



Exploring the Potential of Wireless Integrated Configuration Technology as a Learning Tool

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ABSTRACT

The objective of this study was to determine the feasibility of utilising wireless integrated configuration technology among students enrolled in networking courses. The proposed method entails using Raspberry Pi as the key hardware component to facilitate wireless configuration, hence facilitating seamless connectivity and communication across wireless devices. The networking solution facilitates the transport of data, exchange of resources, and cooperation in a wireless manner, eliminating the need for physical cables or wires. The research methodology for this study entails descriptive analysis in the form of a survey, which will have an impact on the quantitative findings. The results of the needs study found that over 90% of students agreed that the use of wireless configuration devices would improve understanding and interest them in doing network configuration. Based on the findings from interview sessions with experts, it has been demonstrated that the utilisation of wireless integrated configuration technology possesses the capacity to engender an enjoyable learning experience for students. This technology enables students to engage in configuration tasks wirelessly, utilising numerous devices concurrently. Additionally, experts believe that students can learn how to configure it technically as well as theoretically. The results of this study were successful in determining the level of potential for the development of wireless devices and their usage in networking courses.

1. Introduction

Rapid development and implementation of Internet of Things (IoT) technologies has created new possibilities for technological improvements, optimizing operations, increasing efficiency, and improving living standards. This has led to new possibilities that may make our daily lives simpler and provide better services and industrial processes. Due to digitalization, "smart" has emerged as the centre of an ongoing technological revolution [1]. Referring to previous study [2-4], due to its enormous potential for innovation and societal advantages, IoT technologies are increasingly viewed

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as one of the pillars of the 4.0 and 5.0 industrial revolution [4]. Technologies based on the IoT offer a whole new perspective on the development of several industries, including engineering, agriculture, and medicine, traffic monitoring, robotics, and automation [5,6]. Research into the economic sector is essential to reach new and large potential benefits for society. To do this, more research efforts in the sector are needed to understand how valuable IoT technologies will be developed and how they can be used in the future. There are many advanced technologies connected to the Internet today, and the number of gadgets is increasing.

IoT also describes a connected device that enables connections with other devices [7] allowing data to be taken and processed into valuable and pertinent information [8]. RFID, remote wireless communication, real-time localization, and sensor networks are all examples of IoT technology. It includes smartphones, tablets, and laptops, which are used to identify, and position connected devices via wired or wireless connections. The IoT refers to everything that involves computers, software, and the internet, including any network or route that can transport people quickly, any site where people can access or use technology, and anything with an intelligent system built into it. These devices are integrated into the IoT to engage and communicate with people [9-11].

Throughout the world, the IoT is expanding rapidly. The true value of IoT is produced through the incorporation of decisions made using objects and knowledge, which will be applied to business, the home environment, and society [12,13]. Malaysia faces challenges related to IoT deployment, such as integration of network technologies in public IP networks to provide scalable and dependable network connection [14]. As IoT technology is more widely used, each industry must examine its networking practices to provide the best possible data transfer across wired and wireless networks. IoT has been applied in Malaysia to various fields of study, but its use as a teaching aid is limited due to a lack of experience and qualified personnel. To address this, the development of this project aims to apply the use of IoT as an aid in the learning process, to facilitate and accelerate the teaching and learning processes of instructors and students in the institution.

Wireless technology is becoming increasingly popular due to the prevalence of mobile devices such as smartphones, tablets, and laptops. This wireless network offers advantages such as the ability to move and connect without the need for network cables, as well as improved productivity when performing tasks [15]. Wireless configuration technology represents a crucial component of networking, encompassing the establishment and administration of wireless networks. Due to the increasing usage of wireless networking in contemporary computers and communication, it is essential that networking students comprehend this subject. The fundamental principles in the field of wireless configuration technology encompass various key concepts, such as wireless sensor networks, green networking, semantic communication, wireless ad-hoc networks, and wireless security networking [16].

However, this is not the case when employing wired technology. Depending on research from previous study [17] this wired technology has mobility-related drawbacks for which consumers may have difficulty. In terms of mobility, wired networks are extremely inflexible. There is no alternative to installing additional cables and a switch at a separate location to gain access to a wired network [15]. In addition, wired networks restrict the Internet's working area and require many cables to link one machine to another [18]. Lastly, wired technology is tough to manage because more components are utilized during installation and each computer on the network requires a cable. Wireless technology makes installation easier and eliminates the need for untidy cords. Therefore, the configuration job will be tidy and clean [19].

The use of computers and laptops among university students has become an essential part of their lives, as they are no longer used for training sessions. Instructors now prefer to send assignments in softcopy form, which allows students to complete assignments without using much

time. A computer is a device that needs electricity to operate, but it can be used with a laptop due to its power supply, such as a battery, which can be charged and used wirelessly. This has an impact on students who use wired devices such as computers. According to [20], students who use computers in the laboratory or at home will experience a lack of flexibility and a time when other students are more comfortable using devices without, i.e., laptops as soon as the lecturer gives an assignment because they can take the device anywhere. Students who use the computer that is wired devices must wait to go home before they can complete their assignments.

The use of a wireless device, such as a computer monitor, can help students perform tasks flexibly and without being tied to one position only. According to [21], using computers among students for too long time can expose them to a greater risk of discomfort and musculoskeletal disorders. Wires can cause students to move and choose a different seat position to perform tasks, which can be an invitation to their health and safety.

This research aims to limit the use of wired technology in education by using wireless technology to reduce the time required for laboratory practical training. It also enables teachers and students to connect to various devices quickly and with the development of wireless technology that uses IoT equipment as a teaching aid, it is possible to use IoT technology in the process of acquiring new information and implementing IoT technology.

2. Methodology

2.1 Research Population and Sampling Techniques

The methodology phase focuses on understanding the research process and product development of a methodology to achieve objectives. It is divided into two forms: research design and product design. This study would include all students participating in networking courses at Universiti Pendidikan Sultan Idris in Perak. This demographic can be specified by course level, student age, academic background, or any other relevant parameters that may influence their learning and success in the course. The random sample of 233 students enrolled in the networking course is drawn from the population so that each student has an equal chance of being selected. The use of these random sampling approaches has the potential to ensure that the sample of students from the networking course is representative of the overall population and has the ability to give accurate and valid data for the research project.

2.2 Measures

The research instrument used is a periodic five-point Likert scale. The five-point Likert scale used in this research project asks respondents to rate their level of agreement or disagreement with a series of statements on a scale of 1 to 5, with 1 representing "strongly disagree" and 5 representing "strongly agree". The periodic five-point Likert scale used in this research project will be administered to a sample of networking course students to measure the Potential of wireless integrated configuration technology as a learning tool.

The responses collected from the periodic five-point Likert scale will be analysed using statistical techniques to determine changes in the students' perceptions over time. This analysis will provide insights into the effectiveness of the teaching method and can be used to make improvements to the course curriculum or instructional methods.

3. Results

3.1 Demographics Data

According to the data presented in Table 1 below, a total of 233 students have provided their responses to this questionnaire; 92 of these students are male and 141 are female. The majority of those who responded to this questionnaire were between the ages of 19 and 23, totalling 132 students, with the remainder falling between the ages of 23 and 25, totalling 87 students.

The minimum number of respondents is at the age level of 25 years - 30 years and 30 years and above with a disability of only seven respondents. In addition, this preliminary analysis has been conducted for all fields, and most respondents who answered are from majors in Information Technology, which is 222 respondents, followed by Chemistry field which has two respondents. The rest of the respondents are from various fields. One respondent represents each field, and there are nine respondents. This happens because networking is a field familiar to Information technology students because Computer Networking is one of the compulsory subjects for this field compared to other fields.

In addition, this questionnaire has also gathered a total of 174 respondents who have experience in the field of networking for 0 years - 2 years, two years - 4 years for a total of 81 respondents, four years to 6 years for a total of 3 respondents and the minimum is six years and above for a total of 2 people only. This year of experience is monopolized by respondents who do not have any experience up to 2 years of experience because most of these respondents are teenagers aged 19 - 23 years. They are still seeking experience and gaining knowledge related to this network; some still need to work in this field.

Table 1
 Respondent Demographic Data

Items	Frequency
Genre	
Male	92
Female	141
Age	
19 years old – 23 years old	132
23 years old – 25 years old	87
25 years old – 30 years old	7
30 years old - above	7
Courses	
AT20: Bachelor of Education (Information Technology) with Honours	222
AT13: Bachelor of Education (Chemistry) with Honours	2
Others	9
Years Experiences in Networking	
0 years – 2 years	174
2 years – 4 years	81
4 years – 6 years	3
6 years and above	2
Total Respondents	233

3.1.1 Identify the possibility of a wireless product developed for computer network

The probability of a wireless configuration product will be identified by several questions related to the development of this product that were distributed to respondents to assess their level of acceptance if this product were to be developed later. Based on Table 2, there are a total of 153

respondents who strongly agree that they are interested in the field of computer networks ($M=4.519$, $SD=0.777$, $n=233$), followed by respondents who agree as many people, not sure as many as 20 people, disagree as many as two people, and lastly strongly disagree which is as many as two people only. Therefore, based on these findings, it can be proven that this questionnaire will run smoothly because many respondents are very interested in computer networks.

Following, a total of 133 respondents ($M=2.699$, $SD=0.993$, $n=233$) does not agree that they like to use the computer when doing configuration and followed by 52 respondents who are not sure, 25 respondents who agree, 21 who strongly agree and finally, the lowest is two people who strongly disagree to use the computer in doing configuration. Therefore, based on these findings, it is clear that 135 respondents do not like to use computers in configuration. This is because using a computer to configure a device makes the respondent inflexible and requires much movement in terms of providing hardware such as cables.

Furthermore, for the next question, a total of 144 respondents ($M=3.806$, $SD=0.721$, $n=233$) agreed that they know how to configure network hardware such as Routers and Switches, followed by 42 respondents who were not sure, 31 respondents who strongly agreed, 14 who disagreed and finally, two respondents who very not agree. Therefore, based on the findings of the study, it was found that a total of 144 people and 31 respondents knew how to configure network hardware. Moving on to the next question, a total of 138 agreed ($M=3.914$, $SD=0.720$, $n=233$) that they had difficulty configuring using the cable console. This finding is further supported by 42 respondents who strongly agree with the statement. However, 44 respondents are not sure, nine people disagree, and no respondents strongly disagree. Therefore, based on the findings that have been released, it proves that the respondents have difficulty configuring the cable console, which will further strengthen the development of this product. For the following question related to the whereabouts of the respondents, a total of 142 agreed ($M=4.030$, $SD=0.665$, $n=233$) that their movement was limited when configuring the cable console. This point is further supported by the number of respondents who strongly agree with the statement, 51 people. However, a few respondents do not agree that their movement is limited by using the cable console when configuring, follow by 36 respondents who not sure, and four respondents are disagree. With this, it is clear that the use of this cable console is the leading cause of the limited movement of the responder. Using computers and wires in configuration is normal, but every person wants changes that benefit them.

Furthermore, there are times when users think of using other methods to do configuration. Therefore, as many as 127 respondents agree ($M=4.176$, $SD=0.663$, $n=233$), and 74 strongly agree that sometimes they wonder if they can do wireless configuration. However, three respondents need to be sure, and only one disagrees with doing this wireless configuration because they prefer the traditional method over the new process. Therefore, the results prove they are ready for new technology that allows them to do wireless configuration. Every product developed expects a response from users. Because this product is designed as a wireless product, almost all respondents ($M=4.420$, $SD=0.639$, $n=233$) are interested in trying wireless hardware to configure the network, 115 strongly agree, and 103 agree. However, a few respondents are not interested and are not sure about trying this wireless hardware if it is developed. Therefore, based on the findings released, with this wireless hardware, users will welcome to use it as a new method in configuration.

Furthermore, this product is also a teaching aid in networking so that learning in the classroom becomes more fun by applying IoT elements. Therefore, as many as 112 ($M=4.386$, $SD=0.686$, $n=233$) strongly agree, and 103 agree that using wireless hardware to do network configuration will help to understand. However, a few respondents disagreed with the information given, which is 15 respondents needed to be sure, two people disagreed, and one person strongly disagreed. Therefore,

based on the findings that have been released, it is clear that the existence of wireless hardware to facilitate this configuration will help them increase understanding in this field.

Lastly, 159 respondents (M=4.648, SD=0.553, n=233) strongly agree, and 67 respondents agree that the existence of this product will attract students to learn networking. However, six people are not sure, and one disagrees on the existence of this product will be able to attract students' interest. Therefore, the results from the results proved that 159 respondents agree, and 67 respondents strongly agree that this product will attract students' interest in learning the field of computer networks and make the learning session more interesting by applying IoT elements in learning sessions.

Table 2
 Possibility of wireless integrated configuration technology developed

Items	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agreed	Mean	Std. Dev
I interested in computer networks fields.	2	3	20	55	153	4.519	.777
I like to do configuration using the computer.	2	133	52	25	21	2.699	.993
I know how to configure network hardware (Router & Switch).	2	14	42	144	31	3.806	.721
I am having difficulty when configuring using the console cable.	0	9	44	198	42	3.914	.720
My movement is limited due to the configuration using the console cable.	0	4	36	142	51	4.030	.665
Sometimes I think of using another device for network hardware configuration.	0	1	30	136	66	4.145	.640
Sometimes I wonder if I can flexibly configure the hardware without any cables.	0	1	31	127	74	4.176	.663
I am interested in trying the wireless device for network configuration.	0	2	13	103	115	4.420	.639
I feel that the wireless device for network configuration will facilitate the process of understanding.	1	2	15	103	112	4.386	.686
I think the use of wireless configuration products will attract student's interest.	0	1	6	67	159	4.648	.553

4. Conclusions

Third-generation computers are being developed to meet the demand for new products, improve wired devices to wireless, and speed up the configuration task. However, development costs are exceeding expectations, and the products are unreliable, difficult to maintain, and poor performance, creating a software crisis. This requires a new approach to product development. The development of a product is based on the problems faced by students and the solutions for students who are taking computer networking courses. Data finding show that most of the students experienced difficulties in using a cable and found their movement limited due to its use in the learning session (networking courses). This highlights the importance of the wireless in solving these issues. This product might be an excellent product for student understanding as it can be used as an initiative to diversify the way configuration is carried out and improve student understanding. Most of the students also agree that they want to try a wireless device for networking configuration in class session for improve their understanding.

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