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Analysis of the BIM technology status and the development strategy in Korea

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Abstract: BIM could be used for integrating project information through life cycle of building facilities. Also it could improve the accuracy and work efficiency through data interoperability with other disciplines. However, these benefits from adopting BIM could not be attained easily in real project cases. In order to make the most use of BIM and get the maximum benefits from it, the environments such as standards, guidelines and the related technologies are also could be supported. Therefore many countries are developing or already developed the technology roadmap for BIM. In this study, we tried to analyze the BIM technology status and develop the strategy for improve usability of BIM in Korea.

Keywords: BIM, Technology development strategy, Status, Korea

I. Introduction

Even though BIM has been widely applied in many construction projects, it has not been used effectively due to several reasons. To increase the effectiveness of BIM, systematic BIM processes and universal BIM standards must be developed. Moreover, BIM must be aligned with other emerging technologies such as automation and VR/AR technologies. This study reviews the status of current BIM uses, identifies BIM-based technologies, analyzes the importance of each BIM-based technology, and prioritizes them for better BIM use.

II. Research Methodology

In this study, we identified and classified necessary BIM-based technologies at each stage of the lifecycle of construction projects and compared the level of domestic BIM-based technologies with the ones of overseas BIM-based technologies. In addition, we analyzed the importance of each BIM-based technology and identified priorities of technology development to increase the effectiveness of BIM. To evaluate the importance and priorities of each technology, we conducted surveys with BIM professionals in the AEC industry.

III. BIM Technology Differences in Domestic vs. Overseas

Regarding major BIM-based technologies and technologies, a total of 119 technologies and technologies were identified and categorized into six areas as shown in Table 1.

Table 1. BIM Technologies In Need for Development

Category	Technology Group	BIM Technologies
Planning and Delivery Standard	Project Design	Schematic Design, Economic Analysis, Risk Management, etc. (10)
	Standard/Guideline of Project Delivery	BIM Service Delivery Guideline, Modeling Guideline, Standard Classification, etc. (11)
Architecture Design and Planning	Design & Planning	Site Analysis, Mass Design, Space & Program Analysis, etc. (6)
	Drawing/Model Production	Architecture, Structure, MEP Model and Drawing Production, etc. (10)
	Engineering	Energy Design/Simulation, LEED, Structure Design/Analysis, Shop Drawing Production, etc. (16)
Construction Management	Construction Planning	Constructability Analysis, Material Order, Site Planning, etc. (10)
	Construction Management	Scheduling and Control, Cost Management, Quality Management, etc. (13)
Facility Management		As-Built Model Production and Management, Material Information Management, BEMS, etc. (12)
Collaboration Management	Collaboration System	Integrated Database, Cloud System, BIM Library Management, etc. (9)
	Interface	IFC Exchange, Structure, MEP, Schedule/Cost, GIS Data Interface, etc. (9)
High-tech Application	Visualization	VR/AR, Model Viewer, Model Query, 3D Printing, etc. (6)
	Automation	Outdoor/Indoor Position Tracking, Identification Automation, Equipment Automation, etc. (5)

Fig. 1 illustrates the results of our survey on the difference in the level of domestic vs. overseas BIM-based technologies. In general, the level of domestic BIM-based technologies is lower than the level of overseas BIM-based technologies. The total average value of domestic technologies is 1.99 out of 5 and the one of overseas technologies is 3.19 out of 5. As shown in Figure 1, Planning and Delivery Standards presents the biggest gap between domestic and overseas BIM technology levels. Their numeric difference is 1.41. In other words, Planning and Delivery Standards are the weakest area in domestic BIM use cases.

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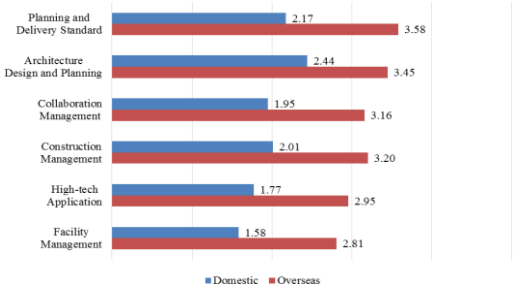

FIG 1. GAP IN DOMESTIC VS. OVERSEAS BIM TECHNOLOGIES

III. SIGNIFICANCE ANALYSIS OF BIM-BASED TECHNOLOGIES

We analyzed the importance of BIM-based technologies according to the three evaluation criteria: (1) market demand, (2) priorities, and (3) technology development possibility. The results of this analysis present 46.3% of market demand, 30% of priorities, and 23.8% of technology development possibility. According to the results of our study, the most significant BIM-based technology is Collaboration Management (average 3.9 out of 5.0). Relatively, the least significant areas are Planning and Delivery Standard, Construction Management, and High-Tech Application. These areas' average values are all 3.36 out of 5.0. Fig. 2 shows more detailed information.

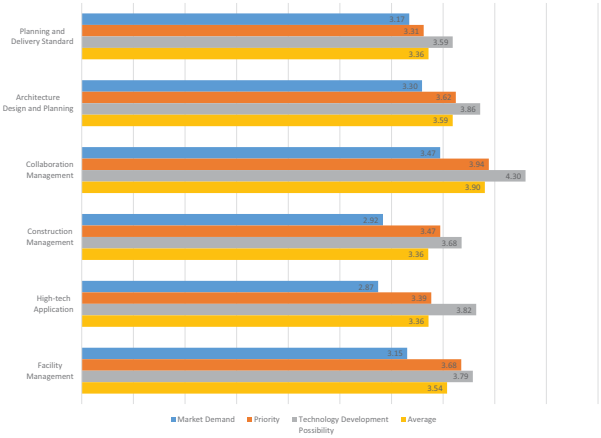

FIG. 2 IMPORTANCE FACTOR ANALYSIS FOR BIM TECHNOLOGY DEVELOPMENT

IV. ANALYSIS OF PRIORITIES FOR DEVELOPING BIM-BASED TECHNOLOGIES

To prioritize development-needing BIM-based technologies, we first divided the entire process of the technology development into three phases: (1) establishing BIM-utilizing environments, (2) utilizing BIM practically in projects, and (3) adopting emerging technologies into BIM. Then, we investigated "in which phase each of the technologies is more appropriate", using a 5 point Likert scale. The index of the phases and priorities were determined by the following formula:

$$P_{score} = \frac{I_{urgency}}{I_{PHASE}}$$

Fig. 3 shows the distributions of the phases and priorities for BIM-based technologies. The highest-ranked BIM technologies are BIM Guideline for Project Delivery, Standard Classification, and BIM Model/Data Submittal Guideline. The lowest-ranked technologies are BIM-based Position Tracking, BIM-based Asset Management, and Model Query Language as shown in Figure 3.

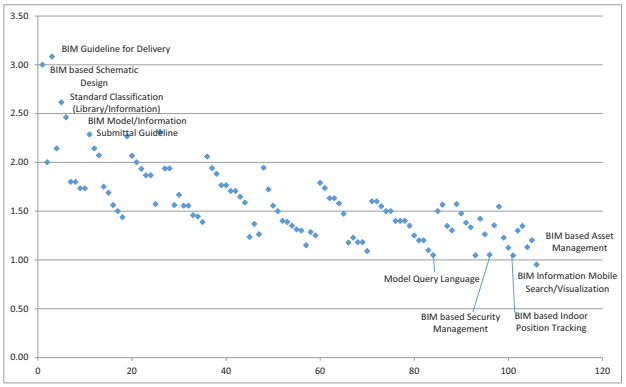

FIG. 3 PRIORITY ANALYSIS FOR THE BIM-BASED TECHNOLOGIES TO BE DEVELOPED

V. CONCLUSION

To use BIM more efficiently, we need to develop an infrastructure for BIM process and BIM should also be aligned with other emerging technologies. The level of domestic infrastructure for BIM process is not sufficient, compared to the one of overseas infrastructure. BIM technologies and standards are also not enough. To overcome these issues, BIM development strategies must be established at the government level.

This study identified BIM-based technologies necessary for better BIM uses and analyzed and prioritized them based on their significance. Furthermore, this study confirmed that guidelines for BIM projects and BIM standards associated with BIM contracts must be developed. Finally, integrated BIM management and technology for BIM automation are also necessary for better BIM uses in the construction industry.

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