

A Study on Perception, Readiness, Expectations, and Future Satisfaction toward Smart Campus Development at Universiti Islam Melaka (Unimel)

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DOI Link: <http://dx.doi.org/10.6007/IJARBS/v15-i12/27172>

Published Date: 27 December 2025

Abstract

The advancement of Smart Campus initiatives has become a strategic priority for higher education institutions seeking to enhance academic delivery, administrative efficiency, and overall campus experience. This study investigates the perception, readiness, expectations, and anticipated future satisfaction of students and staff toward Smart Campus development at Universiti Islam Melaka (Unimel). A quantitative approach was adopted using a structured questionnaire distributed to 120 respondents, comprising both students and staffs. The instrument measured four key constructs using a five-point Likert scale and demonstrated strong internal reliability. Descriptive statistical analysis revealed consistently high mean scores across all constructs, indicating positive perceptions, strong technological readiness, clear expectations of smart campus features, and optimistic future satisfaction. The findings suggest that UniMel's community is well prepared for Smart Campus implementation, particularly in terms of digital skills, acceptance of smart systems, and support for integrated digital services. This study provides institution-specific empirical evidence to support strategic planning and contributes to informed decision-making for the development of a sustainable, user-oriented Smart Campus ecosystem.

Keywords: Smart Campus, Perception, Readiness, Expectations, Future Satisfaction

Introduction

The rapid digital transformation of higher education has positioned universities worldwide under increasing pressure to modernise their teaching, learning, and administrative ecosystems. The emergence of the Smart Campus concept represents a strategic response to this challenge, integrating digital technologies such as cloud computing, mobile platforms, automation, artificial intelligence, and Internet of Things (IoT) solutions to create intelligent, efficient, and user-centred campus environments. In the post-pandemic era, where hybrid

learning, digital service delivery, and data-driven decision-making have become essential rather than optional, Smart Campus development is no longer a technological trend but a critical institutional necessity.

The importance of studying Smart Campus initiatives lies in their potential to directly enhance institutional effectiveness, operational efficiency, and user experience. Smart Campus systems are designed not only to digitise existing processes but also to improve service responsiveness, optimise resource utilisation, strengthen campus safety, and support sustainable practices. When implemented effectively, these systems can reduce administrative burdens, save time, improve access to information, and create a more engaging learning and working environment for students and staff. However, the effectiveness of such initiatives depends heavily on human factors particularly users' perceptions, readiness, expectations, and anticipated satisfaction toward the proposed technologies.

Despite increasing investments in smart technologies, many higher education institutions experience implementation challenges due to insufficient understanding of user needs, limited digital readiness, and misalignment between system design and actual campus practices. Without empirical evidence on how users perceive Smart Campus initiatives and how prepared they are to adopt them, institutions risk developing systems that are underutilised, resisted, or ineffective in addressing real operational and academic challenges. Therefore, it is essential to study Smart Campus initiatives from a user-centred perspective rather than focusing solely on technological infrastructure.

In the context of Universiti Islam Melaka (Unimel), Smart Campus development aligns with national digitalisation aspirations and the university's vision of becoming a modern, value-driven higher education institution. However, prior to large-scale implementation, there is a clear need to assess the university community's perception of Smart Campus concepts, their readiness to adopt smart systems, their expectations of smart services, and their anticipated future satisfaction. Currently, Unimel lacks institution-specific empirical data to guide strategic planning and policy decisions related to Smart Campus implementation. This gap highlights the necessity of the present study.

By systematically examining perception, readiness, expectations, and future satisfaction among Unimel students, this study provides evidence-based insights that are critical for ensuring that Smart Campus initiatives are effective, relevant, and sustainable. Rather than treating smart technologies as isolated tools, the study emphasises their practical utility in improving daily campus life, supporting teaching and learning, and strengthening institutional governance.

Significance of the Study

The significance of this study lies in its practical, institutional, and academic contributions. From an institutional perspective, the findings provide Unimel's management and policymakers with empirical evidence to support informed decision-making. By understanding users' readiness and expectations, the university can prioritise investments, plan suitable training, and implement Smart Campus systems that better match actual campus needs, thereby improving effectiveness and long-term success.

This study is also beneficial to students and staff as the main users of Smart Campus systems. By examining their perceptions and expectations, the research helps ensure that future Smart Campus developments are user-centred, accessible, and supportive of daily academic and administrative activities. This can reduce resistance to technological change and increase user acceptance and satisfaction.

In addition, the study contributes to the Smart Campus literature in the Malaysian higher education context. Unlike studies that focus mainly on technical aspects, this research highlights the importance of human factors in Smart Campus development. The findings may also serve as a reference for other universities with similar characteristics.

Finally, the study provides a baseline for future evaluation. By documenting current perceptions, readiness, expectations, and anticipated satisfaction, Unimel can later assess whether implemented Smart Campus initiatives meet user needs and support continuous improvement.

Literature Review

Globally, the “smart campus” is seen as an extension of the smart city idea, where digital technologies such as IoT, cloud computing, big data analytics and mobile applications are integrated into campus infrastructure to enhance teaching, learning, management and sustainability. In Malaysia, Musa, Ismail and Md Fudzee (2021) define a smart campus as an environment that provides efficient technology and infrastructure to improve teaching, research and student experience, and they identify six key domains: smart learning, smart management, green campus, smart health, smart governance and smart community.

Rahim, Chuing and Obaidellah (2021) show, through a systematic review, that smart campus initiatives are increasingly linked to enhancing campus users’ learning experiences, including applications of augmented reality (AR), virtual reality (VR) and real-time network analytics to personalise services and improve quality of learning. Internationally, Martins et al. (2021) emphasise that smart campus initiatives should not just focus on technology, but also on sustainability, user satisfaction and flexible, data-driven services.

For Malaysian higher education institutions (HEIs), Abu Bakar (2025) synthesises recent smart campus initiatives and concludes that such technologies can improve operational efficiency, decision-making and academic productivity, but they also face barriers such as cost, data security and integration with legacy systems. These broader findings form the background for studying perception, readiness, expectations and future satisfaction at Universiti Islam Melaka (UniMel), which has recently positioned itself as a modern Islamic university and publisher of smart-city and smart-learning–related research.

Perception toward Smart Campus

Student and staff perception is a central construct in smart campus research because positive perceptions of usefulness, convenience and safety drive acceptance and long-term use. Mustafa et al. (2021) examined student perceptions of smart campus initiatives in a Malaysian HEI and found generally positive views, especially on aspects like ubiquitous Wi-Fi, digital services and campus safety; however, students were more critical about reliability and integration of services.

Rahim et al. (2021) similarly report that users tend to perceive smart campus applications as improving access to information, engagement and flexibility, but they also highlight concerns related to privacy, data security and equitable access to devices and connectivity. Abu Bakar's (2025) review reinforces this pattern: campus users value improved service quality and responsiveness, but their perceptions are shaped by how well systems are communicated, how intuitive they feel, and whether they truly reduce administrative burden rather than add extra work.

Outside Malaysia, user-centred studies emphasise that smart campus design must align with the daily experience of students and staff. Elbertsen, Kok and Salimi (2025) identify key design elements valued by users—such as reliable real-time space information, energy-efficient and comfortable learning spaces, and user-friendly interfaces—and show that these features strongly influence the perceived quality of the smart campus environment. This literature suggests that in UniMel's context, student and staff perception will likely depend on how smart campus initiatives translate into visible benefits (better connectivity, easier access to information, safer and more comfortable spaces) rather than on the technology labels themselves.

Readiness for Smart Campus Implementation

"Readiness" in smart campus research covers several dimensions: infrastructure readiness, organizational readiness and individual (technology) readiness.

From an infrastructure perspective, Rawi et al. (2023) conducted a preliminary study on WLAN readiness in Malaysian public HEIs to support smart campus initiatives. They found that while WLAN services were available across institutions, many campuses still needed improvements in logical architecture and coverage to fully support high-bandwidth applications such as smart classrooms, pervasive sensors and video-based safety systems. Their findings imply that for UniMel, network capacity, coverage and reliability are foundational to any perceived "smartness".

At the institutional level, Imbar et al. (2022) propose a smart campus framework that helps HEIs assess their current "smartness" and plan improvements from anthropocentric, systemic and technological perspectives. The framework stresses that readiness includes governance structures, policies, data management, and change management—not only devices and platforms. Al Akbar et al. (2023) further provide guidelines, based on a systematic literature review, for designing smart campus architecture using the latest ICTs, highlighting the need to clarify objectives, select appropriate technologies, and design interoperable systems.

Individual readiness is often discussed using technology readiness and technology acceptance concepts (e.g., optimism and innovativeness versus discomfort and insecurity toward technology). Reviews of smart campus adoption show that students' digital skills, prior exposure to e-learning, and attitudes toward technology significantly affect their readiness to engage with smart campus services, particularly when campuses adopt mobile apps, smart cards or sensor-based systems for everyday activities. In Malaysia, Abu Bakar's (2025) review notes that successful smart campus initiatives tended to be those where leadership support, staff upskilling and stakeholder engagement were prioritised—suggesting that organizational readiness at UniMel should include staff training, clear governance and user involvement, not just procurement of technology.

Expectations toward Smart Campus Services

Expectations represent what students and staff hope a smart campus will deliver in the future. Literature indicates that users usually expect smart campus initiatives to:

- provide seamless, high-quality connectivity and access to learning resources anywhere on campus;
- support personalised, flexible learning (e.g., blended learning, analytics-driven feedback);
- improve safety, security and well-being; and
- contribute to sustainability and “greener” campus operations.

Rahim et al. (2021) show that campus users expect smart campus applications to enhance learning experiences through more interactive and immersive tools (AR, VR) and more responsive network services. Martins et al. (2021) identify user expectations related to sustainability and digital convenience. Students expect smart services that allow them to transact, navigate, and access information easily while contributing to environmental goals. Setiawan (2024) discusses how the development of smart campuses is expected to address challenges such as limited physical space, rising infrastructure costs and the need for innovative learning designs, with an emphasis on flexible learning environments and integration of smart technology into campus architecture. Elbertsen et al. (2025) emphasise that users expect smart campus systems to be intuitive and to provide meaningful, real-time information for example room availability, indoor climate comfort, energy use rather than complex, fragmented tools.

For Unimel, expectations may also include alignment with its Islamic and value-based mission. Mukhlisin (2024), in a Unimell-published article on smart cities-based learning innovation, argues that smart, technology-rich environments should also nurture values such as love of the homeland and ethical character. This suggests that UniMel’s stakeholders may expect a smart campus not only to be technologically advanced, but also to support holistic, value-driven education.

Future Satisfaction with Smart Campus

“Future satisfaction” can be linked to how current perceptions, readiness and expectations shape satisfaction once smart campus solutions are fully implemented. Although relatively few studies use the exact term “future satisfaction”, related constructs such as user satisfaction, perceived service quality and continuance intention are widely used.

Abu Bakar (2025) notes that when smart campus implementations are aligned with clear institutional strategies, supported by leadership and accompanied by stakeholder capacity-building, they tend to yield higher satisfaction in terms of resource management, decision speed and teaching–learning flexibility. Rahim et al. (2021) indicate that satisfaction is strongly influenced by whether smart campus applications genuinely enhance learning experiences, rather than simply digitising existing processes.

From a design perspective, Elbertsen et al. (2025) show that user satisfaction increases when smart campus elements directly address everyday pain points (e.g., finding seats, comfort, energy efficiency) and when systems are user-centred, transparent and easy to use. In a similar vein, Imbar et al. (2022) argue that satisfaction depends on how effectively smart

services solve real campus problems and improve quality of life for stakeholders, not simply on the presence of advanced technologies.

Over time, expectation–confirmation theory suggests that satisfaction will be high if the implemented smart campus meets or exceeds prior expectations regarding connectivity, service quality, safety and sustainability. For UniMel, this means that measuring baseline expectations and perceptions now, and then comparing them with post-implementation experiences, will be important for understanding future satisfaction and continuous improvement.

Implications and Gap for Unimel

Overall, the literature shows that:

- **Perception** of smart campus is generally positive but depends heavily on perceived usefulness, ease of use, safety and visible benefits to learning and daily campus life.
- **Readiness** involves infrastructure (e.g., WLAN, IoT), organizational structures and human factors (digital skills, attitudes, leadership support).
- **Expectations** are oriented toward seamless connectivity, flexible and immersive learning, user-friendly services, safety and sustainability, often with a strong post-COVID-19 emphasis on digital and hybrid learning.
- **Future satisfaction** is likely to be determined by how far the actual implementation of smart campus services at UniMel matches these expectations and addresses existing pain points.

Most existing Malaysian studies focus on national-level initiatives, specific technical aspects (WLAN, IoT applications) or general perceptions in other universities. There is very limited empirical work specifically on UniMel's community. This gap supports the proposed study: examining perception, readiness, expectations and future satisfaction among UniMel students and staff will provide institution-specific evidence to guide the university's smart campus roadmap and help align technological investments with user needs and values.

Methodology

This section presents the findings for Sections A, B, C, and D, which measure Perception, Readiness, Expectations, and Future Satisfaction toward Smart Campus implementation at Universiti Melaka (Unimel). A total of 120 respondents participated in this study, consisting of both students and staff from various faculties. The data were collected using a structured online questionnaire developed based on validated constructs from previous Smart Campus and technology-readiness studies. Each section of the questionnaire employed a five-point Likert scale, ranging from 1 = *Strongly Disagree* to 5 = *Strongly Agree*, allowing respondents to express their level of agreement with each statement.

Data were analysed using descriptive statistics, including mean scores and percentage distributions, to identify the overall agreement level for each construct. Findings across Sections A to D indicate a consistently high level of agreement, suggesting that Unimel's community has positive perceptions, strong readiness, clear expectations, and optimistic future satisfaction regarding the implementation of Smart Campus initiatives.

Findings

This section presents the findings for Sections A, B, C, and D, which measure Perception, Readiness, Expectations, and Future Satisfaction toward Smart Campus implementation at Universiti Melaka (UniMel). A total of 120 respondents participated in this study, and the results show consistently high levels of agreement across all constructs.

Table 1

Section A – Perception Toward Smart Campus

Item	Statement	Mean	Interpretation
A1	I understand the concept of Smart Campus.	4.27	High
A2	I support UniMel's effort to establish a Smart Campus.	4.41	High
A3	Smart Campus will benefit the university community.	4.44	High
A4	Digital technology should be part of university operations.	4.56	High
A5	Smart Campus will improve learning/working experience.	4.39	High
Overall		4.41	High

The results indicate that the community at UniMel has a highly positive outlook toward Smart Campus initiatives. The mean score for perception was high at 4.41, demonstrating strong awareness, understanding, and support for Smart Campus implementation.

Table 2

Section B – Readiness Toward Smart Campus

Item	Statement	Mean	Interpretation
B1	I am ready to use smart systems daily.	4.28	High
B2	I have sufficient ICT skills.	4.08	High
B3	I have suitable devices for digital access.	4.58	High
B4	I am willing to attend training.	4.32	High
B5	I am comfortable using online systems.	4.32	High
Overall		4.31	High

Respondents also exhibited a high level of readiness, reflected by a mean score of 4.31, showing that they possess adequate ICT skills, access to necessary digital devices, and confidence in using online systems.

Table 3

Section C – Expectations Toward Smart Campus Features

Item	Statement	Mean	Interpretation
C1	I expect a unified student/staff portal.	4.46	High
C2	I expect e-wallet or QR payment systems.	4.41	High
C3	I expect automated attendance systems.	4.33	High
C4	I expect strong campus-wide internet coverage.	4.59	High
C5	I expect a mobile app for schedules and results.	4.44	High
Overall		4.45	High

Expectations toward Smart Campus features were equally high, with a mean score of 4.45. Respondents expressed strong interest in features such as high-speed campus-wide internet, a centralised digital portal, automated attendance systems, and a mobile application offering academic and administrative services.

Table 4

Section D – Anticipated Future Satisfaction

Item	Statement	Mean	Interpretation
D1	Smart Campus will ease academic/administrative tasks.	4.47	High
D2	Smart Campus will help save time.	4.38	High
D3	I will be satisfied if systems operate reliably.	4.58	High
D4	I will feel confident with modern digital initiatives.	4.52	High
D5	Smart Campus will enhance UniMel's reputation.	4.56	High
Overall		4.50	High

Future satisfaction recorded the highest mean score of 4.50, showing that respondents believe Smart Campus implementation will improve efficiency, save time, enhance reliability, and uplift UniMel's reputation.

Table 5

Instrument Reliability (Cronbach's Alpha)

Section / Scale	Alpha (α)	Interpretation
Section A – Initial Perception	0.83	Very good
Section B – Readiness	0.75	Good
Section C – Expected Features	0.81	Very good
Section D – Expected Satisfaction	0.85	Very good
Overall (A + B + C + D)	0.85	Very good

The reliability of the instrument used in this study was assessed using Cronbach's Alpha. The results indicate that all sections of the questionnaire demonstrated acceptable to very good levels of internal consistency. Section A, which measured Initial Perception, recorded a Cronbach's Alpha value of 0.83, indicating very good reliability. Section B, focusing on Readiness, obtained an alpha value of 0.75, which reflects good reliability. Section C, which assessed Expected Features, produced an alpha value of 0.81, also classified as very good. Section D, measuring Expected Future Satisfaction, achieved the highest reliability score at 0.85, demonstrating very good internal consistency. The overall reliability score for all constructs combined (A + B + C + D) was 0.85, indicating that the instrument is highly reliable and suitable for measuring perceptions, readiness, expectations, and satisfaction related to Smart Campus implementation. Reliability analysis revealed strong internal consistency across all constructs, with Cronbach's alpha values ranging from 0.75 to 0.85. Correlation and regression analyses confirmed significant relationships between perception, readiness, expectations, and future satisfaction.

Discussions and Conclusion

The findings of this study indicate that Unimel's students demonstrate strong support, high readiness, and clear expectations toward adopting Smart Campus initiatives. Respondents showed positive perceptions of the benefits of smart technologies, including improved access to information, enhanced learning experiences, and more efficient campus services. Their high readiness reflects not only adequate digital skills but also a willingness to adapt to new technologies as an essential factor highlighted in the literature for successful digital transformation. Likewise, the expectations expressed toward seamless connectivity, smart facilities, integrated systems, and user-friendly platforms offer valuable insight into what Unimel's community values most. These expectations serve as important strategic guidance for planners, ensuring that the Smart Campus development aligns with actual user needs rather than purely technological offerings.

Based on these results, Unimel is in a favourable position to implement a Smart Campus ecosystem that enhances both academic and administrative functions. The consistently high agreement across constructs suggests that users are likely to be satisfied in the future if implemented systems are reliable, accessible, and responsive to everyday campus challenges. Therefore, the university administration should leverage these findings to guide infrastructure upgrades, involve users in design decisions, strengthen training and digital literacy initiatives, and establish long-term governance structures to sustain the Smart Campus journey. Collectively, this study provides a clear foundation for Unimel to develop an informed Smart Campus roadmap that supports innovation, improves user experience, and

positions the university as a forward-thinking institution in Malaysia's evolving higher education landscape.

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