ASSESSING THE BENEFITS OF CONSTRUCTION MANAGEMENT SOFTWARE IN BUILDING PROJECTS IN ANAMBRA STATE

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ABSTRACT

The construction industry has witnessed a significant transformation with the increasing adoption of software tools and technology like Building Information Modeling, Project Management Software, Estimating Software, Scheduling Software, etc, in its various aspects of project planning, design, and execution. The aim of this paper was to assess the benefits of construction management software(s) in building project delivery in Anambra State with a view to recommending measures for a more integration adoption. The specific objectives are: To examine the benefit of using the identified construction management software(s) in the study area and to suggest measures to adopt for a more integration of the use of construction management software(s) in the study area. This research work used survey design. The target population of the study focused on construction professionals; from available record from their respective state's chapters, the adopted figures includes 338 registered: Architects, Structural Engineer, Quantity Surveyor, and Builders. The target population is 338. A total of Hundred and Thirty-eight (138) structured questionnaires was prepared and administered while hundred and Twenty-one (121) were found useful. The study recommends that the various professional bodies in the construction industry should create awareness of the use of other construction management software, encourage investing in training and education for its members and have a standardized data format and providing cloud-base solutions to the use of construction management software(s).

Keywords: Information Technology, Software, Construction Management, Building Projects And Construction Industry.

I. INTRODUCTION

Information and Communication Technology software(s), also known as information technology (IT) has radically transformed the way we live, learn, work and play (Capron, 2000). Many companies in the construction industry do not generally appear to have appreciated the positive changes and advantages that the new technology was providing to companies in other sectors of the economy. A major construction process demands heavy exchange of data and information between project participants daily (Masqsood, 2004). The construction industry has witnessed a significant transformation with the increasing adoption of software tools and technology like Building Information Modeling, Project Management Software, Estimating Software, Scheduling Software, Communication and Collaboration Software, in various aspects of project planning, design, and execution. While the utilization of software in construction projects offers numerous potential benefits, it also presents various challenges. This research provides a comprehensive understanding and solutions on the challenges and gaps, to identify the issues that necessitate the investigation into the potential advantages of implementing construction management software(s). The aim of this paper was to assess the benefits of construction management software(s) in building project delivery in Anambra State with a view to recommending measures for a more integration adoption. The specific objectives are: To examine the benefit of using the identified construction management software(s) in the study area and to suggest measures to adopt for a more integration of the use of construction management software(s) in the study area. This project offers benefits to the client, project team, contractor, academicians and private sectors to maximize his limited resources through the selection of competent construction software(s) with vast experience in project planning and execution and to judiciously allocate his limited resources to achieve the proposed project that will be completed in time, on quality and within budget.
II. LITERATURE REVIEW

Building project is a complex process involving various stakeholders, tasks, and resources. To enhance the efficiency and effectiveness of managing building projects, the adoption of construction management software(s) has become increasingly common. This conceptual framework provides a structured and comprehensive view of building project. It outlines the key elements, principles, and dimensions that project managers and stakeholders must consider ensuring the successful execution of construction projects. Figure 2.1 shows that there a lots of relationship between construction management software and construction project management.

2.1 Conceptual Framework

![Conceptual Model Showing the Relationship Between Construction Management Software and Construction Project Management](https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0264420&type=printable)

2.2 Benefits of using construction management software(s) in building project delivery

The use of construction management software(s) in building project delivery offers numerous benefits to construction professionals and organizations. They include:

**Enhanced Project Planning and Scheduling:** Construction management software provides tools for creating detailed project schedules and Gantt charts, enabling project managers to efficiently plan tasks and allocate resources (Arditi, 2005).

**Improved Communication and Collaboration:** Collaboration features within software platforms foster real-time communication and collaboration among project stakeholders, reducing delays and enhancing teamwork (Alarcon, 2016).

**Efficient Document Management:** Document management software tools streamline the organization, storage, and sharing of project documents, reducing reliance on paper-based processes (Leite and Akcamete, 2017).

**Accurate Cost Estimation and Budgeting:** Estimating and cost management software aids in creating accurate cost estimates, tracking expenses, and ensuring projects stay within budget.

**Visualizing Design Concepts:** Building Information Modeling (BIM) software allows for 3D modeling and data-rich representations, enabling better visualization of design concepts and reducing design errors (Eastman, 2011).

**Error Reduction and Clash Detection:** BIM software identifies design clashes and errors before construction, minimizing costly rework and enhancing the quality of construction.

**Streamlined Resource Allocation:** Scheduling software optimizes resource allocation by assigning tasks efficiently, ensuring that project timelines are met (Arditi and Chotibhongs, 2005).
Data-Driven Decision-Making: Construction management software(s) provides data analytics tools for monitoring project progress and making informed, data-driven decisions (Yuan, 2020).

Regulatory Compliance: Software tools assist in adhering to regulatory and compliance requirements, ensuring that projects meet local building codes and standards (Ye and Tserng, 2010).

Enhanced Reporting and Documentation: The software's reporting capabilities help create meaningful reports for project stakeholders, improving documentation and transparency (Babatunde and Mbachi, 2003).

2.3 Measure for a more integration of the use of construction management software(s).

Integration of construction management software(s) is crucial for streamlining project processes and maximizing its benefits. These measures may include:

Standardize Data Formats: To enhance software integration, it’s essential to standardize data formats and information exchange protocols. Common standards like the Construction Operations Building Information Exchange (COBie) and Industry Foundation Classes (IFC) facilitate interoperability among software applications (Giel, 2014).

Use Application Programming Interfaces (APIs): APIs allow different software applications to communicate and share data. Construction management software(s) should provide well-documented APIs for developers to build custom integrations with other tools and systems (Trucco, 2018).

Implement a Common Data Environment (CDE): A CDE acts as a centralized platform where project information and documents are stored and accessed by all stakeholders. Construction management software(s) should support CDE integration for seamless data sharing (BSI, 2019).

Provide Cloud-Based Solutions: Cloud-based construction management software(s) offers real-time access to project data and enables collaborative work. Integration is simplified as multiple users can access and update information from various locations (Alarcon, 2016).

Invest in Training and Education: Training project teams and stakeholders on how to effectively use and integrate construction management software(s) is critical. Proper education ensures that everyone understands the software’s capabilities and benefits (Ribeiro, 2019).

Promote a Collaborative Culture: Foster a culture of collaboration among project stakeholders. Encourage open communication and data sharing to make integration of software tools more effective (Hwang, 2017).

Invest in Change Management: Introducing new software and processes often requires change management efforts. Support and guidance for users during the transition phase can improve the acceptance and integration of construction management software(s).

Data Ownership and Management: Clearly define data ownership and management responsibilities within the project team. Ensure that data input is accurate, and responsibilities for maintaining and updating information are well-defined (Choi, 2019).

Collaborate with Software Providers: Engage with software providers to understand their integration capabilities and roadmaps. Collaborate with providers to ensure their software is aligned with your project's needs and other tools used (Ofori-Boadu, 2018).

Continual Evaluation and Improvement: Regularly evaluate the integration of software tools and seek areas for improvement. Technology evolves, and the construction industry must adapt to take advantage of new opportunities (Alarcon, 2016).

To achieve a greater integration of construction management software(s), it requires a combination of technical, organizational, and cultural measures. Standardization, APIs, and cloud-based solutions play technical roles, while training, collaboration, and change management contribute to a more integrated and efficient use of software tools in the construction industry. The pursuit of integration should be an ongoing process, considering the evolving nature of technology and project requirements.

III. METHODOLOGY

This research work used survey design. This is because it allows detailed information that describe an existing phenomenon to be collected. This study adopted the use of structured questionnaires administered to a selected professional in the construction industry allocated within the selected area. Anambra State is a Nigerian state, located in the southeastern region the country. According to the 2006 census report there are over 5.9 million residents in the state. The state capital is Awka, which is the study area for the research project.
evaluating the benefits of the use of construction management software(s) in building projects. The target population of the study focused on construction professionals within the study area. From available record from their respective state's chapters, the adopted figures include 338 registered: Architects, Structural Engineer, Quantity Surveyor, and Builders. The target population is 338. Using Taro Yamane method to determine the sample size, 138 was adopted. The method of data collection used for the study are the primary and secondary method of data collection. Analysis of the data was done using qualitative analytical techniques such as means while data presentation was in tables.

IV. RESULTS AND DISCUSSIONS

A total of Hundred and Thirty-eight (138) structured questionnaires was prepared and administered to the categories of respondents, Architects, Builders, Structural Engineers, and Quantity Surveyors. Hundred and Twenty-five (125) were returned while Hundred and Twenty-one (121) were found useful. 28.93% of the respondents are Architects, 55.37% of the respondents are Builders, 4.13% of the respondents are Structural Engineers, while 11.57% of the respondents are Quantity Surveyor. This shows that Builders are more involved in the construction industry than other professionals.

4.1 Benefits of using the identified construction management software(s) in the study area.

Respondents indicated the extent of their agreement as regards the benefits accrue from the use of construction management software in building project on a five (5) point scale.

Table 4.1 Respondents perceptions as to the benefits of the use of construction management software(s)

<table>
<thead>
<tr>
<th>Benefits of using construction Management software</th>
<th>Frequency of occurrence</th>
<th>Statistical tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced project planning</td>
<td>80 31 10 0 0</td>
<td>121 554 0.92 4&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Improved communication and scheduling</td>
<td>74 33 6 8 0</td>
<td>121 536 0.89 5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Efficient document management and collaboration</td>
<td>86 30 5 0 0</td>
<td>121 565 0.93 3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Accurate cost estimation and budgeting</td>
<td>94 20 7 0 0</td>
<td>121 571 0.94 2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Visualizing design concepts</td>
<td>98 23 0 0 0</td>
<td>121 582 0.96 1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>Error reduction and clash detection</td>
<td>68 39 11 3 0</td>
<td>121 535 0.88 6&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Streamlined resource allocation</td>
<td>96 23 2 0 0</td>
<td>121 578 0.96 1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>Data-driven decision making</td>
<td>77 41 3 0 0</td>
<td>121 518 0.86 7&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Regulatory compliance</td>
<td>80 41 0 0 0</td>
<td>121 564 0.93 3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Enhanced reporting and documentation</td>
<td>70 37 14 0 0</td>
<td>121 540 0.89 5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

AVERAGE 0.92

Source: Researcher’s field survey, (2024)

Table 4.1 shows that Visualizing design concepts and Streamlined resource allocation ranks top (0.96) with regards to the benefits of using construction management software(s) in the study area; closely followed by Accurate cost estimation and budgeting (0.94) and Efficient document management/Regulatory compliance (0.93). On the other hand, Improved communication and collaboration/ Enhanced reporting and documentation (0.89), Error reduction and clash detection (0.88), and Data-driven decision making (0.86) ranked lowest in the list.
4.2 The measures to adopt for a more integration of the use of construction management software(s) in building project in the study area.

Respondents indicated the extent of their agreement as regards the various challenges accrue from the use of construction management software in construction management project on a five (5) point scale.

Table 4.2 Respondents perceptions as to the measures to adopt for a more integration of the use of construction management software(s)

<table>
<thead>
<tr>
<th>Challenges of using construction Management software</th>
<th>Frequency of occurrence</th>
<th>Statistical tools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Standardized data format</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Use application programming interfaces (APIs)</td>
<td>53</td>
<td>20</td>
</tr>
<tr>
<td>Implement a common data Environment (CDE)</td>
<td>43</td>
<td>23</td>
</tr>
<tr>
<td>Provide cloud-based solutions</td>
<td>77</td>
<td>30</td>
</tr>
<tr>
<td>Invest in Training and Education</td>
<td>97</td>
<td>13</td>
</tr>
<tr>
<td>Promote a collaborative culture</td>
<td>56</td>
<td>36</td>
</tr>
<tr>
<td>Invest in change management</td>
<td>83</td>
<td>30</td>
</tr>
<tr>
<td>Data ownership and management</td>
<td>63</td>
<td>41</td>
</tr>
<tr>
<td>Continual evaluation and improvement</td>
<td>78</td>
<td>28</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>0.87</td>
<td></td>
</tr>
</tbody>
</table>

Source: Researcher’s field survey, (2024)

Table 4.2 shows that Invest in Training and Education ranks top (0.94) with regards to the various measures to adopt for a more integration of the use of construction management software(s) in the study area; closely followed by Invest in change management (0.92) and Provide cloud-based solutions/Continual evaluation and improvement (0.90). On the other hand, promote a collaborative culture (0.83), Standardized data format (0.80), and Implement a common data environment (CDE) (0.77), ranked lowest in the list.

V. CONCLUSION

There are a lot of construction management software(s) being used in different construction site. They include Microsoft project, Building Information Modeling (BIM), and others. From the study, we have found out that; The benefits of the use of construction management software(s) have also been duly highlighted as well (table 4.11) and There is a need for a more integrated use of construction management software(s). Other measure to adopt includes investing in training and education, providing cloud-base solutions, and a continual evaluation and improvement in technologies (table 4.13).

VI. RECOMMENDATION

From the findings and discussions in chapter four, the following recommendations are hereby made:

- The various professional bodies in the construction industry should create awareness of the use of other construction management software and technologies and encourage investing in training and education for its members.
- Standardized data format and providing cloud-base solutions to the use of construction management software(s) should be implemented.

VII. REFERENCES


