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# INTEGRATION OF SOFTWARE TO IMPROVE THE QUALITY OF PROJECT DELIVERY: HOW EFFECTIVE?

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## ABSTRACT

*The importance of the use of software cannot be over emphasized as it influences planning, coordination and control of projects from the design to the execution stage. The study therefore sought to know how the application of software can improve the quality of project delivery in the construction industry. The objectives were to: determine the types of software used by construction firms in project delivery; evaluate the level of usage of software by construction professionals, assess the efficiency of the software on project delivery and how software adoption can improve the construction industry. Primary and Secondary data were collected. Questionnaires*

*were administered to professionals in selected construction firms. Data were analyzed based on Relative Importance Index (RII). The result showed that the use of software has great and positive impact in varying degrees on cost management, quality management, time management and other aspects of construction management for a successful project execution. Moreover, Nigerian construction industry is still lagging behind in the full adoption of software therefore there is urgent need for improvement by embarking on training and re-training of the construction staff internationally in the new skills and construction methods towards achieving more efficient and vibrant construction industry.*

**Keywords:** Construction, management, project, quality, software

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## 1. INTRODUCTION

Construction software is development programming application of projects, procedures and data used to perform different tasks within the building or a structure or framework as a method for improved profitability, productivity, and efficiency. These tasks were previously performed by project manager, construction manager, design engineer, construction engineer and project architect [1][2][3]. As indicated by the Construction Financial Management Association's 2008 Information Technology Survey, the greater part of all contractual workers are presently utilizing programming for capacities, for example, cost estimating, accounting, project management and scheduling and CAD, or computer-aided design others may use specialized construction software applications The prevalence of construction software fluctuates in view of the company's part and the product's capacity; general, probability of utilization increments with organization measure. For firms thinking about development programming, it is essential to consider how the product coordinates and interoperates with the database and existing programming applications utilized by the firm and its subcontractors. Other persuasive variables are CPU speed, equipment design and the measure of memory required. [4]

The Nigerian building industry is yet to fully embrace the adoption of software to enhance or improve her building projects delivery [5], because of factors militating against prompt delivery of construction projects in Lagos megacity, Nigeria: Contractors' perspective [6]. The study therefore sought to know how the application of software can improve the quality of project delivery in the construction industry. The objectives were to: determine the types of software used by construction firms in project delivery; evaluate the level of usage of software by construction professionals, assess the efficiency of the software on project delivery and how software adoption can improve the construction industry. The study will be of immense benefit to construction practitioners and other stake holders in construction because it offers more insight on how the application of software can improve the quality of project delivery in the construction industry.

## 2. REVIEW OF RELATED STUDIES

### 2.1. Capital Project Management Software (CPMS)

Capital Project Management Software (CPMS) refers to the frameworks that are presently now accessible that assist capital venture proprietor/administrators, program managers, and

development supervisors, control and deal with the tremendous measure of data that capital development ventures create. The normal sorts of programming utilized as a part of development incorporate Word Processing, Spreadsheet, CAD and Internet programming. They are utilized by Architects, Structural Engineers, Quantity Surveyors and other stakeholders in the construction industry [7]. While the top new construction management software are: Viewpoint for projects which includes capabilities for Document Control, Project Communications, Field, BIM, and a powerful level of collaboration and mobility [8][9].

## **2.2. The Importance of Software Implementation in Construction Company**

Quality Management is an important element of an organization's overall project management system [10]. The importance of the use of software cannot be over emphasized as it influences planning, co-ordination and control of projects from the design to the execution stage. The entire process chain in the construction industry can be reflected through the software implementation, including planning, project management and supervising of the human force. Popularity of software implementation depends on the firm's sector and also the software functions [11], as stated in Prefabrication Method of Building Construction in Lagos State, Nigeria: Prospects and Challenges, [12].

## **2.3. The benefits and challenges in the implementing software in a Construction Company**

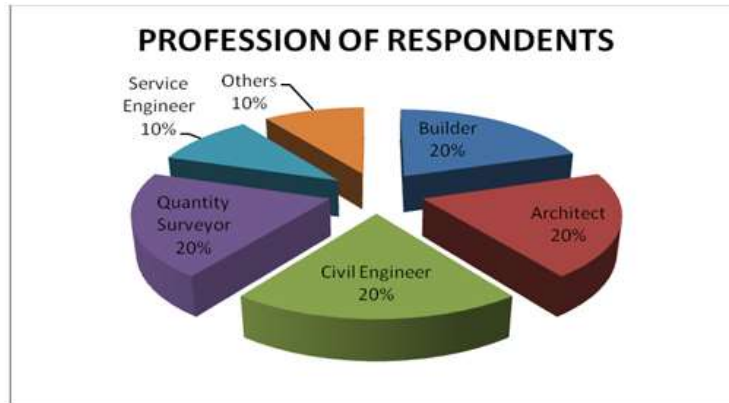
The benefits derived from implementing software in a construction company include: Cutting costs, collaboration in real time, happier clients, more efficient project management. [13]. According to [14], the perceived benefits are: a) cost and time saving, b) reduction in re-work and c) improved collaboration. The challenges preventing the use of software include improper training/education and unsuitable framework to regulate the work process and infringement on third part intellectual property rights [15][16][17][18][19][20][21][22][23].

## **3. RESEARCH METHOD**

The study was carried out based on field survey design using stratified sampling method. The study area is Ogun State, Nigeria. Primary and Secondary data were collected. Data were collected through the use of questionnaires which were administered to mainly professionals in Construction Firms. A total of 50 questionnaires were distributed while 40 were returned representing 80% response rate. The sample frame includes 8- Architects, 8- Builders 8- Quantity surveyors, 8- Structural Engineers, 4- Service Engineers, 2- Estate Valuers and 2- Urban Planners. Data were analyzed by SPSS based on Relative Importance Index (RII) calculation. The results were discussed with descriptive means and presented with graphical aids.

## 4. DATA ANALYSIS AND PRESENTATION

### 4.1. GENERAL INFORMATION OF THE RESPONDENTS



**Figure 1** Profession of Respondents

Fig.1 shows that 8 (20%) of the respondents were Architects, Builders, Civil Engineers, respectively, while 4 (10%) of the respondents were Service Engineers and other professionals respectively. These respondents were mainly professionals in the construction industry.

**Table 4.1** Specialization of Respondents

Consulting	Contracting	Total
22	18	40
55%	45%	100%

Table 4.1 shows that 22 (55%) of the respondents were into consulting and 18 (45%) of them were into contracting. These are the two major areas of construction management.

**Table 4.2** Sector of Respondents

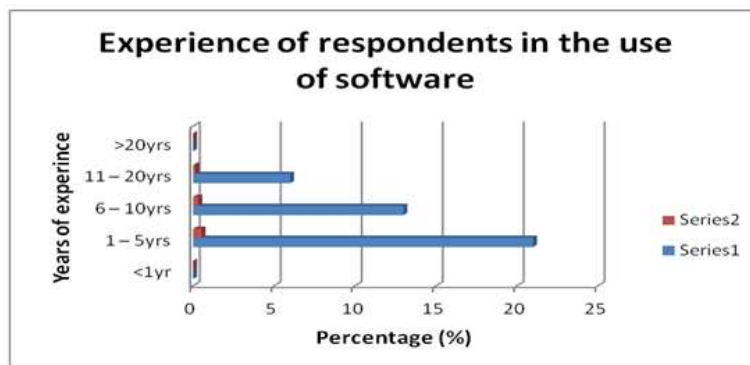
Public	Private	Total
14	26	40
35%	65%	100%

Table 4.2 revealed that 14 (35%) of the respondents worked in the public offices while 26 (65%) of the respondents are employees of private organizations. There are more respondents in the private sector than public sector.

**Table 4.3** Years of Experience of Respondents in the Construction Industry

1 – 5yrs	6 – 10yrs	11 – 20yrs	>20yrs	Total
5	12	16	5	40
12.5%	30%	40%	12.5%	100%

Table 4.3 shows that 5 (12.5%) of the respondents have between 1-5 years experience in the construction industry, 12 (30%) have between 6-10 years experience, 16 (40%) have between 11-20 years experience while 5 (12.5%) of them have more than 20 years experience in the industry. This shows that the respondents 21 (52.5%) have more than 10 years of experience and are competent in their respective fields.



**Figure 2** Years of Experience of Respondents in the use of Software

Fig.2 reveals that none of the respondents have less than one year experience in the construction industry, 21 (52.5%) of them have between 1-5 years experience, 13 (32.5%) have between 6-10 years experience, 6 (15%) have between 11-20 years experience while none of them have more than 20 years experience in the industry. This is an indication that majority (90%) of the respondents do not have more than 10 years experience in the use of software. The majority of the respondents are young people between 31-40 years of age. It also revealed that most Nigerian construction firms are just adopting the use of software to execute their construction projects.

#### 4.2. COMMON SOFTWARE USED IN NIGERIAN CONSTRUCTION FIRMS

**Table 4.4** Common Software used in Nigerian Construction Firms

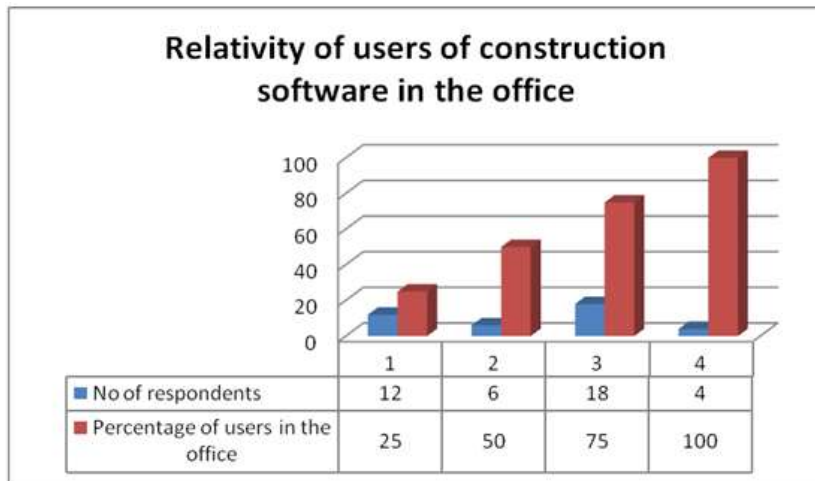
AutoCad	Microsoft Project	Microsoft Office	Orion	Sage	Master Bill	QS Cad	E Views	BIM	Viewpoint	Total
10	2	12	6	2	4	2	2	0	0	40
25%	5%	30%	15%	5%	10%	5%	5%	0%	0%	100%

Table 4.4 shows that 12 (30%) of the respondents believed that Microsoft Office is the most used software in Nigerian construction firms, followed by AutoCAD which 10 (25%) believed is the most common used while 10 (25%) believed in Orion. This shows that Microsoft office, AutoCAD and Orion are the most common software used in Nigerian construction firms. Others are Master Bill (10%), Microsoft Project (5%), QSCad (5%), E Views (5%) and Sage (5%)

**Table 4.5** Duration for the Efficient Learning of Software usage

<1mth	1 – 6mths	6 – 12mths	>1yr	Total
0	24	12	4	40
0%	60%	30%	10%	100%

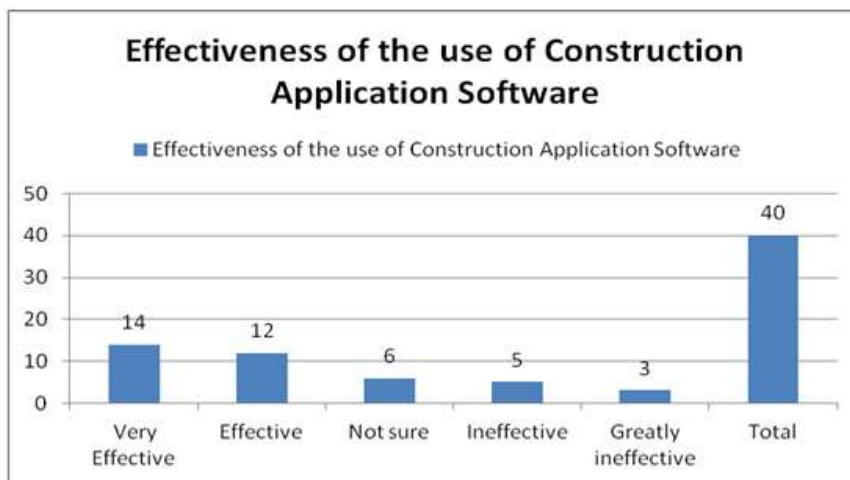
Table 4.5 shows that 24(60%) of the respondents opinioned that it usually takes 1-6 months for intending users of the software to effectively learn them, while 12(30%) believed it will take 6-12 months to acquire the knowledge and 4(10%) believed it will take more than a year. This however depends on the complexity of the software as the use of Orion is more complex than the use of Microsoft word.



**Figure 3** Relativity of Users of Construction Software in the Office

Fig.3 showed that 12 of the respondents said 25% of the total workforce in their firms can use one or more software, 6 of the respondents said 50% of the employees can use software, 18 of the respondents said 75% of them cannot use software while 4 of them said 100% of the workforce can use software. This means that most construction firms will rather employ people with knowledge of software than those who cannot use them.

#### 4.3. EFFECTIVENESS OF THE USE OF CONSTRUCTION SOFTWARE



**Figure 4** Effectiveness of the Use of Construction Software for Project Delivery

Fig.4 shows that 14 (34%) respondents believed that construction application software are very effective when adopted in the execution of projects in Nigeria, 12 (30%) respondents opinioned that software are effective, 5 (12.5%) of the respondents were not sure if they are effective in use or not, 3 (7.5%) believed they are not effective while 3 (7.5%) believed they are greatly not effectively when adopted.

In addition, the adoption of software usage in Nigerian construction companies has improved the activities of the construction industry but the respondents believed it required the use of more than one for it to be more impactful on the quality of project delivery in the organization. This means that most construction firms need more current software and people with knowledge of software than those who cannot use them

#### 4.4. IMPACT OF THE USE OF SOFTWARE ON CONSTRUCTION MANAGEMENT

**Table 4.6** Impact of the use of Software on Construction Management

Aspect of Construction Management	GI 1	I 2	NS 3	E 4	VE 5	Total 40	RSI	Rank
Time Management	0	0	2	10	28	40	0.93	1
Material Management	0	0	4	16	20	40	0.88	2
Cost Management	0	0	2	22	16	40	0.87	3
Quality Management	0	0	2	26	12	40	0.85	4
Human Management	0	0	2	28	10	40	0.84	5
Health and safety Mgt	6	6	8	6	14	40	0.68	6

Legend: GI-Greatly Ineffective, I-Ineffective, NS-Not Sure, E-Effective, VE-Very Effective

Table 4.6 shows Time Management is ranked first with Relative Significant Index (RSI) value of 0.93 (i.e. 93 per cent significance), Material Management is ranked second with RSI of 0.88 (i.e. 88 per cent significance) closely followed by Cost Management with RSI value of 0.87 (i.e. 87 per cent significance). Others in rank order are Quality Management (RSI value of 0.85), Human Management (RSI value of 0.84) and Health and Safety Management (RSI value of 0.68). The study revealed that the use of software in construction management is very effective on construction projects in terms of quality delivery.

#### 4.5. CHALLENGES OF ADOPTION OF SOFTWARE IN CONSTRUCTION INDUSTRY

**Table 4.8** Challenges of Adoption of Software in Construction Industry

Challenges of Adoption of Software on Construction Industry	No 1	Maybe 2	Yes 3	Total 40	RSI	Rank
High cost of purchase of software	0	2	38	40	0.9833	1
Requires Use of more than one software for improve efficiency	0	5	35	40	0.9583	2
Requires steady power supply	4	6	30	40	0.8834	3
Requires update of knowledge periodically	3	10	27	40	0.8666	4
Requires update/replacement of software periodically	6	9	25	40	0.8250	5
None availability of Software	7	11	22	40	0.7916	6

Table 4.8 shows High cost of purchase of software is ranked first with Relative Significant Index (RSI) value of 0.9833, Use of more than one software for improve efficiency is ranked second with RSI of 0.9583 closely followed by Requires steady power supply RSI value of 0.8834, Requires update of knowledge periodically (RSI) value of 0.8666 is ranked fourth, Requires update/replacement of software periodically (RSI) value of 0.8250 is ranked fifth, while None availability of Software with RSI of 0.7916 is ranked least. The study revealed that high cost of purchase of software is the most challenging factor affecting the adoption of Software in the Construction Industry.

### 5. CONCLUSION

The study showed the impact of the use of software on quality project delivery in Nigeria. The importance of the use of software cannot be over emphasized as it influences planning, co-ordination and control of projects from the design to the execution stage. It has great and



positive impact on cost management, quality management, time management and other aspects of construction management for a successful project execution. The effectiveness in the use of software by construction firms has made them improve in project execution and won them more projects. Moreover, Nigerian construction industry is still lagging behind in the full adoption of software therefore there is urgent need for improvement towards achieving more efficient and vibrant construction industry. The construction companies in Nigeria should embark on training and re-training of their staff internationally so that new skills and construction methods like BIM and virtual reality can be acquired to impact positively on the construction industry at large

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