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Assessment of Materials Management Techniques and Inventory Control System on Public Building Projects Delivery in Southeast, Nigeria

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ABSTRACT

Effective management of construction materials is of cardinal importance to the building projects delivery as about three quarter of the total construction cost is expended on building materials. This study sought to assess material management practices and building project delivery in Southeast, Nigeria. The study adopted descriptive research survey which made use of well-structured questionnaire with validated constructs to elicit relevant information from the respondents. The study population comprise of contractors, suppliers, consultants and clients in handling building projects in Southeast Nigeria with total population of 513. Multi-stage sampling technique was used to distribute 348 copies of questionnaire among the four strata. The study objectives were achieved Partial Least Square Structural Equation Modeling. The result from PLS-SEM bootstrapping on effect of material management and building project delivery interpreted that "material planning" had the highest relative contribution with beta value (β) of 0.181. This is followed by "material delivery and distribution" with (β) values of -0.131. However, "material handling" has the least contribution to the building project delivery with (β) values of -0.027. Similarly, result on inventory management techniques and building project delivery. Figures from standardized beta values (O) revealed ABC Analysis" and "vendor-managed inventory" had the highest relative contribution with beta value (β) of 0.196 and 0.191 respectively. This is followed by "Economic Order Quantity (EOQ)" with (β) values of 0.157 while "stock control system" had the least relative contribution to building project delivery in the study area with beta value (β) of 0.041 with insignificant P-value of 0.369. Finally, the result of the study's hypotheses on all material management technique in the study area and inventory management techniques have significant effect on building project delivery due to their significant P-value of 0.000 and 0.001 respectively, Hence the rejection of their null hypotheses. The findings of this study have established that materials storage and handling as well their delivery and distribution to work centres on site need to be critically looked into to achieve project goals and objectives. It was likewise concluded that inventory management technique is highly effective in enhancing building project delivery in the study area. Hence, the study recommended that to ensure continuous availability of construction materials on site, project stakeholders should procure highly materials like cement, rods and so on from competent vendors with track record of quality over cost.

Key words: Material planning, Inventory control, project delivery, Economic Order Quantity,

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INTRODUCTION

Construction industry globally is faced with a lot of problems, among which is delay in project delivery and cost overrun. Building construction materials may constitute 60% to 70% of the total construction expenditure, depending on the type of construction project (Flanagan, 2009; Patel & Vyas, 2011, Arijeloye & Akinradewo, 2016; Zairra, Kasim, Ibrahim & Sarpin, 2018). Hence, effective management of construction materials is of cardinal importance to the building projects delivery. Managing materials on construction sites is a serious issue among contractors. This is because project failure is largely attributed to the poor materials management that results into project bottlenecks, limiting project success. The failure of project is attributed to poor materials management techniques that can result into poor quality materials, damage to materials, poor planning, late deliveries and high costs (Vipin & Rahima, 2019). Therefore, to prevent project failure proper materials management is vital.

Shittu, Suleiman and Tsado (2020) defined materials management as a process that coordinates planning, assessing the requirement, sourcing, purchasing, storing, transporting, and controlling of materials, minimizing the wastage and optimizing the productivity by reducing cost of materials in ways that are cost effective. Materials management system attempts to ensure that the right quality and quantities of materials are appropriately selected, purchased, delivered, and handled on site in a timely manner and at a reasonable cost (Ayegba, 2013). Proper construction materials management assist to ameliorate late delivery of construction materials, unavailability of materials before commencement of construction work, and the long distance of materials from the work location is the principal causes of materials related problems on construction sites (Kasim 2011; Anwar et al., 2017).

Furthermore, Liwan (2015) also reported that difficulty to store materials on site due to limited space is another problem in connection with materials management; sometime machineries cannot be adjusted on site due to acute space or mismanagement of site activities. Inventory control, a function of materials management is responsible for the coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner in order to provide deliverables at a minimum cost (Shittu, Suleiman & Tsado, 2020). The importance of inventory control stems from the importance of determining the economic quantity of demand and determining the point of re-ordering and reducing inventory to the lowest possible extent. Thus, inventory control is the process of providing right quantity and quality of materials at the right place in the right time (Marand et al., 2019). The management of procuring materials is critical as any shortages of materials will delay the project, put it at risk, affect the consistent flow of the materials for construction works and thus affecting the overall project performance (Pellicer et al., 2013).

With about 56,000 abandoned projects in Nigeria across the six geopolitical zones and the existence of this large quantum of uncompleted projects, estimating the cost at N12 trillion, most of these contracts failed due to poor cost estimation, poor materials planning and management, change in government and corruption as the most rated factors (Nigerian Institute of Quantity Surveyors (NIQS), 2021 & Nigerian Society of Engineers (NSE), 2021. More so, many projects were abandoned in Imo State, Southeast Nigeria as a result of poor materials management practices, poor project implementation by the indigenous construction firms has resulted to failures in public building projects delivery (Ikechukwu and Ozuzu, 2021). It is against this background that this study was initiated for effective materials management practices and building construction projects delivery in Southeast, Nigeria

MATERIALS AND METHODS

Study Area

The study area of this research is Southeast Nigeria, which comprised five States: Abia, Anambra, Ebonyi, Enugu and Imo. The research covered only four states from the southeast (Imo, Abia, Ebonyi and Enugu), Anambra state was exempted due to significant political instability and unrest as at the time of carrying out this research work.

Population of the Study

The targeted population of the study comprised the contractor's, the subcontractors/suppliers, consultants and the clients of the selected ongoing public building projects in the study areas. A preliminary survey was carried out to determine the target population within the study area. The study targets a total population of about five

hundred and thirteen (513), comprising three hundred (300) Contractor's and one hundred and three (103) Subcontractor/Suppliers, seventy (70) Consultants, forty (40) Clients from twenty-one selected construction companies with ongoing public building projects in the study areas as shown in table 1 below.

The study population of the staff of the selected construction companies comprised the Managing Director, Architects, Builders, Civil/Structural Engineers, Electrical Engineers, Quantity Surveyors, Mechanical Engineers, Project Managers, Clerk of Works, Contractor Project Directors, Procurement Manager, Store Managers, Store Keeper and Safety and Health Officer in the study area.

Sample Size and Sampling technique

Sample size of 348 from a total population of 513 using Yamane (1976) sample size formula.

Thereafter, multi-stage sampling technique was adopted by first of all dividing the sample size among Contractor, Subcontractors/Suppliers, Consultants and Clients across the four states. Then, random sampling technique was used to select one hundred and seventy-one (171) contractor's, eighty-two (82) Subcontractor/Suppliers, sixty (60) Consultants and thirty-six (35) clients from 21 construction companies with ongoing public building projects in the study areas. The sampling units utilized in this study is as shown in the Table 1

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

n= corrected sample size, N = population size, and e = Margin of error (Moe), e = 0.05 based on the research condition.

Table 1: Study Population and Sample Size

		Population					Sample Size
S/N	**ORGANISATION STAFF**	**Abia**	**Ebonyi**	**Imo**	**Enugu**	**Total**	**n=N/1+N (5%)**
1	Contractor's	59	81	70	90	300	171
2	Subcontractors/ Suppliers	14	35	18	36	103	82
3	Consultants	10	20	15	25	70	60
4	Clients	6	12	8	14	40	35
	TOTAL	89	148	111	165	513	**348**

Data collection

The study made use of primary source of data through a well-structured closed-ended questionnaire which was self-administered to the respondents. The choice of adopting the data collection technique is its ability to provide an efficient use of time, energy and cost. It also affords physical interaction with the respondents which help in seeking appropriate information on the subject matter. The data collected was analysed using inferential statistics with the aid of SmartPLS4.0. SmartPLS4.0 was used to determine the standard path coefficient of constructs of material management technique and inventory control system on public building project delivery in the study area. Also, the study's hypotheses were assessed from the result of bootstrapped structural model of the study variables.

RESULTS AND DISCUSSION

Effect of Materials Management Practices on Building Construction Projects Delivery

Preliminary analysis to determine the suitability of the study's variables was performed. The measurement or quality assessment model tests determining the internal consistency, convergent and discriminant validity and reliability of the constructs was carried out. Thereafter, structural model bootstrapping to establish the path coefficient, P-values, t-statistic of the constructs and variables under study was performed to establish the effect of materials management on building construction projects delivery in the study area.

Measurement Model

Composite Reliability

Table 2 shows the convergent and discriminate validity for the measurement model tests. The composite reliability values for constructs of materials management ranging from 0.70 to 0.83 while the constructs for building projects delivery ranged from 0.71 to 0.78. Also, for the construct of inventory control system, the

composite reliability ranges 0.70 to 0.76 while for the corresponding building project delivery range between 0.72 to 0.76. According to Gefen, Straub, and Boudreau (2000), internal consistency value rho_c above the 0.7 threshold indicates sufficient internal consistency among the items of both variables. Consequently, the measurements utilized in this study were within acceptable levels, affirming the reliability of the constructs. Also, in table 2 shows the average variance explained (AVE) for constructs of materials management techniques, inventory control system and building projects delivery are above the accepted level of 0.50. The outcomes of composite reliability and average variance explained indicated that the measurement model employed in this study demonstrated satisfactory internal consistency and convergent validity.

Table 2: Composite Reliability and Average Variance Explained (AVE) for Constructs of Materials Management, inventory control system and Building Projects Delivery

Constructs	Composite reliability (rho_c)	Average variance extracted (AVE)
MATERIALS MANAGEMENT TECHNIQUE		
Materials Allocation & Control (MAC)	0.79	0.59
Materials Delivery & Distribution (MDD)	0.72	0.50
Materials Handling & Storage (MHS)	0.78	0.56
Materials Identification and Quality Control (MIQC)	0.83	0.62
Materials Planning (MP)	0.70	0.53
Materials Procurement (MPRO)	0.71	0.57
BUILDING PROJECTS DELIVERY		
Budgeted Cost (BCST)	0.78	0.57
Completion Time (CTM)	0.71	0.58
Desired Quality (DQY)	0.76	0.51
INVENTORY MANAGEMENT SYSTEM		
ABC Analysis	0.72	0.54
Just In Time (JIT)	0.72	0.53
Economic Order Quantity (EOQ)	0.77	0.56
Stock Control System	0.73	0.52
Vendor-Managed Inventory (VMI)	0.70	0.50
BUILDING PROJECT DELIVERY		
Budgeted Cost (BCST)	0.76	0.57
Completion Time (CTM)	0.73	0.53
Desired Quality (DQY)	0.72	0.53

Source: SmartPLS4.0

Discriminate Validity

To further ascertain the suitability of measurement, table 3 shows the discriminant validity investigating the exceptionality of a construct whether the phenomenon captured by the construct is not represented by other constructs in the model (Hair *et al.,* 2013). Fornell-Lacker criterion rule which states that the square root of AVE of a construct should be greater than the highest correlation of all the constructs. Thus, the bolded figures (square root of AVE) forming a diagonal from top left to bottom right all had values greater than correlations among the constructs. Thus, constructs are distinctive and appropriate measure for both materials management and building projects delivery.

Table 3: Discriminate Validity of Constructs of Materials Management, inventory control system and Building Projects Delivery

Constructs	MAC	MDD	MHS	MIQC	MP	MPRO		BCST	CTM	DQY
MATERIALS MANAGEMENT PRACTICES							**BUILDING PROJECT DELIVERY**			
MAC	**0.540**						BCST	**0.688**		
MDD	0.594	**0.67**					CTM	0.479	**0.618**	
MHS	0.377	0.313	**0.766**				DQY	0.612	0.225	**0.463**
MIQC	0.384	0.454	0.353	**0.707**						
MP	0.767	0.246	0.287	0.390	**0.731**					
MPRO	0.316	0.614	0.442	0.483	0.374	**0.655**				

INVENTORY CONTROL SYSTEM	ABC	EOQ	JIT	SCS	VMI	**BUILDING PROJECT DELIVERY**			
ABC Analysis	**0.690**					BCST	**0.689**		
EOQ	0.463	**0.543**				CTM	0.479	**0.596**	
JIT	0.569	0.449	**0.601**			DQY	0.570	0.112	**0.4475**
SCS	0.004	0.279	0.472	**0.543**					
VMI	0.490	0.234	0.588	0.124	**0.71**				

SmartPLS4.0

Bootstrapping Effect of Materials Management techniques and Building Projects Delivery

Upon the establishment of the suitability of study variables, table 4 shows the path coefficient of the effect of materials management techniques (independent variable) on building projects delivery (dependent variable) in the study area. The standard beta values (O) in table 4 shows the relative contribution of the constructs of materials management techniques to building projects delivery in the study area. Figures reveal that "materials planning" has the highest relative contribution with beta value (β) of 0.181 and significant P-value of 0.034. These figures affirm the relationship between materials planning and building project delivery. That is a unit increase in materials planning will yield a corresponding increase building projects delivery by 0.181 (18.1%). This connotes that in ensuring building projects delivery, the respondents adjudged that materials planning is paramount as it necessary for establishment of effective procurement procedure, delivery, storage and distribution with regards to materials availability for ceaseless operations among work centres on project sites. This is in connection to Albert, Shakantu and Ibrahim (2018) that proper planning of materials right from the project's planning stage to ensure timely project execution and standard work delivery within reasonable cost, time and quality.

Similarly, a relatively high (β) values of 0.159 and significant P-value of 0.041 attributed to "materials procurement" informed that procurement procedure in the study area is highly scrutinized. Preference is given more to past performance over least price vendor during selection process. In the same vein, "materials identification and quality control" and materials allocation and control" have (β) values of 0.145 and 0.006 respectively. This connotes that conformability of procured materials to the prescribed specifications and allocation to work centres as outlined on work schedules play significant role in ensuring optimal building projects delivery in the study area. This is in connection to Subramani (2018) notion that material quality plays an important role in project delivery hence, it is critical for contractor to consider that timely availability of material in project site.

Similarly, negative (β) values of -0.131 and significant P-value of 0.036 attributed to "materials delivery and distribution" informed that there is association between these two variables indicating that ordered materials arrived project site at the nick of time they are needed for use in the study area. This implies that there is established procedure for prompt delivery of high grade materials in ensuring building project delivery. On the contrary, the study revealed that "materials handling and storage" [(β) = -0.027; P-value = 0.64] and "materials allocation and control" [(β) of 0.012; P-value 0.817] has the least relative contribution to building projects delivery in the study area. This informs the unavailability of adequate material handling and storage equipment which ultimately affect allocation of materials and accountability of material usage among work centres in the study area.

More so, result likewise reveals that majority the constructs of materials management practices are all significant except for materials handling and storage with P-value = 0.64 and materials allocation and control P-value 0.817 greater than 0.05 at 95% significant level. This infers that the materials management practice understudied have proved effective in ensuring building projects delivery in the study area. This is consistent with Arijeloye and Akinradewo (2016) findings that the most common practices of materials management like materials planning method, purchasing of materials, quality control and transportation of materials are adequate enough to ensure building projects delivery.

Table 4: Path coefficient of the effect of materials management technique on Building Projects Delivery

Materials Management Practices-> Building Projects Delivery	Standardized Beta (O)	Sample mean (M)	Standard deviation (STDEV)	Tstatistics (|O/STDEV|)	P values
MAC-> BUILDING PROJECT DELIVERY	0.012	0.009	0.053	0.226	0.817
MDD -> BUILDING PROJECT DELIVERY	-0.131	-0.111	0.063	2.079	0.036
MHS-> BUILDING PROJECT DELIVERY	-0.027	-0.029	0.058	0.466	0.640
MIQC-> BUILDING PROJECT DELIVERY	0.145	0.152	0.042	3.452	0.006
MPL-> BUILDING PROJECT DELIVERY	0.181	0.182	0.085	2.129	0.034
MPRO -> BUILDING PROJECT DELIVERY	0.159	0.165	0.033	4.818	0.041

Source: SmartPLS4.0

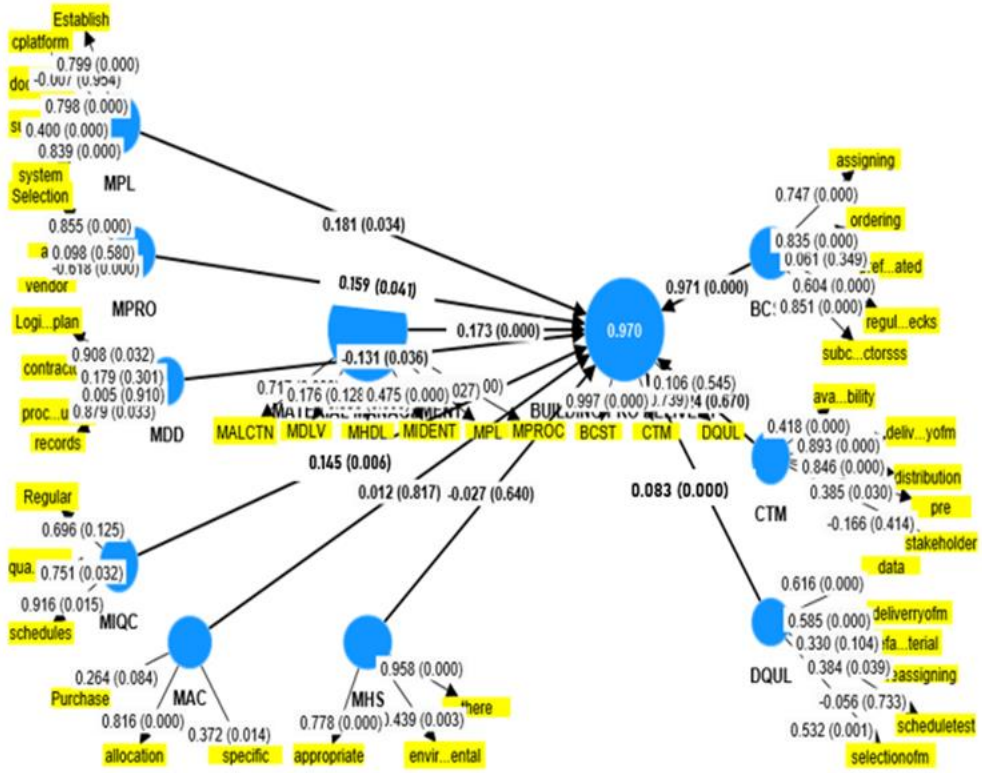

Figure 1: Structural bootstrapping of construct of materials management technique and building project delivery

Bootstrapping Effect of Inventory Control System and Building Projects Delivery

Upon the establishment of the suitability of study variables, table 3 shows the path coefficient of the effect of inventory control system (independent variable) on building projects delivery (dependent variable) in the study area. The standard beta values (O) in Table 5 shows the relative contribution of the constructs of inventory management on building project delivery in the study area. Figures revealed that "ABC Analysis" (value (β) 0.196; significant P-value 0.039) and "Vendor-managed inventory" (beta value (β) 0.191 and significant P-value 0.000) have the highest relative contribution to building project delivery in the study area. This portrays that these are the major inventory control system adopted in the study area. Competent suppliers based on track records are assigned to monitor and manage certain grade of materials on site, hence issues like stockouts, provision of storage and handling facilities will be borne on the supplier hence reducing costs and ensures regular availability of materials for continuous tasks on site. This is also the submission of Ramachandran, Raj

and Gandhi (2021) that proper projects control, tracking and monitoring of the inventorycontrol system is also required and responsible to complete the company project in a specified budget within a certain period of time efficiency. Figures from table 5 also revealed that "Economic Order Quantity (EOQ)" with (β) values of 0.157 and significant P-value of 0.001 indicated that to keep up with continuous availability of materials, assigned vendors are requested to delivered materials to site at specified time thus eliminating avoidable handling and storage costs of daily site consumables/lots like nails, binding wire, fuel while only core materials like cement, reinforcements are provided storage equipment.

Nevertheless, the study gathered that "stock control system" and "Just-In-Time" have the least relative contribution with beta value (β) of 0.041 and 0.095 with insignificant P-values of 0.369 and 0.099 respectively revealed that delivery of materials to site just at their time of use and keeping extra stocks above what is expected have been merely effective practice of inventory control system in the study area.

The significant P-values of "ABC Analysis", "Economic Order Quantity" and Vendor-managed Inventory over insignificant "stock control system" and "Just-In-Time confirms the acknowledgment of the role of inventory management techniques towards building project delivery. This supports the notion of Subramani et al. (2017) that the inventory control system is known to be very important for an organization, for company's project to finish on time, hence called on contractor active involvement in inventory management and also maintain the stock list and material usage and the storage of material safely on sites.

Table 5: Path coefficient of the effect of inventory control system on Building Projects Delivery

Inventory Control System-> Building Projects Delivery	Standardized Beta (O)	Sample mean (M)	Standard Deviation (STDEV)	T statistics (|O/STDEV|)	P values
ABC-> BUILDING PROJECT DELIVERY	0.196	0.178	0.095	2.063	0.039
EOQ -> BUILDING PROJECT DELIVERY	0.157	0.135	0.048	3.270	0.001
JIT-> BUILDING PROJECT DELIVERY	0.095	0.065	0.057	1.651	0.099
SCS-> BUILDING PROJECT DELIVERY	0.041	0.034	0.046	0.899	0.369
VMI-> BUILDING PROJECT DELIVERY	0.191	0.168	0.051	3.745	0.000

Source: SmartPLS4.0

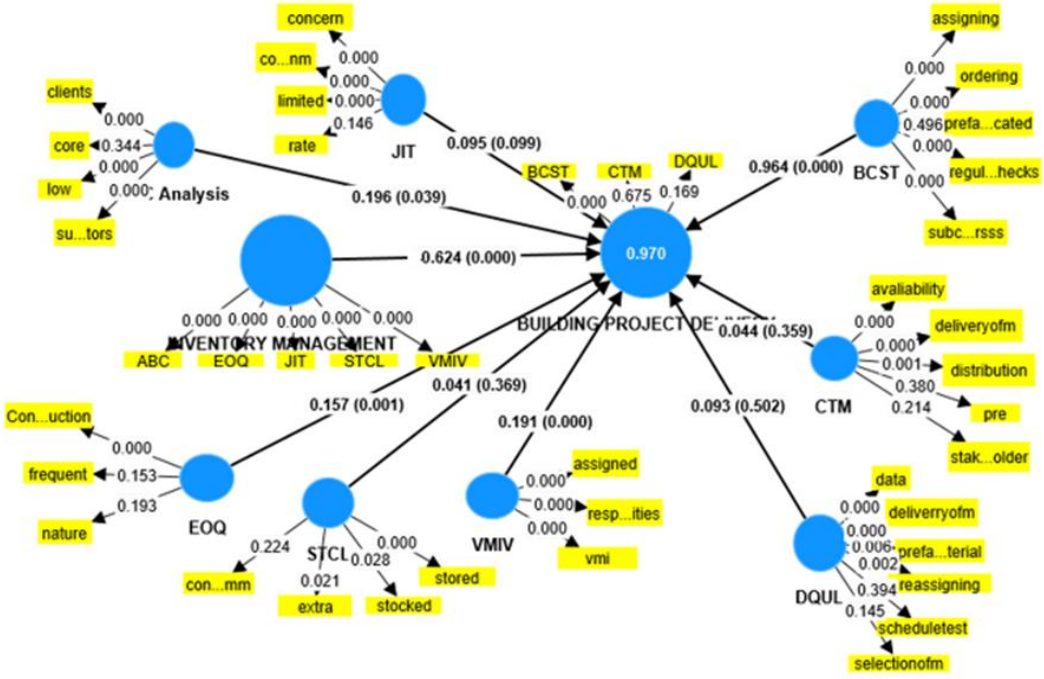

Figure 2: Structural bootstrapping of construct of inventory control system and building projects delivery

Test of Hypotheses

H_{O1}: Materials management practices does not have significant effect on building construction projects delivery in the study area;

Table 6 shows the path analysis of materials management practices and building projects delivery. Results show that materials management practices has positive and significant effect on building projects delivery with a path coefficient of 0.635 and P-value 0.000. Hence, the null hypothesis is rejected. This connotes that materials management practices has significant effect on building projects delivery in the study area. This is consistent to Ibrahim and Daniel (2019) findings on effect of materials management on building projects delivery of selected construction companies whose result as it that coefficient of determination for effective materials management practices is positive (1.056) and is highly significant (0.001) indicating that there is a relationship between the effective management of materials and the level of project success in construction industry.

Table 6: Path Analysis on materials management technique and building projects delivery

H_{01}	**Original Sample**	**Sample mean**	**Std. Dev.**	**T-Statistic**	**P-values**	**Decision**
Material management technique<-building projects delivery	0.635	0.630	0.121	5.258	0.000	Rejected

Source: SmartPLS4.0

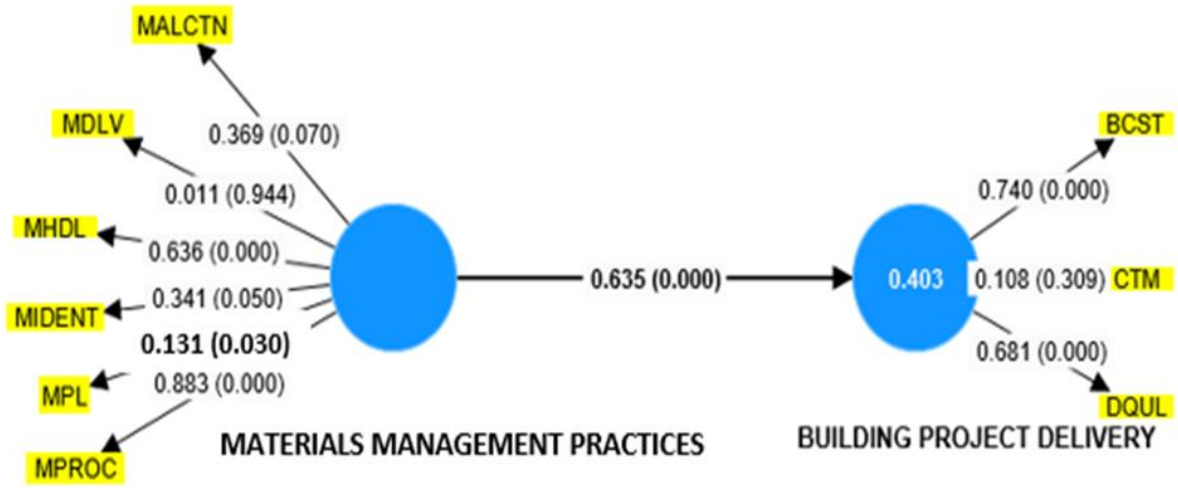

Figure 3: Structural Model on effect of materials management practices and building projects delivery

H_{O2}: inventory control system does not have significant effect on building projects delivery in the study area.

Table 7 shows the path analysis of inventory control system and building projects delivery. Results show that inventory control system has positive and significant direct effect on building project delivery with a path coefficient of 0.677 and P-value 0.000. Hence, the hypothesis is rejected. This connotes that the inventory control system in construction sites in the study area has been an effective materials management practices towards achieving successful building projects delivery.

Table 7: Path Analysis of inventory control system on building projects delivery

H_{02}	Original Sample	Sample mean	Std. Dev.	T-statistics	P-values	Decision
inventory control system->building project delivery(X-->Y)	0.677	0.679	0.026	26.366	0.000	Rejected

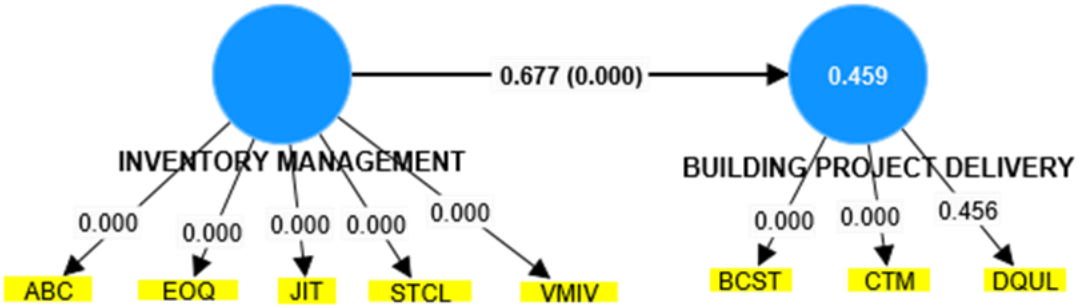

Figure 4: Structural Model on effect of inventory control system and building project delivery

CONCLUSION AND RECOMMENDATION

The study affirmed that the place of materials planning in material management cannot be overemphasized, nevertheless, materials storage and handling as well their delivery and distribution to work centres on site need to be critically looked into to achieve project goals and objectives. It was likewise concluded that inventory management technique is highly effective in enhancing building project delivery in the study area. Hence, the study recommended that to ensure continuous availability of construction materials on site, project stakeholders should procure highly materials like cement, rods and so on from competent vendors with track record of quality over cost.

REFERENCES

[1]. Anwar, K., & Ghafoor, C. (2017). Knowledge management and organizational performance: A study of private universities in Kurdistan. International Journal of Social Sciences & Educational Studies, 4(2), 53

[2]. Arijeloye. B.T. and Akinradewo. F. O (2016). Assessment of materials management on building projects in Ondo State, Nigeria; World Scientific News 55 (2016) 168-185; EISSN 2392-2192

[3]. Ayegba C, (2013) An Assessment of Material Management on Building Construction Sites: Civil and Environmental Research www.iiste.org ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online) Vol.3, No.5, 2013

[4]. Flanagan, D. A. (2009). Assessment of materials on building projects in United States of America. Journal of engineering and technological management Issues 4 (part-1), pp.59-64

[5]. Ibrahim. U.A and Daniel. O. C (2019). Impact of Materials Management on Project Success in Construction Industry. European Journal of Business and Management ISSN 2222-1905 (Paper) ISSN 2222-2839 Vol.11, No.17, 2019.

[6]. Ikechukwu. U. F and Ozuzu. J.C. (2021). An investigation of abandoned projects in Imo state Nigeria. Journal of Engineering Research and Reports 21(2): 9-20, 2021; Article no. JERR.74687

[7]. Kasim, N. (2011). ICT implementation for materials management in construction projects, case studies, KICEM Journal of Construction Engineering and Project Management, pp. 31–36.

[8]. Liwan .S. R., Kasim. N., Zainal. R., (2015) Materials Tracking Practices for Inventory Management in Construction Projects.

[9]. Marand, A. J., Li, H. & Thorstenson, A. (2019). Joint inventory control and pricing in a service-inventory system. International Journal of Production *Economics*, 209, 78- 91.

[10]. Patel. K.V and Vyas. C.M. (2011). Construction Materials Management on Project Sites; National Conference on Recent Trends in Engineering & Technology; May 2011

[11]. Pellicer, E. et al., 2013. Construction Management. Oxford: Wiley Blackwell.

[12]. Ramachandran. R., Raj, C.J., and Gandhi M.A.G., (2021); Inventory Management System in Building Construction International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 08 Issue: 04 | April 2021

[13]. Shittu, A. A., Suleiman, A. & Abel Tsado, A. J. (2020). Effect of Material Management on the Delivery of Building Construction Projects in Minna, Niger State. In R. A. Jimoh (Ed.). Environmental Technology & Science Journal. School of Environmental Technology, Federal University of Technology, Minna, Niger State, Nigeria. December. 11(2): 86 – 97.

[14]. Subramani, T. (2018); Analysing Inventory Material Management; ISSN:2319-4847, Vol.5, Issue 5, PP (239-250).
[15]. Vipin. V.P., Rahima.S.S. (2019) Factors Affecting Material Management in Construction Industry: International
[16]. Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-3, September 2019
[17]. Zairra M. J., Kasim. N., Ibrahim. M. U and Sarpin. N. (2018); Influential Factors for Effective Materials
[18]. Management in Construction Projects; International Journal of Sustainable Construction Engineering & Technology (ISSN: 2180-3242) Vol 9, No 2, 2018