

Chapter 58

Influencers for Adoption of Robots in Indian Construction Industry: An Empirical Study

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ABSTRACT

Robots are developed for various construction processes and used in countries such as the USA, Japan and China. However, their adoption in India is very limited due to weaknesses in the construction sector. The Indian construction industry is poised to grow at a faster rate due to planned investment. Robots will benefit construction industry by way of better productivity, quality, timely completion, etc. resulting in the growth of construction industry. This paper identifies the structure of influencers of adoption of robots in the Indian infrastructure construction sector using exploratory factor analysis. This structure was validated using confirmatory factor analysis. A total of 20 influencers are identified and grouped in eight factors. Based on these influencers, strategies are recommended to enhance adoption of robots in Indian infrastructure construction industry. Finally the authors identify the influencers that are common to India and other countries in Asia, America, Europe and Australia.

INTRODUCTION

The construction industry in India may be broadly classified into infrastructure construction and real estate or building construction. The planned outlay for the Infrastructure, construction industry in India is estimated at about US \$ 1 trillion by 2017. To achieve this target, the construction industry needs to address its weaknesses such as shortage of labour (Wu, 1996; National skill Development Corporation, 2010), technological stagnancy, fragmentation, slow speed and high cost (Jones and Saad, 2003). The

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Construction sector is also labour intensive (Hsiao, 1994; Rajgor and Pitroda, 2013) and dangerous (Rajgor and Pitroda, 2013). Some of the weaknesses may be overcome by the use of robots. (Mukherjee and Shori, 2008) have reported that construction projects in India are becoming complex, thereby requiring sophistication in project design and execution. Robots may help achieve the sophistication in the design as well as the execution of projects. Adoption of robots in the countries such as US, Japan and China is much higher than that in India (ILO, 2001) suggesting that there is a potential for better penetration of robots.

Adoption is defined differently by different scholars. (Rogers, 1962) considers adoption as full use of innovation. (Sarosa, 2007) considers adoption as the physical acquisition of technical artefacts. For our study, we consider adoption as using new technology at three levels: the organizational level, the group level; and the individual level (Zaltman et. al., 1973; Mark and Poltrock, 2004; Jain and Phadtare, 2013). In this paper, we identify different influencers of adoption of robots in the Indian infrastructure construction industry and also suggest strategies to facilitate early adoption of robots. We used the survey technique to collect primary data. Respondents include personnel at different hierarchical levels working for different infrastructure construction firms. These personnel represent the three levels at which adoption takes place – firm level, group level and individual level. A structured, closed-ended and undisguised questionnaire was used for data collection. We analysed the data using exploratory factor analysis (EFA), ANOVA and confirmatory factor analysis (CFA). EFA extracted the structure of the influencers of adoption of robots and CFA was used to validate the same. We then ranked the influencers on the basis of average rating. ANOVA was conducted to see if the three respondent groups - Chief Executive Officer (CEO), Project Managers (PM) and Users differ significantly from each other in rating the influencers. We specify on the basis of influencers, the role that can be played by sellers of robots, construction firms, consulting firms and the government in enhancing the adoption of robots. We have finally identified the influencers of adoption that are common in India, Taiwan, Japan, Malaysia, US, Australia, England and France. The paper is divided into four parts. The first part contains the literature review. The second part contains the detailed research method. The third part contains the data analysis and discussion. The last part contains conclusions and limitations.

LITERATURE REVIEW

The extant literature was reviewed and classified into four themes. The first theme reviewed the reasons for the low adoption of robots in the construction industry. The second theme reviewed the various applications of robots and the geographical areas in which they are used. The third theme reviewed the facilitators of adoption of robots and the last theme dealt with the influencers for the enhancing the use of robots.

Moderators of Adoption of Robots in Construction Industry

Construction technology consists of two types of workflows - steady flow and turbulent flow. Production of components for construction is a part of steady flow, which allows mass or continuous production approach. However, construction comprises of turbulent flow, which requires unit production. (Chang, and Lee, 2004) claim that jumbled construction job site, vague customer needs and frequent changes by the customers during the execution of the project restrict the standardization of processes. They also

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