International Journal of Research in Engineering, Science and Management
Volume-1, Issue-12, December-2018
www.ijresm.com | ISSN (Online): 2581-5792

Application of Artificial Intelligence in Construction Project Management

S. Venkata Nagendra[1], Nadendla Rafi[2]
[1]*M. Tech. Student, Dept. of Civil Engineering, Global College of Engineering and Technology, Kadapa, India*
[2]*Assistant Professor, Dept. of Civil Engineering, Global College of Engineering and Technology, Kadapa, India*

***Abstract*: Select the best option to manage projects, especially in large construction projects, usually has complex nature and a lot of uncertainty. According to the original references, project management, project management success depends on implementing the three pillars are "Management involvement", "create and streaming systems" and "using the tools". Among these, tools and techniques are directly in areas of expertise engineers and executives. While the other two pillars manager, use indirectly from the outputs of the tools and techniques. For this reason, tools and techniques are key role in the successful implementation of project management. Although the nature of artificial intelligence, include data collection, induction and analysis of experiments, in order to understand the modeling of human intelligence and the use of non-numerical algorithms to solve complex problems. .Thus, the tools in four areas: Project Communications Management, Project Risk Management, Project Procurement Management and Integration Management has many applications. Paper presented with nature library presents The 5 areas of project management. Network applications of artificial intelligence and software used in relation to this domain along with practical has noted examples to compare with traditional methods of construction management.**

***Keywords*: artificial intelligence, construct project management**

1. Introduction

Since the invention of computers or machines, their capability to perform various tasks went on growing exponentially. Humans have developed the power of computer systems in terms of their diverse working domains, their increasing speed, and reducing size with respect to time. A branch of Computer Science named Artificial Intelligence pursues creating the computers or machines as intelligent as human beings.

A. Objectives of the study

The objective of this study is to know about the Artificial Intelligence in depth and gain sufficient knowledge about its applications in construction project management. This study is also to find about the different areas of application of Artificial Intelligence and finding the best area where AI can be applied in construction industry.

2. Literature review

Murat Gunaydın et al. (2003) developed and test a model of cost estimating for the structural systems of reinforced concrete skeleton buildings in the early design phase via the application of artificial neural networks (ANN).

Seyed Hossein et al. (2008) presented application of Artificial Neural Network (ANN) to forecast actual cost of a project based on the earned value management system (EVMS) by selecting some projects randomly based on the standard data set.

KimaGwang-Hee et al. (2004) applied the back-propagation network (BPN) model incorporating genetic algorithms (GAs) to cost estimation. GAs were adopted in the BPN to determine the BPN's parameters and to improve the accuracy of construction cost estimation.

3. Research methodology

The research was done in a manner to capture the feedback from the industry about the understanding, applications areas, usage, feasibility and reliability of artificial intelligence in construction project management. A survey was floated to capture the responses from the respondents. The research was conducted in the following manner

Step 1: Identifying the employees from different companies which implemented AI and also the employees who has experience in construction industry and are willing to implement AI in their organization.

Step 2: Identifying the key application areas of construction project management where Artificial Intelligence can be implemented. Through analysis of literature was done to pick the application areas which were most common and areas which can be best suited for use in construction industry and particularly construction project management.

Following application areas were identified by literature review:

1. Site Layout
2. Planning and Scheduling of Construction Projects
3. Cost and Duration estimate of Construction Projects
4. Contracts Management
5. Traffic and Accident Management
6. Valuation of Structures in Real Estate Sector
7. Logistics Management
8. Safety Management
9. Demand Forecasting

10. Alignment Selection of Construction Projects
11. Integration with BIM

Step 3: Identifying Different Logics or Technologies that is used in implementing AI. Each research that was reviewed in literature review have used different logics\technologies for implementing AI in the research. Hence capturing those logics\technologies was one of the essential part of the review.

Following Logics\Technologies were identified as per literature review:

1. Fuzzy logic systems
2. Natural language processing
3. Expert systems
4. Robotics
5. Neural networks

Step 4: A survey was conducted to capture the industry response for the identified findings of the literature review for role of AI in construction project management. The survey was floated to the identified respondent. The survey questionnaire consisted of 3 parts.

Fig. 1. Survey questionnaire parts

Part 1: General information about the respondents was asked. Knowledge and awareness of respondent about Artificial Intelligence was also checked in part 1 of the questionnaire. Following data were captured,

1) Organisation implementing AI
2) Logics/Technology used in implementing AI
3) Hinderance of implementing AI

Part 2: Application Areas of construction project management areas to find out which is the best area where AI would be most feasible and effective based on the expertise and knowledge of respondents.

Survey was designed on five points- likert scale ranging from least feasible to most feasible.

1	2	3	4	5
Least Feasible	Likely Feasible	Moderately Feasible	Feasible	Most Feasible

Part 3: Organizational impacts of AI was captured in the Part-3.

Whether implementation of AI will bring changes with respect to time, quality of work, productivity, cost and competitive advantage to the organization.

Step 5: Analysis of the responses was obtained from the survey.

Step 6: Results, conclusion, limitations and future scope of study was identified from this study.

4. Data analysis and findings

The survey was conducted across various respondents from different sectors of construction industry. The respondents include academicians, civil engineers, project managers, architects, interior designers among others from different domains.

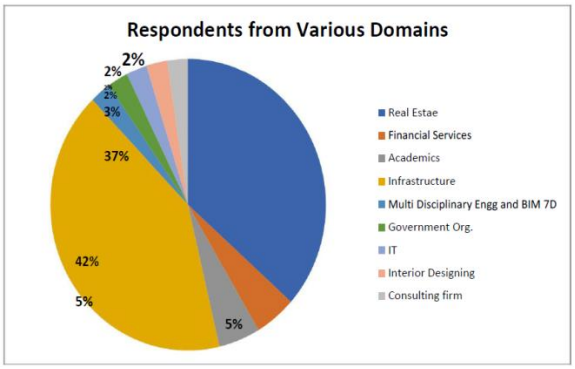

Fig. 2. Breakup of respondents from various domains

A. Results of the application areas of AI in Construction Project Management

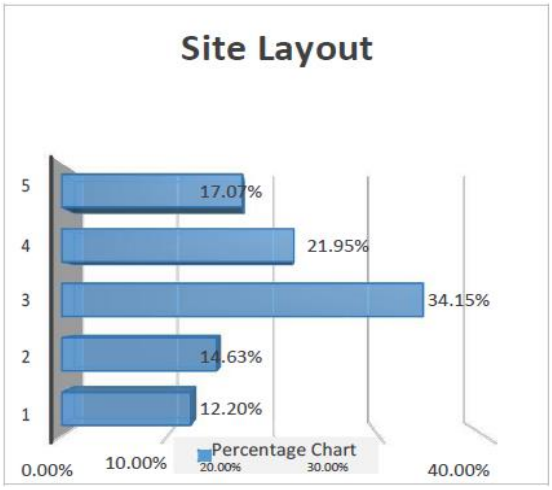

Fig. 3. Site layout results

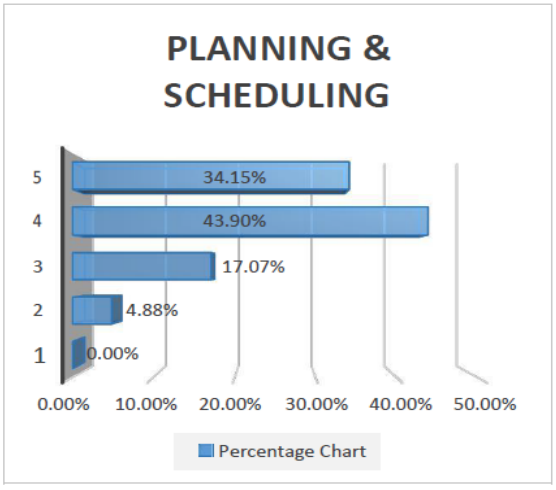

Fig. 4. Planning and scheduling results

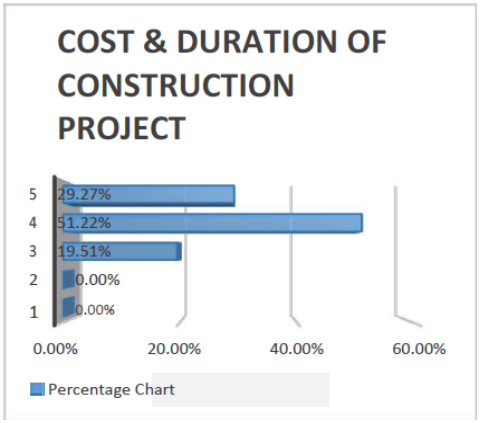

Fig. 5. Cost and duration results

Fig. 6. Contracts management results

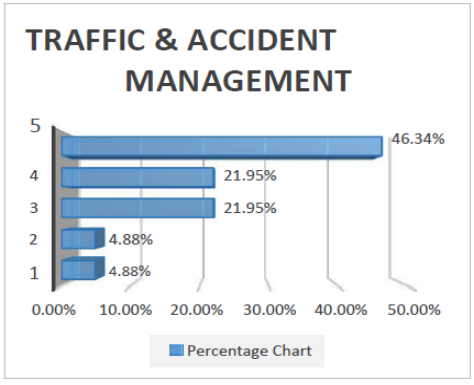

Fig. 7. Traffic and accident management

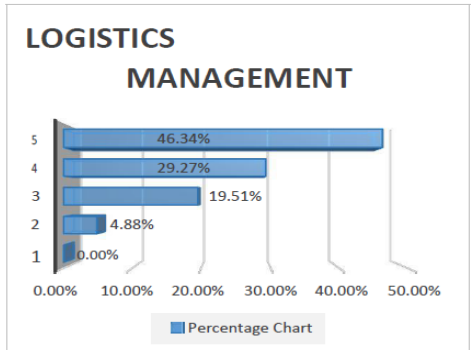

Fig. 8. Logistics management results

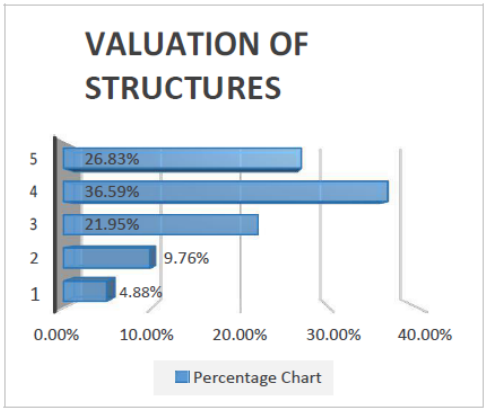

Fig. 9. Valuation of structures results

Fig. 10. Safety Management results

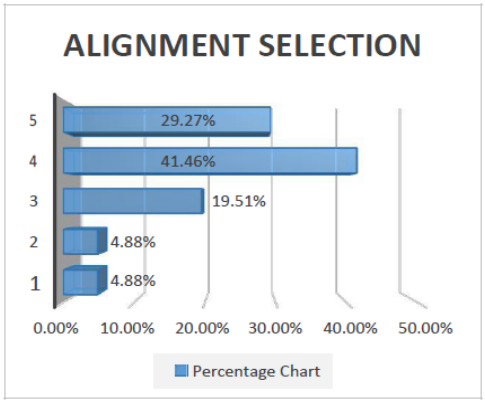

Fig. 11. Alignment selection

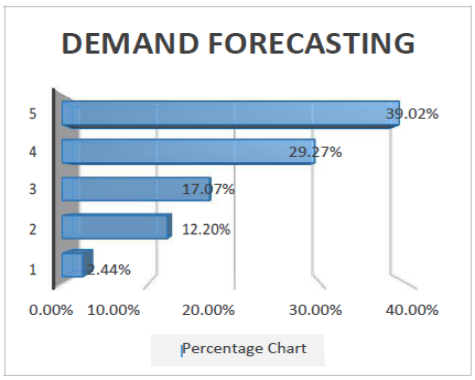

Fig. 12. Demand forecasting results

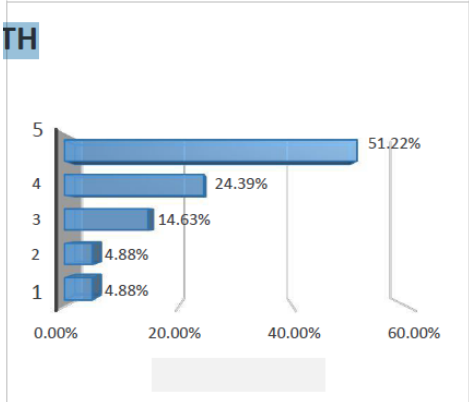

Fig. 13. Integration with BIM

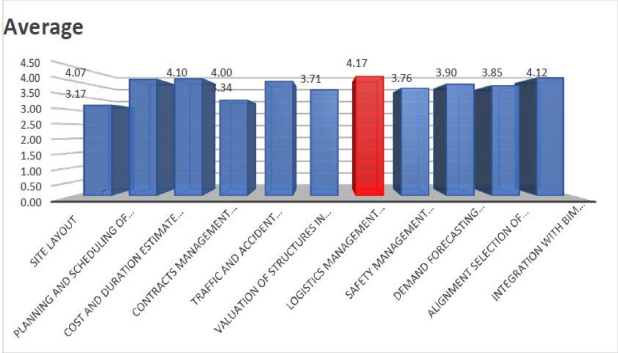

Fig. 14. Average

Table 1
Most feasible area of application

Organizational impact of AI implementation	% of respondent selecting scale 3 to 5	Average Score
Competitive advantage of implementation of AI in organization	95.12 %	3.93
Time effectiveness of implementation of AI in organization	95.12 %	4.07
Cost effectiveness of implementation of AI in organization	82.96 %	3.58
Quality assurance of implementation of AI	97.56 %	4.07

B. Result of organizational impact

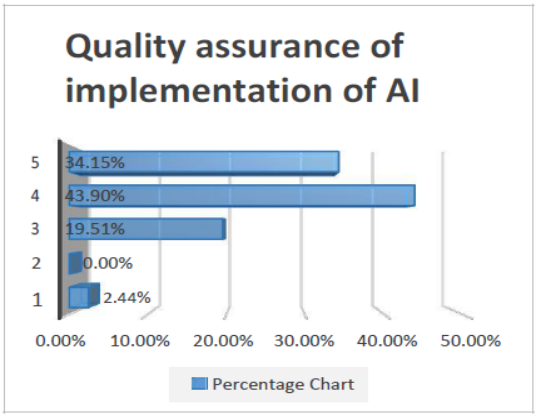

Fig. 15. Quality assurance of implementation of AI

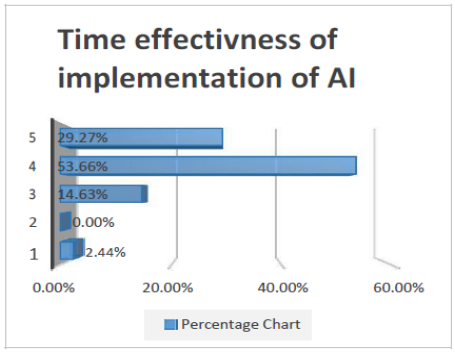

Fig. 16. Time effectiveness of implementation of AI

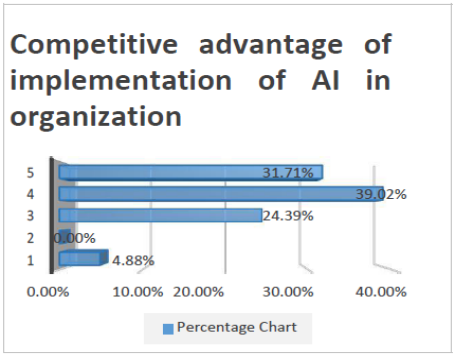

Fig. 17. Competitive advantage of implementation

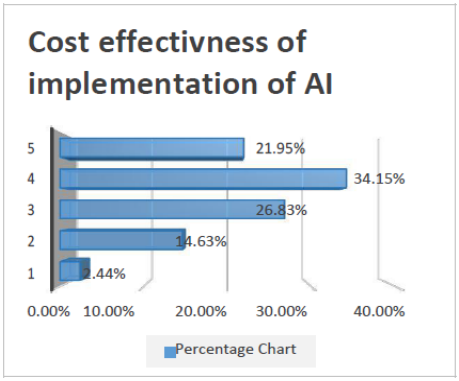

Fig. 18. Cost effectiveness of implementation of AI

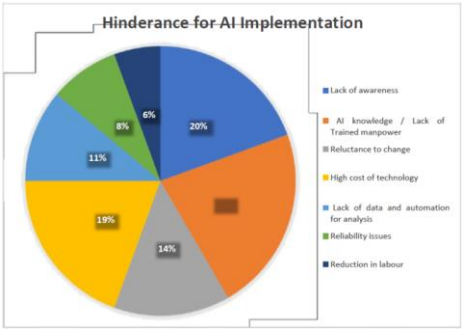

Fig. 19. Hindrances found in implementing AI in organizations

5. Conclusion

According to the research it has been found that with the proper infrastructure AI can be successfully implemented in the

Construction Project Management. Implementation of AI would bring Competitive Advantage to the Organization. AI can also reduce the time and cost of the projects along with the Quality Assurance. The survey revealed that quality assurance and time effectiveness will be the most likely impact on organization implementing AI. Following areas has been found as the best suited for the application of AI – Logistics Management, Integration with BIM and Cost and Duration Estimation of Projects.

References

[1] Nie-Jia Yau, and Jyh-Bin Yang, "Case-Based Reasoning in Construction Management", Computer-Aided Civil and Infrastructure Engineering, 1998.

[2] Remon Fayek Aziz, Sherif Mohamed Hafez, and Yasser Ragab Abuel-Magd "Smart optimization for mega construction projects using artificial intelligence", Alexandria Engineering Journal, 2014.

[3] Megha Jaina, and K. K. Pathak, "Applications of Artificial Neural Network in Construction Engineering and Management-A Review", International Journal of Engineering Technology, Management and Applied Sciences, vol. 2, no. 3, 2014.

[4] Gunaydın H. Murat, Zeynep Do S. gan, "A neural network approach for early cost estimation of structural systems of buildings" International Journal of Project Management vol. 22, pp. 595–602, 2004.

[5] Seyed Hossein Iranmanesh, and Mansoureh Zarezadeh, "Application of Artificial Neural Network to Forecast Actual Cost of a Project to Improve Earned Value Management System "World Academy of Science, Engineering and Technology 2008, pp. 210-213.

[6] Kima Gwang-Hee, Yoona Jie-Eon; Sung-Hoon Ana, Chob, Hun-Hee" Neural network model incorporating a genetic algorithm in estimating construction costs" Building and Environment vol. 39, 2004, pp. 1333 – 1340.

[7] Cheung, Sai On, Wong, Peter ShekPui, Fung, Ada S. Y., and Coffey, Vaughan, "Predicting project performance through neural networks." International Journal of Project Management, 24(3), 2006 207-215.