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Productivity in Construction and Quantity Surveying Functions: Assessing User Satisfaction with the Effectiveness of Software Design

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Abstract

Information technology has had a significant impact on the productivity of business operations and processes in construction. Quantity surveyors are responsible for managing labour, time, and cost in construction projects, with the primary aim of achieving high levels of productivity. Given the transformative potential of information technology, the professional services of quantity surveyors have been digitalized to meet the demands of construction stakeholders through the development of different software packages. It has been difficult for the quantity surveying industry to embrace information and communication technology in order for enhanced professional practice and construction productivity. The ease of use in software design, rather than progress in technology, is the true challenge of the information revolution. This study assesses the effectiveness of the design of different quantity surveying software packages in boosting productivity and facilitating project efficiency in terms of user satisfaction, cost and time savings achieved through their use. The population under investigation for this study comprises quantity surveying professionals engaged in the construction industry in Port Harcourt, Nigeria. Using the survey research strategy, data was collected and analyzed using frequency analysis to determine the distribution of responses. The findings reveal that there is a relatively high level of satisfaction with quantity surveying–based software packages, given the positive impact of these tools on productivity and project-related processes. Suggestions were however made regarding improvements in software integration capabilities, awareness, and familiarity, emphasizing the need for additional training and support resources. This insight identifies specific areas where users perceive the need for enhancement within the software packages, neccesary for increased user satisfaction.

Keywords: Information technology, quantity surveyors, software packages, user satisfaction

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INTRODUCTION

A quantity surveyor is expected to have the knowledge, skills and experience to provide quantity surveying services to clients and designers, as well as financial management during the whole spectrum of construction processes, such services include among others which has been significantly transformed by the adoption of informcation and communication technology (ICT) tools. Business processes and structures have been impacted in ways that cannot be measured by the rapid

expansion of ICT, sometimes known as information technology (IT) [1]. IT is by definition a collective term that refers to the amalgamation of information processing and computer technology, according to Long and Long [2].

Additionally, Marsh and Flanagan [3] point out that an increasing number of software packages are becoming accessible for a variety of functions, including budgeting and project cost control analysis. The progression from isolated, highly specialized applications to environments that can communicate with others, perform multiple tasks, and encompass a variety of concerns is one way to characterize the recent advances in IT in many fields, including construction, according to Bedard [4]. Nonetheless, strategies to boost IT utilization must be contributed to the rise in computer usage that these writers have pointed to.

It has been difficult for the industry of quantity surveying to embrace ICT, which is supposed to improve professional practice. Using technology well is the true difficulty of the information revolution, not the improvement of technology per se. Technology is advancing more quickly than we can use it. According to Cartlidge [5], this slowness may be attributed to the industry's skepticism, the high level of fragmentation in the production system and procurement process, and the lack of a management-driven IT strategy. According to Odeyinka [6], a high percentage of illiteracy, a lack of personal skills, and an inability to use machines and web-based information are the main obstacles to the advancement of IT.

According to Amor et al. [7], there are still certain fundamental inquiries about IT applications in the economy's construction sector that have not been fully answered. These include the varieties and amounts of businesses that have used IT, the types of IT and their purposes, the hardware and software that have been used, the success of the deployment of IT, and the primary advantages and challenges faced. Rajeswara (2018) claims that although AutoCAD allows us to collect observations, it is only useful for simple tasks.

The quantity surveyor has to store the measurements in Microsoft Excel and then compute the quantities using the recorded data. This takes a lot of time and work as well. The main drawback of making use of this is that it is difficult to make changes and the quantity surveyor must redo everything from start to finish, which will need just as much time and effort as beforehand, or perhaps more [8, 9].

Because of the essential roles that the quantity surveyors play, professionals must not fall behind in using tools that might enhance their service delivery. Therefore, a professional update on the state of computation as a technological know-how is required. The gap in computer skill between experts in developed and developing nations, as well as the availability of computers and the right software, is another difficulty. Compared to data-driven and scientifically developed nations (ISDNs), information and scientifically undeveloped nations (ISUNs) have a low rate of adopting information and communication technologies [10].

LITERATURE REVIEW

Through the creation of multiple software programs, the services of quantity surveyors have been digitalized to satisfy the needs of construction clients. According to Cartlidge [11], the IT revolution has a lot of promise to improve measurement and information management, two key elements of quantity surveying tasks [12–14]. According to Odeyinka and Doherty [15], a quick glance at the websites of the majority of statistical software suppliers reveals that the modules included in each software package concentrate on the fundamental tasks of fieldwork.

There are several software used by quantity surveyors to render their services. The development of this software is critical to ease budgeting, cost planning, cash flow, costing and development of any type and scale of construction projects. The advent of these software packages has made delivery of

quantity surveying services effective and efficient. Ogunsina et al. (2015) observed that Workmate, RIPAC, Primus, QS Plus and Microsoft Excel are specialized software used by quantity surveyors. Cardona and Yu [16] also noted that the most commonly used software by quantity surveyors is Masterbill while CostX, Eclipse QSPro, WinQS, CatoPro, Ripac, Planswift, Naviswork, Bleubeam Revu are recent quantity surveying software. However, Akinagbe and Adelakun [17] stated that Microsoft Excel is the most used quantity surveying software. Microsoft Excel is part of the Microsoft suite often used in measurements, bill of quantity preparation, rate calculations, estimation, materials and labour schedule, valuation and preparation of final account. The functions of the above-mentioned quantity surveying software are similar with different modifications.

MasterBill Micro Systems Limited is a member of the Microsoft developer network that deals with the production of construction industry software. It has various packages used for estimating and tender analysis. These include MB3, QSCAD, EstimatorPro, Feasibility Estimate, and Solution. Masterbill MB3 is a fully featured bill of quantities production package comprising pricing, tender analysis and valuation features, plus multiple libraries and the ability to transfer data between projects. It is Microsoft Windows enabled, it has the usual Windows features and it is simple and direct on-screen entry. MB3 contains libraries for SMM7, SMM6, CESMM3, User defined and so on. It uses Electronic Tendering (eTendering) in standard CITE format. Transfer of data is possible using disk or email. It uses SQL database technology for fast access, robust and secure data transmission, NT or NOVELL compatibility and multi-user capability with no limit to user license. It is designed around traditional dimension patterns, that is, QS dim-paper principles. This makes taking-off easy and flexible, as data can be transferred within and between projects.

MB3 can also be used to perform other functions such as compilations of bills of quantities, cost estimates, financial accounts preparation, and comparison of tender. The bills of quantities and schedules of rates can be produced in any combination of parts, elements or workgroups. Cost and elemental analysis and tender evaluation features are also available. Descriptions are selected from the various standard libraries available, which could also be user-defined. These libraries are compiled having the authorized social media marketing (SMM) descriptions. Quantities or data can be transferred from other Windows packages and relevant features required could also be applied since MB3 is Windows compatible. This means that the available features in MS Word such as the font types and sizes, and the MS Excel features can all be used in MB3. MB3 is cost-efficient in that printing is made easy. An additional printing package is not required as the software has a printing facility. MB3 is a very useful tool in carrying out estimating and tender analysis as it enhances efficiency, effectiveness and maximizing productivity. It can also be used to check and correct any tender error provided such tender is returned in soft copy.

CostX, created by RIB, offers commencement and cost estimation tools that support budget planning, material quantity calculation, and creation of reports. To spot changes, managers may point out model changes and compare drawings. To make smart business verdicts, compare several subcontractors at once.

Key differentiators and advantages of CostX are that it can generate precise quotes and upload building information modeling (BIM) files to estimate quantities and costs with just a few clicks. Develop forecast models to test what-if scenarios to improve efficiency. To encourage cooperation, empower several cost planners work together on the same estimate. Additionally. By saving time by dragging and dropping dimensions straight from the structure into Microsoft Excel spreadsheets, it removes data-entry failures.

It can automatically update changes made to estimates to keep everyone on the same page. CostX can perform accurate takeoffs, having a cut takeoff time of up to 80% with 2D takeoff tools. It automatically gives all of the group's positive and negative strategies a random shade.

CostX helps in making informed decisions by creating and analyzing data using reporting modules. It groups work for codes and zones. It can create graphs and charts to locate patterns and outliers. It also allows for cloud storage, which enables users to access files from remote locations through web-enabled devices. Project statuses can be tracked in real time.

WinQs is used for the production of bill of quantities. It was developed by ACE Solutions CC (South Africa). the computation of monthly reviews, project cost analysis, estimate document creation, contract price adjustment computations, budget review, tender analysis, along with expense reports [18].

One of the greatest tools for taking off and estimating is PlanSwift. PlanSwift software is intended for general contractors and subcontractors in practically every construction trade, notably commercial, industrial, institutional, and residential ones. To collect quantity takeoffs and start the estimating process, users may drag and drop individual components or assemblies straight onto a digital layout using PlanSwift's simple point-and-click interface. With a single click, measure linear, unit counts, square footage, pitches, and angles in a matter of seconds. When users bid on tasks, PlanSwift saves companies a great deal of time and work by automatically figuring out the takeoffs.

By clicking on various locations on the screen, users may utilize PlanSwift to compute digital quantities, such as labor and material spending. Users may measure square and linear footage with a single mouse click thanks to the single click functions. Additionally, PlanSwift takeoff amounts may be sent straight to your current MS Excel estimating workbooks using the program's MS Excel a connection [19,20,21].

RESEARCH METHODOLOGY

The research design was targeted at investigating the utilization of quantity surveying–based software in Port Harcourt, Nigeria. The target population included quantity surveyors responsible for the estimation and cost management aspects of projects to provide insights into the factors influencing software adoption, the effectiveness of different software solutions in enhancing project efficiency, and potential areas for improvement to optimize their utilization within the unique context of the Port Harcourt construction landscape. The instrument for data collection in this study is a structured survey questionnaire designed to gather information on various aspects of quantity surveying software utilization in performing different functions. Clear instructions were provided to guide participants through sections covering demographic details, software utilization frequency, factors influencing utilization, and effectiveness assessment. To capture deep qualitative insights, participants are urged to submit open-ended answers.

After completion, the questionnaires were collected, and the quantitative data were entered for statistical analysis, while open-ended responses undergo thematic analysis. Rigorous data validation checks are performed to ensure accuracy, and confidentiality is maintained throughout the process. The culmination of these procedures ensures a comprehensive and reliable dataset, contributing to a robust exploration of quantity surveying software utilization in the unique context of Port Harcourt's construction industry [22,23,24,25].

RESULTS AND DISCUSSION

Respondents Demographic Distribution

The respondents, consisting of 50 individuals, exhibit a demographic profile characterized by a male majority, accounting for 76% of the responses, while 26% are female. The age distribution reveals that 45% fall within the 35 to 44 years range, 25% are aged 25 to 34 years, 20% are between 45 and 54 years, and 6% each for those under 25 and 55 and above. In terms of employment, 74% are full-time employees, 12% are self-employed, 10% are students, and 4% are unemployed. Educationally, 43% hold a master's degree, while 57% have a bachelor's degree. A significant portion, 87%, is registered to a quantity surveying organization, with 77% certified as quantity surveyors and 23% not certified. Furthermore, 84% work in the construction industry, while 16% in government roles. Among them,

70% serve as quantity surveyors, 4% as price estimators, 7% as project managers and 19% as assistant quantity surveyors. A notable 78% are located in Port Harcourt, while 22% are not based in the area. This diverse respondent profile provides a robust foundation for a comprehensive analysis of the utilization of quantity surveying–based software in Port Harcourt [26,27,28].

Analysis of User Satisfaction

The analysis sought to assess the effectiveness of different quantity surveying software packages on project efficiency in Port Harcourt, Nigeria, in terms of user satisfaction, cost and time savings achieved through their use (Table 1).

Question 1. How often do you encounter technical issues or bugs with the software?

The frequency of encountering technical issues or bugs with the software is varied among respondents (Figure 1). Half of the participants, representing 50%, note that such issues occur occasionally, while 30% report experiencing them sometimes. Additionally, 12% state that they never encounter technical issues, whereas 6% face them often, and a minimal 2% contend with these challenges always (Table 2).

Question 2. How well does the software package integrate with other tools and software you use in your work?

The integration of quantity surveying software with other tools (Figure 2) and software used in professional work exhibits varying degrees of success among respondents. A significant majority, comprising 64%, reports that the software integrates well with their existing tools. Furthermore, 14% express that the integration is very well executed, while 20% find it to be fairly integrated. A small minority of 2% indicates a perceived poor integration (Table 3) [29–32].

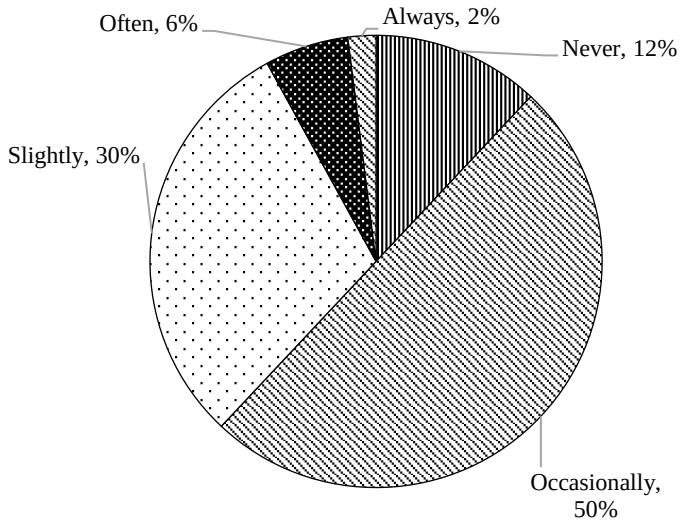

Figure 1. Frequency of encountering technical issues or bugs with the software.

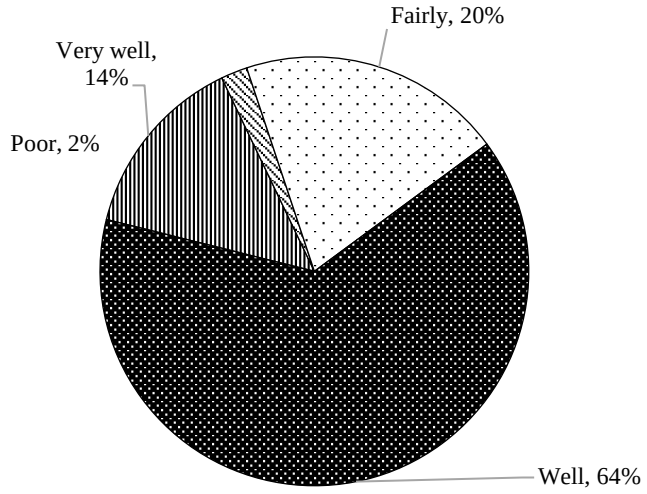

Figure 2. Ability to integrate with other tools and software.

Table 1. Frequency of encountering technical issues or bugs with the software.

Variables	N	Occasionally	Slightly	Often	Always
Frequency	6	25	15	3	1

Table 2. Ability to integrate with other tools and software.

Variables	Very Poor	Poor	Fairly	Well	Very Well
Frequency	0	1	10	32	7

Table 3. Software's provision for support and training resources to its users.

Variables	Somewhat Disagree	Disagree	Neutral	Agree	Somewhat Agree
Frequency	0	11	9	26	4

Table 4. Level of satisfaction with customer support.

Variables	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Frequency	3	0	17	30	0

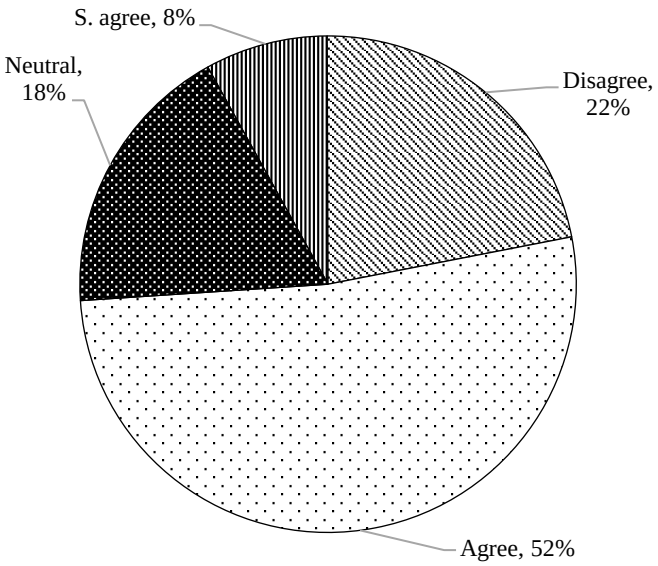

Figure 3. Software's provision for support and training resources to its users.

Question 3. Does the software provide adequate support and training resources for its users?

The assessment of quantity surveying software's support and training (Figure 3) resources reveals varying perspectives among respondents. Notably, 52% of the people surveyed agree, confirming that it offers sufficient training materials and advice.

Additionally, 8% strongly agree with the adequacy of these resources. On the other hand, 22% disagree with the statement, and 18% remain neutral on the matter (Table 4) [33].

Question 4. How satisfied are you with the customer support provided by the software company?

The satisfaction level with the customer (Figure 4) support provided by the software company reveals mixed sentiments among respondents. A significant portion, comprising 60%, remains neutral on their satisfaction level. Meanwhile, 34% expressed satisfaction with the customer support, indicating a positive response. On the contrary, 6% report being very dissatisfied with the support provided (Table 5) [34–37].

Question 5. How often does the software receive updates and improvements?

A substantial majority, representing 68% (Figure 5) notes that updates occur occasionally. Additionally, 22% state that updates are received rarely, while 6% report regular updates. A smaller portion, 4%, indicates that updates are received very regularly. These responses reflect the varying levels of frequency in software updates and improvements as perceived by professionals in Port Harcourt (Table 6).

Question 6. Would you recommend the software package to other quantity surveyors in Port Harcourt?

The likelihood of recommending the quantity surveying software to peers in Port Harcourt varies among respondents (Figure 6). A significant majority, comprising 64%, indicates a probability of recommending the software, reflecting a positive sentiment. Meanwhile, 22% remain neutral on the recommendation, and 8% express a definite intention to recommend. Conversely, 6% indicate a probability of not recommending the software (Table 7).

Table 5. Frequency of software updates and improvements.

Variables	Very Rarely	Rarely	Occasionally	Regularly	Very Regularly
Frequency	0	11	34	3	2

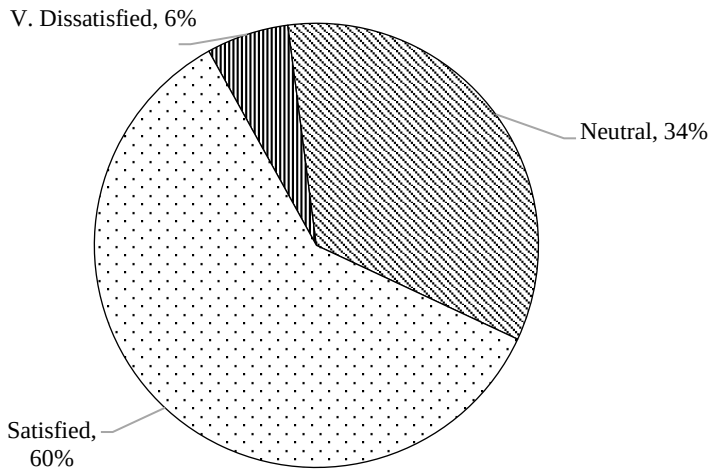

Figure 4. Level of satisfaction with customer support.

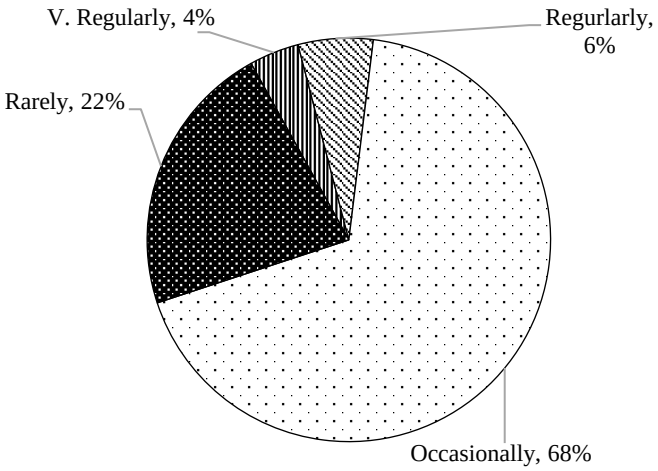

Figure 5. Frequency of software updates and improvements.
Respondents vary in the number of times the quantity surveying technology is updated and modified.

Table 6. Willingness to recommend the software package to other Quantity Surveyors.

Variables	Definitely Not	Probably Not	Neutral	Probably Would	Definitely Would
Frequency	0	3	11	32	4

Table 7. Overall satisfaction with the quantity surveying software package currently in use.

Variables	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
	2	0	2	42	4

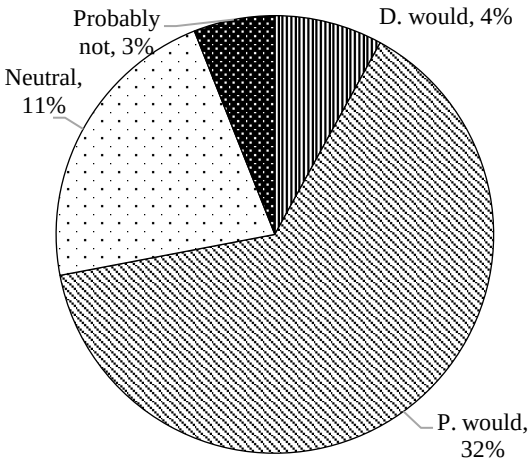

Figure 6. The likelihood of recommending the software package to other quantity surveyors.

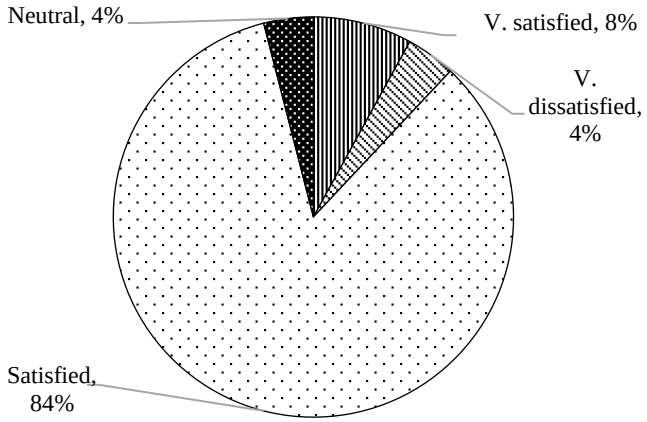

Figure 7. Level of satisfaction with the quantity surveying software package currently in use.

Question 7. Please rate your overall satisfaction with the quantity surveying software package you currently use.

The overall satisfaction (Figure 7) with the quantity surveying software package currently in use is overwhelmingly positive, with 84% expressing satisfaction and an additional 8% indicating they are very satisfied. A minor 4% remain neutral in their satisfaction, while another 4% report being very dissatisfied (Table 8).

Question 8. How easy is it to use the quantity surveying software package for your daily tasks?

Opinions on the ease of use of the quantity surveying software for daily tasks exhibit diverse perspectives among respondents (Figure 8). Half of the participants, representing 50%, express a neutral stance on the ease of use. Additionally, 42% find the software easy to use, 4% consider it difficult, and another 4% perceive it as very easy (Table 9).

Table 8. Ease of use of quantity surveying software package.

Variables	Very Difficult	Difficult	Neutral	Easy	Very Easy
Frequency	0	2	25	21	2

Table 9. Extent to which software has helped in reducing project costs.

Variables	Not at All	Slightly	Moderately	Significantly	Extremely
Frequency	0	6	19	23	2

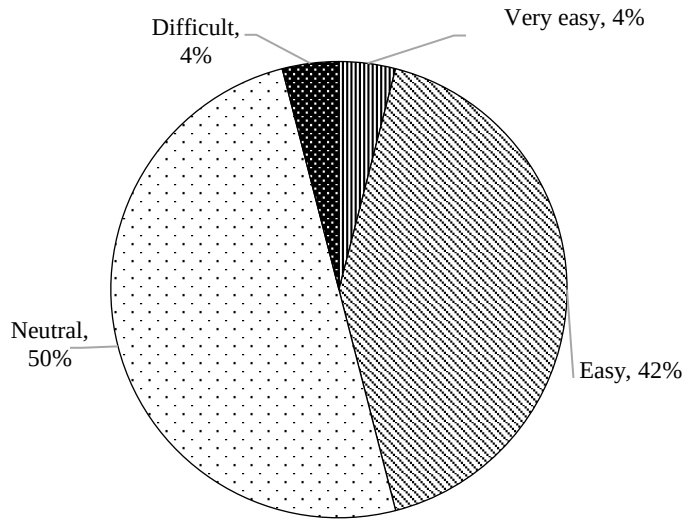

Figure 8. Ease of use of quantity surveying software package.

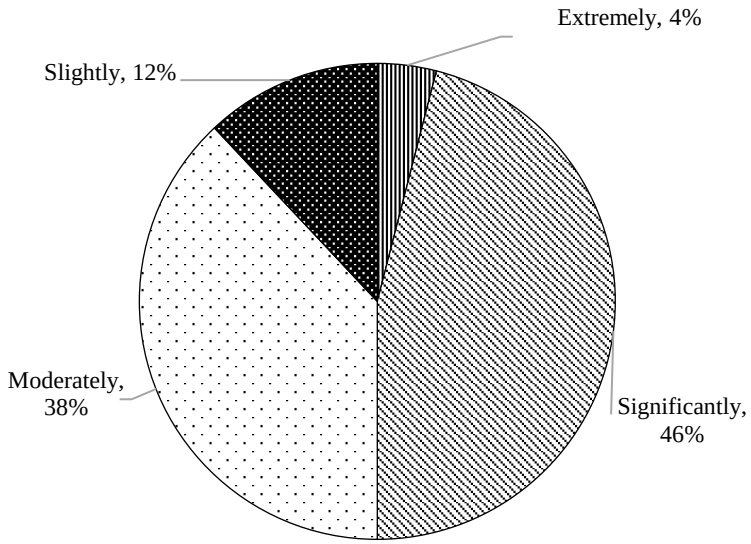

Figure 9. Impact of the quantity surveying software on reducing project costs.

Question 9. To what extent has the software helped in reducing project costs?

The impact of the quantity surveying (Figure 9) software on reducing project costs is evident in the survey data. A significant portion, comprising 46%, acknowledges that the software has significantly contributed to reducing project costs. Additionally, 38% find it to be moderately impactful in this regard, while 12% perceive a slight impact. A minor 4% express that the software has an extremely impactful role in reducing project costs (Table 10).

Table 10. Time saved due to software usage.

Variables	No Time Saved	Minimal Time Saved	Some Time Saved	Significant Time Saved	Substantial Time Saved
Frequency	0	0	7	32	11

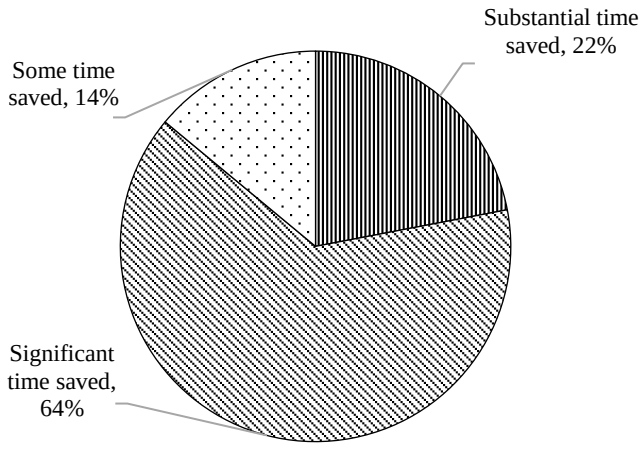

Figure 10. Time saved due to software usage.

Question 10. How much time do you think the software has saved in your project estimation and cost analysis processes?

The impact of the quantity surveying software on time savings in project estimation and cost analysis processes is notable among respondents (Figure 10). A majority, representing 64%, perceive a

significant amount of time saved due to the software. Furthermore, 22% express substantial time savings, while 14% acknowledge that the software sometimes contributes to time efficiency in their estimation and cost analysis processes.

CONCLUSION

The study sought to assess the effectiveness of different quantity surveying software packages on project efficiency in Port Harcourt, Nigeria, in terms of user satisfaction, cost and time savings achieved through their use. This objective is substantially addressed by the key findings. The efficiency of such programs in terms of user happiness, cost, and time savings can be shown by a number of important specifications.

The data indicates that 72% of respondents rate quantity surveying software packages as effective in enhancing project efficiency directly speaks to the objective. This high a percentage of satisfaction highlights how useful these tools are for project-related actions.

Moreover, the software's ability to reduce project costs has been acknowledged by 46% of respondents and 64% perceive significant time savings in project estimation and cost analysis processes provide specific insights into the cost and time-saving aspects. This information directly supports the objective, showcasing tangible benefits experienced by users. The data has demonstrated a high level of user satisfaction and tangible improvements in cost and time efficiency, due to the effectiveness of quantity surveying software packages. The findings contemporize this perspective, providing current insights into software integration capabilities and indicating a general satisfaction level of 62% with software integration. While acknowledging historical hesitancy, the study hints at a changing trend, suggesting a more positive attitude toward technology integration in the current landscape.

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