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WELCOME SPEECH FROM THE CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

بسم الله الرحمن الرحيم السلام

عليكم ورحمة الله وبركاته

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed *"Embracing Construction Revolution 4.0: Transforming Malaysia's Built Environment."* On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'
Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM CO-CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

Associates Professor Dr. Nur Hisham Ibrahim, *PMP*
Co-Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

Sr Dr. Nurul Fadzila Zahari
Project Director
RISM 17th ISCU 2025

ADVANCING BIM IMPLEMENTATION IN FACILITIES MANAGEMENT TO DRIVE SUSTAINABILITY IN THE MALAYSIAN CONSTRUCTION INDUSTRY

See Jia Min[1*], Aimi Sara Binti Ismail [2]

[1]*See Jia Min' Faculty of Built Environment and Surveying, UTM, Johor, MALAYSIA.
Email: seemin@graduate.utm.my
[2]Aimi Sara Binti Ismail, Faculty of Built Environment and Surveying, UTM, Johor, MALAYSIA.
Email: aimisara@utm.my
*Corresponding Author

ABSTRACT

Facilities management (FM) is a profession that encompass various disciplines to ensure functionality of the built environment through integration of people, place, process and technology. Conventional FM practices that focus on manual procedures and reactive maintenance approaches often lead to inefficiency and higher operational cost. Inefficiency at the operational phase could contribute to excessive energy use and waste generation, requiring the implementation of Building Information Modelling (BIM) in FM to address these sustainability issues. However, the adoption of BIM in FM is not widespread and its application in FM is still vaguely explored. The objective of this research is to identify the challenges faced by Malaysian construction industry stakeholders in implementing BIM in FM and to determine their readiness level in implementing BIM in FM. For this research, a quantitative research method is employed in which the questionnaire will be distributed to the selected respondents consisting of the facility managers, professionals working in FM industry, engineers and quantity surveyors who are experienced in FM processes. The questionnaire is designed with closed-ended questions, and it is separated into three sections. Then, the descriptive and inferential analysis will be used to examine and interpret the primary data obtained from the questionnaire. For descriptive analysis, frequency distribution and mean analysis will be employed while the inferential analysis will be performed through normality test and non-parametric test which are one-way ANOVA test or Kruskal-Wallis test, depending on the data distribution. This research provides insight into challenges relating to BIM implementation in FM which can encourage improved facilities management practices. The findings are crucial in assessing the landscape of BIM-enabled FM in Malaysian construction industry context. Meanwhile, the role of BIM-FM in advancing sustainability within the built environment can also be explored from the research findings.

Keywords: Facilities Management (FM), Building Information Modelling (BIM), Sustainability

I. INTRODUCTION

The construction industry is inherently dynamic, challenging and marked by numerous unforeseen risks and uncertainties. Regarding the nature and complexity of the construction industry, the role of construction management is increasingly essential. The type of construction project management includes, but is not limited to, risk management, waste management, supply chain management, contract management as well as facilities management. Facilities management (FM) is a process of coordinating an organization's personnel and activities into the physical workplace to improve the quality and productivity of the business (IFMA, 2018). It serves as an integrated approach in ensuring the functionality of built environment through the management of building and infrastructure. In fact, FM is a multi-disciplinary practice that encompasses a wide range of activities including space allocation, energy management and asset management that could significantly contribute to the sustainability of the built environment.

In recent years, FM in the construction industry is undergoing a significant revolution with the integration and implementation of Building Information Modelling (BIM) (Yilmaz et al., 2023). BIM is a modelling technology that integrates a set of interrelated processes working together to produce, communicate, analyse and utilize digital information models throughout the construction project lifecycle (CIDB, 2021). In the construction industry, BIM provides a visual model and database that are helpful in capturing the life cycle data repository of a project's facility. With the advancement of BIM usage in facilitating the life cycle, BIM has developed rapidly in the Architecture, Engineer and Construction (AEC) industry. However, the integration of BIM in FM is still in

its infancy and the knowledge available for this area is also limited (Kamaruzzaman et al., 2023).

II. LITERATURE REVIEW

Facilities Management (FM)

FM carries out many definitions, but these can be summarized as "an organizational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the primary business" (IFMA, 2018). FM can be applied at any project phase, but it has the highest value when implemented at an early stage. This is because early incorporation of FM will significantly enhance the decision-making process, value-added, innovation as well as sustainable development, resulting in greater value.

People, place, process and technology are the four main pillars of FM which serve as a basis for FM to function effectively (IFMA, 2018). In essence, people are the crucial asset for business success in which a facility manager is responsible to help employees in resolving any difficulties they face whether issues of safety, accommodation or comfort. An effective process can ensure orderliness and moderation in place (Alexander, K., 2003). Thus, the scope of FM covers the establishment of procedures and policies for different departments, assets, places, and personnel. Besides, place refers to the physical workplace where upkeep of facilities and improving the existing structure is necessary. Lastly, the facility manager is required to embrace technology like Computer Aided Facility Management (CAFM) and BIM in FM to ensure the smooth running of building and business operations. In general, FM in construction projects aims to achieve environmental sustainability and cost efficiency by implementing energy-efficient practices (ISO 41011, 2018).

Building Information Modelling (BIM) in FM

BIM can be defined as a highly collaborative process that enables construction professionals to plan, design as well as construction facilities within a 3D model (CIDB, 2021). The adoption of BIM in the Operations and Maintenance (O&M) phase can bring better outcomes at the lowest cost. BIM is made up of several dimensions from basic-dimensional model (3D) to higher-dimensional models (5D – 7D). In this context, the 7D-BIM model focuses on the facilities management application where it is a representation of an as-built model or an updated version of FM which will be used by project managers and owners in overseeing the operations and facilities effectively. On the other hand, there are a total of six BIM Level of Development (LOD) where LOD 500 has been described as a fully detailed as-built or facility management model which is used for building maintenance and operation.

FM makes up 80% of total costs over the buildings' life cycle and the implementation of BIM can significantly reduce the time and resource expenditure caused by inefficient operation during this phase of construction (Hosseini et al., 2022). This is because BIM supports preventive maintenance which allows early problem detection, avoiding unnecessary extra cost related to system failures. By adopting BIM-FM, the total time spent on activities like asset tracking, maintenance and planning can be reduced by at least 30% as compared to traditional FM methods (Al-Turki et al., 2023). Facility managers may have faster access to up-to-date information such as equipment conditions, maintenance schedules and warranty details through the BIM centralized platform, allowing them to plan for replacements or repairs in advance. Besides, BIM models provide real-time visualization that assists in spatial planning and asset management where facility managers may optimize the building performance in terms of space allocation and energy use, contributing to sustainability. In addition, the implementation of BIM-FM is useful for improving communication and decision making as stakeholders can access the same page of comprehensive and accurate real time project data.

Challenges of BIM Implementation in FM

There is a consensus about potential applications and benefits of BIM implementation in FM, evidenced by the support of some pioneering FM organizations as well as the related research and development efforts. However, there are still some challenges of implementing BIM in FM by reviewing and summarizing the findings of related research. Based on the previous studies, the challenges were identified into 6 main themes which are attitude and perception of BIM, organizational culture, technological and infrastructure, skills and knowledge, cost and guideline and legal framework.

One of the main challenges that is often reported in past studies is the incorrect perception of BIM among the industry stakeholders (Hassanain et al., 2023). A significant portion of Malaysian construction professionals are not fully aware of the utilization and benefits of BIM adding to the FM process (Tezel et al., 2021). As a result, it contributes to an imprecise perception towards BIM, leading to resistance and reluctance to adopt BIM in FM practices. Stakeholders always view BIM-FM as a complicated, useless and costly change as they perceive BIM is developed for design and construction stages instead of O&M stages. However, this negative perception of BIM is difficult to be changed due to insufficient real-life successful examples of BIM-FM applications (Becerik-Gerber et, 2012). Hence, the incorrect perception of BIM has significantly hampered BIM adoption.

The current FM industry cultural approach is considered as a key challenge to adopting BIM in FM practices (Siebelink et al., 2021). The current FM industry that is fragmented in nature hinders the implementation of BIM as the application of BIM requires the cooperation of all parties to work together for modelling and model utilization (Zongya, 2023). Besides, there is an unsupportive organization culture where top management possessed a passive attitude and did not allocate sufficient resources to support the BIM adoption. In addition, the FM industry is rigid in adopting new technology in which the parties involved are reluctant to change. The implementation of BIM in FM industry is expected to remain slow unless there is a change in the behavioral and mind set of organizations (Becerik-Gerber et al., 2012).

The next challenge is the interoperability between BIM technologies and current FM technologies (Wong et al., 2018). Interoperability refers to the ability to share data between various applications to automate the task and minimize data re-entry. Interoperability issues arise during BIM-FM integration as the information generated from the BIM models could not be integrated effectively with the existing FM software such as Computer Aided Facility Management (CAFM), leading to incomplete and inaccurate handover of information and increase the likelihood of errors in operation stage (Becerik-Gerber et, 2012). Thus, there is a need for open systems and standardized data libraries that can be utilized by any CAFM. Otherwise, the facility manager must rekey the data into the CAFM system manually, which is time consuming and ineffective. Besides, lack of necessary hardware and software infrastructure within organization are another issues for supporting the operation of BIM in FM practices.

The shortage of BIM skills and knowledge are also subject to hinder the implementation of BIM in FM. The industry is facing a problem of lack of BIM-FM expertise (Tan et al., 2018) where the existing employees have no ideas regarding the use of BIM for performing FM functions. This situation is even more obvious when the findings by Miettinen et al. (2018) show that a huge portion of facility managers in industry have never utilized BIM due to the reason of inadequate software expertise and unfamiliarity with BIM. In this context, insufficient BIM training programmes offered by industry are believed as one of the factors contributing to this situation.

Cost is always an issue for the implementation of BIM in FM. BIM will only be used in the FM phase if it has been used in the project's design and construction stage (Durdyev et al., 2022). This is because the adoption of BIM requires a large investment including the initial cost for purchasing software and hardware, the cost for training and the periodic cost for updating and maintaining the BIM system (Zongya, 2023). Thus, the BIM adoption becomes impracticable and unaffordable unless it is used to a larger extent in a construction project. Besides, most of the organizations are reluctant to adopt BIM because of the absence of guarantee on the positive return on investment in BIM adoption (Miettinen et al., 2018).

The lack of guidelines and legal framework also impedes the FM industry's ability to use BIM (Durdyev et al., 2022). The stakeholders may become confused with the specific requirements and procedures for employing BIM in FM due to the absence of a precise standard procedure. Meanwhile, the lack of contractual framework will raise concerns about copyright and data ownership with the use of BIM, resulting in unreliable contract documents (Dixit et al., 2019). Since there is an absence of legislation governing the FM industry's usage of BIM, there is a risk in managing the organization’s confidential information that is stored in BIM system. Besides, it is also challenging to setting out the handover requirements that should be included in the contract for FM tasks, creating possibility of ambiguity and conflict.

Readiness Level of Adopting BIM in FM

Readiness level refers to the degree to which an organization or person is prepared to do something different in a sustainable manner. It can be influenced by various factors due to its subjective nature. Thus, there are some factors influencing the readiness level of adopting BIM in FM has been identified to determine how well the construction industry is prepared to implement BIM in FM.

Awareness is the key factor in determining the readiness level. It refers to the degree to which an organization is aware of the advantages and necessity of implementing BIM to enhance FM practices. Facilities managers are more likely to adopt BIM if they are aware of the long-term advantages of implementing BIM in FM such as enhanced operational efficiency, reduced cost and improved decision making (Tahir et al., 2021). In contrast, the adoption of BIM can be viewed as an unneeded or disruptive change if facilities management teams do not fully understand how BIM functions with daily operations. With a high awareness of the value of BIM implementation in FM, the stakeholders are more ready to adopt it.

Organizational culture will determine how employees respond to adopt BIM in FM. organizations with flexible culture will always be more likely to be ready to implement a change rather than organization with rigid culture (Gabutti et al., 2023). The adoption of BIM in FM will be more successful if the organization fosters a culture of innovation and technology. Besides, the readiness level of adopting BIM in FM might be lower if the organizational culture is siloed (Zainuddin et al., 2020) because BIM necessitates a collaborative approach in which all stakeholders should work together at the same platform.

Top management support is another element that influences an organization’s readiness to implement a new system (Zureehan & Lee, 2022). Top management should act as a lead in implementing a change by providing a clear vision and direction for BIM adoption, guiding employees to implement the change. They should appreciate

the effort of teams and encourage them during the BIM-FM integration process. This is because the employees will not be interested in or prepared to adopt BIM in FM if the top management shows a passive attitude in adopting BIM. Therefore, the readiness level to adopt BIM in FM will be higher if the employees feel supported by top management.

Resources availability is also a factor influencing the readiness level of stakeholders to adopt BIM in FM. The presence and accessibility of the necessary resources such as finance, tools, technology and personnel are crucial in determining the readiness level in implementing BIM-FM. This is because BIM can only be implemented effectively in FM when there are sufficient resources (Mwai et al., 2018). Therefore, organizations with adequate resources will have a higher readiness level than those with limited resources. Adequate resources are the prerequisite for the smooth implementation of BIM in FM.

The level of skill and knowledge also contributes to varying readiness levels among stakeholders. The readiness level of stakeholders to adopt BIM in FM practices will be high if they have adequate skill and knowledge (Tahir et al., 2021). This is because BIM could not be implemented smoothly without sufficient skill and knowledge even if other resources like finance and technology are in place. Therefore, stakeholders with proper expertise to integrate BIM into FM processes are more prepared to adopt BIM as compared to those who are facing skill and knowledge gaps.

In conclusion, despite BIM's proven benefits, its implementation in Facilities Management (FM), particularly in Malaysia, remains limited. Existing research often overlooks the operational phase, where BIM can provide long-term value through improved maintenance, efficiency, and sustainability. This study addresses that gap by focusing on hard FM, which involves critical building systems. Identifying the challenges that hinder BIM adoption and evaluating stakeholders' readiness are crucial steps. These insights help ensure that implementation strategies are realistic, targeted, and aligned with industry capabilities. Ultimately, it can support a smoother digital transition and promoting sustainable practices in the Malaysian construction sector.

III. METHODOLOGY

For this research, a quantitative research method is employed in which the questionnaire will be distributed to the selected respondents to collect the data required. Quantitative approach provides objective data through systematically measuring and enabling a clear communication and interpretation of results through statistics and numbers. It allows for broader generalizations and accommodates a larger number of respondents, ensuring more accurate findings that can apply to a larger population.

The research methodology can be broadly separated into five phases which are preliminary study, literature review, data collection, data analysis and conclusion and recommendations as shown in Figure 1.0.

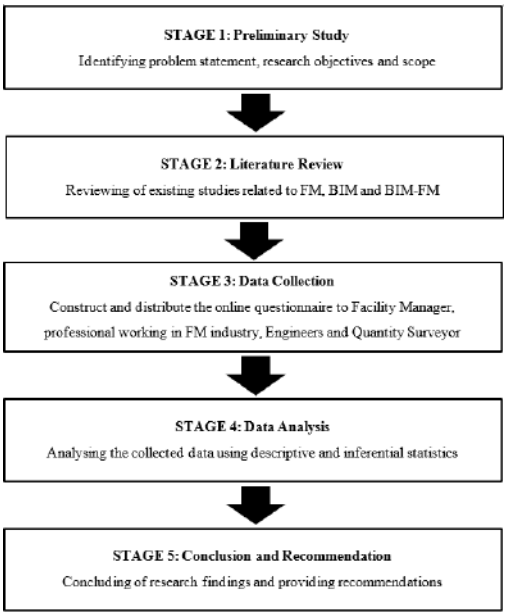

Figure 1.0 Research Process

The research was initiated by conducting a preliminary study to identify the current issues pertaining to the proposed title. The result from the study shows that the low efficiency of facilities management (FM) and

underutilization of technology in FM was a persistent issue in Malaysian construction industry. Literature review involves reviewing secondary data such as journals, books and government publications for developing theoretical framework and conceptual models pertaining to the research topic. Data collection in this research is a process of gathering data from questionnaire to acquire insights regarding the research objectives. The data collected will then be analyzed using the Statistical Package for the Social Sciences (SPSS) to meet the research objectives. The final stage in this research encompasses summarizing the findings of research and providing appropriate recommendations for the improvement of future research.

Instrument Development

The questionnaire is designed with closed-ended questions with 5-point Likert scale where the respondents can answer the questions by selecting "strongly agree", "agree", "neutral", "disagree" or "strongly disagree". All the questions are set to be compulsory to ensure the completeness and sufficient of valid data. It was separated into three sections: Section A, B and C.

Section A mainly focuses on the general information of the respondent. The questions in this section are structured as multiple-choice.

Table 1.0 Respondents' Background

Independent Variable	No.	Items/Questions
Registered Facility Manager, Professional working in FM Industry, Engineer, Quantity Surveyor in Malaysia	1	Profession
	2	Current Organization
	3	Age
	4	Working Experience
	5	Experience in Facilities Management
	6	Experience in BIM

Section B was created to meet the first objective, which is the challenges of BIM implementation in FM in Malaysian construction industry.

Table 2.0 Instrument Table for Section B

Dependent Variable	**Construct**	**Code**	**References**
BIM-FM Challenges	Attitude and Perception of BIM	A1-A3	Tan et al., 2018; Durdyev et al., 2022; Hassanain et al., 2023
	Organizational Culture	O1-O3	
	Technology and Infrastructure	T1-T3	
	Technical Skill and Knowledge	S1-S4	
	Cost	C1-C5	
	Guideline and Legal Framework	G1-G4	Tezel et al., 2021; Durdyev et al., 2022; Hassanain et al., 2023

Section C was designed to meet the second objective, which is the readiness level of implementing BIM in FM in Malaysian Construction Industry.

Table 3.0 Instrument Table for Section C

Dependent Variable	**Construct**	**Code**	**References**
Readiness Level	Awareness	AA1-AA6	Tahir et al., 2021; Mohd Zureehan & Lee, 2022; Gabutti et al., 2023
	Organizational Culture	OC1-OC5	
	Resources Availability	RA1-RA7	
	Skill and Knowledge	SK1-SK5	
	Top Management Support	TS1-TS5	

Population and Sampling

In this research, the targeted population focused on registered facility managers or professionals working in FM industry under Malaysian Association of Facility Management (MAFM), registered engineers under Boards of Engineers Malaysia (BEM) and registered quantity surveyors under Board of Quantity Surveyors Malaysia (BQSM). This is because they are the individuals involved in the facilities management process, possessing a higher level of familiarity and knowledge of the FM area.

Table 4.0 Total Population of Research

Group of Respondent		Total Population	Sources
Facility Manager / Professional Working in FM Industry		141	MAFM, 2024
Engineer	Graduate Engineer	211,993	BEM, 2024
	Professional Engineer	8,105	
Quantity Surveyor (QS)	Provisional QS	2,832	BQSM, 2024
	Professional QS	494	
	Consultant QS	1,282	
TOTAL		**224,847**	

Purposive sampling was utilized in this research as it allows for a specific selection of respondents who are experienced or have knowledge of Facilities Management (FM) and Building Information Modelling (BIM) as well. Based on the Krejcie & Morgan table, the appropriate sample size (S) for this research is 384 where the population size (N) is 224,847.

Data Analysis Method

The data collected for this research will be analyzed using descriptive and inferential statistical methods. Descriptive statistics provide concise summary of data without making any inferences from probability theory. The descriptive analysis will be performed through frequency distribution and mean analysis. A frequency distribution can be different shapes, normal or skewed, either positively or negatively. Typically, the highest percentage of frequency in data analysis reflects the most common responses from the selected respondents. The calculation of frequency is as follows:

$$Percentage = \frac{Frequency\ of\ Selected\ Answer}{Total\ Respondents} \times 100\%$$

Mean analysis will be employed to determine the average of the sample data. The respondents' level of agreement on the challenges of BIM implementation in FM and the readiness level of implementing BIM in FM can be identified by calculating the mean range. In general, the higher the mean score range, the higher the level of agreement. To perform mean analysis, the mean value is calculated by dividing the overall sum of the scores by the total number of respondents. The calculation of means is as follows:

$$Mean, \mu = \frac{\sum X}{N}$$

Where:
$\sum X$ = Sum of all data
N = Number of data

Before proceeding to inferential analysis, normality test will be carried out to check whether the collected dataset is normally distributed. It is important in ensuring the validity and reliability of statistical results and conclusions. Assuming the data is normally distributed, one-way ANOVA test is used to determine whether there is a variation in perception regarding the challenges of BIM implementation in FM. Besides, the test aims to assess the differences in readiness level of implementing BIM in FM based on the respondents' profession, current organization and age. However, the Kruskal-Wallis test will be employed if the data is not normally distributed.

CONCLUSION

The research findings should meet both research objectives which are identifying the challenges of BIM implementation in FM and determining the readiness level of Malaysian construction industry stakeholders in implementing BIM in FM. Stakeholders are expected to benefit from a better understanding of BIM implementation challenges as they can take proactive measures to promote and improve BIM-FM practices. Meanwhile, the readiness level serves as a basis for relevant authorities in forecasting how long the construction industry will take to fully implement BIM in FM as well as assessing the landscape of BIM-enabled FM in Malaysia. A high readiness level in adopting BIM-FM will guarantee a sustainable future for Malaysian construction industry. The research findings will contribute to the landscape of BIM-FM integration, where future

research could focus on executing the implementation of BIM in FM for sustainability.

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