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Project Report

A Study on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

Submit to:	The Hong Kong Institution of Surveyors (Property and Facility Management Division)
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1. Introduction

1.1 Background of the Study

With the advancement of information technology, the use of building information modelling (BIM) has been increasingly promoted across the globe. In Hong Kong, however, the uptake of BIM in the building industry remains sluggish. Whereas the trend of using BIM in building design and construction in Hong Kong has started to develop, the Property and Facility Management Division of the Hong Kong Institution of Surveyors (HKIS-PFMD) noted the limited implementation of BIM in the property/facility management (PFM) industry. In order to investigate what are the main hindrances to the use of BIM by the PFM practitioners and what are the feasible means that can circumvent the hindrances, a study, with its objectives and associated particulars outlined below, is proposed

Commissioned by HKIS-PFMD, the PolyU Technology and Consultancy Company Limited (PTeC), with Dr. Joseph Lai being the Principal Investigator, conducted a project titled "A Study on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong" over a period of 6 months. This report covers the works done for the project and the findings obtained.

1.2 Objectives and scope of work

The study bears the following objectives:

a. To identify the barriers to, and enablers for, the use of BIM by property/facility management practitioners in Hong Kong

b. To provide recommendations for the way forward in promoting the use of BIM by property/facility management practitioners in Hong Kong

To attain the above objectives, the following works were required:

i. Review literature on the barriers to, and enablers for, the use of BIM;

ii. Review literature on overseas/local successful cases of BIM applications in PFM;

iii. Design a questionnaire survey* for soliciting the opinions of HKIS-PFMD members on the barriers to, and enablers for, the use of BIM;

iv. Analyse the survey data to identify the major barriers and enablers;

v. Provide recommendations for the way forward in promoting the use of BIM by property/facility management practitioners in Hong Kong; and

vi. Hold a CPD event to present the study findings after the completion of the study.

*Note: HKIS-PFMD distributed the survey questionnaire.

2. Method and data

Commenced on 28 June 2019, a number of tasks as indicated in the project programme (Appendix A) were undertaken. At the beginning, a meeting was held between HKIS-PFM and the study team to agree on the particulars of the study (see Appendix B for the meeting agenda and minutes). Then, an extensive literature review was conducted to identify barriers and enablers pertaining to the use of BIM and overseas/local successful cases of BIM applications in PFM. For this purpose, a variety of sources including journal papers, conference articles, and publications of government, professional bodies and BIM software vendors were searched and reviewed.

Grounded on the review findings, a questionnaire was designed for soliciting the opinions of PFM practitioners on the barriers to, and enablers for, the use of BIM. After submitting this questionnaire to HKIS-PFM for comment, the feedback collected was taken to finalize the questionnaire for use in the planned survey. In September 2019, the questionnaire, together with a survey message (Appendix C), was distributed to the members of HKIS. Appendices D and E show the hard-copy and electronic versions of the questionnaire, respectively. The electronic version, accessible via a hyperlink (see Appendix C), was disseminated online.

After two weeks of the launch of the questionnaire survey, the responses were found to be low. Upon consultation with HKIS-PFM, a reminder was sent to encourage the target participants to join the survey and the deadline for completing the questionnaire was extended. In order to boost the survey responses, the committee members of HKIS-PFM also requested those PFM practitioners with whom they are connected to participate in the survey. Eventually, a total of 61 completed questionnaires were returned.

Using the survey data, a series of analyses were conducted, which include working out the demographic statistics of the respondents and the ratings and ranks of the barriers and enablers listed in the questionnaire. Based on the analysis results, recommendations were drawn for the way forward in promoting the use of BIM by property/facility management practitioners in Hong Kong.

3. Findings

3.1 Literature review – BIM barriers and enablers

Through an extensive review of literature including journal papers, conference articles, guidebooks, webpages, and publications from government and professional bodies etc., a wide range of barriers that may hinder the use of (BIM) have been identified. The literature review process, in addition, has resulted in the identification of various enabling measures that can help boost the use of BIM.

The barriers and enablers identified from the literature review were provided to HKIS-PFM on 11 Sep 2019 for review. Upon receiving the comments from HKIS-PFM, revisions were made to incorporate the comments and the list of barriers and enablers was finalized.

While some of the barriers/enablers are pertinent to the design or construction stage of building projects, some property management (PM) or facility management (FM) professionals may be involved in such stages as well as the FM stage of a building. Therefore, those design/construction-related barriers/enablers were included as part of the questions of the survey questionnaire.

The barriers, including their abridged headings, the corresponding descriptions and the associated reference sources, are shown in Tables 1 to 4. For systematic organization, the barriers are grouped into four categories:

- Information and knowledge
- Motivation
- Legal and contractual issues
- Existing culture and practice

Table 1 *BIM barriers (Information and knowledge)*

Barrier	Description
IT infrastructure and software related problem	There is a lack of a common standard and protocol for BIM data interoperability and data management between different disciplines.
Lack of studies / evidence to quantify the value of BIM	There is a lack of local studies to quantify the exact benefits and value of BIM.
No opportunity to use	Tight design schedule and intensive construction period often prevent adoption of BIM in projects.
Limited BIM knowledge of PFM practitioners	PFM practitioners have limited knowledge about the application of BIM.

Table 2 *BIM barriers (Motivation)*

Barrier	Description
Lack of client demand	Adopting BIM incurs the client to pay more professional fees to the design professionals. Private clients will demand BIM in their project design and construction when they realized the benefits of BIM.
Lack of training or education	Although there is a wide range of BIM short courses offered in the market, the quality of these BIM courses varies considerably as no clear BIM guidelines are available for institutions to follow.
Lack of government support	Government support is strongly related to the ambitious of BIM implementation in the construction industry.
Lack of industry support	There is insufficient number of case studies showing the potential financial benefit of BIM, and the industry is generally not interested in investing towards the change in technology.
Lack of commitment from senior management	The senior management displays a hesitancy in implementing BIM on a project because of the lack of knowledge about BIM and its distinctive capabilities in the field of construction industry, where BIM benefits are still misunderstood or not known to those not use it in their works.
Lack of incentives for PFM practitioners	Without sufficient incentives (e.g. performance reward), PFM practitioners will not to do extra work for implementing BIM in building operations.

Table 3 *BIM barriers (Legal and contractual issues)*

Barrier	Description
Lack of legal standards or specification to cope with BIM adoption	There is a lack of relevant contract terms and legal standards that reflect the changes in data ownership, confidential information, risk allocation, and procurement practices that will be affected by the adoption of BIM.
Lack of new or amended form of contract to cope with BIM adoption	Prior to BIM adoption, there is a need to review existing contract provisions as to ensure the responsibilities and risks among contracting parties can be properly reflected.
Difficult to define liability when errors exist in BIM files	If a perceived design error is found in the owner of the building files, contributors of the BIM process will look to each other to try to determine who has responsibility for the matter raised. If disagreement ensues, the lead professional will not only be responsible as a matter of law to the claimant but may have difficulty proving fault with others.

Table 4 *BIM barriers (Existing culture and practice)*

Barrier	Description
Project participants related issues	Project participants may not appreciate the value of collaboration among different parties working on the same project throughout its duration.
Widespread of mistakes and errors produced	BIM's integrated concept blurs the accuracy and control of data entered into the model of which an error will be propagated among stakeholders if a mistake is produced.
Timing issues	Most of construction projects have a tight design schedule and intensive construction period in terms of return on investment philosophy. However, design consultants cannot avoid the uncertainty of design changes according to clients' requests. This not only increases the difficulties for design consultants to reduce time on project documentation, but may also contribute to project delay.
Investment and costing issues	Investment of BIM is strongly related to high-level management commitments as adopting BIM incurs initial investment costs related to management and administrative processes, including staff time, hardware, software and training. With limited choices of BIM software, the cost for software maintenance, update etc. is high.
BIM is new and complicated for use	Adopting BIM is difficult for certain amount of building professionals as they are educated and trained in the conventional 2D CAD environment and do not know much about BIM.
Frequent change in the purpose of building during design stage	The construction industry is known for its conflicts regarding change and mistakes where owners like to change their mindset for the use of the building before the construction work starts. This compresses the time available for design in the project process to mostly inadequate levels, which also leads to numerous changes during the construction phase of the project.
Market issues	BIM requires the collaboration, database integration and commitment of professionals and companies of different disciplines to the use of BIM software, while the participations of such parties throughout a building lifecycle are often fragmented.

Likewise, the enablers identified from the literature review, with the comments from HKIS-PFM incorporated, are listed in Tables 5 to 9, where their abridged headings, the corresponding descriptions and the associated reference sources are also indicated. The enablers fall into five categories:

- Knowledge and Information Sharing
- Support
- Documentation and Practice
- Promotion and Education
- Project Management

Table 5 *BIM enablers (Knowledge and information sharing)*

Enabler	**Description**
Provide key messages and case studies on the benefits of BIM applications	Provide key messages and case studies to explain the benefits of BIM to stakeholders, including the added value of BIM applications in generating revenue or improving operational performance, e.g. customer services, safety, energy efficiency.
Conduct experience sharing sessions/workshops on cases using BIM	Conduct sessions/workshops for sharing the experience of using BIM in real cases, including any successful or unsuccessful one.
Establish data exchange standard and management framework for information sharing	Data exchange and management framework tailored for sharing BIM information are lacking. Appropriate data exchange and management framework should be established for wider use of BIM throughout the project lifecycle.

Table 6 *BIM enablers (Support)*

Enabler	Description
Enable and ensure sufficient digital /software capability and vendor support	Software issues such as trouble shooting, continual updates, etc. are often among the concerns of software users. Measures should be taken to enable and ensure the capability of the relevant software and the corresponding vendors will provide sufficient technical support.
Provide institutional support	Provide institutional support to promote the technology and explain the benefits of BIM to clients and professionals.
Incentive given by government on the use of BIM	Incentives, in monetary or non-monetary terms, should be given by the government to encourage the use of BIM.]
Promote collaboration with senior management support	Promote collaboration among project participants with support given by senior management.
Provide compliant BIM tool	Provide compliant BIM tool to ensure that design standards and construction documents are able to suit current practice and fulfill the needs of facility management and frontline maintenance staff.
Enable integration with other operational systems	To achieve higher efficiency, provisions should be made for integrating BIM applications with other operational systems, e.g. computer-aided facility/asset management system, internet of things (IoT), geographic information system (GIS).

Table 7 *BIM enablers (Documentation and practice)*

Enabler	Description
Define clearly BIM input and output requirements	Define clearly BIM input and output requirements so that all stakeholders can maximize the value of BIM.
Establish standards, specifications and new forms of contracts for wider use of BIM	Standards, specifications and forms of contracts for BIM projects are lacking. Appropriate standards, specifications and new forms of contracts should be established for wider use of BIM throughout the project lifecycle.
Review procurement practices, and contract provisions	Review each discipline's current procurement system, intellectual property rights and contract agreements to enable the cooperative use of BIM among the different parties of a project.
Set up a BIM object library for components in buildings	A building project consists of numerous components, but not all such components are available in BIM software. Therefore, a BIM object library for such components should be set up.
Develop standardized legends for better integration between different disciplines	Different legends may be used by different disciplines to represent the same building component. Therefore, standardized legends should be developed for better integration between different disciplines.

Table 8 *BIM enablers (Promotion and education)*

Enabler	Description
Set up industry-wide body to promote collaboration among project participants	Set up industrywide body to promote collaboration among project participants
Develop initiatives to encourage client and stakeholder participation	Develop initiatives to encourage client and stakeholder participation, e.g. demonstrate the quantitative benefits of adopting BIM and illustrate how BIM can support a project in terms of standards, procurement, collaboration, work processes, benefits and issues, etc.
Provide training and guidance on the use of BIM	Develop the industry's BIM capacity by driving curricular change in building-related and computer science academic programmes, and provide training on the use of BIM to building professionals.
Expedite the industry's capacity and capability	Expedite the industry's capacity and capability for the development of BIM, such as extend BIM training to building-related and computer-science programmes and implement a fast-track BIM training programme for construction professionals.

Table 9 *BIM enablers (Project management)*

Enabler	Description
Appointment of BIM manager	Appointment of BIM manager in the project team for communicating and developing an integration mindset and whole lifecycle systems mindset among project participants.
Adopt a strategic risk management process	Commission a risk assessment for BIM implementation at a project and corporate level. The purpose of the risk assessment is to identify possible risk areas and determine how they can be mitigated individually and collectively to reduce and marginalise potential problems following the adoption of BIM-enabled technologies and collaboration.
Get contractors/FM parties involved in design stage	Traditionally, building contractors and FM parties are seldom involved in the design stage of a building project. This practice should be changed; construction and FM requirements should be sought from building contractors and FM parties during the design process.
Allow enough time in project programme for BIM model development	While building projects in Hong Kong are typically on a fast track, a reasonable time period that is essential for developing the required BIM model should be allowed in the project programme.

3.2 Overseas/local successful cases of BIM applications in PFM

Reportedly, BIM has been increasingly adopted in practice. Notable cases where BIM was used, as presented in the review below, include: a case study on a university in the UK; a successful case of BIM application for a city in Europe; the use of BIM for a luxury hotel in the US; and the case of BIM applications implemented on a government department's headquarters building in Hong Kong. Such cases show how BIM was applied and the key benefits/functions that BIM can provide to facilitate PFM work.

Northumbria University

A case study example of BIM applications in FM is on the campus of the Northumbria University in Newcastle upon Tyne, UK. The campus, made up of 32 buildings, has a total gross floor area of more than 120,000m^2. In 2010, five developers were commissioned by the university to develop BIM models, aiming to improve the performance of space management (Mohamad et al., 2015). At a cost of around £0.33/m^2, the developers used DWG format (for the existing Estates Department's floor plans), scans (original elevations), JPEG format (sections) and excel databases (space information) to complete the models for the project.

The practice of the university was that manual updates were made for the drawings (i.e. floor plans) and relevant information in both DWG format and a database in MS Excel format; photos and scanned drawing sheets of sections and elevations were used to verify specific details. An important result of the study is that by applying BIM, it allows automatic updating of the required schedules and fast production of sections, elevations, 3D visuals etc. in a single integrated environment. The estimated benefits include: reduction of labor (e.g. a full-time CAD technician), cumulative saving from improved efficiencies in future work orders, and easy update of additional information related to statutory compliance (e.g. essential maintenance).

The City of Helsinki

As a renowned BIM software provider presented (GRAPHISOFT, 2019), the City of Helsinki encourages the use of BIM as it enables the city to acquire more and better information on its properties and to maintain them more easily. The City of Helsinki Public Works department has its own Architectural Division with a current staff of 14. The principal part of the Architectural Division's work is commissioned by the city's Real Estate Department, which is responsible for the city-owned buildings and their maintenance.

Renovations and refurbishments are the majority of work carried out by the City of Helsinki Architectural Office. The office staff is pleased with the new ArchiCAD renovation tools. The measurement team led by the modeling engineer also operates in the Architectural Division of the Public Works Department. In their work, the team makes use of laser scanning equipment, which the Architectural Office has found

efficient in the creation of the initial model. The point cloud provides accurate dimensional data, and spaces can be observed in 3D, making it unnecessary even to send a surveyor on-site, as the point cloud provides all the data needed. Sometimes the point cloud gives more accurate data than a tape measure. Yet, opening a point cloud directly in ArchiCAD is so far not feasible, as it will open as thousands of individual objects. The Architectural Division therefore extracts the point cloud data with MicroStation software, where it is manually converted into a model, i.e. the points are utilized to position walls and slabs correctly. The MicroStation model is then exported to ArchiCAD for further processing.

Grand Beach Hotel Surfside in Miami Beach

Also presented on the webpage of GRAPHISOFT (2019) is the case of BIM adoption for the Grand Beach Hotel Surfside. Designed in-house by a team of architects with a goal of LEED Silver, the more than 37,000 square-meter hotel includes two distinct and self-contained 13-story structures, each offering panoramic views and a combined total of nine pools and Jacuzzis, a gym and on-site parking. Every facet of the luxury hotel is facilitated through the streamlined application of BIM tools, technologies and workflows to drive collaboration, communication and community connections.

The Grand Beach Hotel Surfside was scheduled to open in November 2013, one month ahead of original expectations. Because BIM enables maintenance of a building throughout the lifecycle, MB Development would manage the hotel with a dynamic, updated 3D model once the Surfside project is complete. As mentioned (GRAPHISOFT, 2019), using BIM as a facility management tool would result in increased savings for the management company in the long term.

Electrical and Mechanical Services Department Headquarters

A pilot of the building information modelling-asset management (BIM-AM) system was made on the headquarters building of the Electrical and Mechanical Services Department, Hong Kong. The system provides a variety of operation and maintenance (O&M) systems/tools to evaluate the effectiveness of real-time information sharing and exchange capabilities. (Chan et al., 2016a).

As shown in Fig. 1, the framework of the integrated BIM-AM system comprises a number of systems/tools such as building management system (BMS), closed circuit television (CCTV) system, radio frequency identification (RFID) scanning tool, and real time location system (RTLS). By using the BIM-AM system, it is possible to continuously upkeep and store AM-related information. With BIM models used in a single integrated environment, the system allows locating and visualizing particular assets with real-time information.

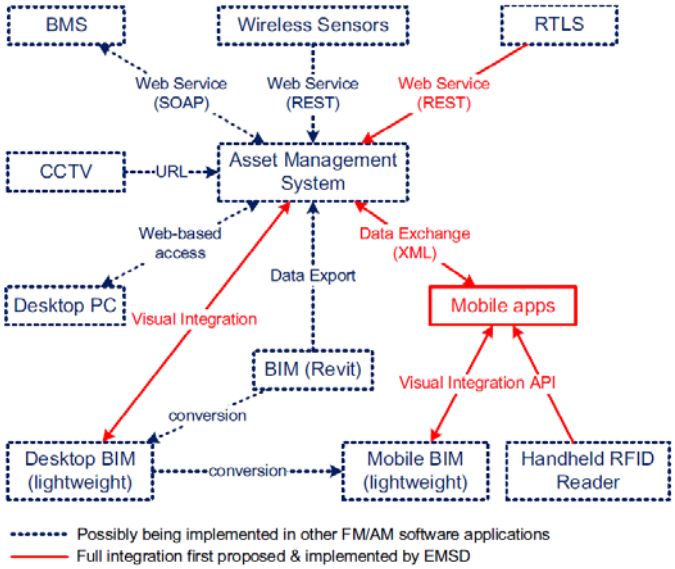

Fig. 1 Architecture of the integrated BIM-AM system (Chan et al., 2016a)

The technologies integrated by the BIM-AM system, as shown in Chan et al. (2016b), include the following:

- *Static Asset Information.* It includes information such as asset attributes, maintenance records, manuals, as-built system drawings, asset relationships and system topology. The display screen aids to visualize the relationships between assets, e.g. variable air volume (VAV) boxes, in a particular system.

- *Integration with BMS and CCTV system*. FM staff can get access to system status via mobile terminals and make use of real-time asset information and live site images for effective fault diagnosis and attendance.

- *Integration with RFID scanning tool and RTLS.* To further extend the locating feature, two advanced technologies, RTLS over WiFi and RTLS over Ultra-Wide-Band (UWB), were incorporated to optimize equipment distribution and utilization, i.e. locating not only fixed assets but also the moving ones.

- *BIM Visualization and Associating Assets.* The Global Unique Identifier (GUID) in the BIM model, which can associate individual assets, is superior to the non-geometric information exchange between BIM models and other FM/AM software applications. In a BIM model, for instance, the georeference of a VAV box can be shown for easy cross-referencing and a floor plan in JPEG format can be shown for streamlining fault attendance and site performance measurement activities.

- *O&M workflow management.* The four key generic users of the BIM-AM system are: client, helpdesk, supervisor and frontline staff. To enable dynamic interactions between the users and effective communication for O&M services, user-friendly interfaces of terminal displays are provided.

3.3 Survey findings

3.3.1 Demography of the respondents

Of all the 61 respondents, the majority (45) were HKIS members (Table 10). Among them, 14 were members of HKIS-PFM and the remaining possessed memberships of the other HKIS divisions (Building Surveying, General Practice, Land Surveying, Planning and Development, Quantity Surveying) or the Young Surveyors Group.

As regards membership classes, over half (35) of the respondents were "Member", 11 were "Fellow" and 10 were "Probationer" (Table 11). Only a few of the respondents were student members of HKIS.

Table 10 Memberships of the respondents

Member	Count
BSOMES	3
HKIA	1
HKIE	5
HKIE, CIBSE, EI, BSOMES	1
HKIE-BSB	1
HKIS (PFM)	14
HKIS (non-PFM)	31
IT	1
PolyU	1
RICS	1
SOE, IET, CIPHE	1
Others (N.A.)	1
Total:	**61**

Table 11 Membership classes of the respondents

Membership class	Count
Fellow	11
Member	35
Probationer	10
Student	3
None	1
Others (N.A.)	1
Total:	**61**

The majority of the respondents worked for the government, developers or consultants, and the counts in these 3 groups were comparable – between 10 and 14 (Table 12). With 9 respondents working for public/utility companies, 4 others worked for non-government organizations (NGOs) and the same number of respondents were employed by contracting companies. The remaining respondents, in total 7 of them, worked in various other organizations.

Table 12 Employer types of the respondents

Employer type	**Count**
Government departments	10
Developers	14
Consultants	13
Public/ Utility companies	9
NGOs	4
Contractor	4
Consultant under secondment to Government	1
Education	1
Engineering Company	1
Property Management	2
Specialist Supplier	1
URA	1
Total:	**61**

Throughout a building life cycle, there are a variety of project types. From the survey responses, it was found that respondents who dealt with operation and maintenance work amounted to 19 (Table 13). Second to this major group were those (16) who worked on new developments, followed by 9 others who mostly dealt with renovation and alteration work, 5 who worked on re-development projects, and 4 with their major duties on fit-out work.

Table 13 Project types the respondents mostly dealt with

Projects that you mostly deal with:	**Count**
New Development	16
Re-development	5
Renovation and Alteration	9
Restoration and Rehabilitation	1
Fit-out	4
Infrastructure	2
Operation and maintenance	19
Building Control	1
Land Information Management	1
Maintenance, renovation and alteration	1
Renovation, alternation, fit-out, retrofit, O&M	1
Teaching and research	1
Total:	**61**

As for job levels, most of the respondents were at the intermediate (e.g. Manager) or senior (e.g. Associate) level (Table 14). With 12 respondents at the junior level, only 7 others were at the top level.

Table 14 *Job levels of the respondents*

Job level	Count
Top (e.g. Director)	7
Senior (e.g. Associate)	15
Intermediate (e.g. Manager)	27
Junior (e.g. Supervisor)	12
Total:	**61**

The work experiences of the respondents were wide-ranging, with the lowest being 2 years while the highest was recorded with a veteran with 38 years of experience (Table 15). Referring to Fig. 2, it was found that 37.7% of respondents had 10 years or less work experience, while 39.3% possessed over 20 years of work experience.

Table 15 *Work experiences of the respondents*

Work experience (years)	Count
2	1
3	2
4	1
5	6
6	3
7	2
8	1
9	2
10	5
13	1
15	1
16	1
18	4
19	1
20	6
21	1
24	2
25	9
29	2
30	6
32	2
37	1
38	1
Total:	**61**

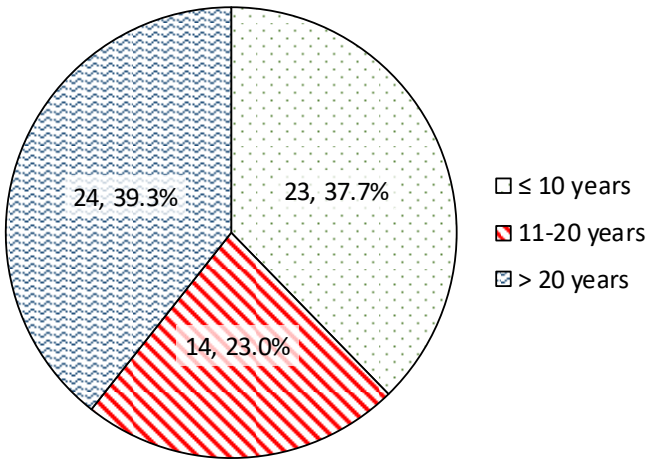

Fig. 2 *Proportions of work experiences of the respondents*

When asked whether they had experience of working on projects that use BIM, the responses of over half (36) of the respondents were affirmative (Table 16). The fact that 25 respondents had not worked on projects that use BIM shows that the adoption of BIM remained uncommon in the industry.

Among those (36) who indicated that they had worked on projects that use BIM, almost one-third (11) of such projects were on design or construction (Table 17). Fig. 3 further illustrates that the majority (69.4%) of them were non-FM projects; only 30.6% involved the FM phase.

Table 16 *Experiences of using BIM*

Experience of using BIM	**Count**
Yes	36
No	25
Total:	**61**

Table 17 *Project phase in which BIM was used*

Project phase	**Count**
Design	6
Construction	7
FM	6
Design; Construction	11
Design; FM	1
Design; Construction; FM	3
Construction; FM	1
Nil	1
Total:	**36**

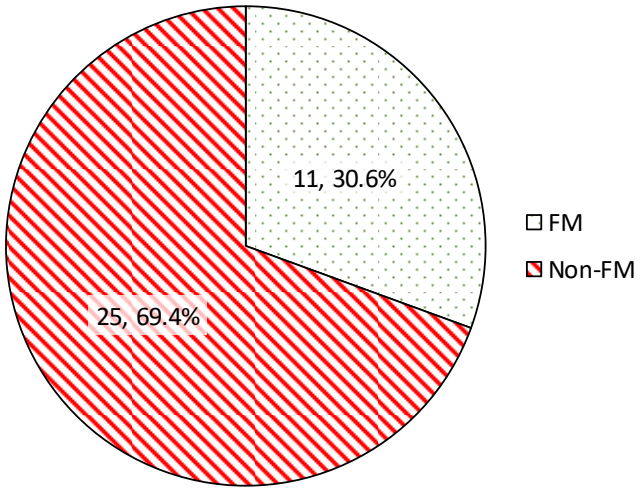

Fig. 3 *Proportions of project phase in which BIM was used*

3.3.2 Opinions on barriers to the use of BIM

Under the survey, the respondents were asked to indicate on a 7-point scale (1: None; 2: Very little; 3: Little; 4: Moderate; 5: Great; 6: Very great; 7: Entire) the level they perceived about each of the listed barriers to the use of BIM. Based on the responses, the mean rating of each barrier was calculated and the corresponding rank was determined, as summarized in Table 18.

Ranging from 4.328 to 5.344, the barriers to the use of BIM were regarded by the respondents as between the moderate level (4) and very great level (6). "Investment and costing issues (high costs for BIM hardware and software)" was the top-rated barrier. Second to this barrier was "Timing issues (tight design schedule and short construction period)", while "Lack of incentives for PFM practitioners" came third, followed by "Lack of commitment from senior management" and "Lack of client demand".

At the other end of the spectrum of meaning ratings in Table 18, the 5 barriers with the lowest ratings are: "Frequent change in purpose of building during design stage", "Lack of government support", "Lack of studies to quantify the value of BIM", "Widespread of mistakes and errors produced from using BIM", and "IT infrastructure and software related problem". Yet, the lowest level (4.328) among such barriers still exceeds the moderate level.

Table 18 *Mean rating of barriers*

Barrier	Mean rating	Rank
Investment and costing issues (high costs for BIM hardware and software)	5.344	1
Timing issues (tight design schedule and short construction period)	5.328	2
Lack of incentives for PFM practitioners	5.180	3
Lack of commitment from senior management	5.131	4
Lack of client demand	5.115	5
Limited BIM knowledge of PFM practitioners	5.098	6
No opportunity to use (companies normally do not use BIM because of tight project schedule)	5.066	7
Lack of legal standards or specifications to cope with BIM adoption	5.049	8
Market issues (fragmented parties throughout a building lifecycle hinder adoption of BIM)	4.984	9
Difficult to define liability when errors exist in BIM files	4.951	10
Lack of new or amended forms of contracts to cope with	4.836	11
Lack of training or education	4.770	12=
Lack of industry support	4.770	12=
BIM is new and complicated for use	4.770	12=
Project participants related issues (e.g. insufficient understanding of the importance of BIM)	4.738	15
Frequent change in purpose of building during design stage	4.705	16
Lack of government support	4.639	17
Lack of studies to quantify the value of BIM	4.508	18=
Widespread of mistakes and errors produced from using BIM	4.508	18=
IT infrastructure and software related problem	4.328	20

The rating results of the barriers were dividing into 4 groups, as shown in Fig. 4 to 7. In the first group (information and knowledge), “Limited BIM knowledge of PFM practitioners” was the top barrier whereas “No opportunity to use” was a close second (Fig. 4). Among the motivation barriers (i.e. the second group), the highest 3 with their

mean ratings all being above the great level (5) were “Lack of incentives for PFM practitioners”, “Lack of commitment from senior management”, and ‘Lack of client demand” (Fig. 5).

The third group of barriers are those about legal and contractual issues. In this group, as Fig. 6 shows, the top barrier is “Lack of legal standards or specifications to cope with BIM adoption”. In the last group (existing culture and practice), the two barriers with their mean ratings above the great level (5) were “investment and costing issues” and “timing issues” (Fig. 7).

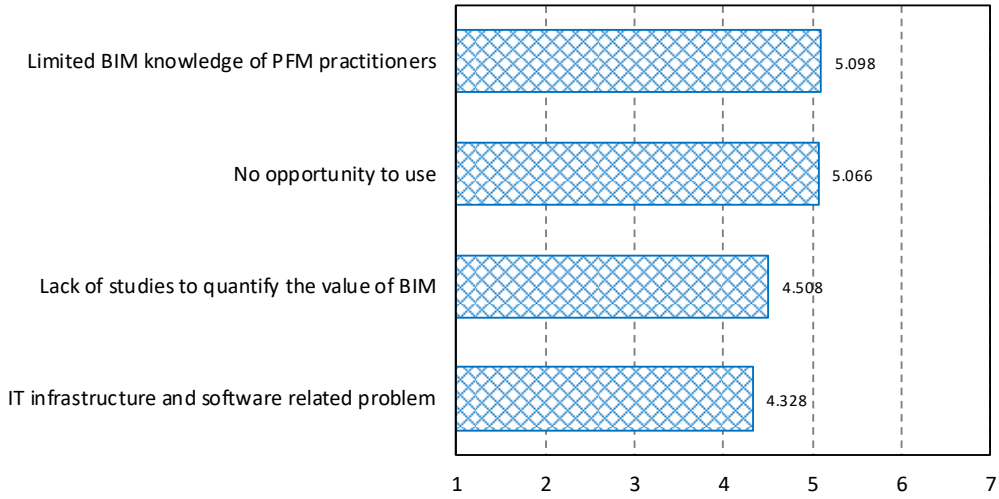

Fig. 4 *Barriers to use of BIM (information and knowledge)*

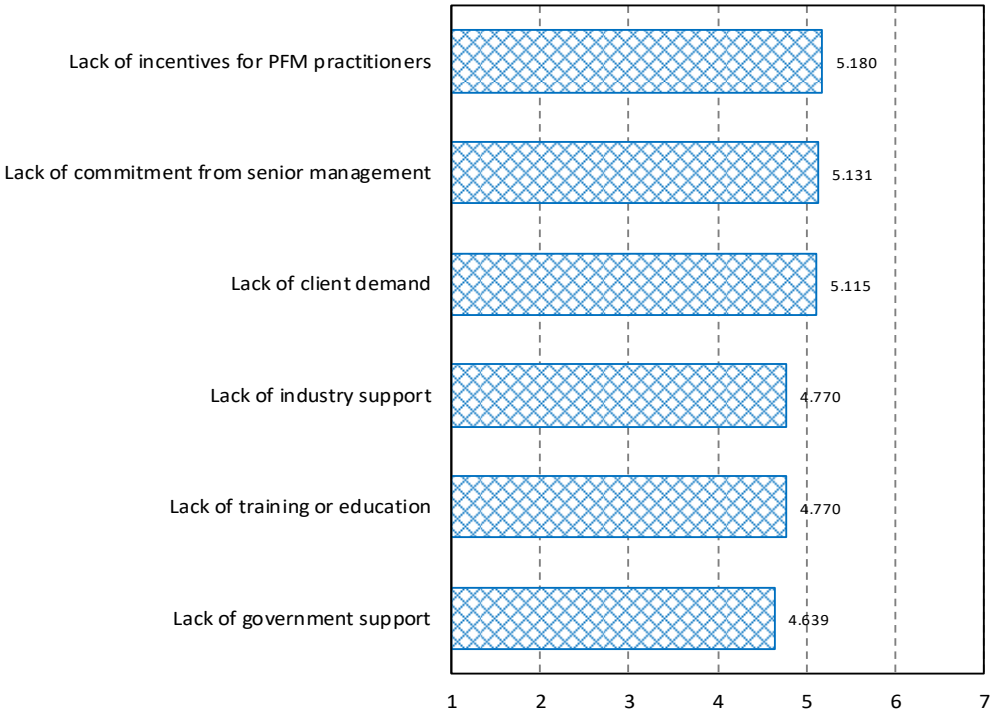

Fig. 5 *Barriers to use of BIM (motivation)*

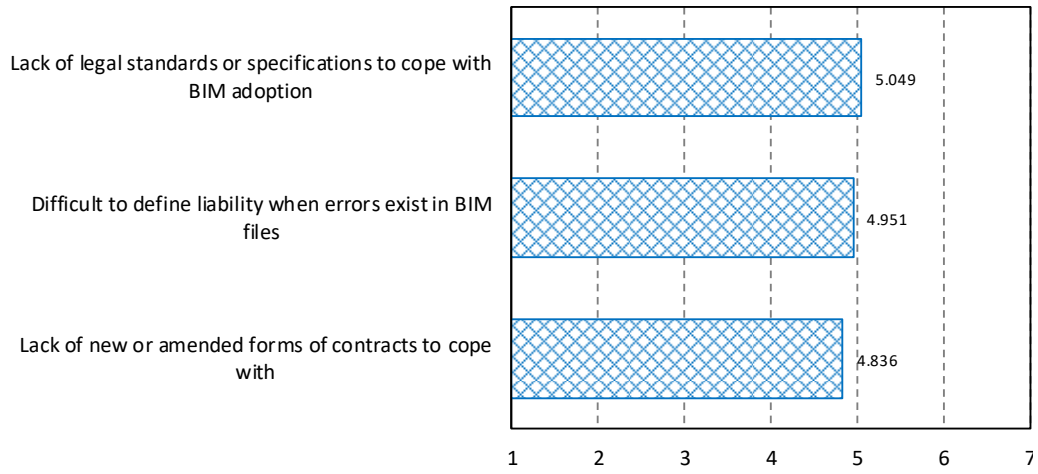

Fig. 6 *Barriers to use of BIM (legal and contractual issues)*

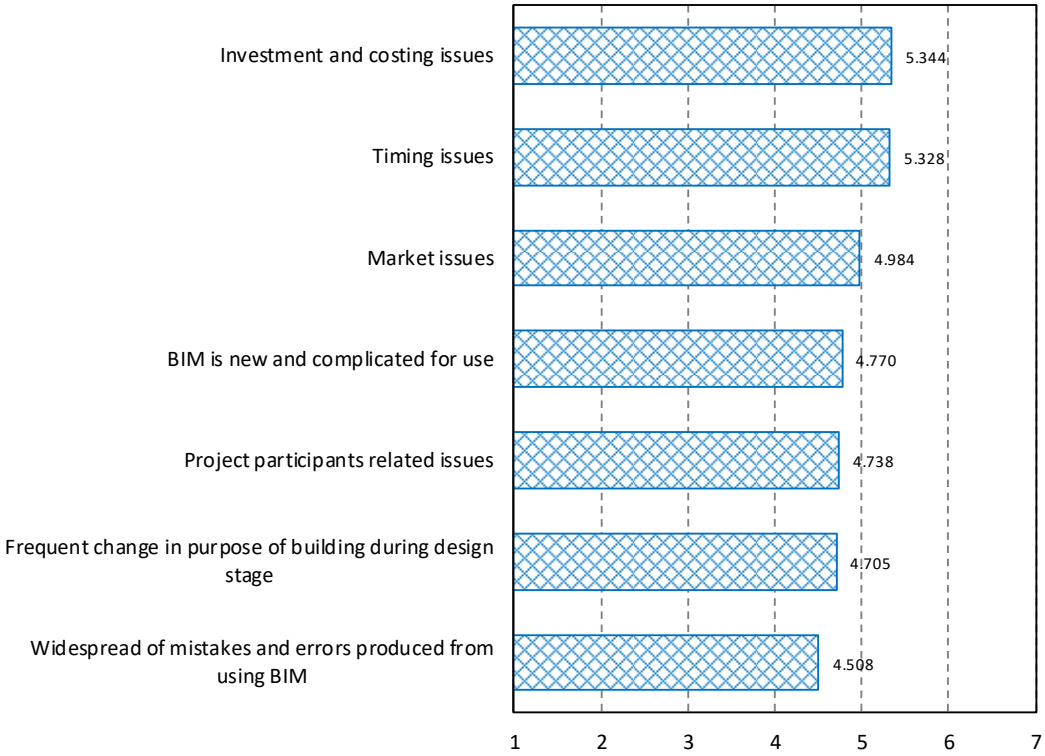

Fig. 7 *Barriers to use of BIM (existing culture and practice)*

3.3.3 Opinions on enablers for the use of BIM

Referring to the same 7-point scale (1: None; 2: Very little; 3: Little; 4: Moderate; 5: Great; 6: Very great; 7: Entire) for rating the barriers to the use of BIM, the survey respondents were requested to indicate the levels they perceived about the enablers for the use of BIM. The mean rating of each enabler was calculated based on the survey data and, according the calculated ratings, the ranks of the respective enablers were determined (Table 19).

All, except two, of the enablers in Table 19 recorded a mean rating above the great level (5). "Promote collaboration with senior management support" was regarded as the paramount enabler. Bearing the same mean rating, ranked second, are two enablers: "Set up a BIM object library for components in buildings" and "Develop initiatives to encourage client and stakeholder participation". The fourth enabler, namely, "Provide compliant BIM tool (to ensure design standards and construction documents fulfil PFM needs)", precedes three other enablers that coincidentally ranked fifth.

As pointed out above, there were two enablers with a meaning rating below 5. They were: "Adopt a strategic risk management process to mitigate potential problems in BIM implementation" and "Provide key messages and case studies on the benefits of BIM applications". Closely related to the latter enabler is "Conduct experience sharing sessions/workshops on cases using BIM", which was given a marginally higher mean rating of 5.098.

Table 19 *Mean rating of enablers*

Enabler	Mean rating	Rank
Promote collaboration with senior management support	5.607	1
Set up a BIM object library for components in buildings	5.574	2=
Develop initiatives to encourage client and stakeholder participation	5.574	2=
Provide compliant BIM tool (to ensure design standards and construction documents fulfil PFM needs)	5.541	4
Develop standardized legends for better integration between different disciplines	5.525	5=
Provide training and guidance on the use of BIM	5.525	5=
Allow enough time in project programme for BIM model development	5.525	5=
Enable integration with other operational systems (e.g. CAFM, IoT, GIS)	5.492	8=
Establish standards, specifications and new forms of contracts for wider use of BIM	5.492	8=
Define clearly BIM input and output requirements	5.459	10
Get contractors/O&M parties involved in design stage	5.426	11
Establish data exchange standard and management framework for information sharing	5.410	12
Expedite the industry's capacity and capability for the development of BIM	5.393	13
Review procurement practices, intellectual property rights and contract provisions	5.361	14
Enable and ensure sufficient digital /software capability and vendor support	5.344	15
Provide institutional support to expedite the development of BIM capacity and capability	5.328	16
Incentive given by government on the use of BIM	5.262	17
Set up industry-wide body to promote collaboration among project participants	5.246	18
Conduct experience sharing sessions/workshops on cases using BIM	5.098	19
Appointment of BIM manager in project team	5.016	20
Adopt a strategic risk management process to mitigate potential problems in BIM implementation	4.902	21
Provide key messages and case studies on the benefits of BIM applications	4.836	22

According to the foregoing literature review, the enablers belong to 5 groups. The first group, entitled “knowledge and information sharing”, comprises 3 enablers, among them the top one was “Establish data exchange standard and management framework for information sharing” (Fig. 8). The next group (support), which consists of 6 measures, was the largest group. Of these enablers, the top one was “Promote collaboration with senior management support” (Fig. 9). This enabler, in fact, also ranked first among all the enablers (Table 19).

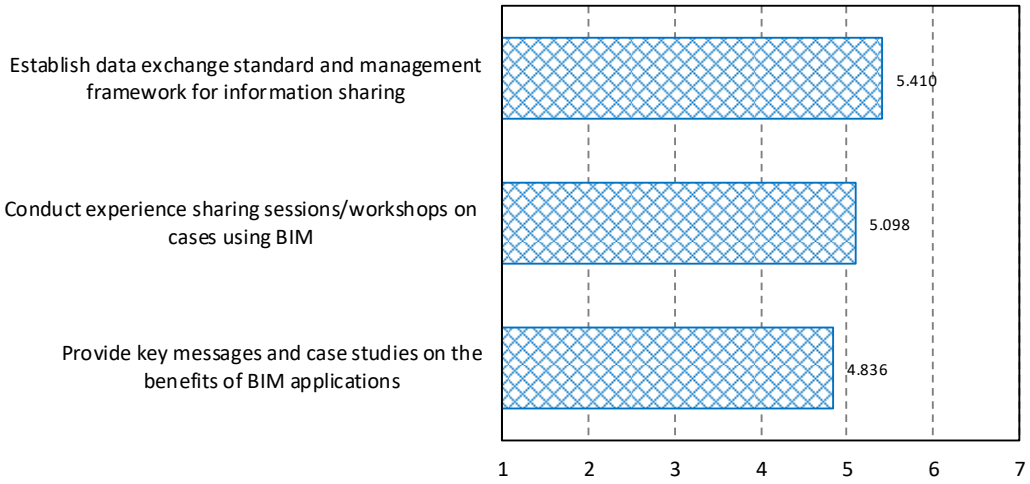

Fig. 8 *Enablers for use of BIM (knowledge and information sharing)*

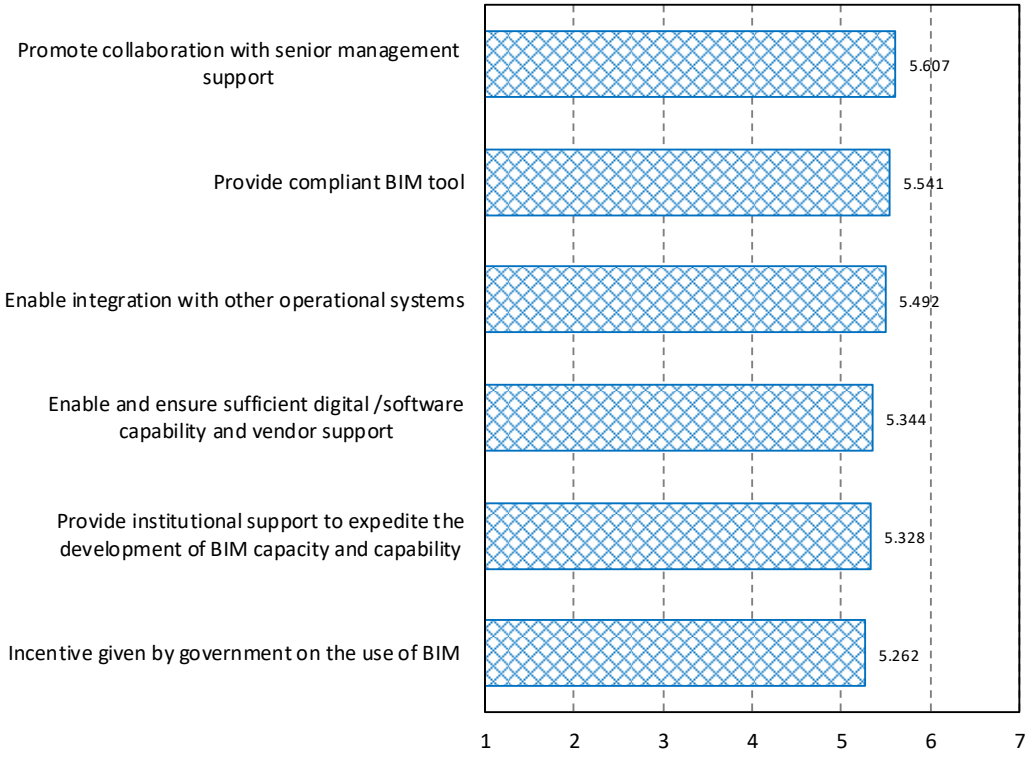

Fig. 9 *Enablers for use of BIM (support)*

The third group of enablers are about "documentation and practice". The mean ratings of the 5 enablers in this group are similar, with the highest (5.574) pertaining to "Set up a BIM object library for components in buildings" (Fig. 10). This enabler, when referring to all the enablers in Table 19, ranked second.

Another enabler that ranked second out of all the enablers (Table 19), which is "Develop initiatives to encourage client and stakeholder participation", came first in the group entitled "promotion and education" (Fig. 11). The second enabler in this group is "Provide training and guidance on the use of BIM".

In "project management" group, the top enabler is "Allow enough time in project programme for BIM model development" (Fig. 12), which ranked fifth among all the enablers (Table 19). The second enabler in this final group (project management) is "Get contractors/O&M parties involved in design stage" (Fig. 12), which is a distant eleventh out of all the enablers (Table 19).

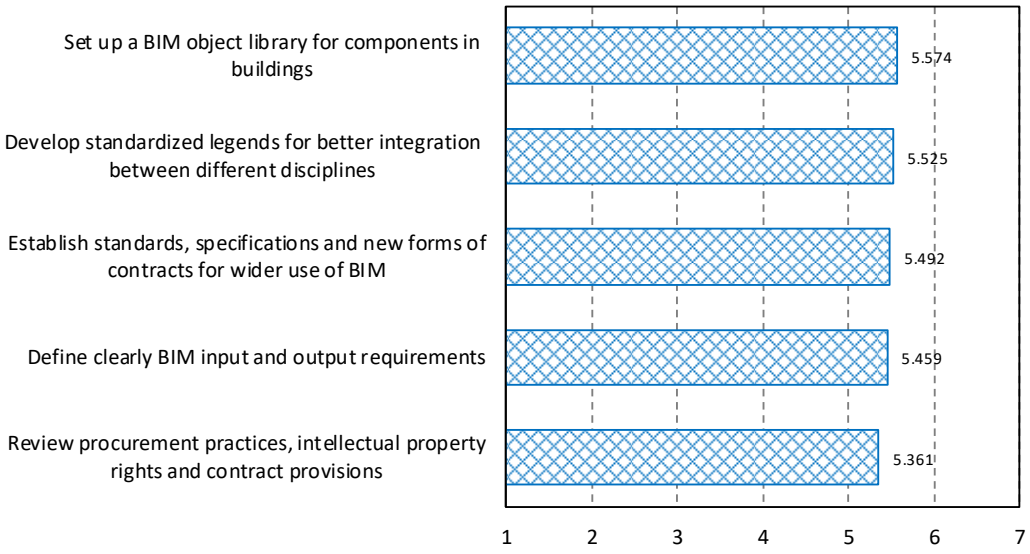

Fig. 10 *Enablers for use of BIM (documentation and practice)*

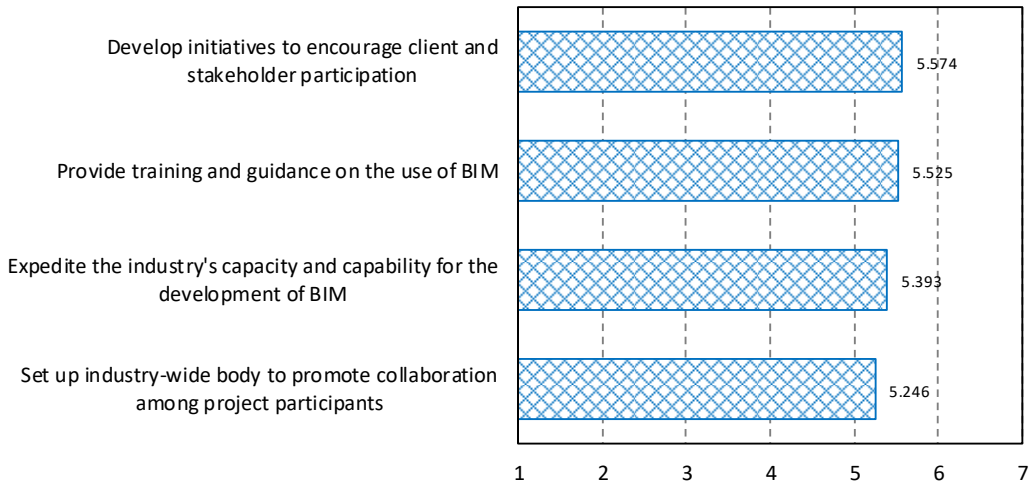

Fig. 11 *Enablers for use of BIM (promotion and education)*

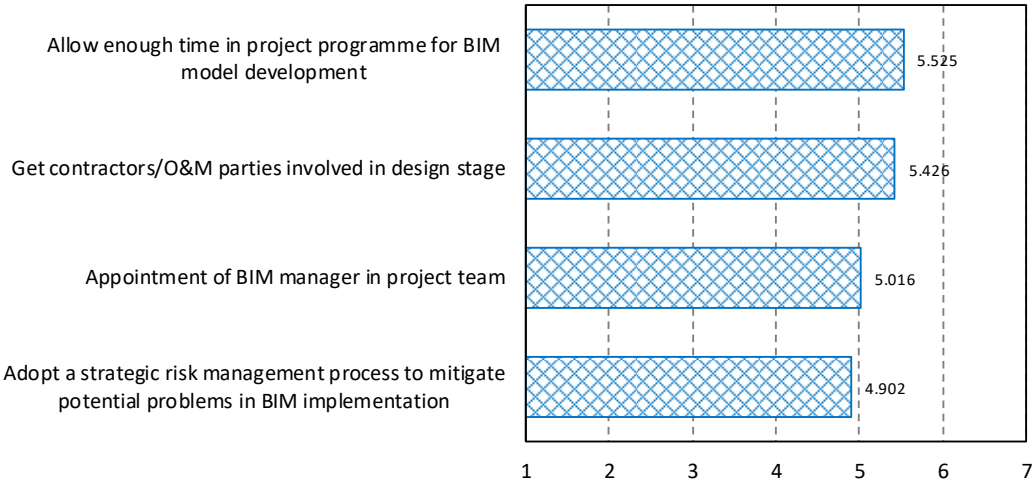

Fig. 12 *Enablers for use of BIM (project management)*

4. Conclusions and recommendations

The study has been successfully completed, with the intended objectives attained. Through an extensive literature review, a range of barriers to, and enablers for, the use of BIM were identified. The notable overseas and local successful cases of BIM applications, as reviewed, serve as reference for the future development of BIM in PFM in Hong Kong.

Facilitated by HKIS-PFMD, the online questionnaire survey was distributed to solicit the opinions of PFM practitioners on barriers and enablers pertaining to the use of BIM. After analyzing the survey data, the major barriers and enablers were identified. According to the importance levels of the top 10 enablers, the following short-, mid- and long-term measures, in 3 tiers (of clustered ratings and hence ranks), are recommended for promoting the use of BIM in PFM in Hong Kong:

<u>Tier 1 (short-term)</u>

- Promote collaboration with senior management support [rank: 1]
- Set up a BIM object library for components in buildings [rank: 2=]
- Develop initiatives to encourage client and stakeholder participation [rank: 2=]

<u>Tier 2 (mid-term)</u>

- Provide compliant BIM tool (to ensure design standards and construction documents fulfil PFM needs) [rank: 4]
- Develop standardized legends for better integration between different disciplines [rank: 5=]
- Provide training and guidance on the use of BIM [rank: 5=]
- Allow enough time in project programme for BIM model development [rank: 5=]

<u>Tier 3 (long-term)</u>

- Enable integration with other operational systems (e.g. CAFM, IoT, GIS) [rank: 8=]
- Establish standards, specifications and new forms of contracts for wider use of BIM [rank: 8=]
- Define clearly BIM input and output requirements [rank: 10]

To work out the details for implementing the above measures, it is recommended to set up relevant task forces or working groups.

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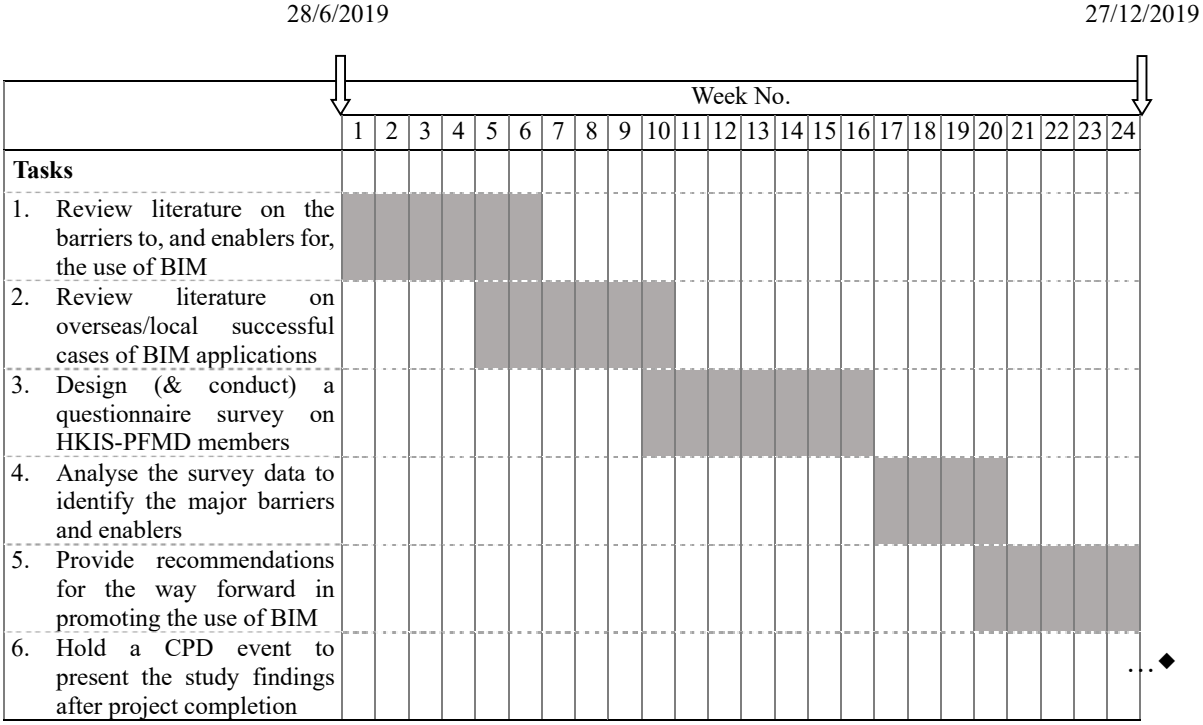
Appendix A – Project programme

A Study on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

Project programme:



Appendix B – Meeting agenda and minutes

HKIS-PFMD Research Project

A Study on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

Meeting Agenda

Date: 5 July 2019 (Fri)
Time: 2:30 pm
Venue: Room CF302, PolyU

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1. Introduction of meeting participants

2. Confirmation of project particulars
    a. Personnel of Project Team
    b. Project period
    c. Project aim
    d. Project funding
    e. Project scope (service) and deliverables

3. Project programme and tasks
    a. Review literature on the barriers and enablers
    b. Review literature on overseas/local successful cases
    c. Design (& conduct) a questionnaire survey on HKIS-PFMD members
    d. Analyse the survey data to identify the major barriers and enablers;
    e. Provide recommendations for the way forward in promoting the use of BIM
    f. Hold a CPD event to present the study findings

4. Next meeting

5. Any other business

HKIS-PFMD Research Project

A Study on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

Minutes of Meeting (No. 1)

Date	:	5 July 2019
Time	:	2:30 pm
Venue	:	Room CF302, PolyU
Present	:	Daniel Hui (DHui) Joseph Lai (JLai) - Secretary

Item	Matters	Action
1.	**Introduction of meeting participants**	
1.1	The meeting participants were DHui, Chairman of HKIS-PFMD and JLai, Principal Investigator of the project team of PolyU.	
2.	**Project particulars**	
2.1	Apart from DHui, Ms. Shelley Chan (council member of HKIS) would also look after this study.	
2.2	The project team leader JLai would carry out the study with the help of an assistant.	
2.3	The project period is 6 months. Commenced on 28 Jun 2019, the project would end on 27 Dec 2019.	
2.4	The project aims at investigating the barriers to, and enablers for, the use of building information modelling (BIM) by property/facility management practitioners in Hong Kong.	
2.5	The project fee is HK$100,000, payable in two instalments. DHui advised JLai to issue invoice for the first instalment in due course.	JLai

2.6 The project scope (service) covers the following:
Review literature on the barriers to, and enablers for, the use of BIM;
Review literature on overseas/local successful cases of BIM applications in PFM;
Design a questionnaire survey for soliciting the opinions of HKIS-PFMD members on the barriers to, and enablers for, the use of BIM;
Analyse the survey data to identify the major barriers and enablers;
Provide recommendations for the way forward in promoting the use of BIM by property/facility management practitioners in Hong Kong; and
Hold a CPD event to present the study findings after the completion of the study.

The project deliverables include a report for the study and a CPD event after completion of the study.

3. Project programme and tasks

3.1 JLai tabled a programme for the project and briefed about the tasks required and their planned periods.

3.2 In the initial stage of the project, JLai would review literature to identify the barriers and enablers as well as successful cases of BIM applications. — JLai

3.3 For the questionnaire survey, JLai would design it as an online survey, with a link for easy dissemination. DHui would arrange the survey to be disseminated to HKIS-PFMD members, members of other HKIS divisions (e.g. BS, QS, GP) and also members of property management companies. JLai requested and DHui agreed to provide the HKIS logo for inclusion in the survey form. — JLai/DHui

3.4 In analysing the survey data, JLai would segregate the responses into different groups, e.g. PFM and non-PFM, etc. — JLai

3.5 Based the survey results, JLai would draw conclusions and provide recommendations for the way forward in promoting the use of BIM by by property/facility management practitioners. — JLai

3.6 After completion of the project, JLai would present the study findings at a CPD event. The event, to be attended by HKIS members, is likely to be held in an evening at the HKIS Learning Centre (seating capacity around 170). — JLai

4. Next meeting

4.1 To be held when required.

5. Any other business

6.1 There was no other business and the meeting was adjourned at 3:10 pm.

Appendix C – Survey message

Survey on the Use of Building Information Modelling (BIM) in the Property/Facility Management (PFM) Industry

Dear Participant,

The use of BIM in the PFM industry of Hong Kong remains uncommon. To investigate the barriers to, and the enablers for, the use of BIM in the PFM industry, the HKIS-PFM Division has commissioned a study team at The Hong Kong Polytechnic University to conduct a research project, for which a questionnaire survey has been devised to solicit opinions of PFM practitioners in Hong Kong.

You are cordially invited to join the survey by clicking https://forms.gle/dGSNuS4gxudeJw5EA, which would take 5-10 minutes to complete. In case of any query, please contact the study team, Dr. Joseph Lai (Email: bejlai@polyu.edu.hk; Tel. 2766 4697) or Mr. Michael Liu (Email: michael.liu@polyu.edu.hk; Tel. 3400 3599).

Yours faithfully,

Sr Daniel Hui
Chairman, HKIS-PFMD

Appendix D – Survey questionnaire (hard copy version)

HKIS-PFMD Research Project

Survey on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

Dear Participants,

Thank you for joining this survey. It aims to solicit your opinion on the barriers to, and enablers for, the use of BIM in the PFM Industry.

Part A - Participant's information	
Member of (may select more than one option):	☐ HKIS (Building Surveying Division) ☐ HKIS (General Practice Division) ☐ HKIS (Land Surveying Division) ☐ HKIS (Planning and Development Division) ☐ HKIS (Property and Facility Management Division) ☐ HKIS (Quantity Surveying Division) ☐ HKIS (Young Surveyors Group) ☐ Others (please specify: _____)
Membership class:	☐ Fellow ☐ Member ☐ Associate Member ☐ Probationer ☐ Student ☐ Others (please specify: _____)
Employer type (organizations that you are working for):	☐ Government departments ☐ Developers ☐ Consultants ☐ Public/ Utility companies ☐ NGOs ☐ Others (please specify: _____)
Projects that you mostly deal with:	☐ New Development ☐ Re-development ☐ Renovation and Alteration ☐ Restoration and Rehabilitation ☐ Fit-out ☐ Infrastructure ☐ Operation and maintenance ☐ Others (please specify: _____)
Job level:	☐ Top (e.g. Director) ☐ Senior (e.g. Associate) ☐ Intermediate (e.g. Manager) ☐ Junior (e.g. Supervisor)
Work experience:	_____ years

Part B - Experience of using BIM	
1. Do you have any experience of working on projects that use BIM?	☐ Yes ☐ No

2. If your answer to Q1 above is "yes", for which phase(s) of the projects was/were BIM used (may select more than one option)?	☐ Design ☐ Construction ☐ FM ☐ Others (please specify: _____)

Part C - Barriers to use of BIM

Please rate the significance level of the following barriers to the use of BIM:

Barriers	None	Very little	Little	Moderate	Great	Very great	Entire
Information and knowledge							
(a) *IT infrastructure and software related problem*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(b) *Lack of studies to quantify the value of BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(c) *No opportunity to use (companies normally do not use BIM because of tight project schedule)*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(d) *Limited BIM knowledge of PFM practitioners*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
Motivation							
(e) *Lack of client demand*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(f) *Lack of training or education*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(g) *Lack of government support*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(h) *Lack of industry support*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(i) *Lack of commitment from senior management*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(j) Lack of incentives for PFM practitioners	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
Legal and contractual issues							
(k) *Lack of legal standards or specifications to cope with BIM adoption*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(l) *Lack of new or amended forms of contracts to cope with*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(m) *Difficult to define liability when errors exist in BIM files*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
Existing Culture and Practice							
(n) *Project participants related issues (e.g. insufficient understanding of the importance of BIM)*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(o) *Widespread of mistakes and errors produced from using BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

Barriers	None	Very little	Little	Moderate	Great	Very great	Entire
(p) *Timing issues (tight design schedule and short construction period)*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(q) *Investment and costing issues (high costs for BIM hardware and software)*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(r) *BIM is new and complicated for use*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(s) *Frequent change in purpose of building during design stage*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(t) *Market issues (fragmented parties throughout a building lifecycle hinder adoption of BIM)*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

Part D – Enablers for use of BIM

Please rate the significance level of the following measures for enabling the use of BIM:

Enablers	None	Very little	Little	Moderate	Great	Very great	Entire
Knowledge and Information Sharing							
(a) *Provide key messages and case studies on the benefits of BIM applications*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(b) *Conduct experience sharing sessions/workshops on cases using BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(c) *Establish data exchange standard and management framework for information sharing*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
Support							
(d) *Enable and ensure sufficient digital /software capability and vendor support*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(e) *Provide institutional support to expedite the development of BIM capacity and capability*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(f) *Incentive given by government on the use of BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(g) *Promote collaboration with senior management support*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(h) *Provide compliant BIM tool* (to ensure design standards and construction documents fulfil PFM needs)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(i) Enable integration with other operational systems (e.g. CAFM, IoT, GIS)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

Enablers	None	Very little	Little	Moderate	Great	Very great	Entire
Documentation and Practice							
(j) *Define clearly BIM input and output requirements*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(k) *Establish standards, specifications and new forms of contracts for wider use of BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(l) *Review procurement practices, intellectual property rights and contract provisions*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(m) *Set up a BIM object library for components in buildings*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(n) *Develop standardized legends for better integration between different disciplines*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
Promotion and Education							
(o) *Set up industry-wide body to promote collaboration among project participants*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(p) *Develop initiatives to encourage client and stakeholder participation*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(q) *Provide training and guidance on the use of BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(r) *Expedite the industry's capacity and capability for the development of BIM*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
Project Management							
(s) *Appointment of BIM manager in project team*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(t) *Adopt a strategic risk management process to mitigate potential problems in BIM implementation*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(u) *Get contractors/O&M parties involved in design stage*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
(v) *Allow enough time in project programme for BIM model development*	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

Part E - Other comments

If you have any opinions on the use of BIM in the property/facility management Industry, please state below:

_____

_____

- End -

Thank you very much for completing the survey!

Appendix E – Survey questionnaire (online version - screenshots)

HKIS-PFMD Research Project: Survey on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

Dear Participants,
Thank you for joining this survey. It aims to solicit your opinion on the barriers to, and enablers for, the use of BIM in the PFM Industry.

NEXT

Never submit passwords through Google Forms.

Part A - Participant's information

Member of (may select more than one option): *

- [ ] HKIS (Building Surveying Division)
- [ ] HKIS (General Practice Division)
- [ ] HKIS (Land Surveying Division)
- [ ] HKIS (Planning and Development Division)
- [ ] HKIS (Property and Facility Management Division)
- [ ] HKIS (Quantity Surveying Division)
- [ ] HKIS (Young Surveyors Group)
- [ ] Other: _____

Membership class: *

- ◯ Fellow
- ◯ Member
- ◯ Associate Member
- ◯ Probationer
- ◯ Student
- ◯ Other: _____

Employer type (organizations that you are working for): *

- ◯ Government departments
- ◯ Developers
- ◯ Consultants
- ◯ Public/ Utility companies
- ◯ NGOs
- ◯ Other: _____

Projects that you mostly deal with: *

- ○ New Development
- ○ Re-development
- ○ Renovation and Alteration
- ○ Restoration and Rehabilitation
- ○ Fit-out
- ○ Infrastructure
- ○ Operation and maintenance
- ○ Other: _____

Job level: *

- ○ Top (e.g. Director)
- ○ Senior (e.g. Associate)
- ○ Intermediate (e.g. Manager)
- ○ Junior (e.g. Supervisor)

Work experience (years): *

Your answer

BACK NEXT

Part B - Experience of using BIM

Do you have any experience of working on project(s) that use BIM? *

- ○ Yes
- ○ No

BACK NEXT

Part B - Experience of using BIM

Which phase(s) of the project(s) was/ were BIM used (may select more than one option)? *

- ☐ Design
- ☐ Construction
- ☐ FM
- ☐ Other: _____

BACK NEXT

Part C - Barriers to use of BIM

Information and knowledge

Please rate the significance level of the following barriers to the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(a) IT infrastructure and software related problem *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(b) Lack of studies to quantify the value of BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(c) No opportunity to use (companies normally do not use BIM because of tight project schedule) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(d) Limited BIM knowledge of PFM practitioners *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Motivation

Please rate the significance level of the following barriers to the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(e) Lack of client demand *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(f) Lack of training or education *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(g) Lack of government support *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(h) Lack of industry support *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(i) Lack of commitment from senior management *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(j) Lack of incentives for PFM practitioners *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Legal and contractual issues

Please rate the significance level of the following barriers to the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(k) Lack of legal standards or specifications to cope with BIM adoption *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(l) Lack of new or amended forms of contracts to cope with *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(m) Difficult to define liability when errors exist in BIM files *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Existing Culture and Practice

(n) Project participants related issues (e.g. insufficient understanding of the importance of BIM) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(o) Widespread of mistakes and errors produced from using BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(p) Timing issues (tight design schedule and short construction period) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(q) Investment and costing issues (high costs for BIM hardware and software) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(r) BIM is new and complicated for use *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(s) Frequent change in purpose of building during design stage *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(t) Market issues (fragmented parties throughout a building lifecycle hinder adoption of BIM) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

BACK NEXT

Part D – Enablers for use of BIM

Knowledge and Information Sharing

Please rate the significance level of the following measures for enabling the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(a) Provide key messages and case studies on the benefits of BIM applications *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(b) Conduct experience sharing sessions/workshops on cases using BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(c) Establish data exchange standard and management framework for information sharing *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Support

Please rate the significance level of the following measures for enabling the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(d) Enable and ensure sufficient digital /software capability and vendor support *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(e) Provide institutional support to expedite the development of BIM capacity and capability *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(f) Incentive given by government on the use of BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(g) Promote collaboration with senior management support *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(h) Provide compliant BIM tool (to ensure design standards and construction documents fulfil PFM needs) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(i) Enable integration with other operational systems (e.g. CAFM, IoT, GIS) *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Documentation and Practice

Please rate the significance level of the following measures for enabling the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(j) Define clearly BIM input and output requirements *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(k) Establish standards, specifications and new forms of contracts for wider use of BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(l) Review procurement practices, intellectual property rights and contract provisions *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(m) Set up a BIM object library for components in buildings *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(n) Develop standardized legends for better integration between different disciplines *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Promotion and Education

Please rate the significance level of the following measures for enabling the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(o) Set up industry-wide body to promote collaboration among project participants *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(p) Develop initiatives to encourage client and stakeholder participation *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(q) Provide training and guidance on the use of BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(r) Expedite the industry's capacity and capability for the development of BIM *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

Project Management

Please rate the significance level of the following measures for enabling the use of BIM:
(1 None / 2 Very little / 3 Little / 4 Moderate / 5 Great / 6 Very great / 7 Entire)

(s) Appointment of BIM manager in project team *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(t) Adopt a strategic risk management process to mitigate potential problems in BIM implementation *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(u) Get contractors/O&M parties involved in design stage *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

(v) Allow enough time in project programme for BIM model development *

	1	2	3	4	5	6	7	
None	○	○	○	○	○	○	○	Entire

BACK NEXT

Part E - Other comments

If you have any opinions on the use of BIM in the property/facility management Industry, please state below:

Your answer

BACK SUBMIT

HKIS-PFMD Research Project: Survey on the Use of Building Information Modelling in the Property/Facility Management Industry in Hong Kong

- End -

Thank you very much for completing the survey!

Submit another response