THE 7TH

ICISS 2020

INTERNATIONAL CONFERENCE ON ICT FOR SMART SOCIETY

"AIoT For Smart Society"

ABSTRACT BOOK FROM 70 PAPERS PRESENTED

19 NOV. 2020

SMART CITY &COMMUNITY INNOVATION CENTRE ITB

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THE 7TH INTERNATIONAL CONFERENCE ON ICT FOR SMART SOCIETY
"AIoT For Smart Society"

ICISS 2020

1st DAY

NOV 19th 2020

Time	Activity
08:00 – 09:00	Registration
OPENING SESSION	
Virtual Conference	
09:00 – 09:20 (UTC +7)	Opening Session: • I Gusti Bagus Baskara Nugraha ST, MT, Ph.D (Chairman)
PANEL SESSION	
Keynote Speaker	
09:20 – 09:50 (UTC +7)	Speaker: • Prof Bambang Permadi S.B., M.U.P., Ph.D Minister of Research and Technology, Government of the Republic of Indonesia
10:00 – 10:30 (UTC +7)	Speaker: • Dr. Ir. Hammam Riza, MSc. IPU (Agency for the Assessment and Application of Technology, Government of the Republic of Indonesia) Question and Answer
10:30 – 11:00 (UTC +7)	Speaker: • Dr. Fabio Bazzucchi (Researcher Senseable City Lab, MIT) Question and Answer
11:05 – 11:35 (UTC +7)	Speaker: • Prof. Koichiro Ishibashi Director of UEC ASEAN Research and Education Center The University of Electro-Communications (UEC) Tokyo - Japan Question and Answer
11:40 – 12:10 (UTC +7)	Speaker: • Sulfikar Amir (Associate Professor of Science Nanyang Technological University – Singapore) Question and Answer
12:10 – 12.15	Photo Session

PARALLEL SESSIONS		
13:00 – 16:30 (UTC +7)	Room 1	Room 2
	Cluster I: AIoT Technology Infrastructure and Ecosystem Integration Moderator : Ryan Aditya Nugraha	Cluster II : Governance and Smart Society Moderator : Firya Nadhifa
	Room 3	Room 4
	Cluster III : Artificial Intelligence, Machine Learning and Bigdata Moderator : Hendra Sandhy F	Cluster IV: Decision Support System and Expert system Moderator : Andrew B Osmond

2nd DAY

NOV 20th 2020

08:00 – 09:00	Registration
PARALLEL SESSIONS	
09:00 – 11:30 (UTC +7)	Room 1 / Room 2
	Cluster I: AIoT Technology Infrastructure and Ecosystem Integration Moderator : Hafid Galih Pratama Cluster II : Governance and Smart Society Moderator : Firya Nadhifa
	Room 3 / Room 4
	Cluster III : Artificial Intelligence, Machine Learning and Bigdata Moderator : Hendra Sandhy F Cluster IV: Decision Support System and Expert system Moderator : Andrew B Osmond

THE 7TH INTERNATIONAL CONFERENCE ON ICT FOR SMART SOCIETY
"AIoT For Smart Society"

Welcome to ICISS 2020

Dear Colleagues,

It is my great pleasure to welcome you to the International Conference on ICT for Smart Society 2020.

I would like to welcome our keynote speakers and all the honourable guests.

First, we would like to introduce our annual conference which was initiated by the Smart City and Community Innovation Center of Bandung Institute of Technology to promote smart society initiatives. The first ICISS was held in 2013 in Jakarta. And then, subsequently, we held the subsequent events in several other cities: Bandung, Surabaya, Tangerang Selatan, and Semarang.

We were planning to hold the conference at ITB. However, because of pandemic circumstances, we have to deliver this year's conference virtually over the Internet.

This year this event is held in conjunction with Goesmart 2020, a great national event on smart city and society, and a joint seminar and workshop between ITB, ECTI Association of Thailand, and The University of Electro-Communication (UEC) Japan, to be held online.

This conference is a special conference with a specific topic on information and communication technology for smart city and society, including cutting-edge technology, governance, and socio-economic aspects of smart society.

This year we raise artificial intelligence and the internet of things as the main theme of the conference.

We would like to thank our keynote speakers,

1. Prof. Bambang Brodjonegoro, the Minister of Research and Technology/ National Research and Innovation Agency
2. Dr. Hammam Riza, the Head of the Agency for the Assessment and Application of Technology of Indonesia
3. Dr. Fabio Bazzucchi, a researcher at MIT senseable city lab, our collaboration partner.
4. Prof. Koichiro Ishibashi, Director of UEC ASEAN Research and Education Center
5. Prof. Sulfikar Amir, Nanyang Technological University of Singapore

We also would like to thank our sponsors and also the IEEE Indonesia Section for its support for the publication and technical guidance in delivering this conference.

We do hope that you enjoy your attendance at the ICISS 2020!

Thank you for your participation.

IGB Baskara Nugraha -- Chairman ICISS 2020

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A study of coping stress strategies on psychological well-being during the COVID-19 pandemic in Jabodetabek Area

Gagar Asmara Sofa, Ananda Findez Shidiq Anugrah, Yudhistira Nugraha, Salman Haydar Al Rasyid, Vicka Aghinasuci, Wahyu Nur Hidayat, Ibnu Wibowo and Alex L. Suherman*

*Correspondence: ibnujarwo06@gmail.com

Abstract— Large-Scale Social Limitations-related policies enacted by the Provincial Government of the Special Capital Region of Jakarta evoked an adaptation process to changes in their usual life patterns. Such adaptation processes are suspected to create new problems, which might become stressors.

This research aims to perceive the effect of coping strategies on the psychological being of Jabodetabek (Jakarta, Bogor, Depok, Tangerang, Bekasi) citizens during the Large- Scale Social Limitations period. Results showed that there was a significant relationship between coping strategies and psychological wellbeing ($p=0.000<0.005$). Research also found that most respondents cope by employing the emotion-focused coping system. It was strongly suspected that citizens were able to cope and manage stressors during the pandemic by doing selfimprovement activities and trying to connect with their social network (friendship or work-related) with existing technological platforms. On the other hand, it was also suspected that the high number of respondents with emotion-focused coping was a result of feelings of helplessness in controlling problems arising during the pandemic, such as local government policies and socioeconomic impacts.

Keywords— COVID-19; smart living, smart people, psychological well-being; coping strategy; government; Jabodetabek; Jakarta

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Smart Campus Model: A Literature Review

Radiant Imbar, Suhono Supangkat and Armein Langi*

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Abstract— Nowadays a lot of literature explaining the framework of smart campus that includes terminology, definition, framework, and best practice that has been implemented in universities, therefore there needs to be a review of the paper so that it can be taken framework suitable for implementation in Indonesia. This study provides a reference for researchers in the smart campus field also for university stakeholders to gain a better understanding of smart campus terminology and framework. The paper is based on review literature from an online scientific database. This paper will contribute to the smart campus research topic with a focus on smart campus terminology and framework. This paper aims to review Smart Definition, Smart Campus Definition, and Smart Campus model.

Keywords—smart, smart campus, smart campus model

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Smart Campus Model: A Literature Review

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***Abstract*— Nowadays a lot of literature explaining the framework of smart campus that includes terminology, definition, framework, and best practice that has been implemented in universities, therefore there needs to be a review of the paper so that it can be taken framework suitable for implementation in Indonesia. This study provides a reference for researchers in the smart campus field also for university stakeholders to gain a better understanding of smart campus terminology and framework. The paper is based on review literature from an online scientific database. This paper will contribute to the smart campus research topic with a focus on smart campus terminology and framework. This paper aims to review Smart Definition, Smart Campus Definition, and Smart Campus model.**

Keywords—smart, smart campus, smart campus model

I. INTRODUCTION

Currently, higher education in Indonesia has many challenges, ranging from competitiveness, qualifications, and competency of lecturers, improving educational infrastructure, technology readiness, and so on. The idea to create a smart campus comes from the term smart city. where we are now entering the smart era. Everything is associated with smart terms, such as smartphones, smart homes, smart city, smart buildings, and including smart campus [1]. Similar to the goal of a smart city is to make the quality of life of its population increase and the purpose of a smart campus is also expected the quality of life of all university stakeholders can be improved.[2][3][4][5]. Nowadays a lot of literature explaining the framework of smart campus that includes terminology, definition, framework, and best practice that has been implemented in universities, therefore there needs to be a review of the paper so that it can be taken framework suitable for implementation in Indonesia. There are several key issues about the smart campus that need to be addressed. There are included in the following question: How can we better understand the concept of smart campus model/framework, what are the suitable definition of smart campus.

This study provides a reference for researchers in the smart campus field also for university stakeholders to gain a better understanding of smart campus terminology and framework. This paper will contribute to the smart campus research topic with a focus on smart campus terminology and framework.

The remaining of this study is structured as follows Section II provides the research method used for this research. Section III gives an overview of the smart campus model. Section IV concludes the review study

II. RESEARCH METHOD

By studying some literature we can analyze, summarize and synthesize hypotheses already made by previous researchers so that we can develop new theories, and we can evaluate the quality of the research that has been done so that we can know the advantages and disadvantages of the methods presented by the researchers[6].

Paper searching using an online scientific database that has the most relevant topic. The database are Science direct (https://www.sciencedirect.com), IEEEXplore (https://ieeexplore.ieee.org), ACM (https://dl.acm.org). The study of literature used the search string contained combinations of keywords related to the research topic as follows: smart campus framework, smart campus, smart campus components, smart campus initiative.

III. RESEARCH RESULT

A. Smart Definition

According to the Merriam Webster dictionary, smart means "Operating by automation" which means an automatically operated tool. Smart means having the ability to make adjustments in response to changing circumstances.[7] smart also means the ability to show or demonstrate intelligence [2]. The system is said to be smart when it can convert information input (stimuli) into action (response)[8]

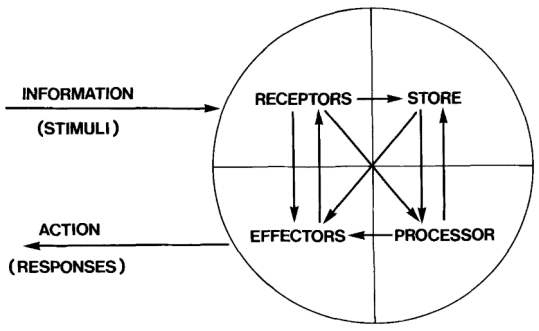

Fig 1. Model Smart

Just like the smart city that has different definitions in each study then the definition of smart campus also varies. The following table contains definitions of smart campus taken from the studied paper.

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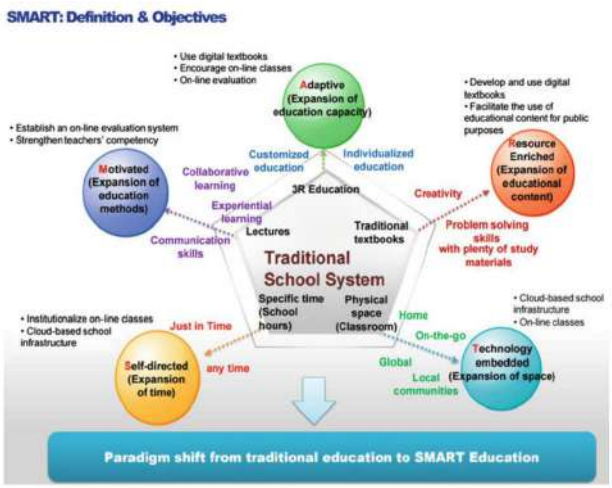

Fig 2. A Paradigm shift from Traditional to Smart [9]

SMART stands for Self-directed, Motivated, Adaptive, Resource, and Technology. It means that education is said to be intelligent when students and lecturers study together in two-way education, students, and lecturers have the same interests in the classroom and the learning environment is enriched with resources available in the cloud using technology so that students and lecturers can take materials online and can store materials that can be utilized by the public so that knowledge is stored more and more that will enrich knowledge and lecturers [9].

B. *Smart Campus Definition*

TABLE I. DEFINITION SMART CAMPUS

NO	Definition	Study
1	The platform used as a data foundation to encourage analysis and improvement of learning and teaching processes	[1],[10]
2	integration of campus life by applying internet of things technology so that it has intelligent characteristics applied to various service applications for stakeholders	[11],[12],[13]
3	reform or modernization of all educational processes, both methods and techniques used.	[14],[15]
4	an emerging trend that allows universities can combine smart technology with infrastructure to provide maximum service, assist in university decision-making and sustainability	[16]
5	The campus that enables everyone from administrators to faculty and students to connect with the learning experience anytime and anywhere	[17]
6	campuses that can manage internal and external resources effectively and efficiently by using smart solutions to maximize the quality of campus services and life	[18]

From all definitions about the smart campus, we can make a summary that a university can be said to be smart if the University can use its knowledge to study, can resolve conflicts of interest among stakeholders, and utilize the cleverness of the public to contribute to the intelligence of the system. Stakeholders in the university are the student, lecturer, employees, Structural officials, shareholders, and government.

C. *Smart Campus Model*

To turn a campus into a smart campus, several studies introduced several smart campus frameworks implemented at their Universities. Universities can be considered as a small town because in some aspects, the same problems such as environmental issues, management problems, infrastructure problems, resource usage issues, stakeholder dissatisfaction issues. For this reason, smart city models can be used in smart campus models.[19]

D. *SC2 Framework*

The first framework to be discussed first is the SC2 framework developed by the University of Rome. The goal is to create a framework to turn traditional campuses into smart campuses.

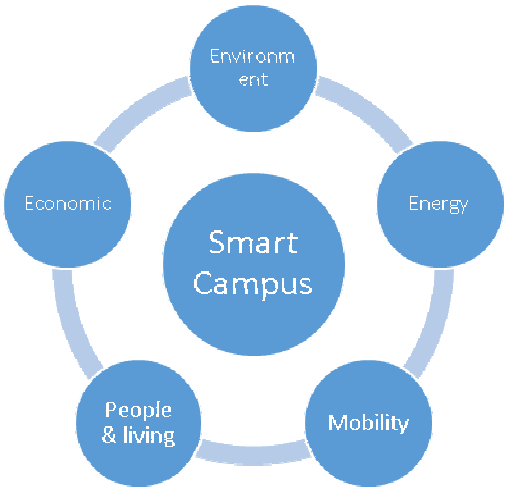

Fig 2. Model SC2 Framework [19].

The field of action have described deeply [19]:

- People & Living: This dimension will contain assessment indicators in terms of academic, research, and administration, the quality of key services for students such as student activities, health services for campus residents, canteen services, libraries, further study services.
- Economic: This dimension will contain indicators of budget plans created by the campus, the quality and purpose of investment, financial transparency, a balanced allocation of grants, employment opportunities for students, partnerships with industry, privately earned funds, funds obtained from graduates, support to produce entrepreneurs, startup companies, a collaboration between universities, purchase of goods and asset arrangements.
- Energy: This dimension will contain indicators related to energy use, energy distribution, energy saving, renewable energy use, distribution network performance of both water, electricity, and gas, energy consumption, efforts to make energy savings, energy production carried out by universities.
- Environment: This dimension will contain indicators concerning the analysis of

environmental impacts that occur in terms of air pollution, green open space, waste management, and dirty water, reuse of wastewaters and rainwater for daily purposes, air quality

- Mobility: This dimension will evaluate transportation and logistics systems to and from campus, availability of parking lots for cars, motorcycles, and bicycles, pedestrian areas, the convenience of environmentally friendly transportation, some courses teach about green transportation.

After we define each dimension along with the indicator then table 2 will contain a set of indicators. for example, will be taken from the environment dimension

TABLE II. SET OF INDICATOR DIMENSION ENVIRONMENT[19]

Dimension	Indicator	Sub Indicator	Variable
ENVIRONMENT	Air Quality	Pollution	Tons of CO2 produced/ Campus users ratio
		Outdoor Air Quality	Air pollutants / Law limits ratio
	Landscape	Density	Campus area / Campus users ratio
		Permeability Area	Built areas / Green permeable areas ratio
		Green Area	Vegetated areas / Total campus area ratio
	Waste	Production	Not recyclable waste production / Campus users ratio
		Management	Tons of recycled waste / total waste ratio
	Water	Consumption	Water consumption per year
		Management	Reused rainwater and wastewater / consumed ratio
	Management	…	….

Data analysis results should be followed up by determining problem-solving priorities. This requires a campus scenario to be able to improve areas that still need to be improved.

The final step is to determine the strategy of each dimension. The process is[19]:

1. Each matrix is associated with an impact (positive(P), negative(N), or none). Efficient action will have a positive impact. Can be filled +1 or +2 points per field. Or a score of -1 or -2 for actions that negatively impact. The result is integration
2. four values added to IS are stakeholders benefits (Users Score(US)), Feasibility (Feasibility Score (FS)), Completion times (Time score(TS))
3. Points are summed up resulting in a winner for each action.

Table III is an example of indicates matrix and Table IV is an environment that indicates matrix.

TABLE III. EXAMPLE INDICATE MATRIX [19]

Other fields of action		ENVIRONMENT					
		TOPICS					
		Air Quality	Landscape	Waste	Water	Management	Information
		ACTIONS					
		Action 1	Action 2	Action 3	Action 4	Action 5	Action 6
Energy	Positive Impact		None	None	None		None
	Negative Impact	None		None		None	None
Environment	Positive Impact	None	None	None	None		None
	Negative Impact		None		None	None	
Economy	Positive Impact	None	None		None		
	Negative Impact	None				None	None
Mobility	Positive Impact	None	None	None	None		None
	Negative Impact	None		None		None	
People & Living	Positive Impact		None	None	None		None
	Negative Impact	None	None				

TABLE IV. ENVIRONMENT INDICATE MATRIX [20]

FIELDS		ENVIRONMENT			
		Topics			
		Air Quality	Waste		Water
		Actions			
		Environmental Sensors	Trash compactor	Recycling	Rainwater collection
ENE	P	None	Consumption reduction in trash collection; possibility of powering the system with PV panels (+2)	Use of recycled waste for energy production (+1)	None
	N	Energy Use (-1)	Energy Use (-1)	None	Energy Use (-1)
ENV	P	Environmental monitoring and data management (+2)	Optimized trash collection: pollution reduction (+1)	Pollution reduction and waste reuse (+2)	Reducing water waste (+2)
	N	None	None	None	None
ECO	P	None	Medium savings (+1)	Potential funding and credits for recycling (+1)	High Savings (+2)
	N	Installation costs (-1)	High initial investment (-2)	Management Costs (-1)	Installation costs (-1)
MOB	P	None	Optimization of trash collection (+2)	None	None
	N	None	None	Potential increase of traffic (-1)	None
P&L	P	Real time data; increase of environmental quality (+1)	Increase of environment quality (+1)	Increase of environmental quality; Raising awareness and attention about sustainability, credits (+2)	None
	N	None	None	None	None
IS		1	4	4	4
US		5	3	4	3
FS		3	2	5	3
TS		3	2	5	2
TOT		12	11	18	12

The advantage of the SC2 model is that it can be adapted not only for the campus but can be for the city. For dimensions, indicators and variables used to evaluate campus performance can be modified according to the characteristics of each campus.

E. Model iCampus

The second framework is iCampus. This concept was explored at MIT, under MIT's collaboration with the Microsoft Alliance

In Figure 3 we can describe the concept of iCampus includes a smart campus digital nervous system that is divided into six main areas[7] :

1. iLearning (related to learning/academic): How universities can improve students' ability to conduct research and education, how we expand students' reach to study by providing online learning opportunities, and how to compete with other Universities to overcome traditional learning barriers using technology
2. iManagement (related to Higher Education management): How universities offer one smart facility to facilitate centralized access and security control, how to create intelligent management systems within campuses
3. iGovernance (relating to the policy aspects of the Higher Education): how university governance can manage the policies of each stakeholder, there is a workflow management system that allows for scheduling, planning, and adaptability.
4. iSocial (Related to the social aspects of higher education): how can we build social networks within campuses to encourage collaboration and communication between students, faculty, and universities. How can we promote community service activities?
5. iGreen (Related to the environmental aspects of the campus): how universities can create renewable energy and save energy use
6. iHealth (Related to the health aspect of the campus): how to provide "anytime-anywhere" healthcare for staff and students? How do we make sure our campus is healthy. How we achieve intelligent health information systems.

Fig 3. Model iCampus[21]

The main purpose of the construction of iCampus is to enrich the learning process of students from start to graduate. There needs to be differentiation in the middle of competition between universities so that it needs to create an effective framework to maximize the potential of students and the goal of improving the quality of learning.

The concept of iCampus includes 6 domains as described in Figure 3. The value of innovation that exists in one domain has an impact on another domain so that inter-domains can be described like figure 4. Figure 4 describes examples of e-learning aimed at supporting distance learning for students who can sign in to the iLearning domain but can also sign in to the iGreen and iSocial domains. Thus creating triangular interactions in 3 domains. This synergy often occurs at this time of year which we call collaborative learning.

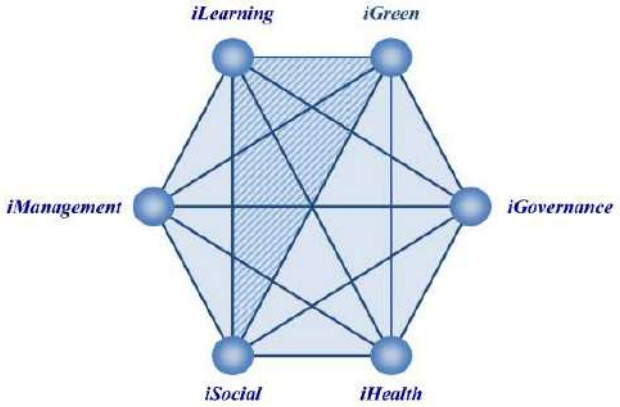

Fig 4. The iCampus interactive Model [7]

From the study so far it can be concluded that KPIs for Higher Education cannot be equated to any institution. Each institution can create KPIs that are in accordance with the objectives of each college. iCampus divides the usual 5 KPIs in education and mapping KPIs to 6 pillars of iCampus to be included in the survey question. The KPI is (a)Ranking of universities, (b) Quality of teaching-learning, (c) research performance, (d) university involvement with the surrounding environment, (e) university sustainability.[21]

F. UMA Smart-Campus[22].

The purpose of the University of Malaga implementing the Smart Campus is to create new pathways in teaching, research and innovation by turning the campus into a Living Lab and implementing the campus as a Smart-City by itself [22]. Figure 5 describes the objective of UMA Smart Campus.

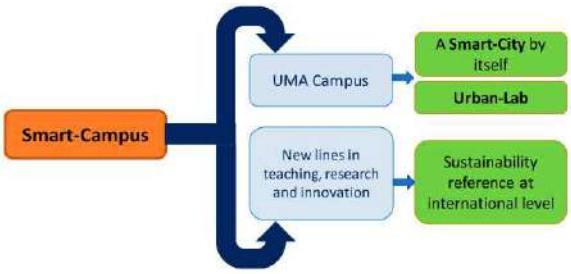

Fig 5. The Objective of UMA Smart Campus.

The methodology used follows 6 pillars namely Emissions, Energy and Water, Nature and Environment, Health and Well Being, Mobility, ICT, and Research Teaching and Innovation. All these pillars relate to each other.

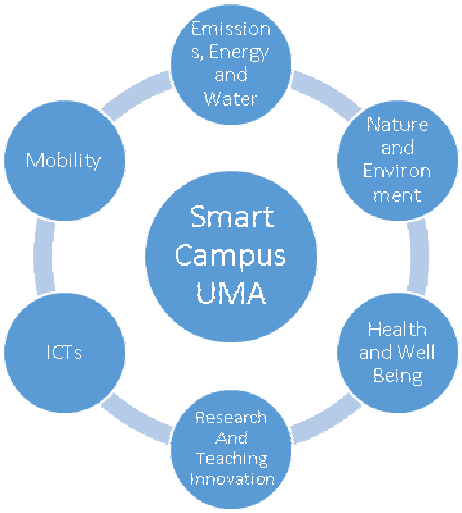

Fig 6. UMA Smart Campus Pillars [22]

4 pillars are pillars commonly used in Smart City models. but the other 2 pillars namely ICT and Research Teaching and Innovation are made specifically for Smart UMA. The purpose of ICT is to be able to use IT technology to support other pillars because only IT can manage all the information that is in other pillars such as the implementation of sensor tools and cameras throughout the campus, telecommunication network to communicate data in the cloud, analyze and process data using Artificial Intelligence and big data [22].

The last pillar aims to

- Research: involves researchers both lecturers and students to develop UMA Smart Campus in various fields such as agriculture, ecology, telecommunications.
- Teaching: translates research results into teaching so that students can be facilitated with examples of projects from the real world. So that it can create a curriculum that aligns with the needs of the industry.
- Innovation: prepare a business incubator consisting of students, lecturers, researchers, and companies to create new business opportunities.

The development of UMA Smart Campus has the aim of improving administration, management, and decision-making services for universities due to greater knowledge of all the information held to improve the quality of life of the entire campus community. But of course, this success rate needs to be measured by existing indicators.

G. IBM Smarter Education Framework [9]

IBM created the Smarter Education Framework to work with universities to support universities by making their universities smarter using technology created by IBM.

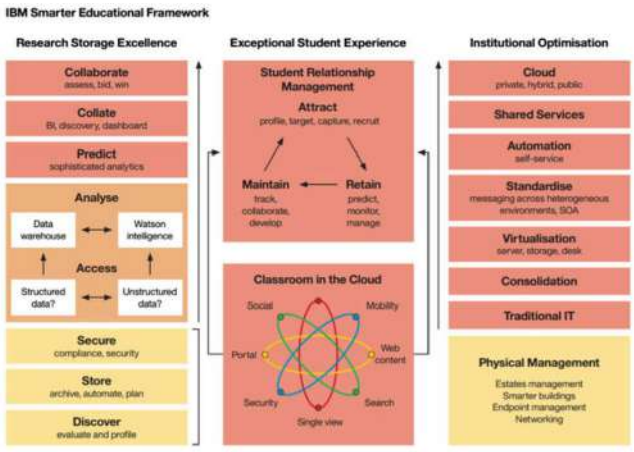

Fig 7. IBM Smarter Framework

With smart universities, there is an improvement in university performance by utilizing technology to make more informed decisions, address problems, and manage resources more effectively (Fig) [9].

H. Garuda Smart Campus Framework [23]

To transform the campus into a smart campus, SCCIC (smart city and community innovation center) introduced a framework that can be used to transform the campus into a smart campus. This framework is Garuda Smart Campus Framework (GSCF) [24].

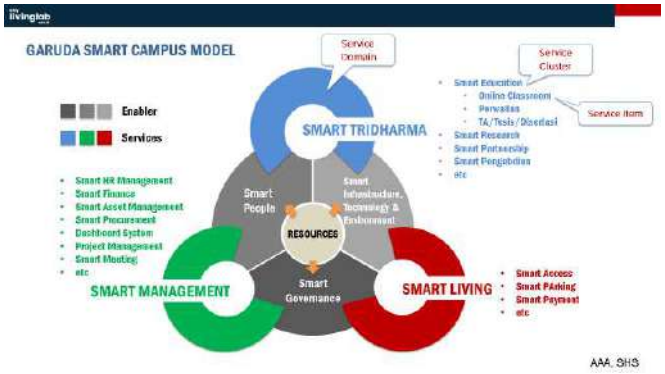

Fig 8. Garuda Smart Campus Framework (GSCF)

Garuda Smart Campus Framework is divided into 3 layers i.e. layer 1 is resources, layer 2 is an enabler, and layer 3 is services. Service is divided into 3 layers namely (1)Smart Management in the form of service for Human Resource, Asset Management, Procurement, Finance, and Dashboard, (2) Smart Living in the form of services for room entrance, parking and payment, and (3) Smart Tridarma Higher Education in the form of services for Teaching, Research, and Community Service. Resources are resources that are required to perform the services provided.

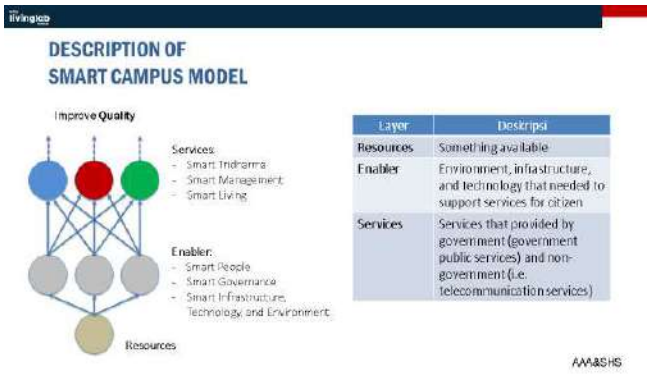

Fig 9. Description Smart Campus Model

In this model, Smart Campus is represented in 3 layers: (1) resources, (2) enablers, and (3) services. Services are grouped into 3 layers: (1) Service Domains, (2) Service Clusters, and (3) Smart Campus Service Items (Service Items) are services of the university provided to the community. Resources are available on campus as a resource. Resources can be upgraded to enablers. An enabler is an enhanced resource or something that is made to be a leverage of its top layer (service layer). There are three types of enablers: (1) people, (2) governance, (3) infrastructure, technology, and environment. People as resources are different from people as an enabler. People as a resource are people as they are, without increasing capacity and ability. [23]

IV. Conclusion

From all definitions about the smart campus, we can make a summary that a university can be said to be smart if the University can use its knowledge to study, can resolve conflicts of interest among stakeholders, and utilize the cleverness of the public to contribute to the intelligence of the system. Smart University acts like in the context of smart cities, which offer intelligent services and applications to their citizens to improve their quality of life. To make a traditional university into a smart campus, it is necessary to implement the framework/model smart campus. From the results of the literature review, the existing framework still follows the framework of the smart city but is adapted to the needs of the campus. For further research, we will focus on examining which framework is best suited to apply in Indonesia, and next, we will design indicators for smart campus measurement in Indonesia.

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