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Building smart universities based on the Internet of Things and information technology service management

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Abstract
This study aimed to explain whether academic community readiness, the Internet of Things, and Information Technology Service Management significantly affect university performance towards a smart university. This research also aimed to examine whether Information Technology Service Management mediates the relationship between academic community readiness and the Internet of Things with university performance towards a smart university. The study was conducted with a quantitative approach with a correlational type at several universities in Indonesia and Malaysia. The research sample consisted of 492 people, comprised of students, lecturers, and staff. Data were analyzed using the SmartPLS program version 3.2.9. The results showed that academic community readiness, the Internet of Things, and Information Technology Service Management significantly affect university performance towards a smart university. This study also found that exemplary Information Technology Service Management implementation can mediate the relationship between academic community readiness and IoT with university performance towards a smart university. This research explains the importance of tertiary institutions measuring the preparedness of their academic community to become an innovative community to support the success of the smart university program. This research suggests that the implementation of the Internet of Things and Information Technology Service Management is an essential and primary indicator in supporting the achievement of the smart university program.

Keywords: Community readiness; Internet of Things; smart campus; smart university; university performance.

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1. INTRODUCTION

Facing the 5.0 era, universities should be more brilliant in providing services to the community (Husin et al., 2022). The drive to become an intelligent campus is essential for universities to overcome the new challenge in the new world order (Adnan et al., 2022; Xieling et al., 2021). If universities prepare to become smart campuses, people, as customers, will stay behind because they are also getting smarter (Abidin, 2021). The smart campus has various meanings depending on which point of view researchers have seen. Some people associate it with aspects of technology services (Sadeghi, 2022) and others link it with integrative elements and ease of getting services so that people can get information and university services quickly, safely, and comfortably (Smith, 2022). Nevertheless, the technological aspect is essential in building a smart campus because it will connect all the elements needed in an intelligent campus (Muhamad et al., 2017; Agbo et al., 2021).

Higher education institutions are similar to business institutions (Berbegal-Mirabent & Gil-Doménech 2020) because both have similarities in customer service. However, they differ in terms of products and types of services (Miller et al., 2014). Therefore, the essential things needed by a company are also needed by universities. In terms of implementing IT in the service aspect, for example, universities should be at the forefront because higher education is an agent of change for community change, so they must be able to become pioneers in providing accessible, practical, and efficient services for the community (Sara & Jones, 2018). However, in reality, many higher education institutions play the opposite role; instead of being agents of change, they usually become the object of change itself (Doring, 2002).

Most universities have been supported by adequate infrastructures, such as information technology systems (Shabdin et al., 2020). However, in its application, many universities still need to improve. This deficiency can be seen in the number of complaints from customers and the dissatisfaction of service users with the services provided by universities (Abidin, 2021). In line with these conditions, the main challenge faced by universities is how to optimize the use of systems and information technology (IT) to provide services with the proper access targets to provide satisfaction and convenience to customers, which in the end, the institution's goals are achieved (Ahmed et al., 2020). To realize this goal, universities must commit to improving various institutional sectors, including the IT sector. This commitment is usually stated in a strategic management program in developing management processes in the field of information technology, known as Information Technology Service Management (ITSM) technology (Iden & Eikebrokk, 2013).

ITSM is an IT organizational approach used to design, build, integrate, manage, and develop quality IT services. IT service management (ITSM) is an effort by the IT team to provide IT services by prioritizing customers (Addy, 2007). The IT team is usually a combination of people responsible for the design, product creation, and others. This IT service allows customers to quickly access service information provided by an institution or company (Mohr & Bitner, 1995). The ITSM method can be applied to various services, such as procuring hardware, software, and others. ITSM arises because information technology is closely related to services (Weed-Schertzer, 2019).

In building a smart university, the readiness of the academic community to become a smart community and the readiness of universities to implement ITSM and IoT is essential to support the improvement of smart university performance (Downes & Campbell, 2018; Hu et al., 2022). Several previous studies have stated that community readiness is the primary basis that must be prepared to build a smart city (Antoni et al., 2020), and the government is required to test the readiness of its people first before building a smart city or smart government. Likewise, in universities, a chancellor cannot immediately build a smart university before knowing the readiness of his academic community to become a smart community (Hidayat et al., 2021) to avoid failure (Donnermeyer et al., 1997; Oetting et al., 1995).

1.1. Literature review

1.1.1. Smart academic community readiness

The readiness of the campus academic community to become a smart community is an essential factor that supports the success of a smart university (Samancioglu & Nuere 2023). Like a city leader who wants to build a smart city, he must first know the readiness of its citizens to become a smart community (Antoni et al., 2020; Zimmermann, 2023) because if the community is not ready to become a smart community, the goal of building a smart city will be challenging to realize. Likewise, efforts to build a smart university must be preceded by looking at the readiness of the university academic community to become a smart community to avoid failure (Oetting et al., 1995).

Measuring the readiness of campus residents to become a smart academic community is difficult because the communities in it are varied. However, measuring their readiness to become a smart academic community can be related to the general characteristics of the smart community. One of the instruments that can be used to measure people's readiness to become a smart community is the one developed by Statistics Indicators Benchmarking the Information Society (SIBIS), which consists of four variables, namely internet usage behavior, internet usage, e-government, and additional human resources (SIBIS, 2003).

The researchers developed indicators of the four variables to measure community readiness. Internet usage behavior consists of four indicators: Personal Activities, Ease of Access, providing and sharing information with colleagues, and Communication Services. The use of the Internet indicator covers five aspects, namely: Finding information via the Internet every day; Using the Internet to get information online; Sending job data using email; and Communicating with colleagues (Tyas et al., 2015; Fakhruldeen et al., 2024). Meanwhile, to develop the E-government variable, the researcher borrowed the theory of Antoni et al. (Antoni et al., 2020) consisting of Government information search through e-government services; ease of e-government services; Ease of Access; confidence in the truth of e-government information; and Data Security. As for explaining the human resources readiness variable, the researcher took several indicators developed by Fariani: Training, Building Competency, Knowledge Management, Education, and Workshops.

Many studies explain that community readiness is an essential factor for the achievement of a program. Research on community readiness is vital to guarantee that the owners can achieve the program objectives (Beebe et al., 2001) and avoid failure (Oetting et al., 1995). Research on community readiness has been carried out in various fields before program implementation, such as health (Oetting et al., 2001; Thurman et al., 2003), social marketing (Kelly et al., 2003), building smart cities (Buckner-Brown et al., 2014), and other fields. Some of these studies confirm that research on community readiness needs to be carried out to ensure that incumbents or program owners can validate the planned program successfully and not fail (Donnermeyer et al., 1997). Likewise, with the development of a smart Islamic university, adequate knowledge is needed related to the readiness of the academic community to become a smart community to support the achievement of the Islamic Smart University program that will be developed.

1.1.2. Application of ITSM and IoT at smart universities

IT service management consists of two main parts: service delivery and service support (Addy, 2007). Service Delivery is a tactical process that provides the ability to provide adequate support to customers, oriented toward planning. Service delivery includes various processes as follows (Meziani & Saleh, 2010):

- Service Level Management (SLM). The primary purpose of SLM is to provide an easy-to-understand mechanism for the expectations of customers and user groups to use the services provided. Activities covered by cataloging include services, identifying requirements, negotiating, and managing service continuity, availability, and capacity (Motta et al., 2014).

- Financial Management, which is a financial management process that is managed based on IT management to make it easier for customers in financial processes both to pay service fees and receive money from institutions, such as salaries and scholarships (Seiyaboh & Bahja, 2021).
- Capacity Management is a management process that controls service capacity to satisfy user needs and ensure that IT infrastructure can meet changing business needs on time and within budget (Yu-Lee, 2002). Capacity management includes the capacity of hardware, network equipment, printers, software, and all human resources (McLean, 2012).
- IT Service Continuity Management is a management process that aims to minimize disruption to institutions caused by system errors in achieving predetermined targets (Klems et al., 2010).
- Availability Management: the management process that ensures that IT services are available to all users when they need IT services (McLean, 2012).
- IT Service Desk: the main gateway for communication for end users if they need assistance. The IT service desk receives incident reports, records, tracks incidents, provides solutions during the first call, monitors status, and sees the progress of all incoming incidents (Tang & Todo, 2013).

The Internet of Things (IoT) application is also essential in building a smart university (Downes & Campbell, 2018). With IoT, campuses will monitor, manage, and control devices remotely. Smart universities require integral information technology and a comprehensive application of information resources (Sneesl et al., 2022). Essential components of smart university development should include smart technology, smart services, smart management, and smart living. The Internet of Things forms a smart university connecting all elements of the campus with the Internet through special protocols for information exchange and communication to achieve intelligent recognition, location, tracking, monitoring, and management (Zhamanov et al., 2017).

With the support of IoT, smart universities will have three superior service features: instrumented, interconnected, and intelligent (Nikitas et al., 2020). A smart university can integrate all its service features into one system. The development of a smart university and the Internet of Things are two things that cannot be separated because if a smart university is built without implementing an IoT system, it will not be able to provide smart, efficient, scalable, and reliable services (Zhamanov et al., 2017). The application of IoT and ITSM in building a smart university is assumed to have a major impact on the successful performance of a smart university.

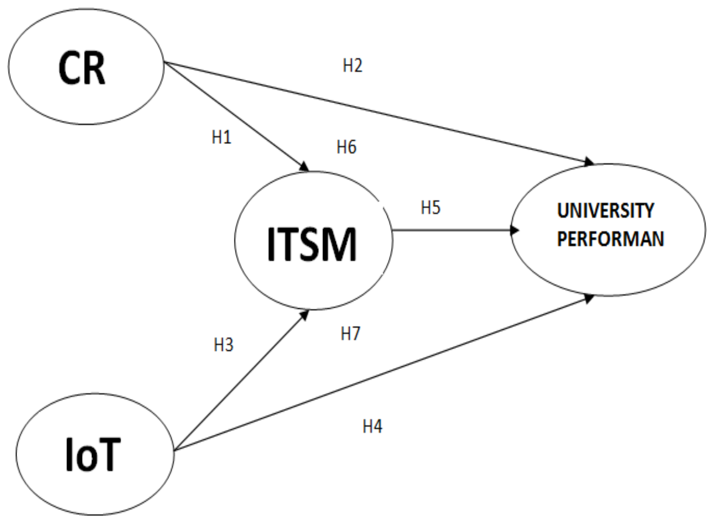
A smart university or smart campus is a campus that provides sophisticated, innovative, and holistic educational services in terms of learning, collaboration, communication, reporting, and all of its services. ICT and IoT are significant in supporting the success of the smart university program. For the implementation of ICT to run well in a smart university environment, it must also be supported by good ICT management. If ICT management is available properly, the performance of the smart university will also be good.

1.1.3. Research model and hypothesis

Generally, the research framework is described in the following research model.

Figure 1

Research model and hypothesis



Based on the theoretical review and Figure 1, researchers developed the following research hypotheses:

H1. The academic community's readiness affects the implementation of ITSM.

H2. The readiness of the campus academic community to become a smart community significantly affects the success of becoming a smart university.

H3. IoT implementation has a significant effect on ITSM.

H4. Exemplary IoT implementation has a significant effect on improving the performance of smart universities.

H5. ITSM implementation has a significant effect on improving the performance of smart universities.

H6. ITSM mediates the relationship between smart community readiness and smart university performance.

H7. ITSM mediates the relationship between IoT deployment and smart university performance toward the smart university.

1.2. Purpose of study

This study aims to see the extent of the readiness of several research universities to become smart universities or smart campuses. Therefore, several variables that influence the success of building a smart university will be measured, especially the readiness of the academic community to become a smart community and the readiness of the university to implement IoT and ITSM. These variables will then be linked to the university's performance variable to see their effect on the university's performance. What is different in this study from previous studies is the placement of the ITSM variable as a mediator for the relationship between smart community readiness and IoT and university performance.

2. METHODS AND MATERIALS

This study uses a quantitative approach. The research was conducted at several Islamic universities in East Java, Indonesia, and Malaysia.

2.1. Participants

The study's respondents were 492 people from the tertiary institution's community, including the leaders, lecturers, employees, and students. The data were collected through a questionnaire distributed to them either directly or indirectly. Direct questionnaires were sent directly in print to their offices, especially the leaders, to obtain data certainty. Meanwhile, indirectly it was sent via WhatsApp groups, Telegram, Facebook, E-mail, and other possible media by filling out the Google form. Once the data is collected, they will be put together for further analysis.

2.2. Data collection instrument

The research instrument is a measuring instrument that will be used to collect research data. The research instrument was developed based on the theories and then supplemented with indicators. The researcher collects the data through questionnaires to obtain comprehensive, valid, reliable, and objective data. This step is essential to help researchers get an overview of the readiness of the campus and its academic community to build a smart university (Creswell, 1999). Four main variables will be measured in this study: community readiness, IoT implementation, ITSM, and smart university performance.

To measure the performance variable of a smart university, the researcher uses the theory of Ng et al. (2010), which classifies smart university services into six sections; iLearning, iGovernance, iGreen, iHealth, iSocial, and iManagement. These six indicators were further developed into 13 question items. Meanwhile, to measure community readiness, the researcher adopted the Statistics Indicators Benchmarking the Information Society (SIBIS) theory, which consists of four variables: internet usage behavior, usefulness, e-government, and variables for adding human resources (SIBIS, 2003). These four indicators were further developed into 8 question items.

To measure the application of ITSM, the researcher uses Addy's theory, which says that IT service management consists of two main parts: service delivery and service support (Addy, 2007). These indicators were further developed into 8 question items. To measure the application of IoT in research universities, researchers used indicators developed by Kazenga et al. that IoT has four categories: electronic appliances, information management facilities, device communication, and human capacity (Kazenga et al., 2017). The researcher also developed an instrument from the Organization for Economic Co-operation and Development ('OECD') theory on the Internet of Things (BEREC, 2019). These indicators were further developed into 8 question items.

2.3. Data analysis

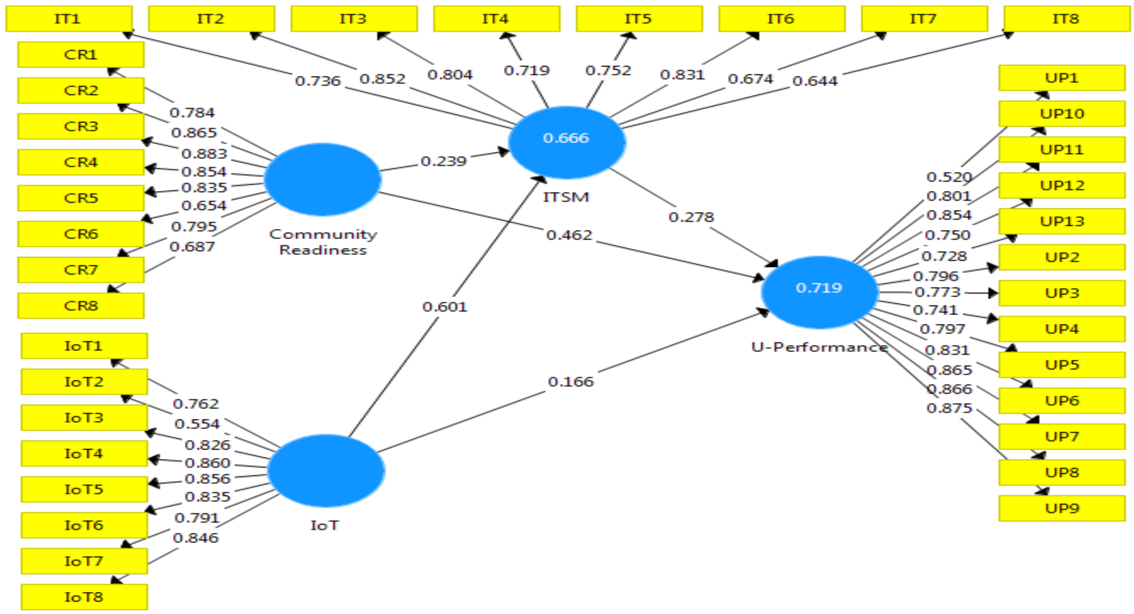
This study uses Partial Least Square (PLS) analysis to test the proposed hypothesis. The hypothesis is analyzed using Smart PLS 3.2.9 Software. PLS is a Structural Equation Modeling (SEM) based on components or variants (Lowry & Gaskin, 2014). The PLS measurement model consists of two stages: the outer and inner models. The outer model consists of a reflective and formative measurement model, while the inner measurement model consists of a structural model (Vilares et al., 2009).

3. RESULTS

A research concept and model can only be tested in a relational relationship prediction model if it has passed the purification stage in the measurement model. The measurement model was used to test the construct validity and instrument reliability. The validity test was conducted to determine the ability of the research instrument to measure what it was supposed to measure. A reliability test is used to measure the consistency of measuring instruments in measuring a concept or can also be used to measure the consistency of respondents in answering questions in questionnaires or research instruments (Drost, 2011). The following (table 2) is a test of validity and reliability in the PLS measurement model.

Figure 2

Bootstrapping Value of factor loading operating with SmartPLS.



3.1. Reflective measurement model

Before testing the research hypothesis, the researcher tested the validity and reliability of the data first. At this stage, the researcher conducted a reflective measurement model analysis. In the reflective model, indicators are seen as the effects of latent variables that can be observed empirically. The reflective measurement model measures indicator reliability, convergent validity (average variance extracted), internal consistency (Composite reliability), and discriminant validity.

Indicator Reliability shows the correlation between the indicator and its construct. An indicator with a low loading value indicates that it does not work in its measurement model. The recommended loading factor value is > 0.70. However, if its value is less than 0.70, the researcher can keep the indicator if the AVE value is more significant than 0.5 (Vinzi, 2010). Picture 2 shows the factor loading values. Indeed, several indicator items are less than 0.70, such as CR6, CR8, IoT2, IT7, and UP1, but when viewed from the AVE value, all variables meet the requirements because they are more significant than 0.5.

Convergent validity or average variance extracted (AVE) shows whether each estimated indicator validly measures the dimensions of the tested concept. AVE measures the amount of variance the construct can capture compared to the variance caused by measurement error. To determine Convergent validity, one must consider the outer loading and AVE (average variance extracted). The AVE value must be higher than 0.50 (Ramayah et al., 2018). Table 2 shows the Average Variance Extracted (AVE) values of all variables greater than 0.5. Because the recommended value for the AVE value is 0.5, it is said that all dimensions meet the requirements.

Internal Consistency or Composite reliability shows the consistency of each indicator in measuring the construct. Internal consistency reliability is considered reliable in more advanced research if its value is > 0.70 (Ringle et al., 2015). Table 1 shows the results of construct validity and reliability values. The table shows that all composite reliability values are > 0.70, meaning they have fulfilled the measurement requirements. Judging from the

Cronbach Alpha value, it also shows > 0.7 greater than recommended, so it meets the requirements for measuring reliability in each dimension.

Table 1

Validity and reliability test results of CR, ITSM, IoT, and UP

Components	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
CR	0,917	0,926	0,933	0,638
ITSM	0,891	0,902	0,913	0,569
IoT	0,915	0,925	0,932	0,635
UP	0,948	0,952	0,955	0,623

CR: Community readiness, ITSM: Information Technology System Management, IoT: Internet of Things, UP: University performance.

Discriminant Validity is a measure to determine whether the constructs or factors being tested are different and whether each is a different construct. A method to assess Discriminant Validity is to examine the cross-loading of the indicators. In particular, the indicator's outer loadings on the associated construct must be greater than all its loadings on other constructs. The indicator's outer loadings on the construction must be higher than all of its cross-loads with other constructions (Ab Hamid et al., 2017).

Table 2

Cross loadings value test result of CR, ITSM, IoT, and UP indicators

Indicators	Community Readiness	ITSM	IoT	UP
CR1	**0,784**	0,579	0,639	0,657
CR2	**0,865**	0,623	0,709	0,741
CR3	**0,883**	0,671	0,724	0,741
CR4	**0,854**	0,637	0,775	0,729
CR5	**0,835**	0,637	0,705	0,676
CR6	**0,654**	0,421	0,530	0,505
CR7	**0,795**	0,685	0,751	0,621
CR8	**0,887**	0,551	0,658	0,489
IT1	0,673	**0,736**	0,669	0,609
IT2	0,671	**0,852**	0,714	0,692
IT3	0,608	**0,804**	0,664	0,600
IT4	0,454	**0,719**	0,569	0,443
IT5	0,615	**0,752**	0,651	0,618
IT6	0,621	**0,831**	0,644	0,654
IT7	0,411	**0,874**	0,430	0,424
IT8	0,431	**0,744**	0,452	0,477
IoT1	0,716	0,619	**0,762**	0,564
IoT2	0,431	0,498	**0,854**	0,355
IoT3	0,750	0,622	**0,826**	0,663
IoT4	0,773	0,662	**0,860**	0,719
IoT5	0,734	0,697	**0,856**	0,679
IoT6	0,699	0,712	**0,835**	0,684
IoT7	0,644	0,613	**0,791**	0,636
IoT8	0,705	0,702	**0,846**	0,659
UP1	0,431	0,562	0,467	**0,820**

UP10	0,650	0,613	0,609	**0,801**
UP11	0,695	0,614	0,672	**0,854**
UP12	0,540	0,457	0,530	**0,750**
UP13	0,539	0,524	0,546	**0,728**
UP2	0,641	0,587	0,602	**0,796**
UP3	0,637	0,640	0,643	**0,773**
UP4	0,634	0,612	0,601	**0,741**
UP5	0,736	0,633	0,706	**0,797**
UP6	0,696	0,621	0,656	**0,831**
UP7	0,691	0,654	0,668	**0,865**
UP8	0,700	0,614	0,652	**0,866**
UP9	0,698	0,652	0,682	**0,875**

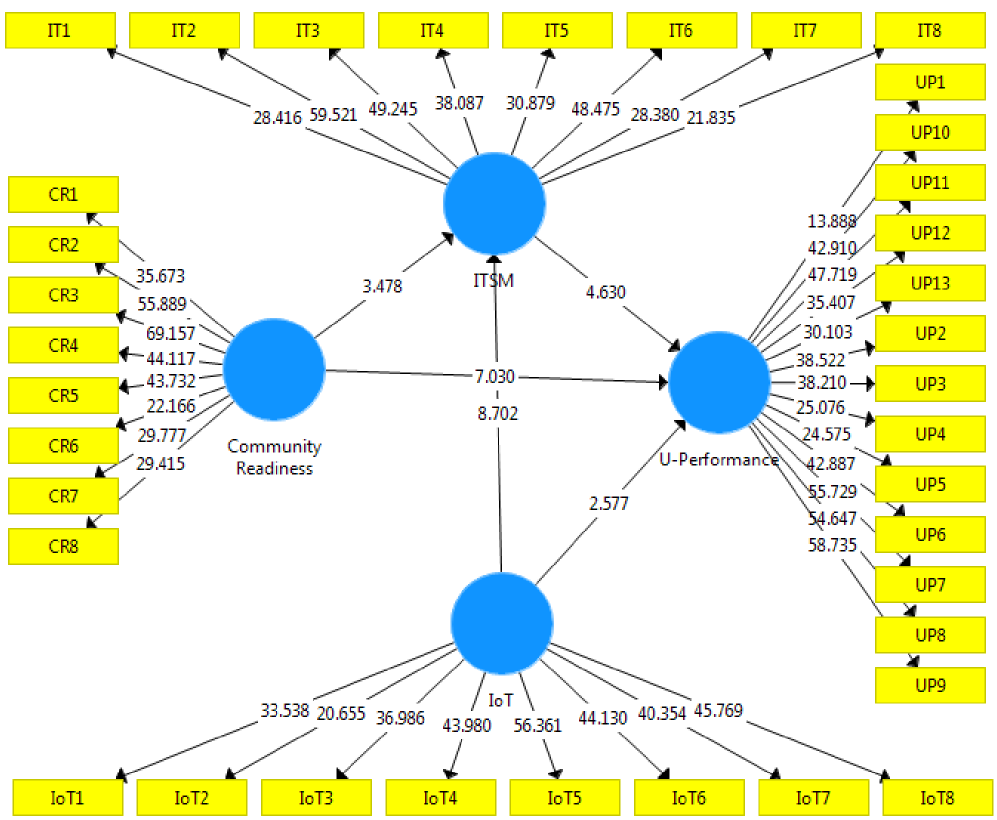
The data in Table 2 shows that the indicator value in each construct is greater than the cross-loading value, so it can be said that all indicators in each variable are different and have discriminant validity.

3.2. Analysis of hypothesis

After all the constructs met the validity and reliability requirements, the researcher continued testing the research hypothesis. To test the research hypothesis that has been set, the researcher analyzes it with the smartPLS program by bootstrapping with the following results (figure 3):

Figure 3

Bootstrapping result proceeds with SmartPLS.



3.3. Path coefficients

In the PLS-SEM analysis, the value of the direct effect is also known as the path coefficient. Measurement of path coefficients aims to see the significance and strength of the relationship between constructs and also to test hypotheses. Path coefficient values range from -1 to 1. The path coefficients get closer to 1, the stronger the relationship between the two constructs. A relationship closer to -1 indicates that the relationship is negative (Sarstedt, 2019).

Table 4

Path coefficient of CR, IoT, ITSM and U-Performance

Dimensions	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Community Readiness -> ITSM	0,239	0,238	0,069	3,478	**0,001**
Community Readiness -> U-Performance	0,462	0,463	0,066	7,030	**0,000**
ITSM -> U-Performance	0,278	0,277	0,060	4,630	**0,000**
IoT -> ITSM	0,601	0,602	0,069	8,702	**0,000**
IoT -> U-Performance	0,166	0,165	0,064	2,577	**0,010**

Answering the first hypothesis, does CR have a significant effect on ITSM? After the bootstrapping process, the result shows in Table 4, that the direct effect of CR on ITSM is 0.239, which means that if CR increases by one point, ITSM can increase by 23.9%. This influence is positive and significant, with a P value of 0.001 < 0.05.

The second hypothesis is the direct effect of CR on UP. The analysis shows. The result shows that the direct effect of CR on U-performance is 0.462, which means that if CR increases by one point, ITSM increases by 46,2%. This influence is positive and significant, with a P value of 0.000 < 0.05.

The third hypothesis about the direct effect of ITSM on U-performance is 0.278, which means that if ITSM increases by one point, U-performance will increase by 27.8%. This influence is positive and significant, with a P value of 0.000 < 0.05.

Answering the fourth hypothesis about the effect of IoT on ITSM, the result shows that the direct effect of IoT on ITSM is 0.601, which means that if IoT increases by one point, ITSM will increase by 60.1%. This influence is positive and significant, with a P value of 0.000 < 0.05.

The direct effect of IoT on U-performance fifth hypothesis- is 0.166, which means that if IoT increases by one point, U-performance will increase by 16.6%. This influence is positive and significant, with a P value of 0.010 < 0.05.

Table 5

Total Indirect Effect of CR, IoT, and ITSM on U-Performance

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Community Readiness -> ITSM					
Community Readiness -> U-Performance	0,066	0,066	0,024	2,776	**0,006**
ITSM -> U-Performance					
IoT -> ITSM					
IoT -> U-Performance	0,167	0,166	0,040	4,153	**0,000**

Based on the indirect effects, table 5 above shows that the indirect effect of CR on U-performance through ITSM is 0.066, which means that if CR increases by one point, U-performance will increase indirectly through ITSM by 6.6%. This influence is positive and significant because the P value is 0.000 < 0.05.

The indirect effect of IoT on U-performance through ITSM is 0.167, which means that if IoT increases by one point, U-performance will increase indirectly through ITSM by 16.7%. This influence is positive and significant, with a P value of 0.000 < 0.05.

3.4. R-Square

The R-Square is the value that indicates how all predictor variables (endogen) affect the exogen variable. The data (table 6) shows that endogen variables (CR and IoT) affect ITSM improvement by 67%, while other factors outside the model influence the other 33%. The table also shows that the CR, IoT, and ITSM variables increase U-performance by 71.9%, while other factors outside the research model influence the other 28.1%.

Table 6

R-square value of CR, IoT, and ITSM effect on UP

Dimensions	R Square	R Square Adjusted
ITSM	0,666	0,665
U-Performance	0,719	0,717

For measuring the R-square, Chin (1998) applies criteria to see the effect of endogenous variables on exogenous variables; R-square values of 0.67 (strong), 0.33 (moderate), and 0.19 (weak). Based on these criteria, the influence of Community Readiness and IoT variables on implementing ITSM is strong. Likewise, the influence of CR, IoT, and ITSM on U-performance is powerful.

4. DISCUSSION

Social changes happening so fast, caused by the increasingly widespread Industrial Revolution 5.0, encourage all institutions to carry out and follow these changes in social, business, political, and educational institutions so that they are updated. Likewise, the world of education should make fundamental changes in providing services to the community, such as developing campuses to become Smart Universities.

Towards a smart university, the quality of human resources is the principal capital. Human resources are the main capital in managing institutions towards Smart Universities and having an objective and comprehensive concept. Qualified students and lecturers become the principal capital in managing institutions towards an intelligent campus. Therefore, the readiness of human resources to become a smart community is the main requirement to be prepared to build a smart university.

This study examines whether the readiness of tertiary human resources to become smart communities is a significant factor influencing the success of tertiary institutions to become smart universities. The study results revealed that the readiness of tertiary human resources to become a smart community significantly affects the performance of tertiary institutions toward a smart university. This research supports previous studies that explain the importance of assessing community readiness to become a smart community before building a smart city (Antoni et al., 2020). Testing the community's readiness is essential to ensure success in implementing the proposed program (Oetting et al., 1995). Community readiness surveys are also essential to support program success and initial validation (Beebe et al., 2001). Therefore, if universities want to succeed in building a smart university, they must survey their human resources' readiness and whether they are ready to become a smart community to support the smart university program.

A Smart University requires the readiness of human resources and other interrelated aspects. Because each aspect influences other aspects, thus encouraging the achievement of the goal of becoming a Smart University. One aspect that has received much attention from researchers in building Smart University is the implementation of sophisticated technology and information interconnected with one another, known as the Internet of Things. Smart campuses do not only prioritize technology software or hardware and teaching or learning strategies that are modern and innovative, but campuses need to have a system that can operate management that is interconnected between one aspect and another by implementing the Internet of Things.

This study found that the implementation of IoT significantly affects the success of tertiary institutions in improving their performance towards a smart university. This research is in line with several other studies that explain that the application of the Internet of Things is one indicator that explains a smart university (Downes & Campbell, 2018).

This research also confirms the importance of ITSM in building a smart university. Especially during the past COVID-19, Smart Campus technology was increasingly popular in Indonesia's education world. This technology has been applied in several countries in the last few years. However, the Covid-19 pandemic has accelerated the implementation of this technology. Becoming a Smart Campus requires tertiary institutions to use various intelligent technologies based on information technology in an academic environment, be it universities, institutes, colleges, to polytechnics. With good ITSM, all higher education activities and services can be adequately managed, starting from the admission of new students, the learning process, the relationship between lecturers and academics, and the assessment process will be integrated into one. Besides supporting the learning process, Smart Campus technology can also help business processes in tertiary institutions become more efficient and effective so that tertiary institutions can carry out the Tri Dharma of higher education more easily, controlled, and properly monitored.

Smart University must be an option for future higher education development. Higher education leaders should look to the future with optimism, alertness, responsiveness, adaptability, and responsiveness to all changes because the challenge ahead will be a significant change that comes uncertainly. Circumstances demand that we follow these changes quickly. Higher education leaders must focus more on thoughts and actions towards a Smart University.

5. CONCLUSION

From the data and research results above, we concluded that all alternative hypotheses in this study are accepted. Academic Community Readiness, IoT, and ITSM have a significant direct effect on improving university performance. Likewise, the implementation of ITSM in tertiary institutions mediates the relationship between Community Readiness and IoT implementation with University Performance.

This research explains that to build an intelligent university with good performance, universities can strengthen it by implementing the Internet of Things in higher education management. In addition, universities that want to build an innovative university must prepare their academic community first to become an intelligent community that is always adaptive and willing to learn to become a good community according to the university's goals. To further strengthen the improvement of higher education performance, they must also implement a sound IT management system to synchronize the readiness of the campus community and the application of IoT to improve the performance of higher education towards a smart university.

This research was conducted using a quantitative approach by connecting the main supporting variables for forming an innovative university. However, this research did not picture universities' strategies to become smart universities. Because of that, further research is suggested to emphasize the discovery aspect of this strategy with a qualitative approach that is explored directly by universities that have practiced smart universities.

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