

# The Student Relationship Management System Process via the Internet of Things

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**Abstract** – The objectives of the study were as follows: (1) to study the student relationship management system process via the internet of things, (2) to design the student relationship management system process via the internet of things and (3) to evaluate the student relationship management system process via the internet of things provided by ten experts who had experience in a related field. The study findings suggested that the student relationship management system process via the internet of things consists of five parts: (1) Identify, (2) Differentiate, (3) Interact, (4) Customize and (5) Report. After analyzing the data, it showed that the overall result of the evaluation of the student relationship management process via the internet of things was at a very high appropriate level ( $\bar{x} = 4.85$ , S.D. = 0.34), which can be applied to real situations.

**Keywords** – process, internet of things, student relationship management, digital footprint.

## 1. Introduction

At present, university is highly competitive, especially regarding the providing services to students. Thus, concepts was developed to manage relationships with students. This places importance on maintaining information about students who have a relationship with the university, including

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improving the quality of learning and the students' learning activities [1],[2].As part of university life students have to adapt themselves, both in class, to obtain good academic results, and outside the classroom, to learn many things from the world around. In addition, they have to have time management skills, maintain contact with friends and family, and try to maintain their physical and mental health to achieve balance and success in all matters. Therefore, these issues can be considered as the challenges that students must cope [3].

Applying student relationship management (SRM) to Higher Education Institutions (HEIs) inevitably allows students get good experience and satisfaction in life and learning [4]. Student services are important, and they are the main function of the university. For students, who need to experience a good environment and educational quality, the sources that provide student services have to be comprehensive and adequate. Therefore, student's services are considered to be an important strength of the university [5]. Student's behaviour is reflected in various forms, and it can be used as a reference within the university's image. Whether it is a matter of corporate culture or student management, the personnel who are involved in providing student services, including teachers and managers, have to understand student's behaviour. This will enable them to create or improve the university's strategies in order to promote a good image of the university and create more satisfaction among the students as well [6],[7].

Nowadays the use of Information and Communications Technology (ICT) for Education to enhance the knowledge, ability and performance of students are : embedded systems competency and technical skills in software engineering. There are many interesting technologies that support education both in teaching and learning services [8],[9].These can be used for the management of various training experiments which can help teachers to improve teaching efficiency. Technology can be used to transfer knowledge from the system anywhere, anytime, to every type of device. This technology is an educational revolution because it offers a good and safe environment for students, which is an important issue. Many studies have examined using

Internet of Things (IoT) in tracking. This enables educators to check the activities and movements for children in schools, because IoT will gather, check and manipulate data instantly [10],[11] and other interesting examples of tracking with IoT for HEIs such as to track and management assets for support good governance and to monitor student and management digital footprint support student services and analyse student’s behavior [12],[13].

Digital footprint are traces of information obtained via the internet users, which are considered to be personal information collected by the system. There are jobs that study this information to make it more valuable and useful [14].Variety of research will synthesize the process in order to obtain a suitable research, which will cause good output and outcome able to develop students to meet the needs and support useful for HEIs such as: the digital knowledge engineering-based learning process[9], asset supply chain management process [13], the learning process of scientific Imagineering through AR [15], multiuser Interactive learning processes [16] and the process of augmented reality and digital twin [17]. The internet of things for educational purposes comprises four parts: people, process, data and things. The process plays an important role in enabling people, information and things to work, link and exchange information [18].

When the background is outlined and the significance of the study prompted in order to study, the student relationship management system process via the internet of things.

**2. Objective**

1. The findings of the student relationship management system process via the internet of things.
2. The design of the student relationship management system process via the internet of things.
3. The evaluation of the student relationship management system process via the internet of things.

**3. Methodology**

This study was conducted in three phases as follows:

Phase 1: The findings of the student relationship management system process via the internet of things were conducted by reviewing documents, literature and related research.

Phase 2: The design the student relationship management system process via the internet of things. The instruments of study for this phase were 1) the student relationship management system process via the internet of things and 2)the evaluation of the process designed.

Phase 3: The evaluation of the student relationship management system process via the internet of things was conducted by ten experts who have experience in the field of the student relationship management (SRM), the internet of things (IoT) and information and communication technology (ICT) using the purposive method.

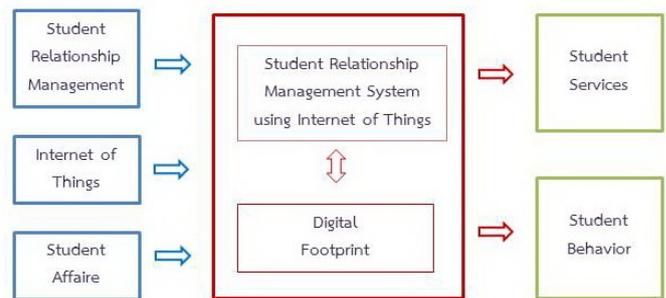


Figure 1: The conceptual framework

**4. Results**

**Phase 1:** The findings of the student relationship management system process via the internet of things are as shown in Table 1.

Table 1. The findings of the student relationship management system process via the internet of things.

The Student Relationship Management System Process via The Internet of Things	Peppers, D. and Rogers, M. [19]	Machado, M., Oliveira, J. and Souza, J.M. [20]	Ahmadi, H., Osmani, M., Ibrahim, O. and Nilashi, M. [21]	Osmani, M., Ahmadi, H., Ibrahim, O. and Nilashi, M. [22]	Ahmadi, H., Nilashi, M., Ibrahim, O. and Rad, M.S. [23]	Mouyabi, M. [24]	Maitra, S. [25]	Adikaram, C.N.K., Khatibi, A. and Yajid, M.S.A.[26]	Puri, P. and Gill. H.S. [27]
Identify	✓	✓	✓	✓	✓	✓	✓	✓	✓
Differentiate	✓	✓	✓	✓	✓	✓	✓	✓	
Interact	✓	✓	✓	✓	✓	✓	✓	✓	
Customize	✓	✓	✓	✓	✓	✓	✓	✓	
Report	✓		✓			✓		✓	

According to Table 1, the findings of the student relationship management system process via the internet of things are divided into five parts as follows: (1) Identify, (2) Differentiate, (3) Interact, (4) Customize and (5) Report as follows:

**1) Identify** is the first part in which students and IoT access services stations including the library, academic services, student affairs and the first aid room.(show Figure 2) The SRMS will identify the student’s data, such as code, name, field of study, contact information, and then it will gather their digital footprint.

**2) Differentiate** is the second part in which the SRMS differentiates students by value and by need. The SRMS discriminates students into groups according to the services provided by HEIs, such as education level, activities of interest, subject areas studied, etc.

**3) Interact** is the third part in which the SRMS interacts with students, such as giving initial greetings by identifying their name, to learn their needs and create an initial impression of the service.

**4) Customize** is the fourth part in which the SRMS checks the student and the SRM database in services stations, including the library, academic

services, student affairs and the first aid room. The SRM then offers data services that are suitable or special to each student. The SRMS will create greater satisfaction that the student will remember, and they will learn to use the service the next time.

**5) Report** is the final part in which the SRMS reports on the services stations and provides an overview. The student summary report contains the digital footprint from the four services stations, the library, academic services, student affairs and the first aid room. The information from the SRMS is instant, accurate, consistent and appropriate. It provides information to enable good decisions to be made in order to improve the services of the university.

The relevant actors and the responsibility of the student relationship management system process via the internet of things include:

- **Administrator** who maintains the overall picture of every part of the system in order to be effective.
- **Students** who receive the service, and who are digitized to access the services stations.
- **Provider** who maintains the service information at the service stations including the

library, academic services, student affairs and the first aid room.

• **Teacher** who monitors the information about services and the behaviour of students, so that it can be used in the areas of teaching and learning, and other useful areas related to students.

• **Manager** who tracks all the data, both about providing student services and student's behaviour. This information is used for decision making and to improve the service of the university further.

The services stations of the student relationship management system process via the internet of things are shown in Figure 2:

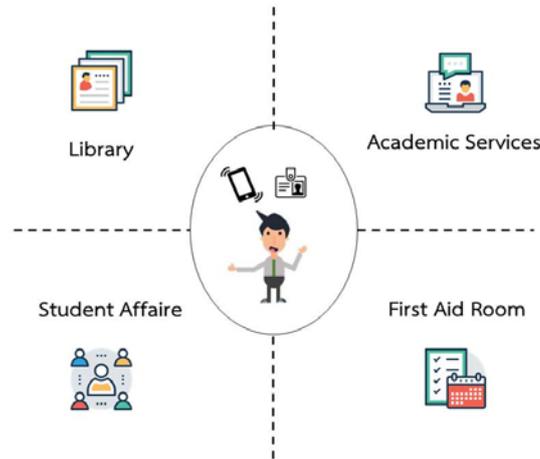


Figure 2 : The Services stations of the student relationship management system process via the internet of things

Figure 2 indicates the services stations of the student relationship management system process via the internet of things. These include the library, academic services, student affairs and the first aid room.

**Phase 2:** The design of the student relationship management system process via the internet of things, is shown in Figure 3.

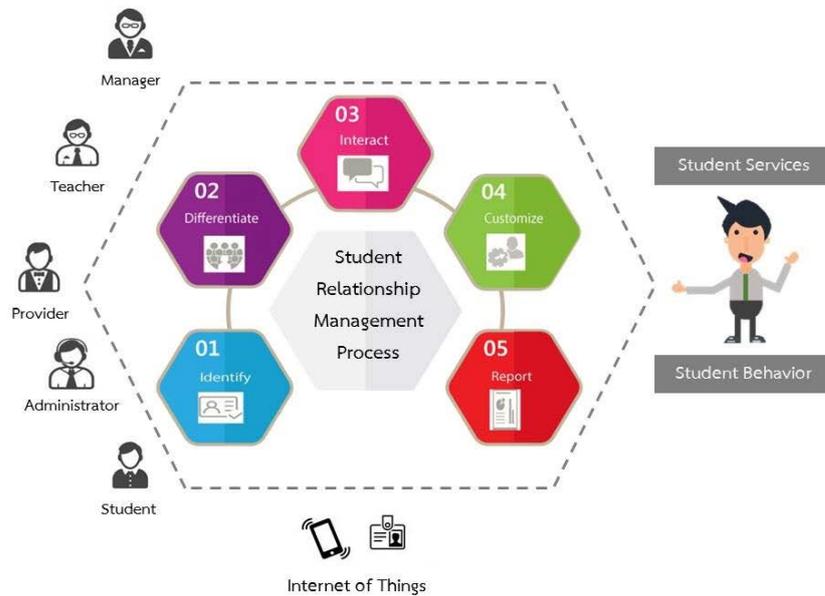


Figure 3 : The student relationship management system process via the internet of things

Figure 3 indicates the student relationship management system process via the internet of things. It is a process developed to monitor and analyze student information for HEIs via the concept of student affairs, SRM and IoT to link information. IoT devices are installed at services stations including the library, academic services, student affairs and the first aid room. The student relationship management system process via the internet of things is divided into five parts, as follows: (1) Identify, (2) Differentiate, (3) Interact, (4) Customize and (5) Report.

The internet of things is modern technology that helps management to track student’s information that will be available at various points of the university. Appropriate data gathered by the IoT can be analysed via methods including an RFID card, which works with an RFID reader, and a mobile application,

which works with a beacon station. This system collects the digital footprint, which are traces of information left by students after they have accessed the SRMS via IoT. The digital footprint is stored, and it will be analysed and processed in order to extract useful information.

The output of the student relationship management system process via the internet of things consists of the following two elements: (1) student services are analysed based on the digital footprint collected to summarise the results of the message notification services provided from services station at the library, academic services, student affairs office and first aid room. (2) Student behaviour is analysed, and it is based on the digital footprint collected to summarise student’s behaviour including service station, date-in, time-in, date-out and time-out.

**Phase 3:** The Evaluation of the student relationship management system process via the internet of things, as shown in Table 2.

Table 2. The Evaluation of the student relationship management system process via the internet of things.

List of Evaluation	$\bar{x}$	S.D.	Level of Quality
<b>Input (Internet of Things)</b>			
RFID	5.00	0.00	very high
Beacon	5.00	0.00	very high
Services Stations	4.25	0.46	high
<b>Process</b>			
1. Identify	5.00	0.00	very high
2. Differentiate	4.88	0.35	very high
3. Interact	4.75	0.46	very high
4. Customize	5.00	0.00	very high
5. Report	5.00	0.00	very high
<b>Output</b>			
Student Services	4.63	0.52	very high
Student Behaviour	5.00	0.00	very high
<b>Total</b>	<b>4.85</b>	<b>0.34</b>	very high

According to Table 2, the overall result of the evaluation of the student relationship management process via the internet of things was at a very high appropriate level ( $\bar{x} = 4.85, S.D. = 0.34$ ). Considering each item, most items were at a very high appropriate level, except for services stations, which was at a high appropriate level.

The overall evaluation result of each part of the the student relationship management process via the internet of things was at very high appropriate levels, as follows: 1. Identify ( $\bar{x} = 5.00, S.D. = 0.00$ ), 2. Differentiate ( $\bar{x} = 4.88, S.D. = 0.35$ ), 3. Interact ( $\bar{x} = 4.75, S.D. = 0.46$ ), 4. Customize ( $\bar{x} = 5.00, S.D. = 0.00$ ) and 5. Report ( $\bar{x} = 5.00, S.D. = 0.00$ ).

Considering each item, every item was at a very high appropriate level.

**5. Conclusion and Discussion**

According to the evaluation results, the SRMS process via the IoT to collect digital footprint had an overall appropriateness at a very high level. Considering each item, most items were at a very high appropriate level except services stations, which was at a high appropriate level, and it showed that the experts had consistent opinions. As it is shown in the finding results, the SRMS process via the IoT to collect digital footprint is divided into five parts as follows: (1)

Identify, (2) Differentiate, (3) Interact, (4) Customize and (5) Report.

The first part was Identify in which the students and IoT accessed services stations, and the SRMS collected digital footprint. This is in accordance with Machado, Oliveira and Souza [20], who stated that the identifying customers learn the desired form of contact in the transaction with the agency. Differentiate was the second part in which the SRMS differentiated students by value and by need, which is in accordance with Ahmadi, Nilashi, Ibrahim and Rad [23], who stated that dividing the alumni into two parts is based on their value, and according to their needs showed that each person will have different levels. Interact was the third part in which the SRMS interacted with students, such as giving initial greetings. This is in accordance with Mouyabi [24], who stated that organizations that use strategies to interact with customers will be effective, and effective in a better way to manage customers. Customize was the fourth part in which the SRMS checked students and the SRM database in services stations and offered SRM data services that were suitable or special to each student. This is in accordance with Adikaram, Khatibi and Yajid [26], who stated that if an organization understands the needs of customers the service will be adjusted accordingly. Report was the final part in which the SRMS reported on the services stations and provided an overview. The student summary report provided the digital footprint from the four services stations. Information from the SRMS was instant, accurate, consistent and appropriate enabling the institution to make good decisions in order to improve the services of the university. This is in accordance with Mouyabi [24], who stated that every process should have tools, technology and software to help managing in order to have more work efficiency.

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