective action.

Hayes (2014) presented a model of a CM that comprises of seven steps; recognising the need for change and starting the change process, diagnosing what needs to be changed and formulating a vision of a preferred future state, planning how to intervene to achieve the desired change, implementing plans and reviewing progress, sustaining the change, leading and managing the people issues, and learning.

The Construction Industry Institute (CII) established Project CM Research Team. The research team proposed five principles of effective CM: promote a balanced change culture, recognise change, evaluate change, implement change and continuously improve from lessons learned (CII, 1994).

Nadler (1997) has developed a management framework of twelve action steps which is helpful for managers and executives to apply at every level of hierarchy during the change process.

Moreover, Sun et al. (2006) developed a CM toolkit, which provides a standard framework and tool support for CM in construction projects. This includes a change dependency framework, a change prediction tool, a workflow tool, and a knowledge management guide. CIRIA (2001) published a best practice guide that proposes best practice guidelines for the effective management of change on projects. These include anticipate change, recognise change, evaluate change, resolve change and learn from change.

Motawa (2005) developed a generic CM process model that consists of four stages, namely, pre-change, identification and evaluation, approval, and implementation and review. At the pre-change stage, activities and requirements that are important for effective CM are defined. These consist of the role and responsibility of the team and the process and procedure for the change management. At the identification stage, the team will identify as early as possible the potential change that may likely occur in the project and subsequently evaluate their impact on the project.

The approval and implementation stage defines the process of approving and implementing the chosen changes. Next, the approved changes need to be communicated to all team members whose work will be affected for implementation. The fourth stage is the review stage, where the changes made will be reviewed by the project team, and the lesson learned will be archived for future experience.

2.1 Theoretical framework

Based on the previous studies on CM presented above, this study synthesises these ideas and found that CMS can be grouped into five steps processes, namely promote a balanced change culture, recognise change, evaluate change, implement change and continuously improve from lessons learned as suggested by CII (1994). Thus, the five principles of effective CM proposed by CII (1994) form the basis of this study. Furthermore, it has been reported that implementing effective CM in a project can result in cost and time savings, quality improvement as well as end users' satisfaction (Senaratine and Sextone, 2011, Liu et al., 2014, Hwang and Low, 2012). This means implementation of effective CM can lead to improved project performance. However, one of the limitations of the CM framework proposed by CII (1994) is that it failed to link the components of the CM with project performance. Thus, this study is set to address this gap as explained in the conceptual framework in Section 2.2.

2.2 Conceptual framework for the impact of change management on construction projects performance

Figure 1 presents a conceptual framework for the impacts of CM on construction Projects performance in Nigeria. The framework is based on the principles of effective CM proposed by the CII research team because of its wide support in the literature and the notion that effective CM improves project performance. The framework is divided into two parts, the five principles of effective CM are the independent variables and construction project performance is the dependent variable. The line drawn from each of the principles of CM pointing to the project performance indicates a direct positive relationship between them.

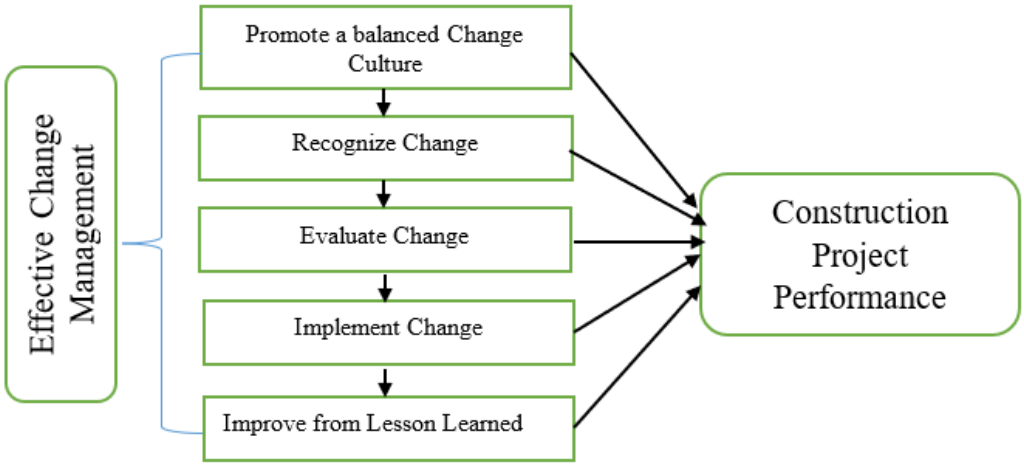

Figure 1: Conceptual Framework for the Impact of CM on Construction Projects Performance in Nigeria.

2.3 Description of the constructs

The five constructs presented in Fig. 1 have been described as follows (CII, 1994):

i) Promote a Balanced Change Culture

The first principle for effective CM is to promote a balanced change culture. At the startup of a project, a strategy should be adopted that will encourage beneficial change and discourage detrimental change so that the change will benefit the project end-users.

ii) Recognise Change

The second principle for effective CM is to recognise the change. To identify and document potential change at the earliest possible time and provide effective means of communication among the team members. The team members should understand the total number and impact of changes on the project.

iii) Evaluate Change

The third principle for effective CM is to evaluate change. Evaluate the change to determine its impact on the project objective and decide the appropriate measures to be taken. Once a necessary change is identified it impact should be evaluated and implemented immediately.

iv) Implement Change

The fourth principle for effective CM is to implement change. Following the evaluation and approval of the identified change, the team members should implement the change at an appropriate point during the project implementation. This involves monitoring and documenting the process of implementing the change.

v) Continuously Improve from Lessons Learned

The fifth principle of effective CM is to improve from lessons learned continuously. Parties to a project should take advantage of the lesson learned from the project at hand to improve future projects. This means the parties should discuss the root causes of changes and suggest possible ways for improvement. These should be documented to improve future projects.

2.4 Construction project performance

Project performance can be measured and assessed using several performance indicators. The common indicators used are time, cost and quality, known as the iron triangle (Sibiya, 2015; Mostafavi, 2017).). Other indicators such as the absence of conflicts, safety, and end users' satisfaction are also employed to measure the project performance (Toor and Ogunlana,

2010; Sibiya, 2015). However, Pinto and Slevin (1987) argued that a project is said to be successful if it is completed on time, within budget, to set a quality standard, achieves all project goals, and end-users are satisfied with the project. Therefore, this study employs four criteria to measure construction project performance: cost, time, quality, and end users' satisfaction because the literature mentioned these criteria as performance measures.

3.0 METHODOLOGY

The research was carried out in Bauchi state, North-East Nigeria. This study area was chosen because of the high concentration of construction activities in the state. The study opted for an explanatory research design to explain the impacts of CM on construction project performance. A questionnaire survey was employed as a method of data collection. According to Sekaran and Bougie (2009) questionnaire is widely used by researchers as a means of data collection because it can collect data fairly and easily. This data collection method was used by similar studies (Hwang and Low 2012; Musa et al., 2017). Initially, an intensive literature review was carried out to identify activities involved in the CM process. The principles of effective CM proposed by the CII (1994) research team have been adopted for this study because of their wide support in the literature. The Nineteen CM activities presented in Table 2 were also derived from CII (1994).

The list of the CM activities was presented to six experts (construction professionals) with at least 15 years of working experience in relevant fields for validation. Subsequently, after effecting all the observations made by the experts, the variables (the list of CM activities) were used to develop the preliminary questionnaire for the study.

The questionnaire was adapted from CII (1994) and consisted of sections A, B, and C using closed-ended questions. Section A asked for the respondents' demographic data, including the respondents' highest academic qualification, professional affiliation, and years of experience in the construction industry. Section B and C cover information related to practices of CM at the project level (At a project level, change may be defined as any addition, deletion, or modification of original project scope, time, cost and quality).

Section B elicited information from the respondents on the extent to which they applied the CM system at the project level in their previous projects using a five-point Likert Scale; where 1 represents very low, 2= low, 3= moderate, 4= *and 5= very high.* Finally, section C collected information from respondents on the performance of their recently completed projects with respect to time/schedule, cost/budget, quality and client/ end user's satisfaction in which CM has been applied. The five-point Likert Scale was used in similar studies (Hwang and Low 2012; Mbabazi et al., 2016).

The target population for this study was experienced construction professionals (architects, quantity surveyors, and building technologist/ builders) that were domiciled in the study area. The total population was found to be 213, as obtained from respondents' professional bodies. (Nigerian Institute of Architects, Nigerian Institute of Quantity Surveyors,, Nigeria institute of Builders). They were chosen as the study population because they are the core building procurement professionals who are mostly engaged in the administration of CM.

The appropriate sample size for this study was 140 using Krejcie and Morgan, (1970) Table. However, 190 questionnaires were administered to the respondents to take care of the non-return ones. Because there is no sampling frame for construction professionals that implement formalised CM in their project, the study adopted the purposive sampling technique in selecting the sample; this enabled the researchers to access the available respondents that implement CM in their projects (that met specified requirements). (Saunders, Lewis & Thornhill, 2012).

The data collected were screened to address the issues of normality, missing data, and outliers, as suggested by Hair et al. (2009). Subsequently. The data were analysed using

factor analysis and multiple regression analysis. Unit of analysis was CM activities at a project level. The factor analysis was carried out on the nineteen CMS activities in order to reduce the variables into a smaller set of factors/ components based on the interrelationship among the variables (Pallant, 2013).

Hair et al. (2009) and Cohen et al. (2003) suggest that multiple regression analysis can be used to assess the impact of independent variables in predicting dependent variables. Thus, in this study, multiple regression analysis was employed to determine the impact of CMS on construction project performance. The project performance criteria (time, cost, quality and end satisfaction) were used as dependent variables, and the seven factors were independent variables using the SPSS program. The regression method in SPSS was employed to calculate seven-factor scores for each respondent. These factor scores formed the data set for the multiple regression analysis. Internal consistency of the responses was measured using the Cronbach Alpha reliability test. The Cronbach Alpha value was found to be 0.76, which according to Pallant (2013), is satisfactory.

4.0 RESULTS AND DISCUSSIONS

Out of the 190 questionnaires distributed, 147 were returned completed; these represent a 77% response rate. Table 1 presents a summary of the background information of the respondents. The table indicates that, in terms of academic qualifications, 87% of the respondents possessed at least a Bachelor degree and about 50% acquired a postgraduate degree. Furthermore, in terms of working experience, about 70% have more than six years of working experience, while 30% of the respondents have more than ten years of working experience in the construction industry. Therefore, these results show that the respondents have adequate knowledge and experience to provide reliable information.

Table 1: Summary of Background Information of Respondents

Category	Classification	Frequency	Percentage
Academic qualification	ND	19	12.9
	Bsc/B.Tech	66	44.9
	M.Sc/M.Tech	55	37..4
	PhD.	7	4.8
	Total	147	100
Professional affiliation	Architect	38	25.9
	Quantity surveyors	78	53.1
	Builders	31	21.0
	Total	147	100
Years of experience (in years)	0-5	43	29.3
	6-10	60	40.8
	11-15	30	20.4
	16-20	13	8.8
	Above 20	1	0.7
	Total	147	100

4.1 Extent of application of change management system/activities on construction projects in Bauchi, Nigeria

The results in Table 2 presents the extent of application of various CM activities in construction projects by the respondents. The results show that, out of the nineteen (19) CM activities, six were moderately applied (mean score (3.08-3.38). These are; project goal was communicated to all the project team, beneficial changes were promoted, approved change had been communicated to all affected parties, the change was immediately implemented, the implementation of changes was monitored, and the changes were categorised into required and elective changes. All the remaining CM activities were either applied low (mean score

2.01-2.65) or very low (mean score 1.36-1.94). Thus, on average, there was a low application of CMS in the study area (average mean score 2.48). This result is of concern, as a low application of the activities means changes in projects are not properly managed, which may lead to cost and time overrun. This finding is supported by previous studies (Musa et al., 2017; Hwang and Low, 2012).

Table 2: Extent of Application of Change Management System in Construction Projects

Change management Activities	Mean Score	Rank
The project goal was communicated to all the project team	3.38	1
Beneficial changes were promoted	3.27	2
An approved change had been communicated to all affected parties	3.24	3
The change was immediately implemented	3.19	4
The implementation of changes was monitored	3.09	5
The changes were categorised into required and elective changes	3.08	6
A funding source for the change was determined	2.65	7
The detrimental change was discouraged	2.58	8
Responsibility for approval of changes was established	2.35	9
Corrective measures on the project were implemented	2.32	10
Risk areas where change may likely occur were identified	2.26	11
Potential changes were documented	2.25	12
Previous projects were referred for early recognition of problems	2.22	13
Root cause evaluation of change was performed	2.2	14
The time frame for change decision was determined (immediate or not)	2.09	15
Project feasibility with proposed change was re-evaluated	2.01	16
The Basis for change was identified	1.94	17
An analysis to determine the impact of change in the project performance was conducted	1.89	18
Lessons learned throughout the project lifecycle were prepared	1.36	19
Average	2.48	

4.2 Components of a change management system

Principal factors extraction with Varimax rotation was performed through the SPSS FACTORS program on the 19 activities of CM processes for a sample of 147 responses, as shown in Table 3. The results show that the activities were grouped into seven principal components/factors with eigenvalues greater than 1.000, explaining 67% of the variance as shown in Table 3. The remaining factors together accounted for 33% of the variance.

The factor grouping presented in Table 3 indicates that each variable of the seven factors belongs to only one of the factors, with the loading on each factor greater than 0.5. Thus, in general, the loadings were adequate. However, three variables (approved change had been communicated to all affected parties, responsibility for approval of changes was established, and time frame for change decision was determined) do not belong to any of the seven-factor groupings because the components/factors they belong to, have eigenvalues less than 1.000, thus were excluded from the analysis as suggested by Hair et al. (2009).

The Bartlett's Test of Sphericity was significant at $p<0.001$, which indicated that all correlations were significantly different from zero. The value of the Kaiser-Meyer-Olkin (KMO) statistic is 0.832, which according to Kaiser (Norusis, 1992), is satisfactory for factor analysis. Table 3 also presents the factor structure for principal factors extraction and varimax rotation, which shows the factor loadings, eigenvalues, percentage of variance explained and cumulative percentage of variance.

Table 3: Factor Structure for Principal Factors Extraction and Varimax Rotation on CM

NO	Item	Factor Loading	Initial Eigenvalues		
			Total	Percentage of variance explained	Cumulative percentage of variance explained
a)	*Factor 1: Recognising potential change*				
1	Potential changes were documented	0.865			
2	The project goal was communicated to all project team	0.821			
3	An analysis to determine the impact of change in the project performance was conducted	0.548	3.27	17.213	17.213
b)	*Factor 2: Evaluate the feasibility of the project with change*				
4	Project feasibility with proposed change was re-evaluated	0.798			
5	Basics for change was identified	0.723			
6	Previous change was referred to for early recognition of problems	0.713	2.238	11.778	29.011
c)	*Factor 3: Improving from lesson learned*				
7	Corrective measures were implemented	0.940			
8	Root cause evaluation of change was performed	0.932	2.075	10.921	39.932
d)	*Factor 4: Promoting beneficial changes*				
9	The beneficial change was promoted	0.716			
10	The change was immediately implemented	0.615			
11	The implementation of change was monitored	0.519	1.534	8.075	48.007
e)	*Factor 5: Sustaining the change*				
12	Change was divided into elective and required change	0.712			
13	Funding source of the change was determined	0.678	1.426	7.505	55.511
f)	*Factor 6: Discouraging detrimental change*				
14	The detrimental change was discouraged	0.777			
15	Lessons learned throughout the project were prepared	0.701	1.185	6.237	61.749
g)	*Factor 7: Identifying risk areas*				
16	Risk areas where change may likely occur were identified	0.814	1.03	5.421	67.17

The meanings of the factors were interpreted based on their measure variables and factor loadings as follows:

Factor 1: Recognising Potential Changes

This factor consists of 3 items, potential changes were documented, the project goal was communicated to all project teams, and an analysis to determine the impact of change in the project performance was conducted. This factor contains the highest percentage variance of 17.21%. Recognition of changes by project team members as early as possible and analysing their impacts on the project objectives can help manage the changes effectively. The finding is consistent with previous studies (CII 1994; Hayes, 2014).

Factor 2: Evaluating feasibility of the project with a proposed change

This factor contains three variables, project feasibility with proposed change was re-evaluated, the basis for the change was identified, and previous change was referred to for

early recognition of problems—the factor account for 11.78% variance. Evaluating feasibility of the project with the proposed change will help decide whether to implement the changes or not. This is supported by CII (1994) and Teczke et al. (2017).

Factor 3: Improving from lesson learned

This factor consists of two variables; corrective measures on the project were implemented, and Root cause evaluation of change was performed—the factor account for 10.92% variance. Evaluating root causes of changes and reviewing lessons learned by the project team will help in improving future projects. The finding is in agreement with previous studies (Lewin, 1951; Motawa, 2005).

Factor 4: Promoting Beneficial changes

There are three variables in this factor. The beneficial change was promoted, the change was immediately implemented, and the implementation of change was monitored—the factor accounted for an 8.08% variance. Promoting beneficial changes that will add value to the project or reduce cost and schedule will facilitate the achievement of project goals and consequently benefit the project end-users. This is in agreement with CII (1994).

Factor 5: Sustaining beneficial change

This factor consists of two variables; the change was divided into elective and required change, and the funding source was determined—the factor accounts for 7.51% variance. Therefore, identifying means of implementing and sustaining desired changes are essentials to ineffective CM (Hayes, 2014).

Factor 6: Discouraging detrimental change

This factor also has two variables and account for a 6.24% variance. The variables are detrimental change discouraged, and lessons learned throughout the project were prepared. Detrimental changes can affect the project objective negatively (CII, 1994); thus, it should be discouraged.

Factor 7: Identifying risk areas

The last factor consists of only one variable, namely risk areas where change may likely occur were identified. Thus, the factor explained 5.42% of the variance. Identifying risk areas where change may likely occur will help in taking appropriate measures on time. These seven factors are essential areas of CM that all project teams should focus on. Although they may not cover all the areas of change management, they comprise important components of CMS.

4.3 Impact of CM practice on construction project performance

Multiple regression analysis was carried out to determine the impact of CM practice on the construction project performance. The project performance criteria (time, cost, quality and end satisfaction) were used as dependent variables, against the sixteen (16) CMS activities as the independent variables using the SPSS REGRESSION program. Sixteen-factor scores for each respondent were calculated using the regression method in SPSS. These factor scores formed the data set for the multiple regression analysis. Table 4 presents the results of the regression analysis.

Table 4: Summary of Impact of CMS on construction project performance

Model	R	R Square	Adjusted R Square	P
Time	0.817[a]	0.668	0.647	0.001
Cost	0.777[a]	0.603	0.578	0.001
Quality	0.449[a]	0.202	0.151	0.001
Satisfaction	0.613[a]	0.375	0.335	0.001
Overall	0.693[a]	0.480	0.447	0.001

The results in Table 4 show that for time performance, R2 = 0.67, P= 0.01, suggesting that CMS's impact on construction time performance is moderate and significant (P<0.05).

For cost performance of construction projects, the results show that $R^2 = 0.60$, P= 0.01, suggesting that CMS's impact on cost performance is also moderate and significant (P<0.05). This implied that despite the low practice of CM in the study area, it relatively reduced the time and cost overrun of construction projects. The results for the impact of CMS on the quality performance of construction projects show that $R^2 = 0.20$, P= 0.01, suggesting that the impact of CMS on quality performance is very low but significant (P<0.05). The result is surprising, but a possible reason for the low impact of CMS on quality performance is that most of the changes on the construction projects in the study area may not be related to change in the quality of the project; in addition, measuring quality may be difficult. The table also reveals that the impact of CMS on end users' satisfaction is low but significant ($R^2 = 0.38$, P= 0.01). Generally, low application of CMS will lead to low impact on end users' satisfaction.

Finally, the results indicate that the impact of CMS on the overall project performance is low but significant (R^2= 0.48, P= 0.01) and explained a 48% variance of construction project performance. This implied that CM practices by the respondents need to be improved; otherwise, the projects handled by them may suffer cost and time overrun. The results are in line with the findings of Hwang and Low (2012), who assert that overall project performance could be improved by practising CM.

5.0 CONCLUSION

Changes in construction projects are considered as inevitable. Previous studies on CM focused on developing models and guidelines rather than assessing its impact on projects performance. To adequately address the main aspects of CM, there is a need to assess its impacts on the project performance. The impact of CM on construction projects plays an important role in achieving project success. This study was conducted to determine the impacts of CM practices on construction project performance in Bauchi state, Nigeria.

Despite there is an agreement among researchers that implementation of project CM improve performance, it was found that projects in the study area do not realise the full benefits of CMS due to low implementation. Generally, projects in which effective CM has not been implemented will incur high change in costs and delays compared to those in which formal CMS has been applied. In addition, the low implementation of CMS in the study area indicates that the construction professionals in the area seem to be unfamiliar with CMS or rather unaware of the benefits of CM practices.

Moreover, the results also indicated that the overall impact of CM practices on construction project performance in the study area was low, with an R^2 value of 0.48, suggesting that CMS explained a 48% variance of the overall construction project performance. Although the impact of CM on overall project performance was found to be positive and significant, it varies among the performance criteria. The impacts on time and cost performance are high than on quality and end users' satisfaction.

The study identified 19 CM activities for effective CM practice in construction projects. Factor analysis was carried out on the 19 CM activities; the results produced seven principal components that defined the underlying structure of the variables. The components were interpreted based on their factor loadings as follows: identifying risk areas where changes may likely occur, recognising potential changes, evaluating the feasibility of the project with a proposed change, promoting beneficial changes, sustaining beneficial change, discouraging detrimental change and improving from lesson learned. These components should be understood and applied by construction professionals during project implementation.

In terms of practical application, the seven components provide a framework for effective CMS that can be used by construction professionals in managing changes in their projects. This will assist in reducing the effects of detrimental changes in construction projects. In

addition, the application of these components in project implementation can result in cost and time savings and quality improvement.

Generally, the CM activities identified in this study can help project managers and team members improve construction project management practices, leading to project success. However, to improve the practice of CM among construction professionals in Nigeria, there is a need to organise regular workshops and conferences to train professionals on ways of effective implementation of CMS in construction projects. In addition, to equip potential construction professionals with the knowledge of effective CMS, academic institutions such as Universities and Polytechnics should incorporate CMS in their undergraduate and postgraduate curriculum. Finally, further studies should be conducted to identify the impact of CM at each phase of the project life cycle.

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APPRAISING CAPACITY-RELATED CHALLENGES NEGATING INFRASTRUCTURE DELIVERY PERFORMANCE IN GOVERNMENT DEPARTMENTS: INSIGHTS FROM THE RESOURCE-BASED THEORY

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ABSTRACT

Public sector's effort to bridge the gap between capacity demand and supply has been elusive. This challenge is glaringly noticeable, especially when mega infrastructural projects are undertaken. This study uses the Value, Rarity, Imitability and Organised (VRIO) Framework to assess the human resource attributes of government departments in South Africa and how this impact organisational performance vis-à-vis infrastructure delivery. It also proposes practical guidelines via an improvement plan developed to enhance overall organisational performance. A within-case study mixed methods research design was used. Data were elicited from a provincial government department in KwaZulu-Natal, South Africa. Quantitative data was obtained via a structured questionnaire survey, whereas qualitative data was obtained through structured interviews. The findings of the study confirm the capacity constraints prevalent within the public sector. Based on the VRIO Framework, the human resource attributes of the department were found to be valuable, and the organisation organised. However, the resources lacked the rarity and inimitability attributes. Consequently, this impacted the department's competitive advantage and overall performance. Furthermore, when the organisation's performance was assessed across nine dimensions, namely; strategy, leadership, people, products, culture, technology, operations, customers and governance, culture had the lowest performance rating. Limited studies have sought to investigate the level of preparedness of public sector organisations to carry out their cardinal roles required for successful infrastructure delivery. Accordingly, this study evaluates the government's performance in public infrastructure delivery using the VRIO Framework, which is underpinned by the resource-based theory (RBT).

Keywords: Public Sector, Infrastructure, Organisational Performance, Competitive Advantage, VRIO Framework, Resource-Based Theory

1. INTRODUCTION

The government's primary mandate is to ensure that the social welfare of its citizens is well catered for by providing public goods and services without maximising profit (Fourie and Poggenpoel, 2016). Properly planned and delivered infrastructure remains a vehicle to welfare maximisation and economic growth (Malete and Khatleli, 2020; Hua, 2017: 4; Azam and Bakar, 2017). Infrastructure assets are considered by the government and government-

owned businesses as a platform for facilitating service delivery to citizens (SIPDM, 2015). According to the McKinsey Global Institute estimates, infrastructure assets make significant contributions to the GDP, in certain instances accruing an estimated socioeconomic rate of return of 20 per cent (Bielenberg, Williams and Woetzel, 2020: 2). To achieve national macro-objectives leveraging infrastructure as one of the key drivers for economic growth, the pivotal role of governments around the globe in the infrastructure delivery process has been elucidated severally. Such involvement has led to the choice of projects being influenced by political dynamics, among other factors associated with government bureaucracy (Bielenberg et al. 2020: 2; DeGood, 2020: 1; OECD, 2015: 2). Accordingly, political power is demonstrated through the design, location, scale, and scope of the infrastructure projects (DeGood, 2020: 1). DeGood (2020:1) further observed that infrastructural development trends indicate that access to infrastructure is disproportionately allocated. The discernible spatial and disparate distribution of infrastructure is such that benefits accrue to the affluent groups, while the burdens of disinvestment, pollution, and geographic isolation fall on low-income communities and communities of colour (DeGood, 2020:1). South Africa is no exception in this regard, DPME (2014) emphasised how subsidised services were delivered to certain population groups on equity or other grounds. This led to the post-1994 government of South Africa placing emphasis on remedying the imbalances in infrastructure distribution by prioritising fair and equitable distribution of services to all communities (Bolton, 2006). To curb such challenges, Bielenberg et al (2020: 2) suggest that a government ought to prioritize infrastructure projects that generate substantial public benefits. Unfortunately, most governments find it difficult to select the right projects with the most benefits due to their inability to harness reliable data and analytics, robust financial models and designs, and deploy same during project selection (Bielenberg, 2020: 2). This appears to be the case in developing countries, like South Africa.

Successive democratic governments in South Africa appear to have brought about a new dispensation aimed at rebuilding and reallocating infrastructure assets towards bridging the infrastructure deficit, stimulating economic growth, and engendering inclusivity (DPME, 2014). Despite the significant budgetary commitments made by the South African government towards the actualization of these mandates, the demand for infrastructure remains unmatched (Malete and Khatleli, 2020; Policy Brief, 2015; NDP2030, 2011). The prevalent lack of capacity and inadequate skills within government contracting institutions for clearly articulating a sustainable pipeline of projects, thereby culminating in infrastructure backlogs and the lack of business confidence, has been blamed for the partial realization of the total infrastructure value. Consequently, a substantial proportion of the population still lives below the poverty threshold, approximately 55.5% (30.3 million people), whilst the society remains highly unequal (World Bank Group, 2020). According to SAICE (2017) excerpts from a recent evaluation of the state of South African infrastructure on a scale of A to E, with A being "world class" and E "unfit for purpose; indicated that the country was rated at an average of D+. Buttressing the poor state of South African infrastructure, Draga (2017: 238) whilst reporting on the results from a survey of school infrastructure, concluded that "…crumbling classrooms, horrendous bathrooms, cracked fences, and non-existent libraries and laboratories remain a reality for thousands of school-going children across South Africa".

The challenges associated with infrastructure developments in South Africa have been primarily attributed to poor performance, institutional failures, and capacity constraints within the public sector (Malete and Khatleli, 2020; Thumbiran and Raphiri, 2016; National Treasury, 2012). Bolstering this assertion, Hagerman (2012) maintained that public entities remained the most affected by capacity deficiencies, resulting in reported low performance levels. According to CIDB (2012), the poor performance and incapacity of the public sector has given rise to the following infrastructural delivery challenges, which all have a bearing on project success:

- Poor planning and budgeting
- Poor project designs and inadequate documentation
- Poor management of projects during execution
- Inadequate support during the delivery processes
- Inadequate knowledge management and reporting.

In a nutshell, South Africa needs to have the capability and capacity to oversee and manage infrastructure projects from inception to close out to ensure that they are effectively and efficiently delivered. Despite infrastructure being one of the core areas highlighted to address societal challenges, the performance of public sector organisations in this regard appears to be failing, judging from the plethora of failed or abandoned projects in the country. Whereas various studies have sought to investigate extant infrastructure delivery models in South Africa and, to recommend improvements thereof from a multi-stakeholder perspective (Khumalo, Choga and Munapo, 2017; Isa, Emuze, Das and Awuzie, 2018; Dithebe, Aigbavboa, Thwala and Oke, 2019), limited studies have sought to investigate the level of preparedness of public sector organisations to carry out the cardinal roles required for successful infrastructure delivery. Accordingly, this study evaluates the government's performance in public infrastructure delivery using the Value, Rarity, Imitability and Organised (VRIO) Framework, which is underpinned by the resource-based theory (RBT). Also, this study proposes practical guidelines via an improvement plan for enhancing overall organisational performance in such project environments. It is expected that public sector organisations can adapt this plan in addressing the challenges they are faced with during infrastructure delivery.

Subsequent sections of this article are structured as follows: a brief review of literature articulating the relationship between organisational performance and competitive advantage in the public sector, the resource-based theory and the VRIO framework, a justification and clarification of the research methodology deployed in the study, the presentation and discussion of findings and a conclusion.

2. LITERATURE REVIEW

2.1 Competitive Advantage

Competitive advantage can be viewed as the ability of an organisation to significantly predict the variance in its performance (Matthews and Shulman, 2005). An organisation can only gain a competitive advantage when it develops or acquires certain characteristics that enhance it to outperform its rivals (Wang, 2014). As an important component of strategic management, competitive advantage can be viewed from two lenses; on the one hand, it focuses on performance aspects, such as superior financial performance and economic profits, and on the other hand, it focuses on its determinants, for example, distinct firm resources and capabilities (Sigalas and Pekka-Economou, 2013). Competitive advantage has been a subject of interest to many researchers and industry practitioners alike, as it seeks to explain performance variances among firms (Ceccagnoli, 2009).

Competitive Advantage in the Public Sector

Within the public sector, competitive advantage plays a dual role of (i) enhancing improvement in the delivery of public services and (ii) helping in the elimination of inefficiencies and waste (Popa, Dobrin, Popescu and Draghici, 2011). Public sector organisations are funded by the government, and the amount of funding allocated to each entity is largely dependent on the entity's ability to persuasively motivate for such funding (Matthews and Shulman, 2005). This creates competition within the public sector as each entity strives to get a budget allocation that is as close to its target as possible. A firm's

resources and its ability to effectively and efficiently deploy these resources will contribute to the organisation's competitive advantage. Characteristics enhancing competitive advantage within the public sector, which can be referred to as distinctive capabilities, include, inter alia, innovation, reputation, human capital and information technology (Popa et al., 2011).

Innovation is one of the most important sources of competitive advantage. According to Popa et al. (2011), innovation affects the very essence of the organisation and, it is through innovation that improvements in service delivery are sought. Innovation propels most institutions to strive for continuous improvement and to continuously adapt to changes, the needs of citizens, stakeholders, etc. (Alimin, Raduan, Haslinda and Jegak, 2010).

Human Capital (Competencies) is another source of competitive advantage for public sector organisations. Skills, training, and experience are examples of human capital that can enhance public sector performance (Popa et al., 2011; Waheed, 1999). With adequate human capital, the inefficiencies experienced within the public sector, such as time and cost overruns, can be significantly reduced, and the quality of services can be improved (Alimin et al., 2010). Competencies, which have been cited as essential strategic possessions within an organisation, signify both the knowledge and skills required to perform useful actions (Majeed, 2011). According to Morris (2019), human capital is very important to such an extent that when most managers are asked what they attribute the performance of firms, they briefly respond with, "our people".

Information Technology (IT) also represents a source of competitive advantage (Swamidass and Kotha, 1998). With the digital era and technology evolving at a fast pace, it is no doubt that organisations are frequently turning to information to gain competitive advantage and recognize the need to engage in new management technologies (Popa et al., 2011; Abdelkader and Abed, 2016). However, some scholars dispute that IT can be a source of competitive advantage, especially when the IT environment is dynamic and is easy to replicate (Dehning and Stratopoulos, 2003). However, IT can be used as a strategic tool that offers differentiation between organisations (Bobb and Harris, 2011).

Reputation - Good reputation is considered a valuable asset that allows a firm to achieve superior performance (Baldarelli and Gigli, 2014). According to Olmedo-Cifuentes et al. (2014), reputation can be assessed through aspects such as, inter alia, financial performance, quality of management, quality of leadership, human resources, quality of products and services, and innovation.

2.2 Performance

Performance can be viewed in terms of quality; quality of actions is termed competence or capacity, and quality of the achievements equates to results (Van Dooren, Bouckaert and Halligan, 2015. When both of these quality aspects are achieved, this results in sustainable outcomes (Ibid). Extant literature is replete with various definitions of the term 'performance'. While Krause (2005) defined performance as the extent to which objectives are achieved, Wettstein and Kueng (2002) described the performance as the degree of stakeholder satisfaction. The term 'performance' describes the contribution of specific systems (organisational units of differing sizes, employees, and processes) to attain an organisation's goal (Hauber, 2002). Amidst all the definitions brought forth by different authors, the two 'E's, namely 'effectiveness and efficiency' are commonplace, with the former being the delivery of desired outputs and even outcomes, whilst the latter points to using as few inputs as possible to obtain these outputs (Samsonowa, 2012). Samsonowa viewed performance as a team rather than an individual effort and went further to define it as the degree of goal achievement of an organisation. Building on the definition proffered by Samsonowa (2012), Ghalem, Okar, Chroqui, and Semma (2016: 5) suggested that performance be defined in terms of goal achievement as a whole rather than the degree (partial) of goal achievement. They went further to define performance as "the goal

achievement of an organisation rather than of individuals, with the minimum resources consumed to reach the goal". This aligns with Raduan, Jegak, Haslinda and Alimin's (2009) proposition that the source of performance is linked to organisational resources, capabilities, and systems.

Performance in the Public Sector

According to Otley (2001), the term performance is applicable to both private and public sector organisational contexts. However, in the public sector context, performance can be viewed in terms of the triple 'E's, namely: effectiveness (focused on the level of goal attainment or delivering desired outputs), efficiency (the resources that were consumed to reach the level of achievement, the least the resources, the more efficient), and economy (buying inputs as cheaply as possible) (*Ibid*). Chai (2009) expanded on these to five 'E's' by adding equity and environment.

Similarly, Profiroiu (2001) defined performance in the public sector as "the result of the simultaneous exercise of efficiency, effectiveness and adequate budgetary process". On the other hand, Van Doreen, Bouckert and Halligan (2015) stated that the public sector's performance is about intentional behaviour, which can either be at an individual or organisational level. In terms of public sector performance, Otley (1999) stated that a well-performing organisation is one that successfully attains its objectives. Demeestére in Matei (2006) stated that organisational performance embraces the concepts of; adequate implementation processes, focus on target groups (customers, users, etc.) and effective use of institutional resources to achieve the desired results. A graphical presentation of organisational performance, according to Matei (2006), is provided in Figure 1.

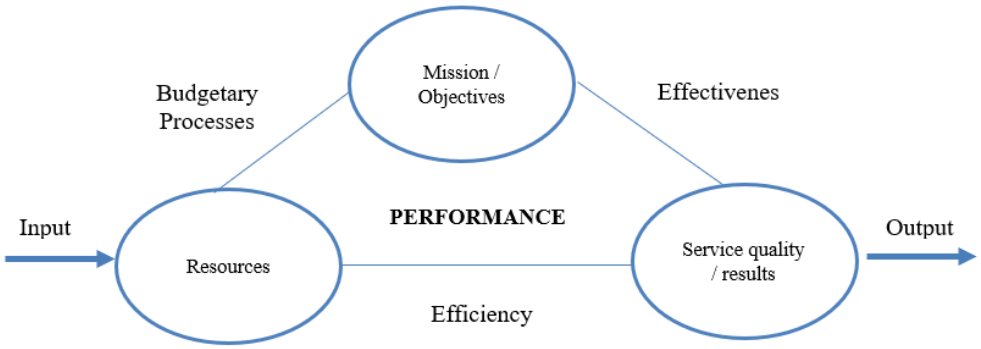

Figure 1: Performance (Matei, 2006)

In defining performance, Folan (2007) seemed to have taken into account Matei's perspective as he articulated the three objectives of performance, namely: (i) performance should be analysed by each entity within the limits of the environment in which they decide to operate (resources), (ii) performance is always linked to one or several objectives (set by the entity whose performance is analysed) (mission/objectives), and (iii) performance is reduced to the relevant and recognizable features (results). Consequently, it is imperative that the public sector be adequately resourced and capacitated.

Capacity within the public sector entails a government's ability to deliver services (infrastructure in this case), implement policies, and provide policy advice to decision-makers (Polidano, 2000). Considering the status of the public sector as the largest owner and occupier of immovable assets, it is crucial for public sector entities to be adequately resourced, possessing a skilled and competent workforce, to adequately manage these assets (Yusof, 2013). This bolsters the need for capacity building and skills development throughout all

organisational levels to ensure that projects are properly conceptualised, prepared and executed (Ramokgopa, 2021). This is corroborated by Andrews and Boyne (2010), who observed that capacity has a positive correlation with public sector performance. Their study concluded that high-performing governments have better capacity than their lower-performing counterparts. Furthermore, Ingraham, Joyce, and Donahue (2003) assert that capacity is a critical determinant of improved performance and service quality in organisations. These findings buttress the link between the lack of requisite capacity and capabilities within South Africa's public sector and its perceived poor performance with regard to infrastructure delivery.

In a bid to improve the performance of public infrastructure development, the South African government allocated R400 million to address the capacity challenges (Budget Review Report, 2019). However, issues dealing with compliance among public sector organisations, like the case with the i-tender and register of projects (RoP) where it is mandatory for public sector clients to register projects with a minimum value of R200 000, remains a challenge. Also, the CIDB Annual Report (2020) highlighted the poor performance of provincial government departments. In comparison to the national average of 33%, KwaZulu-Natal departments were compliant on 489 out of 1453 projects indicating a 34% compliance. Only two out of the nine provinces had a compliance level above 50 %, namely Northern Cape (71%) and Western Cape (63%), whereas Gauteng had a deplorable performance at a mere 3%. The overall poor performance was largely attributed to incapacitation by the departments, leading the CIDB to offer ongoing capacitation programmes. The Budget Review Report (2019) revealed that some government departments were facing major challenges in attracting and retaining built environment professionals, and this counters and undermines efforts to increase capacity.

Given the above discussions on performance and competitive advantage, it could be deduced that human capital and resources have a significant impact on organisational performance.

2.3 Competitive Advantage and Organisational Performance in the Public Sector

Alimin et al. (2010) asset that every organisation strives to attain both a competitive advantage and improved performance relative to its rivals. However, the relationship between an organisation's competitive advantage and its performance remains contentious in the corpus of extant literature. For instance, whereas Ma (2000) has argued that competitive advantage does not necessarily result in improved performance, other scholars have shown that achieving a position of competitive advantage impacts significantly on a firm's performance (Alimin et al., 2010; Raduan et al., 2009; Morgan, Kaleka, and Katsikeas 2004). Also, Majeed (2011) indicated that a positive association between a company's competitive advantage and its performance does, in fact, exist.

Competitive advantage in relation to organisational performance can be viewed from three perspectives, namely;

(i) Cost-based – organisations that have a cost-based advantage have been shown to have a comparatively better performance when compared to their counterparts (Gimenez and Ventura, 2002; Morgan et al., 2004).
(ii) Product-based – similarly, organisations with a product-based competitive advantage over their rivals have been shown to have better performance (Gimenez and Ventura, 2002; Morgan et al., 2004).
(iii) Service-based – organisations that have a service-based competitive advantage compared to their rivals have been found to have comparatively better performance (Gimenez and Ventura, 2002; Morgan et al., 2004).

The association between competitive advantage and organisational performance was depicted by Raduan et al. (2009) as follows:

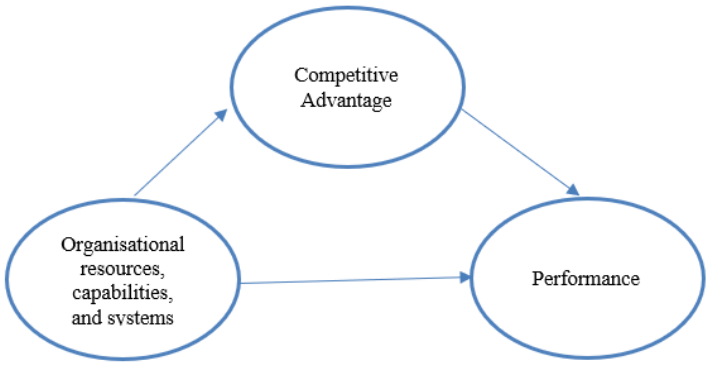

Figure 2: Link between competitive advantage and organisation performance (Raduan et al., 2009)

2.4 Resource-Based Theory (RBT)

An earlier study by Barney (1991) suggested that an organisation is only as good as its internal human capital, that is, the knowledge acquired, its competence and skills-levels, and interactions between employees, which are all critical for both productivity and sustainability. Wu (2007) expanded on that definition and advised that an organisation's performance, therefore, depended on the firm's ability to gather and utilize such intangible resources. These resources encapsulate all aspects of resources utilised by an organisation, namely, assets, capacity, skills set, competence, business practice and processes, systems and procedures, information management, and intellectual property (Ibid). These allusions gave rise to the resource-based theory (RBT). A central premise of RBT is that it is one of the "most prominent and powerful theories for understanding organizations" (Barney et al., 2011). Contextually, the RBT accentuates the principle that an organisation's performance is dependent on the resources available, and it directly represents the capabilities of the organisation (Bridoux, 2003). Also, organisational success is determined by the competence level of human capital, especially that of management (Berger and Bonaccorsi di Patti, 2003).

The RBT focuses on an organisation from within and argues that performance is a result of utilising available resources and capabilities to seize any market opportunities (Barney, 1991). Contemporary views by Anantadjaya (2008) affirm that the RBT points to the organisation's performance as being dependent on the resources it possesses. The importance of human resources stretches to and is crucial within governmental departments, especially those responsible for the formulation and implementation of public policy (Ibid). Equally important is the ability of these organisations to skillfully deploy their human resources so as to realise their full potential and accomplish set objectives, which are often of a complex nature (Rainey, 2009). Within the past five years, organisational capabilities of the public sector have been a subject of major interest for many researchers and analysts alike (Abderisak and Göran, 2017; Teece, Peteraf and Leih, 2016; Winch and Leiringer, 2016). This interest has been in response to the need to ameliorate the performance of public organisations whose poor efficiency is salient when compared to their private-sector counterparts (O'Toole and Meier, 2015).

Resources are often classified into categories such as physical (e.g., technology and equipment), human (e.g., skills, knowledge, training and expertise) and organisational resources (e.g., organisational structuring and planning, controlling and coordination). For companies to transform these resources into sustainable competitive advantage and improved organisational performance, these resources must have four attributes that can be summarized into the Valuable, Rare, Inimitable and Organised (VRIO) framework (Cardeal

and António, 2012: 10159). This paper will focus on the human category as it seeks to explore the issues of capacity and capabilities constraints.

Valuable, Rare, Inimitable and Organised (VRIO) Framework

The VRIO framework is underpinned by the RBT, which seeks to examine the link between an organisation's internal characteristics and its performance (Cardeal and António, 2012). It is a strategic tool that helps organisations to determine the quality and usefulness of their resources.

Valuable - A resource must be valuable, and it is considered so when it enables a firm to improve its efficiency and effectiveness by exploiting opportunities or neutralizing threats (Cardeal and António, 2012). According to Newbert (2008), valuable resources will remain latent until the firm has the capabilities needed to deploy them, hence the importance of capabilities.

Rare - Resources must be rare. That is to say that it must only be acquired by one or a few companies to be considered rare (Cardeal and António, 2012).

Inimitable - Resources should not be easily imitable or, at the least, should be hard and costly to imitate or substitute. According to the RBT, resources can be imperfectly imitable due to a combination of three reasons:

(i) Unique historical conditions - for example, lessons learned to influence future decisions or location of a facility
(ii) Causal ambiguity - competitors are unaware of the resources to imitate; therefore they would not have the ability to duplicate them
(iii) Social complexity – which social network strength, which makes it very hard for competitors to build an identical social network as it is dependent on a lot of variables

Organised - An organisation only gets to benefit from its resources if it is organised in such a manner as to adequately exploit its resources and capture the value from them. The organisation, therefore, needs the *capability* to assemble and coordinate its resources effectively. When all four resource attributes are present, this enhances an organisation to have a sustainable competitive advantage and improved performance.

The VRIO framework has been extensively deployed in extant studies for conducting different strategy-performance evaluations within various organisational contexts. For instance, (Miethlich and Oldenburg, 2019) used the framework in assessing the impact which the employment of persons with disabilities will have on organisational performance, leveraging the engagement of such persons as a strategic asset. Also, Chatzoglou, Chatroudes, Sarigiannidis and Theriou (2018) used the framework to appraise the role of firm-specific factors in facilitating the strategy-performance nexus within organisations. The framework was used by Gutiérrez-Martínez and Duhamel (2019) in an evaluation of the impact of sustainability-oriented attributes of firms operating in Mexico's hospitality industry on performance. Hussain and Terziovski (2019) utilized the VRIO framework in assessing the appropriation of intellectual property as a resource in technology-intensive organisations. Judging from this varied use of the framework for assessing the contribution of firm-specific factors towards engendering sustainable competitive advantage in organisations, it is hoped that its deployment in the present study will contribute towards an effective assessment of and identification of any capacity/capability gaps within South African public sector organisations which might negate effective and efficient infrastructure delivery therein, albeit relying on cases within a particular province, KwaZulu-Natal.

3. METHODOLOGY

3.1 Research Methods

A within-case study research design was used to appraise capacity-related challenges negating infrastructure delivery performance in a KwaZulu-Natal provincial government

department. This study adopted a mixed-methods approach by following a sequential explanatory strategy as suggested by Terrell (2012). Data collection was carried out through a two-step process with the questionnaire survey preceding interviews, as depicted in figure 3.

Figure 3: Sequential explanatory strategy (Terrell, 2012)

For the design of the questionnaire, a literature review was used to establish key aspects impacting the government's role in public infrastructure delivery. Thereafter, a preliminary questionnaire was developed, and a pilot study was undertaken to improve the questionnaire and to provide valuable feedback that would be incorporated subsequently.

Distribution of questionnaires was done from October 2019 to July 2020 electronically, via email and SurveyMonkey, which had the added advantage of being environmentally friendly (Nwaki and Eze 2020: 65). The latter step involved the use of follow-up semi-structured interviews to better understand the results of the quantitative survey and validate the findings from the questionnaire survey. The primary focus of the selected strategy was to provide for in-depth interrogation of the quantitative results through interviews, placing more emphasis on the lowly ranked items to improve their implementation and organisation performance.

3.2 Population and Sample

Senior built environment professionals, namely architects, engineers and quantity surveyors, were the target respondents within the case organisation. It was a prerequisite for all respondents to have over five years of experience working in the public sector. A pilot study was conducted to test the adequacy, clarity and completeness of the questionnaire and to identify any potential problems that could be encountered during the data collection stage. The pilot questionnaire was sent to 12 individuals within the Department; nine employees and three senior managers, resulting in twelve pilot questionnaires being administered.

As informed by the outcome from the pilot study, the population was greatly reduced to include only senior professionals and individuals in managerial positions as they possessed the adequate knowledge to make meaningful contributions to the study. This resulted in a combined list of 20 individuals forming the population. Krejcie and Morgan (1970: 608) recommends that for a population of 20, the sample size be 19. This study however surveyed the entire population due to its small size. Additionally, the study placed priority on obtaining quality results rather than population and sample sizes.

Questionnaires were sent to the 20 participants by email and a total of 12 questionnaires were completed correctly and returned representing a 60% response rate. Taking a proposition by Moyo and Crafford, (2010: 68) into account where survey responses within the built environment vary between 7% and 40%, the response rate is deemed as appropriate to support this empirical study.

Table 1: Data sources

Source	Number	Example
Questionnaires	20	Senior professionals
Interviews	3	Managers and directors

3.3 Questionnaires

The questionnaires were distributed only to senior professionals and managers as they possessed the relevant knowledge and experience to make valuable input. To reduce the respondents' bias, the questionnaires were structured to contain definite and pre-determined questions which were closed (Akintoye and Main, 2007: 601). The questionnaire was divided into two sections and comprised of 55 questions. The first section had three questions that captured the demographics of the respondents, such as their years of experience and the position that they occupy. The remaining 52 questions in the second section were expected to capture data on the nine dimensions which impact organisational performance in relation to public infrastructure delivery. The questions in the second section were elicited from literature review Respondents were required to rate the questions on a 5-point Likert scale (1 = almost always, 5= never).

3.4 Interviews

Interviews were conducted with three directors of infrastructure/senior managers to validate the findings from the questionnaire surveys. The semi-structured interviews focused on the lowest-ranked items from each dimension, as improving on these aspects would result in an improvement of the dimension, consequently resulting in overall performance improvement. Furthermore, the interviews sort to establish the human resource attributes of the department via the VRIO framework. An important feature of interviews is that, unlike other data collection methods, they allow for dialogue and are interactive, leaving room for emerging related topics to be discussed and for the provision of clarity when needed (Alshenqeeti, 2014). In adherence to the advice provided by Berg (2007), the researchers used a checklist to ensure that the interview questions aligned with the study aim and that all relevant topics were covered. In adherence to the Covid-19 protocols, the interviews were conducted telephonically or via electronic communication channels to eliminate physical contact. Since the interview method was a follow-up to the questionnaire survey, the study was limited to one interview session for each respondent. At the conclusion of the interview, interviewees were given the opportunity to comment or ask any questions concerning the study.

3.5 Data Analysis

Quantitative data analysis was done using the Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistical analysis was used to analyse quantitative data, and inferential statistical analysis was used to generalize the findings. When quantitative data was subjected to a reliability and consistency test using the Cronbach alpha test. The alpha values ranged between 0.70 and 0.91, which is indicative of at least a "good" level of reliability and is therefore acceptable. These values align with the recommended acceptable Cronbach's alpha values of between 0.60 - 0.95 (Taber, 2018: 1279).

On the other hand, thematic analysis was used for qualitative data. The interview responses were analysed through the following guidelines for analysing textual data developed by Taylor-Powell and Renner (2003). This followed a five-step process, namely: (i) get to know and understand your data, (ii) focus the analysis (iii) categorise information by identifying themes and patterns and organising them into coherent categories, (iv) identify patterns and connections within and between categories, (v) and interpretation, by bringing it all together.

4. RESULT AND DISCUSSION

4.1 Questionnaire Survey

Basic Respondents Information

The results in Table 2 below indicate that there were no respondents in the age range of between 18 and 25. This can be attributed to the fact that the department did not have anyone within that age range with the requisite five years' experience to partake in the survey. Furthermore, the results demonstrate the gender imbalance within the department with a 1:2 female to male ratio in respondents. 75% of the respondents were senior professionals, with the balance being in management positions.

Table 2: Respondents' Profile

Characteristics	Category	Frequency (n = 12)	Percentage
Age	18 - 25 years	-	0
	26 - 39 years	5	41.7
	40 - 49 years	5	41.7
	50 - 59 years	2	16,7
	60 - 65 years	0	-
Gender	Female	4	33.3
	Male	8	66.7
Profession	Architect	6	50.0
	Quantity Surveyor	4	33.3
	Engineer	2	16.7
Position	Management	3	25.0
	Senior Level	9	75.0
Experience	< 5 years	0	-
	5 -10 years	10	83.3
	11 - 15 years	2	16.7

Organisational performance

Table 3 is a presentation of the mean rankings pertaining to the frequency in which dimension items are implemented. The department had an overall performance rating of 3.00 across all nine dimensions.

Table 3: Organisational performance across all nine dimensions

Dimension	Mean	SD	Rank
Governance	4.063	0.715	1
People	3.500	1.059	2
Products	3.438	1.045	3
Leadership	2.778	0.927	4
Strategy	2.774	0.790	5
Customers	2.764	0.989	6
Technology	2.727	0.819	7
Operations	2.683	0.998	8
Culture	2.300	0.824	9
Grand mean	3.003	0.907	

A number of inferences can be drawn from the responses received from the survey that was conducted. Table 3 shows that the department performed better on the Governance and Products dimensions. This indicates that the department prioritizes and seemingly upholds the aspects of governance. This finding aligns with the Department's Strategic Plan 2015 - 2020, which placed governance aspects, such as transparency, integrity, and accountability, atop organisational core values. The priority placed on governance tenets could be in

response to the reported widespread corruption, fraud and maladministration within government departments. The department's performance within the products dimension is second highest. This is probably to ensure that infrastructure projects are delivered according to need and are fit for purpose. This is especially when the department is committed to the provision of efficient and responsive infrastructure, which is demonstrated through product outcomes.

On the other hand, the culture dimension scored the lowest. While a positive organisational culture has been argued to improve the overall performance of the organisation, a negative one has the potential to hinder even the most successful organisations (Shahzad, Luqman, Khan and Shabbir, 2012). Taking into account the role of an organisation's culture in influencing performance improvement, the generally low performance in this dimension could be linked to the overall poor organisational performance. Culture is a key attribute in attracting talent, and it has been cited as greatly influencing employee commitments and job retentions (Wong, 2020). However, an Annual Performance Report (2020) indicated that provincial government departments were experiencing challenges in attracting and retaining built professionals, and this undermined the effort to increase capacity.

Furthermore, Shahzad et al. (2012) argue that it is the leadership's responsibility to ensure that employees understand and embrace the organisation's culture to enhance improved performance. The relatively low score attached to the leadership dimension, as a result, could be linked to the low to average departmental performance. Although the general organisational performance mean stands at level 3, implementation of six out of the nine dimensions remains at level 2. Therefore, the department ought to focus and improve on these aspects to enhance organisational performance and infrastructure delivery. This can be achieved through capacity building in the following areas;

(i) Administration and systems include, among other factors, policy and governance issues, procurement strategies, monitoring and evaluation, and feedback loops.
(ii) Skills - namely technical, financial and people-oriented skills
(iii) Resources - namely training programmes and mentoring processes, and policies
(iv) Decision making
(v) Technology and IT support

4.2 Interviews' Data Analysis

Three interviews were undertaken with interviewees X, Y and Z. In response to being asked to provide possible explanations for the lowest-ranked questionnaire aspects, Respondents' responses are as follows.

Culture (2.30) - There was consensus among the respondents in relation to the low score attached to this dimension. Respondent Z admitted that "this is an area the department could improve on", as it had not been adequately supporting team-building initiatives. He went further to assert that when tackling the aspects of innovation within the departments, it was observed that although the department appeared to support and encourage innovation, the stringent protocols within the department somewhat made it difficult for individuals to be innovative.

Operations (2.68) - The interviewees seemed to slightly disagree with the low score. The main aspects that were brought up under this dimension bordered around having decentralised systems and frequency of audits and training to improve the quality of processes. Transparency required when managing the budget or when dealing with public funding was a major factor in having a centralised system. Respondent X noted that when systems are completely decentralized, one loses control, and as such, "Financial control is the main reason why the systems are not decentralized". The respondents agreed that quality is a key objective, as such regular audits were undertaken. However, the department did not

support the certain endeavour; for example, training was not prioritized, and neither was it conducted on a frequent basis conducted.

Technology (2.73) - Respondent Z indicated that the technology aspect goes far beyond communication and information flow. Their department, however, utilized mostly emails, and the absence of a web-based system was cited as a big problem that would hopefully be addressed in the near future. Generally, there was consensus among the respondents in relation to this low score. It could be summarised that the technology dimension in its entirety requires improvement, and the department could do more to improve given the direction in which the world is taking.

Customers (2.76) - There was consensus among the interviewees that they partly agreed with the seemingly low score attached to this dimension. Interviewee Z justified this low score as he indicated that the department has a customer data/project priority list, which they utilized, although it is often interfered with, leaving some beneficiaries dissatisfied as they had to wait longer than usual.

Strategy (2.77) - All interviewees disputed the low score attributed to the strategy dimension as they emphasized that strategy was at the core of the department. It could be a lack of buy-in from the survey respondents to the values and directions of the organisation. This calls for more training on the mission and vision of the department.

Leadership (2.78) - The interviewees had mixed views on the low score attached to this dimension. Interviewee Z noted that even though the organisation employed individuals based on their experience and qualifications, some individuals in management capacity lacked adequate leadership skills. On the contrary, Interviewee Y opined that the department has excellent managers that are qualified to be in those positions. He further noted that leadership is the driver of an organisation, and it is individually based; it is how an individual manages the resources available. Interviewee X also disputed the low score attached to the leadership dimension by virtue of the Human Resource capacitation programme, where a manager is employed only if they meet specific qualification criteria. He further noted that "…… it could be a possibility but less so, that the individuals appointed by the department are coming from the private sector", with minimum knowledge of the public sector modus operandi, perhaps the perceived low score attached to having a qualified manager per department.

Products (3.44) - One of the department's major objectives is to ensure that they build infrastructure, for example, schools that are accessible to their learners and that cater for the disabled learners, "which is part of our strategic designs, we embrace that" noted interviewee Y. However, due to soaring unplanned settlements, resulting from the province being largely rural and a lot of the land belonging to the Ingonyama Trust Board and Tribal Land, land restitution frequently occurs where large pieces of land are given to a community. The interviewees somewhat concurred with the dimension score as they agreed that meeting key project objectives was very crucial. The department aims at delivering quality projects within the specified time and budget parameters. However, due to various other factors such as contractors' issues, incapacity challenges, etc., this was not always achievable.

People (3.50) - The interviewees seemed to have mixed views on the people dimension. Interviewee X disputed the score attached to this dimension due to the recently initiated government Human Resource capacitation programme and stated that as a result of the programme, "the department is sitting at over 90% capacitation with adequately skilled and competent individuals". However, the other interviewees highlighted that the departments are bedevilled by capacity constraints, and this challenge is apparent when megaprojects ought to be undertaken

Governance (4.06) - The interviewees concurred that the overall high scores attached to governance aspects are justifiable. The organisation generally upholds all aspects related to governance as the department is subject to stringent audits as they utilize public funding.

However, Interviewee Z noted that the civil service is generally poor at governance and disciplining people, "it really has to be bad before anything is done".

Impediments to Department's Performance

When asked to highlight major impediments to the department's performance, there was a consensus among the interviewees that the performance of the department was disappointing, and the department ought to improve its performance. The impediments were summarised and presented below. It can be concluded that most of these challenges emanate from constrained human capital resources:

(i) Incapacity within the department, though it was highlighted that the department sits at 90% occupancy
(ii) Lack of contractor capacity – some contractors have been cited to lack the capacity and experience
(iii) Incapacity of service providers
(iv) Industry challenges - the department works with implementing agents who have their own challenges; the implementing agents, in turn, work with consultants and contractors who have their own challenges
(v) Poor workmanship – which ultimately results in rework, consequently leading to increased project durations and budgets (capabilities constraints)
(vi) Capabilities constraints – for example, confusion, misinterpretation and misunderstanding of contract documents sometimes resulting in disputes between project stakeholders
(vii) Technology and systems challenges – The department manages thousands of projects but works from spreadsheets instead of a webpage.
(viii) Political interference – The projects priority list is often interfered with hence pushing some projects further down the list
(ix) Lack of continuation between financial years - the biggest challenge was cited as getting momentum going between financial years.
(x) Budget Allocation shortfalls – the demand in infrastructure is greater than supply
(xi) Sabotage – the labour force of some contractors, both skilled and unskilled, retard progress to prolong their project duration; the longer the project, the longer they are on the payroll
(xii) Business Forums such as "Delangokubonas" – these are disruptive on sites and consequently lead to, inter alia time and cost overruns
(xiii) Unplanned urgent requirements – In some instances, things are done in a hurry in response to urgent requirements, therefore making it difficult to apply adequate processes and procedures

4.3 Discussion of the findings

This study sought to establish the level of preparedness of public sector organisations in carrying out their key roles required for successful infrastructure delivery. It was found that the level of preparedness was generally on a low to average rating. Consequently, this results in the poor performance of these entities, with a direct impact on the poor state of infrastructure delivery, which is evident and widely reported. With a specific focus on the human capital and capacity aspects, namely, the people and leadership dimensions, despite public entities' efforts to bridge the gap between capacity demand and supply, capacity improvements have been elusive. A report by OECD (2006) identified capacity shortages and building as major challenges affecting most countries, especially the developing ones. These challenges are glaringly noticeable, especially when mega infrastructural projects are undertaken.

Primarily, the human capital aspect oversees and influences the performance of all other dimensions. Given the impact a robust leadership has on organisational performance, low performance in this dimension impacts negatively on the overall infrastructure delivery process. This much was confirmed in Tehreem et al's study in 2013, where it was found that poor leadership skills negatively impacted organisational performance. Additionally, in their study Alnachef and Alhajjar (2015) noted that in order to improve organisational performance, firms need to invest in developing and improving their human resources and capacity, leadership included. In her study, Waheed (1999) found that human resources are very crucial to an organisation's effectiveness, posing as an organisation's main competitive advantage.

Culture, an aspect that has been cited repeatedly in literature as being a critical determinant to organisational effectiveness and performance (Cameron and Quinn, 2011; Waheed, 1999), had the lowest implementation score. A correlation between organisational environments (culture) and the quality of its human resource management system was postulated (*Ibid*). A study undertaken by Kotter and Heskett (2011) of 207 organisations over a period of 11 years affirmed the impact culture has on organisational performance, where they observed that organisations with an adaptive culture performed financially and economically well. Impliedly, this suggests that a positive culture cultivates a good/effective human resource system and vice versa.

Department's Assessment through the VRIO Framework

The VRIO framework was used to assess the human resource attributes of the department as the study sort to appraise capacity-related challenges within the public sector and how these challenges impact organisational performance. The human resource category tackles aspects such as capacity, skills and knowledge, which have been argued to enhance public sector performance (Popa et al., 2011). Following interviews with senior management, the interviewees X, Y and Z concurred that the human resources within the department were valuable and the organisation was organised. However, they cited that the resources lacked the rarity and inimitability attributes. Figure 4 summarises the department's attributes.

Since change is an inevitable aspect of life, it is imperative that for the department's VRIO framework to remain relevant and advantageous, it should be frequently revisited to adapt to these changes.

Department's VRIO and Relative Firm Performance

Table 4 below was adapted from Morris' (2019) work, and it interprets the organisation's competitive advantage and performance based on the VRIO framework. The results from Figure 4 indicate that, relative to the human resource attributes, the department has 'competitive parity' and has 'normal performance'. These results align with those from the questionnaire survey where it was found that the department had an average performance (3.00) across all nine dimensions assessed.

In respect to the VRIO framework, the department's human resources were found to be valuable, and the department organised; however, they lacked the rarity and inimitable attributes. Consequently, this impacted the department's competitive advantage and overall performance. On a VRIO relative firm performance scale from 1 to 4 (where 1=competitive disadvantage and 4=competitive advantage), the department is at 2, with the attributes, namely, 'competitive parity' and 'normal performance'. It is imperative, therefore, that the department focuses on gaining the rarity and inimitable attributes within the human resource category.

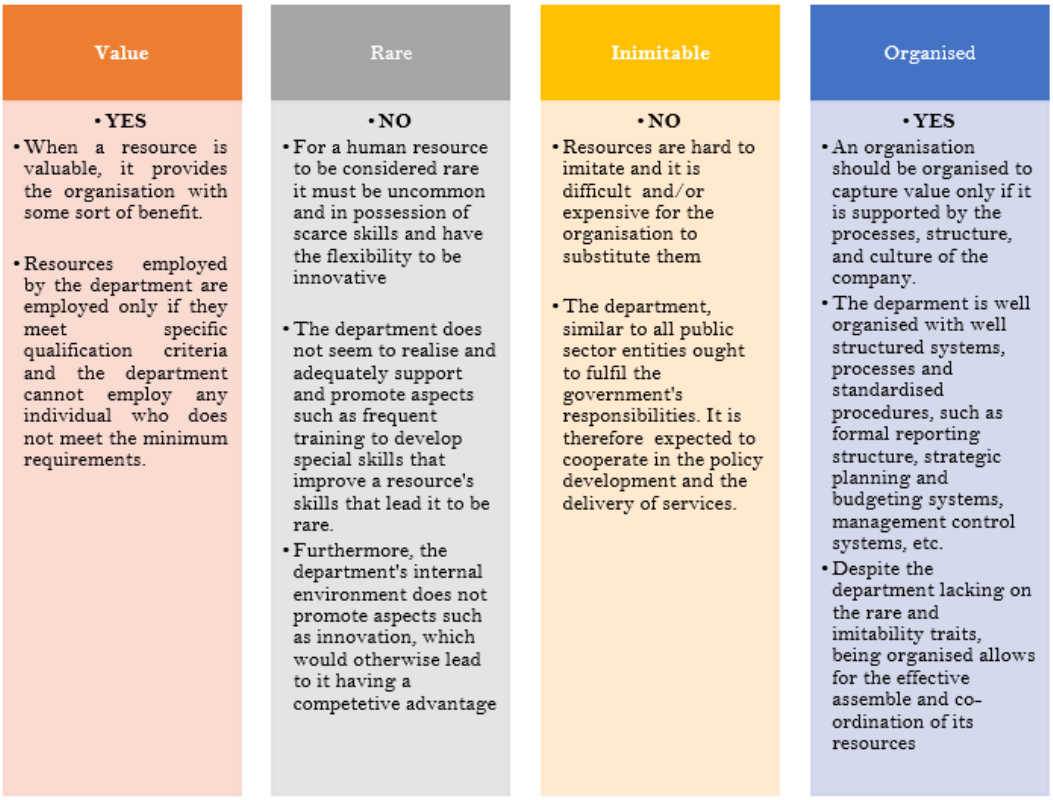

Figure 4: VRIO Framework for the Department

Table 4: VRIO and Relative Firm Performance (Source: Morris, 2019)

Valuable	Rare	Inimitable	Organised / Supported by Organisation	Competitive Implications	Performance
No	--	--	Yes	Competitive Disadvantage	Below Normal
Yes	No	--		Competitive Parity	Normal
Yes	Yes	No		Temporary Competitive Advantage	Above Normal
Yes	No	No		Sustained Competitive Advantage	Above Normal

Improvement Plan: An Example

Practical examples using extracts from this study were used to demonstrate how organisations can improve their performance by focusing on the lowly rated aspects. This would be done by establishing short, medium and long-term improvement plans. For the purposes of this study, the following timeframes will be used:

(i) Short Term – < 1 year
(ii) Medium Term – More than 1 year but less than 5 years
(iii) Long Term – > 5 years

In order to achieve the long-term plans, it is imperative that the short- and medium-term plans are adhered to. By considering the lowest-ranked dimension, namely Culture, Table 5 presents the proposed improvement action plan for this aspect in relation to organisational performance. This process should be followed for every aspect of the department and become a valuable tool to be used in the process of continuous organisational improvement.

4.4 Implications of the study

A major implication of this study is that it provides public departments with the much-needed VRIO tenets to appraise their capacity attributes. Focusing on these specifics would propel the department to improve on its competitive advantage and overall performance.

With the generally low to average preparedness and implementation levels across the dimensions, this study proposes an improvement framework to improve overall public sector performance. This research study is especially timely and relevant given the prevalent mal-performance and incapacity of public sector departments. Depending on the nature of the issues being addressed, the proposed improvement plan can be applied within the short, medium or long term.

Table 5: Improvement action plan

Specific Dimension	Performance concern (Item with the lowest implementation score	Desired performance standard	Short term improvement action	Medium term improvement action	Long term improvement action	Review Information	Date to achieve desired performance
Culture	Lack of periodic training Performance level = 1.83	To have skilled individuals Per level < 4.50	To ensure that there is allocation for periodic training, say once every 4 months	Monitoring of training schedules to ensure strict adherence	Adequate budget provision to cater for training sessions Continued monitoring for adherence to the scheduled training sessions	To be reviewed once every year where the performance of the organisation is to be assessed	A year from implementing periodic training schedule. Dimension performance level is expected to improve following adherence to periodic training by the department

5. CONCLUSION

This study set out to examine the performance of a Provincial Government Department in the South African Province of KwaZulu-Natal in infrastructure development. By deployment of structured questionnaires and interviews through electronic communication channels, data were collected from experienced individuals. Appropriate analytical tools were adopted, and the study was able to make meaningful findings.

The findings of the study confirm the capacity constraints bedevilling the public sector. The findings presented here provide valuable evidence on which to base recommendations for improving public services through building capacity and promoting better leadership. Through using the VRIO framework to analyse the human resource aspect of the organisation, it was found that the department's resources were valuable, and the organisation was organised. However, they lacked the rarity and inimitable attributes. Some employees could possess valuable knowledge and talent but could be oblivious to that and consequently could not be utilising such talent to the maximum. Management could

therefore explore options to enhance interaction and activities that allow for an active flow of knowledge that will promote employees to demonstrate their unique attributes. The department should be more flexible and open to innovation to enable those talented employees to maximise their talent. As a way to promote such initiatives, some form of incentives should be put in place to reward and motivate such talented employees

A recommendation would be for the public sector entities to provide frequent training to their employees and to promote aspects of continuous professional development. Above all, the public sector ought to maintain a culture and environment that helps in retaining its employees. In summary, the findings of this study demonstrate the need for public sector entities to focus on building capacity to improve public sector preparedness and readiness to undertake their roles. Capacity building to improve public sector performance is therefore key in development initiatives, in this respect, infrastructure delivery. Furthermore, an improvement within the cultural dimension is imperative. This much is a necessity, especially when an organisation's culture has been linked to influencing performance improvement. Furthermore, organisational culture can be viewed as a panacea to the capacity challenges affecting public sector entities as it has been cited to contribute to attracting talent and greatly influencing employee commitments and job retentions.

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