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Navigating Electronic Procurement – Technology Adoption in Public Sector Construction projects in Bayelsa State, Nigeria

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ABSTRACT

We examined the elements involved in Adoption of electronic procurement in public sector construction projects (PSCP) in Bayelsa State. The objectives are: to evaluate major element influencing the adoption of e-procurement in PSCP in BS; to group evaluated elements into component variables; to assess the level of contribution of the factor component groups to successful e-procurement adoption in BS PSCP. Field survey with purposive sampling techniques were employed. Primary data obtained from Bayelsa State's Ministries, Department and Agencies (MDAs). Questionnaire modeled in Likert five-point scale was used for data collection. Factor analysis and multiple regression analysis were used for analysis. The confirmatory factor analysis collapsed and grouped the 12 identified success elements into 3 components related groups. These were subjected to multiple regression to ascertain their collective and individual contributions to adoption of e-procurement in PSCP. The findings predispose ICT as being the highest critical success factor the following significant ranking order; system integration, technology standard and reliability, security and authentication and choice of implementation strategy adopted. They were found to be influential for adoption of electronic procurement for PSCP success. The study recommends ICT-based capacity building for stakeholders in PSCP value chain as to spur successful adoption of E-procurement system.

Key words: Public sector, Construction Projects, Critical Success Factors, E-procurement, Purchasing and Supply Chain factors, Information and Communication factors.

1. INTRODUCTION

Public infrastructure spending in Nigeria forms one of the key expenditures on the budget list. As a result, public sectors, always engage in public spending via a structured mechanism known as public procurement. It is a common practice with large construction projects that numerous suppliers provide a wide range of materials, components, and services. [1] complained that the existing conventional method of procurement is being challenged by unreliable order, lead time, order processing, lack of information sharing and follow-up update, delay in movement and supplies of materials, etc. The case of Bayelsa State (BS) in Nigeria has become worrisome regarding the activities of contracting firms handling the public sector construction projects (PSCP). Bayelsa State is riverine in nature with marshy and rugged geological terrain. Performance of PSCP implementation are usually challenged due to constraints imposed by existing conventional procurement methods which are usually impeded by so many teething problems such as geological terrain, compromise in quality standard, delays in the supply of materials, high cost of transaction, poor materials handling and inability to access and follow-up the transactions electronically on supply chain. It is therefore a critical factor for contracting firms involved PSCP in BS to have good control over the procurement activities because vast material flows influence their profit rate considerably. This can be done with the help of communication networks like Electronic Data Interchange (EDI); a standard based mode of communication which allows companies to collaborate and exchange information electronically.

However, there exist considerable uncertainties in the procurement process in the Nigeria public sector, which to a great extent, affect the achievements of value for money in the procurement of public infrastructure as a result of corruption [2]. Studies have shown that procurement of goods, and infrastructure accounts for 70% of Nigeria public expenditure [3, 4). There is significant need for the adoption of e-procurement technology in the Nigerian public sector to facilitate efficiency, reliability, cost reduction, and improve service delivery. Also to examine the performance of inventory control, risk management, integrity of stakeholders and most importantly enhancing transparency and accountability of the government procurement processes in the Ministries, Departments and Agencies (MDAs). The MDAs are Bayelsa State Universal Basic Education Board (SUBEB), Ministry of Works and Infrastructure (MOW&I) and Niger Delta Development Commission (NDDC).

According to [5], e-procurement has been popular in advanced countries like Australia, UK as well as in governments of emerging economies (China, India, Mexico, South Korea and Brazil) which are adopting e-procurement initiative, hence the need for it to be replicated in Nigeria. Surprisingly, despite the numerous benefits of e-procurement practices around the world and

extensively in the developing economies, its adoption and use in the Nigeria public sector seems to be foot-dragging. Thus evaluating the critical success factors (CSFs) as yardsticks for the adoption of e-procurement in the Nigerian public sector has become paramount and breathtaking.

According to [6], government and other public institutions which have successfully adopted e-procurement process have experienced improved transparency, contracts award notices, reduced budgetary cost, improved ICT base, online bid submission and better tenderers participation, etc. due to increased information technology access opportunities. Unfortunately, these are not the cases with the NDDC, SUBEB and the MOW&I of BS Nigeria, hence the motivation for the study.

1.1 Problem Statement

The traditional methods of procurement in Bayelsa State have been characterized by lackadaisical bureaucratic processes, low level of technology acquisition and inconsistent enabling legal framework. These have resulted in the State not being seen as committed to formulating e-procurement adoption driven policies to address the problems. There have been incessant cases of corruption, sharp practices and delay in delivery along the procurement supply chain due to traditional methods currently being used [7]. The bidding processes are complex, inefficient, costly with longer duration. Notably, the performance of e-procurement by the NDDC, SUBEB and the BS MOW&I have not been impressive. Procurement specialist from the donor agencies have lamented immense corruption that exist in the Nigerian procurement processes [6]; a plague that only e-procurement can remedy. However, a casual survey indicates that BS has no plan for adoption of e-procurement in near future. This is because the State is yet to establish State Public Procurement Agency-PPA [8]. The suppliers claimed that it cost more money to change from manual to electronic process.

However, authors like [1]; [7] have made several suggestions like transparent process of awarding contracts, facilitating procurement supply chain, etc. yet the problem still persist. This is evident in Tables 2, 3, and 4 in Appendix. These procurement issues, according to [6]; [5], can be eradicated only by adopting and implementing e-procurement practices in the public sector. The issues to be addressed by proffering e-procurement to the PSCP include; corruption, delay in delivery of materials, inefficiency along supply chain, lack of ICT-based monitoring, follow-up and evaluation, deficiency in transparency, fairness and accountability. These aforementioned problems be cloud the procurement process and have become a general concern. Hence, this research seeks to examine critical success elements of e-procurement adoption in the Nigerian public sector, using Bayelsa State's SUBEB, MOW&I and NDDC projects as case studies.

1.2 Objectives of the Study

The aim is to examine the elements involved in adoption of electronic procurement in PSCP in Bayelsa State, Nigeria. The specific objectives are: i.) To evaluate major element/factors influencing the adoption of e-procurement in PSCP in BS; ii.) To group evaluated elements into component variables; iii.) To assess the level of contribution of the factor component groups to successful e-procurement adoption in BS PSCP.

1.3 Research Hypotheses

The following hypotheses aided the researcher in addressing some of the research questions of the study.

H_{01}: The level of e-procurement adoption of PSCP in BS by MDAs will not significantly be high.

H_{02}: There is no significant relationship between factor component groups and adoption of e-procurement in PSCP in BS Nigeria.

2. CONCEPTUAL REVIEW

Generally, procurement is the purchase of works, services and goods. [9] defined procurement as the business supervision function that ensures the noticing, requisition, payment and administration of the external resources that an organization requires or may need to meet its planned objectives. It also includes functions that pertain to obtaining any goods, works or services, selection and invitation of tenders, preparation and award of contract [10]. The practice whereby public sector institutions procure goods, services and work from contractors is called Public Procurement, but it is practiced manually in Nigeria. In the current digital era, technology distribution in all sectors is crucial, no exception in the procurement of goods and service sectors. Knowing this situation, the Government of Nigeria then makes a policy that requires the process of procurement done electronically through E-procurement application. [2] claim that by adopting and implementing this policy, the government expects an improvement of transparency, accountability and efficiency in the process of procurement. [5], posits that a number of public sector agencies worldwide have identified e-procurement as a prioritized e-government agenda and have adopted or in the process of adopting e-procurement system. On the other hand, public procurement is an important function of government [10]. It has to satisfy requirements for goods, works, system, and services in a timely manner. Furthermore, it has to meet the basic principles of good governance: transparency, accountability and integrity.

2.1 Traditional Procurement System

Decades ago, the Nigerian government procurement system has been done manually by the process of inviting contractors to bid for projects (invitation for prequalification/tender) and then, for the selection of successful bidders [7]. In this procurement model, purchase orders are not being processed in a timely manner and delivery dates are not met. The failure of Nigeria National carrier, Nigerian Airways is traceable to poor procurement system and the consequence and resultant effect is being suffered by Nigerians [11]. According to [3], procurement account for about 80% of Nigeria Government expenditures in MDAs. The traditional procurement suffers a lot of setbacks such as inordinate delays in tender processing, heavy paper work, multi-level scrutiny, physical threat to bidders, cartel formation by contractors to suppress competition, human interface at every stage, inadequate transparency, discretionary treatment in the entire tender process, etc.

[3]. The Nigeria procurement system is also reportedly engulfed in corrupt practices by issuing bribe to public officers to secure a contract [12]. This emboldens contractors to use substandard materials and goods, rendering poor quality jobs and services and abandonment of projects. As such, the problems with the traditional procurement model in Nigeria can be categorized into four distinct themes: Technology related; Process related; People related and; Compliance related [3].

2.2 Electronic Procurement

Electronic procurement is the acquisition of goods and services without the use of paper process and involves procuring goods and services via electronics means [13]. [14] suggested that the digitalization of the procurement process is aimed at reduction of costs, high market transparency and better coordination and collaboration.

E-procurement uses information and communication technology, such as internet /web based system by governments in conducting their procurement in relationship with bidders for the acquisition of goods, works, services and other consulting services required by the public sectors. It is also an inter-organizational information system, which automatizes any part of the procurement process in order to improve efficiency, quality, and transparency in government procurement [5]. Presently, there are sundry types of e-Procurement system available in the market place, such as e-market, e-MRO, e-sourcing, e-tendering and e-exchange [15]. Each type of system is built for special purpose and has its own specific characteristics. Also in developing countries, there are more chances of corruption in planning phase than developed countries. To address this issue, public e-procurement can play an anti-corruption role to reduce the risk of corruption.

Through e-procurement, the bidders can view and monitor all the procurement activities through the government web portal. Public e-procurement helps to disclose all the procurement related information. In this way, it becomes difficult to hide confidential information to others as all the project technical specifications are posted in e-procurement web-portal so that the officers or planning level officers cannot easily add extra specification for their private benefit. When public procurement system and process are made open and transparent to every interested party, the tendency of crooked and unwholesome practices is automatically checked to its barest minimum.

Tendering and contract awarding is one of the most vulnerable stages of public procurement process where most of corruption occurs. It is a serious problem in Nigeria, where most of the government contract processes are paper-based which offers greater potential for corrupt behavior [16]. The tendency is that the potential contractors, who use their coercive power are favoured. Government officers can be involved directly and indirectly to abuse their official power for their private benefits. The accounting and auditing phase is probably the most vulnerable phase for corruption. Audits are not regularly and systematically performed which makes it harder to detect corruption. Government audit reporting mechanisms are not clear, dependent, and lack cooperation with other relevant agencies and institutions to ensure transparent and effective flow of information for the audit [7].

However, e-procurement improves transparency and integrity in public sector procurement such as tendering, sourcing, ordering, and auctioning. Recently, many countries have adopted e-procurement systems as a key tool to reduce corruption by opening competition in government procurement processes to the public. Countries like South Korea, Singapore, New Zealand, Denmark, India, and Mexico adopted e-procurement to prevent and control corruption in public procurement [17].

The existing literature has identified various benefits of e-procurement in the public sector as follows: E-procurement can centralize data in order to improve audit and analysis [18]; Government can monitor all the works and services more easily and efficiently [19]; [20]; E-procurement eliminates the direct human interaction on bidding and other work and services, corruption is decreased significantly, and internal efficiency increase in government departments [21]; Online bidding system automatically reduces the cartel, collusion and riggings among the bidders [40]; It increases transparency in works and services and improves better interaction between supplier and vendors and citizens through online system [22] and; E-procurement system provides better status for monitoring and tracking of applications.

Developed countries like; Singapore, Australia, New Zealand, UK, USA, Denmark, and Japan, have already materialized public e-procurement and received many perceived benefits of e-procurement performance in public and private sectors [17]. In the context of developing countries, adoption of e-procurement at government level is in a preliminary stage. Unfortunately, some governments have a position of “wait and see” for e-procurement performance before embarking on adoption.

2.3 Critical Elements for Successful Adoption of E-Procurement

According to [6] variables such as government direction, policy & legal framework, agencies change, awareness and capacity building and technology, contribute to the successful adoption of e-procurement system. [5] mentioned eleven critical success factors (CSFs) in their research on CSFs that influence e-procurement adoption and implementation success in the public sector. The identified CSFs are:

i) End-User Uptake and Training. End-users must be included in the training to avoid resistance to adoption. [23] inferred staff competence while [24] asserted that training given to end-users influences adoption of e-procurement.

ii) Top Management support: According to [5], there is little doubt that senior management leadership is critical to the success of an e-procurement adoption and that top management steering team must be composed of the project managers, any consultant working with the committee, and agency staff to develop an adoption strategy. [25] and other authors concurred with [5] on this view.

iii) Re-engineering the Existing Purchasing Process: [11] stated that the high degree of re-engineering of the process is positively associated with the practices, processes and adoption perspective of an e-procurement initiative. According to [26] reliability of IT and suppliers' performance are proactive to adoption of e-procurement.
iv) System Integration: The successful adoption of e-procurement system requires a detailed understanding of the level of integration required between the e-procurement solution and existing information technology systems [11]. For example, linking of the e-procurement system to the financial management system (FMS) in order to facilitate the process of online payment to suppliers.

v) Supplier Involvement: It has been observed that the successful adoption of e-procurement is closely related to early supplier involvement (ESI). It is therefore important to demonstrate the proposed solution to the suppliers and discuss any necessary changes, issues, and concerns before rolling out e-procurement tools to avoid resistance by suppliers [11]. This initiative gives an opportunity for the suppliers to have a great understanding of the proposed system and encourages strong relationship which is vital for the successful adoption of e-procurement systems. [24] aver that reliability of users' acceptance influences adoption of e-procurement

vi) Security and Authentication: Government should include establishing appropriate authorization privileges and authentication measures, logical and physical access controls, adequate infrastructure security to maintain appropriate boundaries and restrictions on both internal and external user activities and data integrity of transactions, records and information. [27], and [28] identified availability of reliable and secured electronic system and cyber security respectively as success factors for e-procurement adoption.

vii) Performance Measurement: Lack of measurement capability ensures management has only limited tools for assessing organizational progress and proposes that there is need to define key performance indicators (KPIs) early in the process to enable successful benefits tracking and instill the business case into measurable KPIs.
According to [29], several studies have emphasized that for faster adoption of e-procurement, certain political-legal structural factors that are peculiar to a particular political and administrative context must be considered and addressed. It takes political will power to initiate administrative and legal interventions [29].

2.4 Theoretical Review

Research on the adoption of new technology has been conducted using a variety of theories. However, the diffusion of innovation (DOI) theory developed by Everett M. Rogers in 1962 is pertinent to this study because it focusses on how organisations embrace e-procurement. According to Rogers' DOI theory, an innovation's characteristics affect its acceptance and diffusion, among other things [30]. According to his findings, these qualities include trialability, observability, complexity, compatibility, and relative benefit [30]. [31] pointed out that the three characteristics that are consistently found to be relevant to innovation adoption are relative advantage, compatibility, and complexity Despite [30] belief that these attributes explain between 49% and 87% of the variation in innovation adoption. [32] noted that the factors identified by [30] are perception measures that represent independent variables used in exploring the likelihood and propensity to, or actual adoption of, an innovation as the dependent variable. ICT diffusion and adoption studies in the construction sector have used Roger's DOI theory (see [33]; [31]. However, it has been criticized for failing to take into account how market and industry variables affect firms' adoption decisions.

[34] proposed a theory Technology, Diffusion and Acceptance Theory. One of the major theories used to study adoption of technology in organization is technology diffusion theory [34]. According to the theory, technology has been adopted in organizations based on the ease of its usage and effectiveness. This theory has a huge effect in explaining about adoption of technology in organization. The theory can better be understood by the use of communication channel which is major contributor on the success of adoption of technology.

Also, the theory of technology acceptance model is essential in the way in which it explains about the behavior of individuals who use technology. The theory offers an explanation on why a user is likely to accept or reject the information technology through adopting the theory of reasoned action. The two cognitive beliefs according to the theory are the ease of use and perceived usefulness. The theory provides the foundation where external variables have an impact on the belief, attitudes and also the intention of usage [34].

[35] also proposed and developed theoretical framework for organizational e-readiness that consolidated relevant factors that have been categorized into perceived management readiness, perceived technological readiness and perceived environmental readiness. Beside the impact of organizational e-readiness and e-procurement adoption.

According to [38], the aim of e-procurement is to dematerialize commercial transactions between business and their supplies via digital solution in order to optimize procurement process. At the Lisbon submit in 2000, it was decided that EU should pay special attention to e-procurement. The emergence of ICT offers promising opportunities as regards the efficiency, transparency and opening up of public procurements. The e-procurement perspectives by [37] addresses capability, interactivity, value distribution and orientation of decision, as their analysis suggests efficiency and effectiveness (capability) and improved coordination of private and public sector interaction (interactivity) are the drivers for the adoption strategy. [38] opines that e-procurement primarily aimed at four groups within a business: the purchasing department which sets and optimizes procurement strategies; end users- who place order; the approver who confirm the order, the finance and accounting departments who accepts the orders and invoices and make payments.

[38] explored the elements that impact the initial adoption of e-procurement in developing countries. They proposed a research model based on an interaction

perspective that is a combination of the technology-organization – environment framework and a theory of reasoned action. They also found that government plays an extremely important role in decision making of both initial adoption and institutionalization of e-procurement in individual construction enterprise.

2.5 Content Analysis for Factor Identification

It is clear that most of CSFs identified by various authors overlapped, synonymous and share many constructs and characteristics in common. Hence, it is necessary to examine, collapse, and refine to sieve out non relevant CSFs for this study in favour of decisive ones for the successful adoption of e-procurement in PSCP of BS MDAs. Table 1 shows the Summary and Content Analysis for Contributions from Authors.

Table 1: Summary and Content Analysis for Contributions from Authors

Authors	Contribution on factors of e-procurement adoption & implementation
Asare and Prempeh (2017)	ICT infrastructure, public procurement regulations, management commitment to E-procurement, staff competence
Omwono, Mayanaja and Rodrigue (2020)	The size of firm, the management support, The level of Government support, Ability to link directly to existing system, Financial resources availability, The top management support, Competitive pressure from competitors and other stakeholders, National IT infrastructure available.
Kade Manuga and Phiri (2019)	Senior Management and end users acceptance, confidence level, technology and innovation, the size of the firm, organizational readiness process reengineering, management of expectations.
Shiferaw Mitiku-Tebeka and Yessuf A. 2019 (They use kendals.....for analysis)	Training given to employees on how to use e-procurement tools, best procurement practices, the existence of Change management for users on implementation of e-procurement, effective consultations, high skill of procurement employees with IT perspective, reliability of IT infrastructure, provision of reliable monitoring and evaluation systems, reliability of users acceptance (buyer and supplier), top management support, employee commitment, availability of reliable legal environment for e-procurement adoption.
Aduwo, Ibem, & Oluwunmi A (2020)	The role in the industry, the areas of construction, procurement experience, number of offices they have, availability of reliable and secured electronic systems and applications, cost of internet services, acceptability of electronic contracts.
Afolabi, Ibem, Aduwo, Tunji-Olayemi & Oluwunmi, (2019)	Unreliable order, lead time, order processing, lack of information sharing and follow-up update, delay in movement and supplies of materials.
Abdullahi, A. Oyewobi, I. Ganiyu, B and Shittu A. (2021)	Availability of services, investment cost, technical know- how, electricity supply, internet diffusion, cyber-security.
Asian Development Bank (2013)	Government direction, policy and legal framework, agencies change, awareness and capacity building, technology.
Vaidya, Sajeez and Callender (2006)	End- users uptake and training, Top management support, re-engineering the existing purchasing process, system integration, suppliers involvement security and authentication, performance measurement.
Panda and Sahu (2012)	Certain political and legal factors
Henrisksen, et al, (2003)	Political will, legal interventions.
Afolabi et al. (2019	Security and authentication of e-procurement, top management commitment and support, availability of affordable e-procurement tools etc.
European Scientific Journal (2013)	Employees and management, reliability of IT and suppliers performance, monitoring performance of e-procurement, commitment to success of adoption, suppliers performance.

Based on the content analysis of the literature review, the identified elements used for this study are;

X_1 = End users update and training
X_2 = Top management and employees support
X_3 = Re – engineering of existing purchasing process
X_4 = System integration
X_5 = Suppliers involvement and adoption
X_6 = Security and authentication
X_7 = Performance measurement and monitoring
X_8 = Change management
X_9 = E – procurement implementation strategy
X_{10} = Technology (ICT) standards and reliability
X_{11} = Government policy and Legal framework.
X_{12} = Employees commitment to success of adoption

3. METHODOLOGY

The study adopted field survey research design. This was done because the study involved observation of the situation and designing questionnaire to collect relevant data for descriptive and inferential analyses. A total number of 12 hypothetical elements influencing adoption of e-procurement were identified which formed the basis of data collection from MDAs in BS. Data were collected via questionnaire and performance data from the MDAs, (NDDC, SUBEB, and MOW&I) in Bayelsa State. The questionnaire was designed using Likert's five-point scale. The target respondents are those who are knowledgeable and with years of experience working for the MDAs and contracting firms handling the projects in BS. They include, quantity surveyors, purchasing and supply managers, project managers, civil engineers, cost accountants. The population size of PSCP undertaking by the 3 selected MDAs from the BS government project monitoring and evaluation office is thirty (30), as shown in Tables 2, 3 and 4. Each with 10 projects, making it a total of 30 PSCPs.

3.1 Study Population and Sampling Technique

From the database of BS government, a population size (N) of PSCP with their respective contracting firms were sampled on selected on-going and completed projects of the MDAs as follows; NDDC = 10, SUBEB = 10 and MOW&I =10, total = 30. Out of which, 5 PSCP with their respective contracting firms were conveniently selected from each of the MDAs. The criteria for selection being the PSCP with the highest contract value from each group. Therefore, a sample size (n) of 15 PSCP and their contracting firms were selected for the study as follows: MOW&I = TR, PA, RA, PE, AK; SUBEB = AG, JI, AT, Ti, GG, and;
NDDC = MV, KE, JV, BU, OS.

The target respondents are experts from the contracting firms and MDAs. They consist of professionals in the areas of quantity surveying, project management, purchasing and supply, civil engineering, cost accounting. The information gathered indicates that the numbers of the procurement officers are very few in each firm, ranging from 2 to 6. Six copies of the questionnaire were distributed to the target respondents in each of the contracting firms making it a total of ninety (90) copies. The sample size (n) = population (N) due to small N. The target respondents were requested to elucidate their opinions and perceptions on the hypothetical elements influencing adoption of e-procurement in order to deduce, infer and isolate the CSFs through quantitative statistical models.

3.2 Methods of Data Analysis

The confirmatory data analysis was carried out in two stages. In analyzing the data collected, weighted score distribution tables are used. Further analysis is performed on the weighted score using principal maximum likelihood analysis of factor analysis tool. Also the multiple regression model was used to capture the effect of identified principal factor groups on realization of the cost, time and quality objectives in the adoption of e-procurement in MDAs projects in BS. All the analysis and test of hypothesis were conducted at 5% significance level.

Decision Rule

The decision rule is reject the null hypothesis if the p-value is ≤ 0.05 and vice versa.

4. RESULTS AND DISCUSSIONS

Data collected were presented and analyzed in the following tables:

Table 2: Public Sector Projects in Bayelsa State MOW & I

S/N	Code	Contractor	Project Description	Year Of Award	Location	Contract Sum	Variation Amount	Amount Paid	Balance	Status Level (%)	Remark
1.	TR	Trenur Nig Ltd	Const Of Road 38/27	2012	Yenagoa	2,024,050,000.00		1,605,635,141,51	418,401,858.46	75	Uncompleted
2.	PA	Paache Const Nig Ltd	Const. Of Road 28	2012	Yenagoa	2,127,763,508.50		2,110,776,242.25	1,877,763,508.50	10	Uncompleted
3.	RA	Raffoul Nig. Ltd	Const. Of Tourist Island Bridge	2012	Yenagoa	5,710,500,450.00	999,403,727.26	4,564,746,426.26	2,145,157,714.00	90	Uncompleted
4.	HR	Horizion Const Co. Ltd	Const. Of 1no Collapsed Bridge At Imirinigi Town, Baylesa State	2012	Ogbia	800,000,000.00		593,773,584.91	206,226.00	90	Uncompleted
5.	AK	Akson Engineering Ltd	Const Of Hostel No 4 At Nysc Permanent Camp Kaima	2013	Yenagoa	280,000,000.00		271,240,000.00	8,760,000.00	100	Completed
6.	PE	Patronix Ltd	Shoreline Protection At Toru-Orua	2014	Toru-Orua	3,900,000,000.00		2,300,000,000.00	1,600,000,000.00	70	Uncompleted
7.	HO	Horison Const Co. Ltd	Const Of Old Assembly Quarter Road	2015	Yenagoa	490,000,000.00		486,034,072.76	3,965,927.24	100	Completed
8.	AK	A & K CONST.NIG. LTD	Consst of Ultra Modern Office Block At Ndu (Senate Building)	2016	Amassoma	1,805,180,400.00		1,482,704,402,55	332,472,997.45	80	Uncompleted
9.	PB	Princess Beulah Golden Investment Ltd	Construction Of BTC Garage	2016	Sagbama/ Ekeremor	580,533,973.25		343,1600,000.08	146,373,973.25	45	Uncompleted
10.	ME	Marine Energy & Invt	Dressing of Sand At Ofoni, Aleibiri Sagbama-Ekeremor Road	2016	Sagbama	350,000,000.00		406,519,076.00	(56,519,076.00)	90	Uncompleted

Table 3: Bayelsa State Universal Basic Education Board (SUBEB) 2019/2020 1ST-3RD Quarter UBE Intervention Projects

S/N	Code	Name Of Contractor	Name Of Project	Location	Contract Value	Project Status Completed
1.	CA	Christabel & Anabel Enterprises	Construction of 3-Unit One Bedroom Flat With Kitchen and Dining	Community Junior Secondary School Korokorosei Southern Ijaw	23,164,548.00	Completed
2.	AG	Aphanzo Global Enterprises	Construction of Perimeter Fence	Community Primary School Torouorua Sagbama LGA	47,104,837.56	Completed
3.	JI	J.I Win-Dels Enterprises	Construction of Perimeter Fence	Basic Junior Secondary School Biogbolo Yahagoa	104,477,257.50	Uncompleted
4.	MG	Meneizibeya Global Service	Construction of Inter-Locking Walkway, Car Park, Concrete Access Road And Sand-Filling	Basic Junior Secondary School Biogblo, Yenagoa	44,008,058.00	Uncompleted
5.	EM	Embarks And Sons Company	Construction of Six Classroom Block, With Three Offices and Seven Toilets	Community Primary School Opukusi Ekeremor	49,975,508.00	Completed
6.	NS	Nocturnus Security Limited	Construction of Six Classroom Block, With Three Offices And Seven Toilets	Basic Junior Secondary School Liama	49,313,506.00	Uncompleted
7.	AT	Atup Oil & Gas Ltd	Construction of Twelve Classroom With Computer Room, Two Staff Room And Ten Toilets	Kaiama Junior Secondary School Kolokuma	94,828,173.00	Completed
8.	TI	Tesio International Ltd	Construction of Twelve Classroom With Computer Room, Two Staff Room And Ten Toilets	Community Comprehensive Junior Secondary School, Ologoama	95,876,385.00	Uncompleted
9.	GG	Gta Global Enterprise	Construction of Twelve Classroom, Storey Building With ICT Hall, Library, Office And Twenty-Four Toilets	Community Junior Secondary School Ebedebiri, Sagbama	132,143,424.60	Uncompleted
10.	JX	Jessgold Xploitz Ltd	Construction Of VIP Toilet	Community Primary School Feremoama Ekeremor	5,076,017.17	Completed

Table 4: NDDC Projects in Bayelsa State

S/N	Code	Name Of Contractor	Name Of Project/Location	Years Of Award	Contract Value	Project Status Completed	Client
1.	MV	Mellivan Nig Ltd	Provision of Solar Street Light/Otuabagi Ogbia	17th Oct. 2019	249,750,000.00	51% Completed	NDDC
2.	MR	Maceluan Gloa Resources Ltd	Construction of Hospital Road Ikema/Otueke Ogbia	5th Sept. 2019	185,750,000.00	46% Completed	NDDC
3.	KE	Keheiah Nig Ltd	Construction of Internal Road/Oruakain Ogbia	28th May, 2017	231,000,000.00	46% Completed	NDDC
4.	JV	Jesad Ventures Ltd	Construction of Concrete Road/Kolo Town Ogbia	31st May, 2018	791,729,412.69	Uncompleted	NDDC
5.	BU	Bunkol Nig Ltd	Construction of Specialist Hospital/Otuoke Ogbia	20th May, 2018	791,729,412.69	Uncompleted	NDDC
6.	OH	Oneplus Holding Nig Ltd	Constructionof Presidential Resort Loop Road/Otakeme Ogbia	3rd June, 2018	140,000,000.20	26% Completed	NDDC

7.	OS	Olby Synergy Ltd	Construction of Kigid Pavement/Opolo Yenagoa	21st March, 2017	249,825,050.20	70% Completed	NDDC
8.	GR	Gendrian Resources Service	Provision And Installation of Solar Powered Street Light in Communities/Ayamassa, Ekeremor	4th Feb. 2020	200,000,000.00	Completed	NDDC
9.	PO	Protect Option Ltd	Provision And Installation Of Solar Powered Street Light in Aleibiri, Ekeremor	15th Feb. 2020	200,000,000.00	Completed	NDDC
10.	RR	Rotem Resources Ltd	Construction of Internal Road Network (Rigid Pavement)/Isampou Town, Ekeremor	21st March, 2017	167,432,375.00	42.3% Completed	NDDC

Source: Bayelsa State Government Project Management Office

Table 5: Questionnaire Distribution and Returned by Contracting Firms in MDAs**.**

MDA	**Contracting Firm**	**Number Distributed**	**Number returned**
MOW&I	TR	6	4
	PA	6	6
	RA	6	4
	PE	6	5
	AK	6	3
SUBEB	AG	6	2
	JI	6	3
	AT	6	2
	TI	6	3
	GG	6	3
NDDC	MV	6	3
	KE	6	2
	JV	6	5
	BU	6	4
	OS	6	3
		90	54

54 copies were filled, completed and returned,
90 copies of the questionnaire were distributed to the target respondents in each contracting firms.

Table 6: Questionnaire Distributed and Returned by Experts.

Profession	**Number Distributed**	**Number returned**	**% Returned**
Quantity Surveyors	25	14	56
Project Managers	20	12	60
Purchasing and Supply Officer	25	16	64
Construction /Civil Engineers	20	12	60
TOTAL	**90**	**54**	**60**

Factor Analysis

Table 7: Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	cumulative %	Total	% of Variance	cumulative %
1	2.211	19.423	19.423	2.211	19.423	19.423	1.725	18.995	18.995
2	1.734	16.453	35.876	1.734	16.453	35.876	1.709	16.987	35.982
3	1.639	15.657	51.534	1.639	15.657	51.534	1.621	15.552	51.534
4	1.259	12.490	64.024						
5	1.190	8.917	72.941						
6	.921	6.674	79.615						
7	.819	5..827	85.442						
8	.585	4.871	90.312						
9	.521	3.340	93.652						
10	.491	3.090	96.742						
11	.348	2.096	98.838						
12	.283	1.162	100.000						

Extraction Method: Principal Component Analysis

Table 8: Component Matrix (a)

	Component		
	1	2	3
X1	-.351	.721	.085
X2	.212	.626	-.174
X3	.612	-.021	-.221
X4	-.187	.119	.817
X5	.749	.093	.361
X6	.138	-.268	.704
X7	.534	-.341	.141
X8	.240	.671	.025
X9	-.192	.006	.659
X10	-.014	-.496	.781
X11	.610	-.019	.167
X12	.398	.867	.282

Extraction Method: Principal Component Analysis.
[a]3 components extracted.

Table 9: Component Transformation Matrix

Component	1	2	3
1	.664	.180	.568
2	.565	.904	-.352
3	-.344	.587	.684

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

4.1 Extraction of Significant Elements from Respective Component Loading.

The clusters of significant elements are further described, regrouped and named as follows; based on group extraction from Table 8.

Group 1: Purchasing and supply chain elements (PSC): X_3 = 0.612, X_5 = 0.749, X_7 = 0.534, X_{11} = 0.610.

Group 2: Organizational factors (OGZ): X_1=0.721, X_2=0.626, X_8=0.671, X_{12}=0.867

Group 3: Information and Communication Technology factors (ICT): X_4=0.817, X_6=0.704, X_9=0.659, X_{10}=0.781X4.

The three clusters; OGZ, PSC, and ICT were used as independent variables and further subjected to multiple regression analysis to ascertain their collective and individual influence on successful adoption of e-procurement (dependent variable).

Multiple Regression Analysis

Table 10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.822(a)	.704	.650	0.8264

a Predictors: (Constant), ICT, PSC, OGZ

Table 11: ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	301.274	3	100.425	7.443	.000(a)
	Residual	674.726	50	13.495		
	Total	976.000	53			

a Predictors: (Constant), ICT, PSC, OGZ)
b Dependent Variable: Y

Table 12: Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	28.847	5.200		5.548	.000
	OGZ	.340	.134	.236	5.998	.001
	PSC	.298	.112	.169	3.511	.003
	ICT	.563	.126	.468	6.948	.000

a Dependent Variable: Y

4.2 Hypothesis Testing

H_{01}: The level of e-procurement adoption of PSCP in BS by MDAs will not be significantly high.

The hypothesis is tested using total variance explained by factor analysis in Table 7. The cumulative variance of 51.534 percent shows that the level of adoption of e-procurement by MDAs in BS is not significantly high. We therefore, accept the null hypothesis. This justified the study for improvement.

H_{02}: There is no significant relationship between factor component groups and adoption of e-procurement in PSCP in BS Nigeria.

From Table 10, an r-value of 0.822 is significant because it indicates that there is 82.2% level of relationship between the loaded factor group OGZ, PSC, ICT and e-procurement adoption. This implies that the three groups of elements could drive to a significant level of e-procurement adoption.

The results of multiple regression in Table 11 show an F-value (p-value) of 7.443(0.000) and Table 12 indicates that the three groups OGZ, PSC & ICT with t-value (p-value) of 6.948(0.000), 5.998(0.001) and 3.511(0.003) respectively, collectively and individually influence the successful adoption of e-procurement in MDAs in BS.

A fitted regression model as deduced from Table 12 is;

Y =28.847 + 0.340 OGZ + 0.298 PSC + 0.563 ICT…… eqn. 1

This can be used to predict level of e-procurement adoption when the three groups of elements are taken into consideration.

The performance of ICT factors for successful adoption of e-procurement has been ascertained to be very proactive, influential and decisive. When it comes to large PSCP especially in BS, hundreds of suppliers provide wide range of materials, components, fitting, furnishing items, services etc. They are too complex to successfully handle manually. However, ICT factors ranked first in the significance ranking of elements influencing e-procurement in the PSCP of MDAs in BS. The ranking position of ICT factors inferred them as the CSF influencing e-procurement adoption. The ICT factors facilitate the use of cyber connectivity and internet to operate the transactional aspect of public sector requisitioning, authorized ordering, receiving and payment process for the required services and products. Improved communication is a key driver that favours visibility of customers' demand and information sharing. The study attested that the use of ICT in MDAs will inspire and influence the adoption of e-procurement. According to [11], the reliability and capability of the organizations infrastructure particularly, network connectivity impacted directly on the operational performance of the e-procurement system. In many cases, the links to suppliers could not be directly over internet but via existing electronic data interchange connections, automated fax or mail print out.

The finding from the data analysis concur with Rajkumar (2001) in identifying system integration; X_4 that loaded 72.10% as a critical success factor for e-procurement adoption across UK public sector organizations. The general findings also show that the participants are of the view that suppliers will have positive perception about information technology and the use of internet to do business transactions. Hence, they are ready to use e-procurement systems irrespective of the challenges. ICT could achieve the expectations through e-procurement value chain processes and management consisting of e-auction, e-catalogue, e-commerce, electronic data inter-change, e-payment, e-market place, e-purchasing, vendor management and e-tendering.

5. CONCLUSION

From the findings the following recommendations were made:

i.) Government should provide the e-procurement infrastructure and procedures to facilitate the achievement of the principles, including transparency and accountability platforms and requirements of the public offices. Enhancing efficiency, transparency, effectiveness and flexibility in the procurement process will be achieved by so doing.

ii.) There should be integrated capacity building in ICT and project management techniques so as to see implementation of e-procurement initiatives as an effort to improve procurement goals like; quality, timeliness, cost reduction, minimization of business financial and technical risks, maximizing competition and maintaining integrity.

iii.) E-procurement should be embedded with supply chain system with radio frequency identification devices in construction firms through cyber connectivity for real time follow-up, optimistic supply lead time, online quality assessment, data acquisition and analytics.

To accomplish its goals, this study used empirical data from a questionnaire survey of BS client organizations, government bodies, and architectural, building construction, and quantity surveying firms. By outlining the factors that public sector organizations in the BS deem significant when deciding whether to implement e-Procurement, the study advances knowledge. It also adds to our understanding of which of these factors best explains the real-world use of e-procurement in public construction, making it a significant addition to the present conversation on e-procurement in construction from Nigerian perspective.

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