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Barriers to implementation of Building Information Modelling- A global perspective

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Abstract - *The construction industry is undergoing a rapid change.Many new technologies like 3D printing are slowly making their way into the construction ecosystem. BIM is one of the many new technologies being adopted by the bleeding edge of construction industry. Even though there are tangible and proven benefits for the adoption of BIM, there are still considerable number of barriers to the adoption of this technology. Here a comprehensive literature review of the various barriers faced in the adoption of BIM by different countries is carried out. Various studies published by authors around the globe were collected and studied. Data of 18 countries from 5 different continents were collected. The results are presented according to the most prevalent barriers present. Also a study regarding the correlation of the barriers and the economic condition of the country is also studied upon. This will give an idea about the current status of adoption of BIM worldwide and in future will assist in developing an action plan for the further implementation of building information modelling technology.*

Key Words: BIM, Barriers, Building Information Modelling, Survey, Statistical analysis

1. INTRODUCTION

Construction industry is one of the oldest and largest industries of the world (1). However, it has always been slow to adapt to new technologies. This has caused the construction industry to lag behind other industries in terms of productivity or efficiency. While changes in technologies have helped other industries advance in leaps and bounds, it has been a slow ride for the construction industry.

Of the many new technologies, which are being adopted into the construction industry, BIM is perhaps the most famous. Building Information Modelling or BIM is a 3D model based system, which helps in visualizing the project throughout its various phases (2). Computer generated models with precise geometry and the data needed to support the various construction phases are made available through the use of BIM.(3) There seems no question that BIM methodologies are to become the norm in the long term but more factual evidence is required today to provide guidance to industry. Currently BIM is being developed into 4D 5D and 6D taking into consideration the cost, time and the life cycle of a project respectively.

These advantages of BIM has helped it to become industry standard in many countries. Some of the worlds most developed countries are adopting BIM into their infrastructure development plans. In US, since 2006, the general services administration (GSA) has included spatial programme BIMs as part of the minimum requirements for submissions to the Office of Chief Architect for final concept approvals. Since 2012, the UK govt. has mandated that all its government works now make use of BIM. In Asia, Singapore has been actively promoting BIM since 1997(4) almost 80 percent of the construction industry in countries like US, Canada and Denmark are using BIM.

However, even with all these advantages, BIM is still not prevalent in most of the world. The status of BIM adoption in India is only 10 to 18 percent whereas only 29 percent of the Rwandan population actually knows about BIM(5). A plethora of reasons exist for this, which will be discussed further on. But clearly we can see that the Implementation of BIM around the globe is tied to a lot of barriers.

2. Methodology

This study is conducted based on the research of different authors who compiled the various barriers facing the adoption of BIM in their respective countries. A total of 18 countries spread over 5 continents are studied in this study. The various barriers mentioned in various studies are grouped into a group of 17 and their prevalence n the literature is measured. In addition, a study based on the economic conditions of the countries was also conducted. The countries were grouped according to their per capita incomes to better understand how the amount of money reflects upon the distribution of the barriers. The major barriers identified from the literature are given in table 1 The most prevalent barriers among these are then identified and presented. Also an attempt has been made to study how the distribution of wealth affect the prevalence of these barriers in the society. For this the countries were divided into two groups with high and low per-capita incomes and the most prevalent barriers among these were also identified.

Table -1: Identified barriers

Barrier	Code
Lack Of Training/Skilled Personnel	A
Cost of implementation	B
Statutory aspects/Lack of policy	C
Lack of awareness	D
cultural issues/Resistance to change	E
lack of standardization	F
Data ownership Issues/liability issues	G
Lack of technical support	H
Lack of client intrest	I
lack of study on benefits	J
interoperability issues	K
software issues	L
Lack of educational Support	M
lack of support from senior management	N
Reluctance of other stakeholders	O
Requires changes in workflow	P
BIM feels redundant	Q
Lack of internet connectivity	R

3. Results and discussions

The most prevalent barriers to the implementation of BIM among all the countries are as follows

3.1 Global Barriers

Lack Of Training/Skilled Personnel

Given that BIM is a new technology, fewer experts are available in the field. This might cause firms looking to adopt BIM to postpone their plan until they can provide adequate training to their employees. But in a hectic field like the construction industry, this training might never come and the firm might never transition into BIM

Cost of implementation

This is another one of the most important barriers in BIM implementation. The high initial cost of BIM implementation might be a deal breaker to most. But research have shown that(6) BIM provides adequate return of investment regardless of the project size.

Statutory aspects/Lack of policy

A lack of action from the part of the government is another of the reasons why the use of BIM is not as prevalent as it should. Even as the developed countries of the world such as the US, UK and Singapore are making BIM mandatory, other countries are still reluctant to follow suite.

Table -2a: Low income countries
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Table -2b: Low income countries**Error! Not a valid link.Error! Not a valid link.**
Table -3a: High income countries
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3.2 Barriers in low-income countries

Statutory aspects/Lack of policy

In developing countries, industries are generally reliant upon government subsidies to implement novel changes. Without this, the firms might not have enough finances to cover a cost intensive transition. This might be the reason why the most prevalent barrier against the implementation of BIM in developing countries is the lack of government acts.

Lack of awareness

In countries with lower level of income, it is harder for the general populace to have an idea of the changes occurring in the technological space. This might have caused the lower awareness among them about the uses and benefits of BIM.

Table -3b: High income countries
Error! Not a valid link.
Error! Not a valid link.3.2 Barriers in high-income countries

Cost of implementation

Surprisingly, the most prevalent barrier in high-income countries is the high investment required. This might be due to the absence of other prevalent barriers in such economies where the use of BIM has already matured past a point.

Cultural issues/Resistance to change

Construction industry is one of the oldest industries. In high-income countries where the construction firms are old and have a legacy, these firms might have a hard time switching their tried and tested methods. This transition might be easier for the up and coming industries of the developing world

4. CONCLUSIONS

The state of adoption of BIM in the global community is still nowhere near a satisfactory level. The major reasons for this

is the lack of skilled labor. It is high time that BIM be included in university curriculums to take advantage of this vacuum of skilled hands. A lack of government incentives is also a major barrier in the implementation of BIM. Especially in developing countries, an apathetic attitude from the government can often mean stagnation and diminishing returns. Another factor that contributes as a barrier is the high setting up cost of BIM. The cost of the hardware and software required for a transition into BIM is often too much for small or medium scale firms. A government intervention would be helpful in this regard also. The single most important step to take regarding the speeding up of BIM adoption would be to provide adequate awareness among the industry about the benefits and uses of BIM with respect to the contemporary methods. Only with awareness can we expedite the transition to novel technologies faster and more efficient

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