

Study of Barriers in Implementing ICT in Indian Construction Industry

Monali Bartake, Dr. Y.S. Patil, R.M. Swamy

Department of Civil Engineering, Shivajirao S. Jondhale College of Engineering & Technology, Maharashtra, India

Abstract: Information Communication Technology (ICT) has influenced present construction industry in the way of familiarising and implementing newly developed ICT tools with the latest technology. If we see the current scenario of India, it is observed that, there is reasonable level of awareness about the potential benefits of ICT in the construction industry. However, present ICT implementation in most firms is still quite slow, ingenuous and the advanced ICT applications are lacking in most of these firms. This paper aims to study the factors that affect ICT implementation through three different perspectives, viz., Participant, Organisation and Industry. This paper discusses the elements of the barriers in ICT by studying literature review in respect to Indian construction industry. A questionnaire survey was conducted online and through this quantitative data analysis of different barriers affecting the implementation of ICT were studied. The result of this analysis includes identification of the main issues that require to be addressed at the three levels of perspectives.

Keywords: ICT, Construction Industry, Construction Project, Information Technology, India, ICT barriers, ICT utilization, Automation

I. INTRODUCTION

The present Indian real estate market, as per industry estimate is around USD 78.5 Billion in 2013 and predicted to grow further. Traditional construction management approaches have been criticised for not improving construction productivity. Most of the construction projects involve different phases from conception till completion. Each phase demands effective communication, latest knowledge and effective co-ordination. Due to the varied nature of this industry, variation of expertise, professional skills, specialities, education backgrounds, working environment and computer literacy becomes a challenge in implementing information management and communication of the project team. The field of construction involves three major factors driving the project process namely, collaboration, communication and information. In addition to construction, architecture also seems to have many benefits from the use of IT (LiH, 1996). Looking at the rapid progress of IT in the industry, investment in IT is likely to increase in the near future.

ICT is the most strategic and effective management tool used to enhance the productivity and competitiveness in the construction project. One of the agenda to use ICT in construction is to improvise information transfer and communication among the project participants or team

members involved in the process from conception till conclusion (Luiten GT, 1997).

II. LITERATURE REVIEW

The beginning of ICT development has been both beneficial and detrimental. According to the survey of Rivard (H, 2000), ICT implementations have raised productivity in many construction businesses and particularly in design, administration, project management. However, the advantages of ICT come at a cost, as the construction field comes with complexity of work, the proportion of new operations, the administrative needs and the business cost. In the face of these challenges however, there are several factors indicating that the nature of the Construction industry is changing (ÇİFTÇİ, 2005). In order to achieve effective project management and implementation many levels need to be studied from the perspective of ICT implementation.

Hewage et al. (2008) believed that the Construction Industry lacks behind other industries in its satisfactory execution and use of modern ICT technology. The previous studies shows that many construction organisations have failed to meet ICT investment expectations. ICT implementation was known as one of the perilous processes of project management. It was discussed that implementation involves several uncertain matters relating to people, technology and organisation, which makes ICT implementation difficult. Addition to it, continuous industry changes and ICT developments presents the construction profession with many threats, challenges and unknown opportunities. Lack of understanding of how the effective implementation of ICT can be done into a construction sector is a substantial research gap. To see this problem, this research attempts to understand various thoughts in implementation process at different levels of construction project.

Corporate culture can be a key barrier of ICT implementation. As stated by Young & Davis, if ICT applications do not fit with users/group culture, the implementation or adoption could be problematic (Young and Davis, 2001). According to study done by Ahuja on Indian Construction industry especially SMEs, construction professionals are still opting personal meetings over teleconferences and other e-meeting solutions for managing building construction projects. He said, "IT infrastructure at project sites and IT capability of site staff is an important factor and needs improvement in Indian construction industry" requires action at the organization level

(Ahuja, 2009). High cost of initial investment associated with systems. Hence the fear of over-investment in technology. Some regulatory issues like legal, financial, tax, etc. are many times unclear to participants resulting in deemed 'major restrictions'.

Previous studies by the Tavistock Institute (1964) have already suggested that collaboration between the social and technical system is needed in organizations to overcome difficulties in ICT implementation (Tavistock Institute of Human Relations, 1964).

This study finds the factors affecting ICT implementation process and suggests few effective strategies to overcome this hurdles.

III. RESEARCH METHODOLOGY

The key objective of this research is to focus and highlight the factors affecting ICT implementation in Indian construction industry. The study is in relation to company's inclination towards ICT innovations by employing digital skills, upgrading technologies and ICT project management techniques. Further, the research intends to display Indian construction sector's inclination towards modernization not only for surviving in the fierce market but to utilize current ICT tools to improve product quality, enhance efficiency and in turn boost Indian economy and stand strong in a global markets. Furthermore, this research also showcases and studies how the construction companies identify the behavioural pattern of Indian employee class and encourage and manage the process of actual ICT implementation in Indian construction industry.

The research methodology used in the study uses secondary data to study the preceding conclusions as well as historical studies. The sources used are various research papers and website links. The factors affecting implementation of ICT were identified from three main areas of construction industry: Participant Perspective, Organisational Perspective and Industrial Perspective. Followed by the gathering of primary data from the source itself that is by questioning participants of construction industry, by use of Likert scale based questions which are both qualitative and quantitative in nature. Some of the factors could be measure quantitatively, but some factors like employee mind-set require qualitative assessment and therefore this study falls in the category of mixed -methodology. The answers obtained were analysed using SPSS which builds predictive models (IBM, 2018). SPSS generates and conduct statistics using complex algorithms and integration function's giving simple results which help researchers to produce and helps derive an improved version of conclusion.

IV. QUESTIONNAIRE SURVEY

To fulfil the objective of the study in identifying the barriers of implementing ICT at various levels, only architects, engineers, administrators and contractors of firms were invited for the survey. Study collected 103 responses, out of

which 41 were incomplete & 62 responses were complete and for few questions some preferred to abstain from answering. The survey had 23 questions, two (2) of them being demographic questions. The questionnaire is broadly categorized into three main sections, participant perspective, organisation perspective and industry perspective apart from initial demographic section.

Participant's perceptive section serves to know participants area of work and understand their point-of-view for implementation of ICT in this industry. The outline of Organisation perspective section is to get a brief idea on accessibility, limitations, and problems in using, training, investment issues, literacy level, benefits, etc. in terms of organisation perspective in the construction industry of India. The Industry Perspective section was to get a general idea of government policies, whether they are supportive for construction industry for implementation of ICT. In addition, the willingness of the people to adapt the latest ICT technology and the existing knowledge base of the people from construction industry is arbitrated. Construction industry stakeholders are also questioned to check whether existing technology is sufficiently supportive or there is scope for innovation in this field.

V. RESULT ANALYSIS AND DISCUSSION

Data based information collected from the survey describes the current scenario of ICT implementation in India is described in three general categories as: (1) Participant, (2) Organisation and (3) Industry. As it was stated earlier, this paper discusses the use and implementation issues of ICT in construction industry. The data analysis revealed that Indian construction firms try to put much efforts on enhancing the efficiency of their administrative activities by implementing different ICT features despite many hurdles in adoptions.

1) Participant's Analysis:

Table 1 Participant's point of view regarding ICT use

Drivers	Mean	Standard Deviation
Increased use of ICT Tools	3.30	1.38
Is ICT tools beneficial	2.89	1.42
Workforce satisfaction using ICT	2.99	1.36
Communicating using ICT	2.89	1.55

Table 1 shows the result in perspective of persons in construction industry. It is observed that ICT is preferred in today's construction industry due its benefits and that the use of ICT is increased. Participants are satisfied using ICT tools and this helps them in easier communication within the organisation.

2) Organisation's Analysis:

Table 2 Organisation's point of view regarding hurdles in ICT implementation

Drivers	Mean	Standard Deviation
Prefer to store information electronically	2.09	1.19
Training as a major barrier in implementation of ICT	2.94	1.45
Literacy level of ICT in the company	3.09	1.07
People reluctant to adapt ICT	3.56	1.75
Data Security Concern with ICT	3.27	1.19
Problem with rapid ICT Software up-gradation	3.27	1.19
Low investment in ICT	3.25	1.07

Table 2 determines the most important factors affecting the ICT implementation from organisation's perspective. It was observed that though participants agreed with the importance of ICT, organisation were having many obstacles while implementation. The main reason being employee's reluctance to get familiarize with ICT. Followed by data security concerns, need for continuous software updates, lack of funds, lack of training, etc.

3) Industry's Analysis:

Table 3 Industry's point of view regarding hurdles in ICT implementation

Drivers	Mean	Standard Deviation
Political policies by government	3.14	1.58
People's willingness to adapt ICT	2.65	1.08
Lack of IT manpower	2.75	1.05
Innovation in ICT	2.07	1.39

The result from industry's perspective shows that the main barrier of implementing ICT is political policies led by government of India. Apart from other barriers, the most sought after hurdles were that people are less willing to accept ICT in day-to-day activities. Further lack of skilled IT manpower limits the use of ICT in industry. Innovation though important for ICT, industry preferred this as the lowest factor from the above.

VI. CONCLUSION

Findings of the study reveals that major ICT related works from participant's point-of-view is still not as advanced as required and there is lot more scope to motivate people for complete usage of technology within the construction firms to ease their own work. The study shows that firms are still reluctant in investing fully into ICT tools. Those handful of firms implementing tools are also seen upgrading and maintaining the technology on regular basis. This study analysed that from stakeholder's point of view, ICT usage in construction is increased and is quite better than last ten years.

And also feel that current political policies are quite favourable but still need to improvise for effective implementation of ICT in this industry. It is observed that industry perspective is changing and many are willing to adapt this new technology and are eager to use the tools but reforms are to be made to motivate to use it often by giving proper training. Nonetheless, many feel that IT manpower is not still up to the mark in Indian construction, and that it needs to get improved to make efficient use of IT tools. Lastly, the study also highlights the need for innovation in ICT for this booming sector.

The future research can be focused on identifying strategies to overcome the barriers in ICT usage in construction industry by studying diverse case studies. The issues can be considered in several groups like cultural matters, training, infrastructure, regulations, financial issues and the common standard of ICT adoption amongst the firms.

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