Development of IoT Management System in Mathematics, Science and Computer Department, Politeknik Mukah Sarawak

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Abstract. The Covid-19 pandemic and Movement Control Order (MCO) resulted in the closure of all higher education institutions throughout the country to prevent the spread of this contagious outbreak. During MCO staff are directed to work from home only and are not allowed to enter the office without the permission of the director or head of the department. Hence the IOT Management System apps is an innovation that is created to overcome incomplete data problems during decision making, monitoring, time savings, and administrative costs. Pioneering this innovation was used in the office of the Department of Mathematics, Science & Computer (JMSK). Hence, the objective of this innovation is to collect all the important information of the department in one application, to enable all staff to obtain data or information via smartphone, to facilitate online assessment and learning through CCTV monitoring, and subsequently produce automatic light control systems. Secondly to determine the level of applications among both departments staff institutions using the IOT Management Systems and lastly the recommendations. This research is a pilot research project. This mobile application was developed with three elements include data apps, CCTV, and I-Switch. Data were obtained using the survey research method. A total of 25 staff from JMSK and Facility Development and Maintenance Unit (UPPF), Politeknik Mukah Sarawak (PMU) participated in the survey. The survey findings further revealed that the using IoT Management System is better than the conventional method with the highest mean = 4.500. The outcome of this research can benefit the decision-makers of higher institutions in Politeknik Mukah Sarawak regard the way to facilitate the work administration process during the Covid-19 pandemic.

Keywords: Mobile Application · Iot · Management · Covid-19

1 Introduction

The Internet of Things (IoT) is rapidly expanding and is widely regarded as today's most important technological initiative [1]. The primary goal of an Internet of Things-based environmental monitoring system is to deliver environmental parameters at a

remote location. Internet use Cloud-based applications that analyze and transfer data from various sensors are required for the Internet of Things to work. The IoT solution enables users to log measurements from anywhere on the earth, as well as visualize and analyze the data collected, using any Internet-connected device [2]. Implementing IoT technology in institutions as part of a smart campus enables professors, students, and administrators to automate the educational process effectively [3]. The idea of producing this innovation material is to speed up the department's management processes as well as to make accurate and fast decision-making. [4] indicates, Iot benefits where educator can customize curriculum, access to learning resources on any device from anytime, cheaper costs, individualized learning, increased safety, and cooperation.

Previously, the department had difficulty making management decisions due to the incomplete lost document or information. This resulted the rotation of job scope between staff and the documents mostly in hardcopy basis. This support by [5], IoT is open, allowing data acquired for one reason to be used in a variety of applications to accomplish numerous goals, exposing previously uncovered insights. As soon as it is generated, more detailed data that is automatically gathered and easily shareable is available. One of the main advantages of IoT technology for businesses [6, 7].

The Iot Managements System apps applicable when the staff need urgently to attend the affair outside the test or quiz room can still monitor as it is recorded by CCTV and shown live via smartphone. Furthermore, for savings and electrical control, the department has trouble switching on or off the lights in the laboratory room. Directly, a system will be developed whereby department staff can control the lights when outside the campus. IoT technology enables individuals to automate a variety of tasks, including turning on lights or air conditioners in response to changing environmental conditions such as cold, hot, dark, or bright. So, these are some of the everyday jobs that can be automated via the Internet of Things. Devices equipped with necessary sensors will be able to communicate with one another over the phone or over any internet communication network. Hence, the objective of this innovation is to collect all the important information of the department in one application, to enable all staff to obtain data or information via smartphone, to facilitate online assessment and learning through CCTV monitoring and subsequently producing automatic light control systems. Secondly to determine the level of applications among both departments staff institutions using the IOT Management Systems and lastly the recommendations.

2 Research Design and Methodology

2.1 Innovation Implementation Method

The main basis of this operation should have an internet network for the combination of the above three elements. Thus, the theoretical framework of this innovation is explained as follows: (Fig. 1).

IoT Management System is a system designed using smartphones as the main equipment combined through data apps, CCTV, and I-switch. The use of WIFI or internet data is the main medium for data and information access (Fig. 2).

The application is generated later through three phases of Creative Commons Attribution-NonCommercial construction (Fig. 3). It must be carried out consecutively
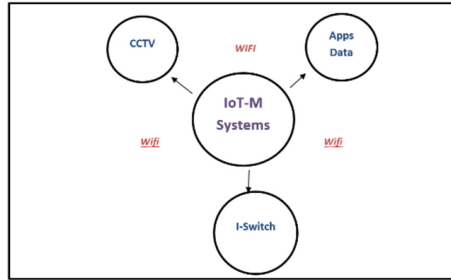
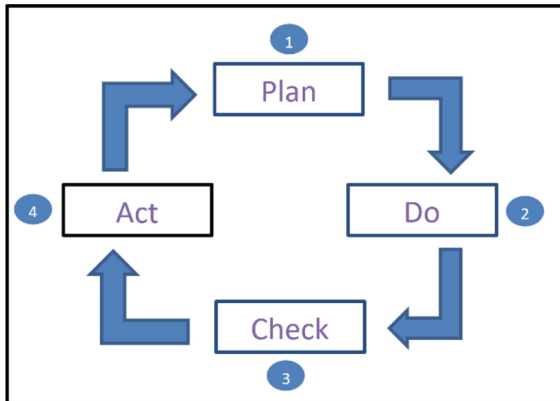**Fig. 1.** The theoretical framework of this innovation

Fig. 2. The Process intelligent switch installation

through phase 1: Installation of I-switch (Fig. 4). This process is an intelligent switch installation process where the light switch can be controlled using a mobile phone after all planning, do, check & act (PDCA) processes. After all the process is completed, he entered phase 2: CCTV. This process is installation and trial and both phase 1 and 2 of the connection base is using WIFI modem. After the new strong connection with smartphone. To enter phase 3, it develops basic data and information in google forms and is transferred to apps. Finally, phase 4: all apps are put together in a smart phone app. However, phases 1, 2, 3 and 4 will be added both from time to time according to department requirements (Fig. 5).

2.2   Innovation Development Design

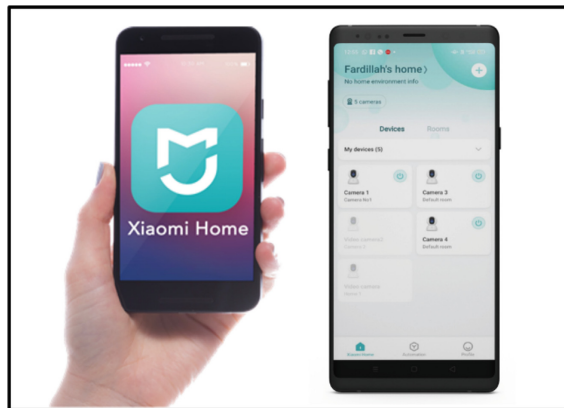**Fig. 3.** Display Innovation Design 1

Fig. 4. Display Innovation Design 2

Fig. 5. Display Innovation Design 3

3   Finding of the Study

The scope is focused on JMSK and UPPF staff December 2020, which is a total of 25 staff. The UPPF staff selected to participate in this questionnaire due to assist in the installation of this innovation project. Additionally, given time and financial restrictions, the selected sample is justified. Convenience sampling is used in this study due to time and financial restrictions. To gather data for this study, a survey method was used. Refer to the tables below; there were two sections to the questionnaire. Obtaining respondents' demographic characteristics, such as age and gender, was the main goal of the first portion. The Iot Management System application is covered in the questionnaire's second section. This part contained 15 questions to gauge staff usage of the IoT Management System. Questions were slightly modified to suit the context of mobile technology utilization. The relative importance of each construct was assessed by a 5-point Likert scale from one being "strongly disagree (Table 1).

In a good level above 0.60, the Cronbach Alpha reliability test result was 0.840. This demonstrates that survey participants comprehend the survey's question.

Refer to Table 2, JMSK and UPFF staff as respondents. The majority of respondents aged between 20 to 30 years of age (44%), followed by 31 to 40 years (32%) followed by 41 to 50 years (20%) and over 51 years (1%) only. The respondents were 15 female (60%), while male were only 10 (40%) only.

Table 3 demonstrates that JMSK and UPPF employees at PMU use mobile applications at a rate where the mean value ranges between 3.50 and 4.49. Using an IoT Management System is superior to the traditional way for this category, which has the highest mean value of 4.500. IoT Management System adoption was deemed necessary

Table 1. Reliability test item questionnaire Effectiveness of Iot Management System

Reliability Statistics	
Cronbach's Alpha	No of Items
0.828	15

Table 2. The demographic background of the respondents

Respondent Profile		n	(%)
Gender	Men	10	40
	Women	15	60
Age	51 and above	1	4
	41-50 years old	5	20
	31-40 years old	8	32
	20-30 years old	11	44

Table 3. Mean and Standard deviation for Iot Management System

Descriptive Statistics

No.	Item	n	Mean	Std. Deviation
1.	Using Iot Management System is better than the conventional method.	25	4.5600	.58310
2.	Iot Management System design is good.	25	4.1200	0.6658
3.	Iot Management System is user friendly.	25	3.9200	.49329
4.	Iot Management System interface is very attractive.	25	4.0000	.70711
5.	Iot Management System important for data access	25	4.4800	.58595
6.	Iot Management System are easy to install.	25	4.2800	.73711
7.	Using Iot Management System easy to upload and download documents.	25	4.4000	.64550
8.	Iot Management System can be used offline.	25	4.0400	.78951
9.	Iot Management System can be used anytime.	25	3.6000	.86603
10.	Iot Management System can be used by android and iOS systems.	25	3.9600	.73485
11.	Iot Management System can be installed using a smartphone, tablet, and laptop.	25	4.0800	.64031
12.	ICT skills and knowledge are important in using Iot Management System	25	3.9600	0.6110
13.	Using Iot Management System during Covid-19 pandemic.	25	4.3600	.48990
14.	Using Iot Management System are free and have no fees.	25	4.2800	.67823
15.	Overall using Iot Management System easy to use.	25	4.1600	.55377

for data access by the vast majority of respondents (mean = 4.480). The IoT Management System can be used at any time, but, has the lowest mean value in this category. (mean = 3.600).

4   Discussion and Recommendation

Align with the first objectives, the innovations of Iot Management Systems help the JMSK staff to facilitates the information efficiently access work, safety controls, reduced costs and increased work productivity. Second objective which Iot Management System is better than the conventional method. This aligns with the finding from (Brous et al., 2020) which IoT can provide the organizations with several benefits including improvement in procedures, and systems are required to develop capabilities and guarantee that IoT is appropriate for the firm's goals. This shows that the staff agreed using the applications faster and more convenient. This app is improved with the addition of a budget

switch on off the Department of Mathematics, Science & Computer. The use of this switch can directly reduce cases of loss of government equipment or assets, improve the efficiency of management.

Since the IoT management systems still in pilot test, this can be implemented with another department in PMU. The systems also need strong internet connections to support the Switch and CCTV systems. The data information's need to update every semester. Lastly, the implementations of IoT Management System proven to be.

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