

# Smart Telehealth Appointment System – WI Care

**Siah Cheong Lin, Heshalini Rajagopal, Thong Chee Ling**

*Institute of Computer Science and Digital Innovation, UCSI University, 56000 Kuala Lumpur, Malaysia*

*E-mail: heshalini@ucsiuniversity.edu.my, chloethong@ucsiuniversity.edu.my  
www.ucsiuniversity.edu.my*

## Abstract

Modern technology is all about speed and efficiency to connects you with your healthcare provider, ensures virtual communications, and gives you more access and control over the services you receive. Based on literature study, there is a lack of healthcare appointment system that enables patients making appointment and doctor confirming the appointment on the fly. This project aims to create a Smart Telehealth Appointment System -WI Care that enables user to make an appointment in ease. Compared to existing health care system, WI Care will be more prior to services instead of technology. Due to COVID-19 pandemics, constant lockdown had resulting social distancing measures, movement control order, and people avoid outdoor activities. These also led to poor service quality due to limitation of staff working in office with less working hours which directly affects the GPs and doctors' career at dead end. For the fundamentals of the system, WI Care will have an appointment system that can be managed by doctors meanwhile appointer can keep submitting form. WI Care ensure both parties can be conducting the same procedure as how every GPs and doctors able to work anywhere anytime. With dashboard and time scheduling, these are able to create chance for doctors and GPs having manageable workload as individual without the reliance of hiring staff members. This project suggests the healthy environment whereas every doctor can join WI Care as big community, share skills and tackles problem together.

*Keywords:* Telehealth; Appointment System; Web-Based Clinic System

## 1. Introduction

Health Care System is system that provides for services to be given to people in defined settings, which including residences, academic institutions, workplaces, public places, societies, hospitals, and health centers, in order to contribute to their wellness. It also specifically designed to meet the health needs of a population, and as a result, it is much broader than one would think upon first, which would include community care and programs, public health and protection, private and publicly funded health care, and so forth.

Health Care System can break down into many counterparts, ranking by most common used such as Electronic Health Record (EHR) Software that collects information of the patients and provide recommendations; Medical Database Software that stores medical historical records and treatment plans; Telemedicine that assist on handle appointments with patients online through web and mobile platform etc. [1].

However, Smart Telehealth Appointment System is a web application that consist similar feature to any appointment system. The system can be accessed by doctors, administrator and any other user. Tasks can be performed by current system in making appointment, scheduling and modifying the result through the system, and also enabled description and design editing. Despite lockdown has been lifted in our country long ago, people still rely on virtual meeting format. These activities are also applied to medical field as well. Currently, doctors and nurses also prefer using handheld devices to record patients' status, which has proven for better precision and efficiency for diagnoses and treatments, overall improving the quality of healthcare [2]. Consumers also start to value their health more during the crisis of COVID-19. The findings validate that virtual visit are being used by consumers higher than before. From 2019 till early 2020, the result shows that virtual visits rate ascended from 15% to 19%, and a huge increment to 28% in April 2020 [3]. The majority of customers were pleased with their visits and mentioned that they would utilize this form of therapy again.

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One of the systems that applies for the current healthcare technology are the smart systems. It is a system integrated with functions of sensing, control, and actuation to examine real life scenario, hence make decisions based on available data that is predictive or adaptive and therefore carry out “smart” action. Smart system has been applied in many fields of work like consultation, delivery, smart home, or even devices such as SMART TV, Smart refrigerators and etc.

Most existing smart healthcare project are focus on IoT field, where the smart technologies are applied on wearable items and devices such as Biosensors, connected inhalers, Smart watches, FitBits, Blood pressure monitors and more [4]. However, telehealth also started gain popularity only when arrival of COVID-19. Telehealth cover services like video call meeting, healthcare portals to assist doctors and patients in keeping track of therapy, storing health records, and collecting and accessing data via wearable devices and clinic visits. In spite of that, most telehealth project are only targeting mobile platform. Although smartphone devices are far more convenient to track medical records and communications as it has high accessibility, most of the mobile system platform need to update manually, contains lack of IoT interaction and limitations for hardware. Telehealth project in app format also tend to have less accurate record and support services compare to other devices. Virtual meeting and notifications are two of the important services needed to offer within telehealth consulting system, so the best alternative to replace existing telehealth project is access through mobile website integrated with automation services.

## 2. Methods

The WI Care serves as a web application integrated with services that provides utility similar to every healthcare system. Table 1 has shown the functionality comparison between the WI Care with other existing healthcare system. The main focus of the WI Care is to enhance customer experience towards the appointment services. Ensuring every record is all-rounded standby with privacy protection and reduce the possibility of network congestion. WI Care has been developed with Visual Studio Code based on HTML, CSS and JavaScript. Front-end design includes the Main Portal which stores information, and the back-end design is developed under PHP syntax where the files is allocated under XAMPP folder that includes Login portal, Appointment Portal and Admin Portal. The main composition of WI Care is not just about the system. It prioritizes social media aspect that came along with

automation that will come as the future development that will be included for later version release. For the main elements, this project came with a combination of four portals that make every user access to the system in different perspective. The system will also include different types of access levels for admins and doctors to create account and manage the dashboard, edit appointment list and also set schedule time. Appointer can have access information about WI Care services and also create appointment between doctor and appointer. Database will be stored in local server which contains admin and doctor accounts, and also capable of receive appointment form data.

Table 1: Comparison of smart healthcare systems

Applications	Anura <sup>TM</sup>	SmartHealth (Android)	Sense Care	WI Care
IoMT sensor support			✓	
Online appointment			✓	✓
Account management	✓	✓	✓	✓
Store information and medical records	✓	✓	✓	✓
A.I. Processing	✓		✓	
Mobile Apps	✓	✓		

## 3. Results and Discussion

### 3.1. Main Portal

As for the back-end development of WI Care, two appointment portals were developed for admin, doctors and appointer access which can be found in Figs. 1 and 2.



Fig. 1: Appointment Portal

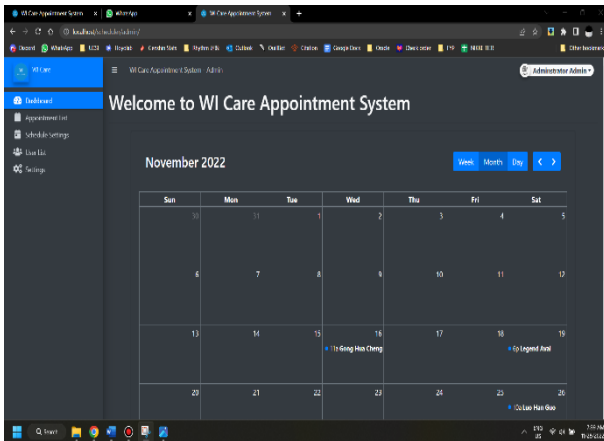


Fig. 2: Admin Portal

As for the front-end development of WI Care, three webpage tabs were designed for WI Care main portal information display to let user understand clearly regarding the background of WI Care services and system. The sample are shown in Figs. 3, 4 and 5.

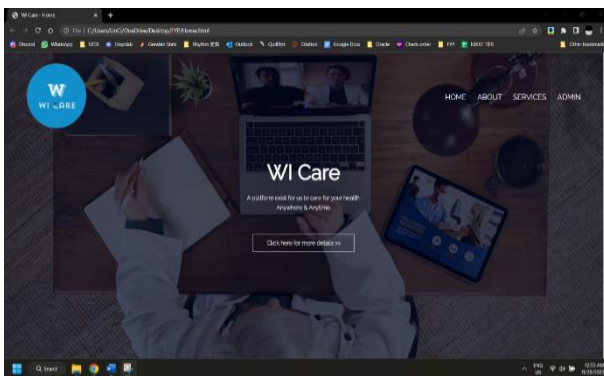


Fig. 3: Home Tab

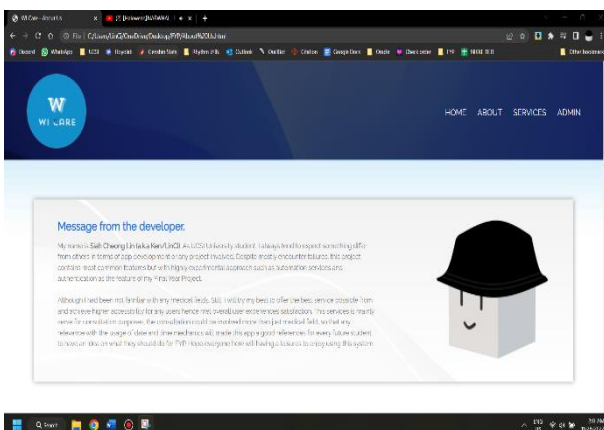


Fig. 4: About Tab

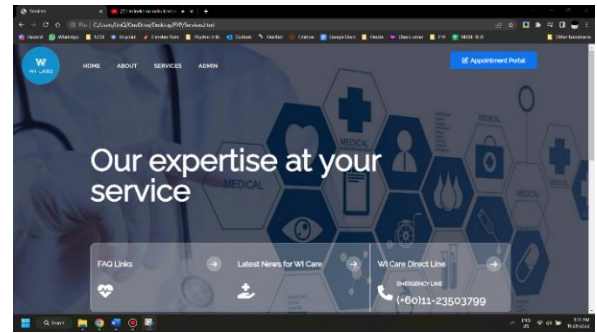


Fig. 5: Service Tab

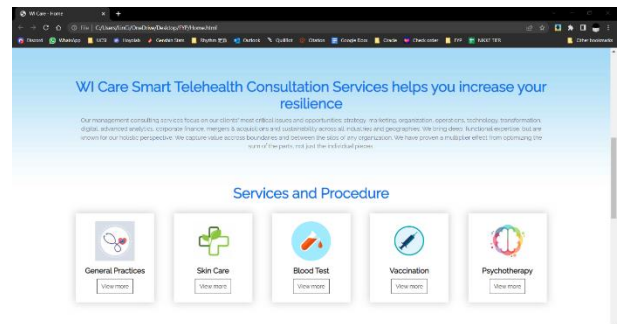


Fig. 6: Main Portal – Home Tab (Content: Introduction / Service and Procedure)

Fig. 6 shows the Home Tab contains the introduction of WI Care and the provided services included. The services such as General Practices, Skin Care, Blood Test, Vaccination and lastly Psychotherapy. “View more” is a button that will navigate to the About Tab which doesn’t allocate at Home Tab, as selecting “View More”, the page will be navigate to About Tab and scroll down to the Service Description section. This applies to other 4 services as well which can be referred from Fig. 7. Whereas after selecting “View More” on Skin Care section, it will automatically lead to the same section on Fig. 7 and automatically show the Skin Care Info on Fig. 8.

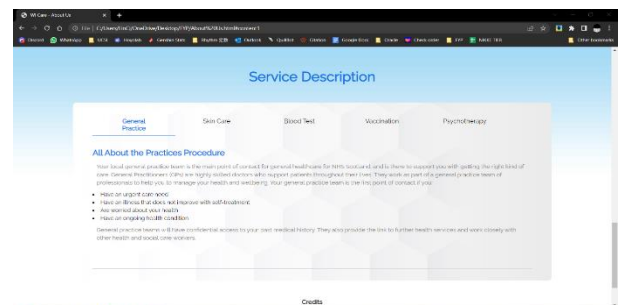


Fig. 7: Main Portal – About Tab (Content: Service Description – General Practice)

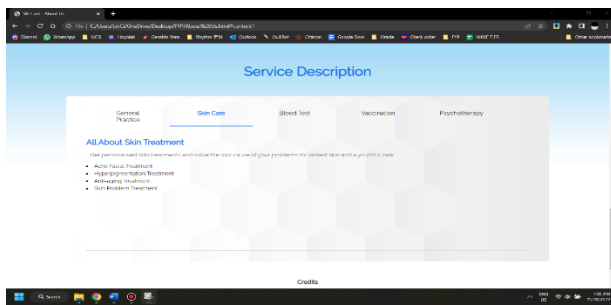


Fig. 8: Main Portal – About Tab (Content: Service Description – Skin Care)

After Service and Procedure section, at the ending section for the home Tab display one white gradient background image which contains 2 buttons, the buttons are “Appointment” in blue color and “Admin Login” in yellow color which can be refer from Fig. 9.

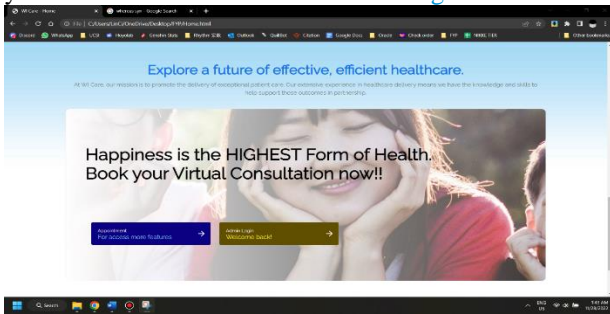


Fig. 9: Main Portal – Home Tab (Content: Ending section)

### 3.2. Appointment Portal

Appointment Portal and Main portal are the portals can be access from any user. Appointment Portal is also the only portal can be access from other 3 portals. The summarize webpage design of this portal can be referred back to Fig. 10.

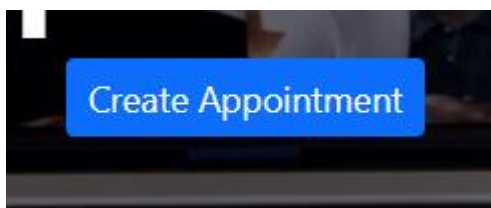


Fig. 10: Appointment Portal – Create Appointment Button

“Create Appointment” is the only interactable button within the portal. After select the button, an appointment modal form will appear for the user, refer from Fig. 11.

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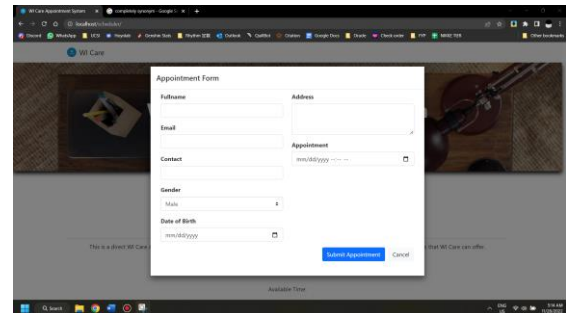


Fig. 11: Appointment Form displayed in modal view

Appointment Form consist of 7 field needed to be fill in. User must input all of the field to submit the appointment. Full name, email, contact and address will be input using the text-box provided. For the gender, it will appear a dropdown list that shows male or female, users are require to select one of them to complete the input, refer from Fig. 12.

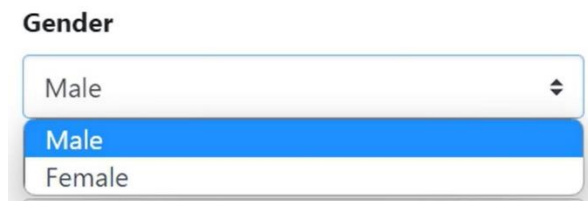
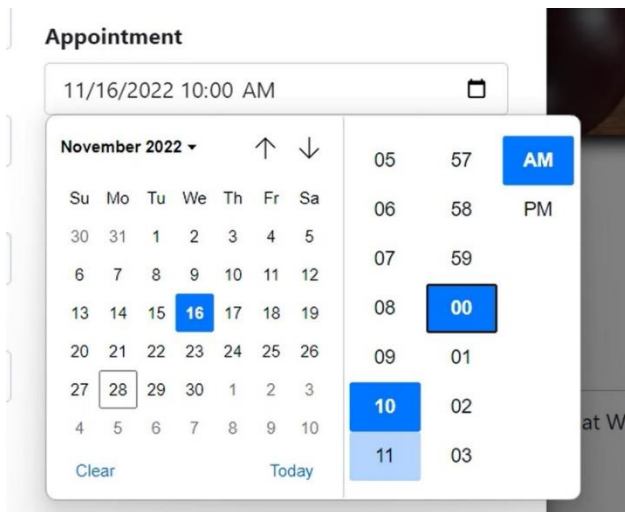


Fig. 12: Appointment form – Gender

As for the date of birth and appointment, user can either type in as normal text-field or press the calendar logo to show the calendar display and select one of the dates which will automatically fill in the result after the selection, referring from Fig. 13. Additionally, the calendar can be toggle months using up and down arrows. User can select anywhere outside of calendar display to close the calendar.

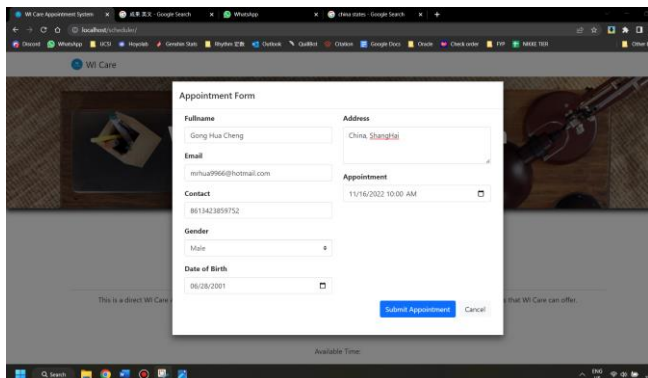




The image shows a web-based appointment form titled "Appointment". At the top, it displays the selected date and time: "11/16/2022 10:00 AM". Below this is a calendar for November 2022. The 16th is highlighted in blue. To the right of the calendar is a time selection interface with two columns of numbers (05 to 11) and two rows for "AM" and "PM". The time "10:00 AM" is selected and highlighted in blue. There are "Clear" and "Today" buttons at the bottom of the calendar.

Fig. 13: Appointment Form – Calendar View

After all of the input has been fill in, the result of the input should be shown as Fig. 14 displays.



The image shows a screenshot of a web browser displaying the "Appointment Form". The form is filled out with the following information: Fullname: Gong Hua Cheng, Address: China, Shanghai, Email: renhua9966@hotmail.com, Contact: 8613423859752, Gender: Male, Date of Birth: 06/08/2001, and Appointment: 11/16/2022 10:00 AM. A blue "Submit Appointment" button and a grey "Cancel" button are at the bottom right of the form.

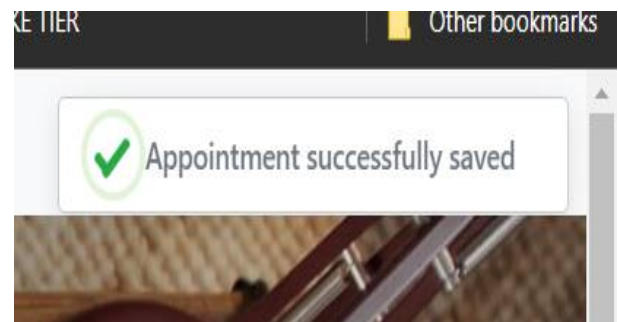
Fig. 14: Input result of Appointment Form

Selecting “Submit Appointment” button will have three types of conditions occurred, if users not complete fill in all of the require inputs, the system will pop-up message informed user to fill in the blanks, referring from Fig. 12. The second condition is if the schedule time does not meet with the time available, another error message will show on top of the form prompting the schedule time is invalid, referring from Fig. 13. And the last condition is if all of the input success, after select “Submit Appointment” will automatically close the form and display submit successful message on the top right corner of the webpage, referring from Figs. 14, 15, 16 and 17. Selecting “Cancel” will close the Appointment Form.



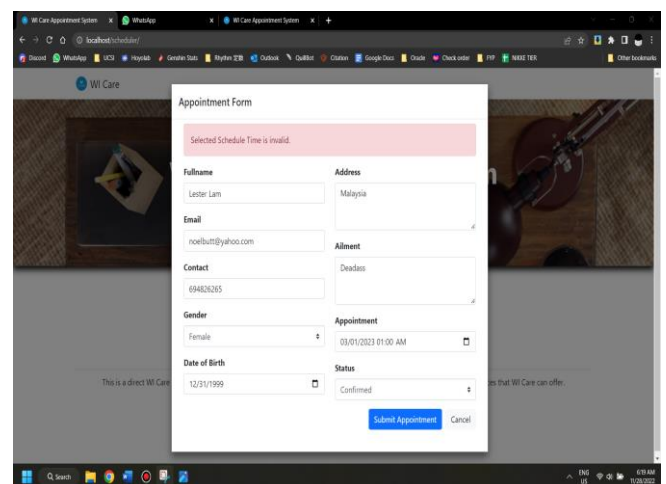
The image shows a close-up of the "Appointment Form" submission process. A red error message box is visible, stating "Please fill out this field." with an exclamation mark icon. The form fields for "Address" and "Appointment" are visible, with the "Appointment" field showing "11/16/2022 10:00 AM".

Fig. 15: Submit Appointment form



The image shows a green checkmark icon and the text "Appointment successfully saved" in a white box, indicating a successful submission. The background shows a blurred view of a microscope.

Fig. 16: Appointment Form submission successful fill in the input field.



The image shows a screenshot of the "Appointment Form" with a red error message at the top: "Selected Schedule Time is Invalid." The form fields are filled out: Fullname: Lester Lam, Address: Malaysia, Email: noelbunt@yahoo.com, Contact: 694026265, Gender: Female, Date of Birth: 12/31/1999, and Appointment: 03/01/2023 01:00 AM. The "Status" is set to "Confirmed". The "Submit Appointment" and "Cancel" buttons are at the bottom right.

Fig. 17: Submit Appointment with appointment date that is not active.

Scrolling down to the footer of the Appointment Portal will found a blue text which is a button that leads user to Microsoft Outlook and automatically fill in the developer's email whereas user can reply for any system error occur, referring from Fig. 18 And so, this has concluded the Appointment Portal available interaction.

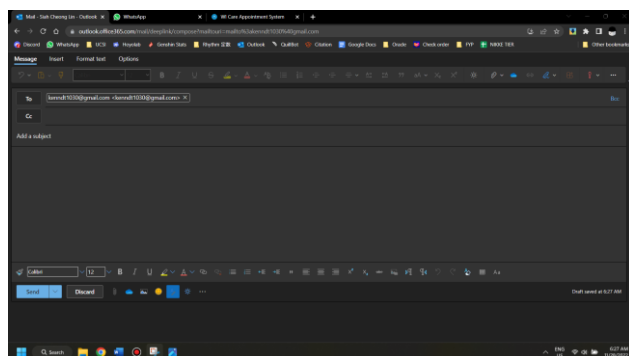


Fig. 18: Microsoft Outlook with developers email as receiver.

WI Care appointment system are not limited to medical field. Any system that involves appointment can utilize our WI Care system and integrated as part of their main feature as well. WI Care also do benefit towards our target audience. With this system, most of the doctor should get significantly better management time on report access, IT usage quality and most importantly, the better health-care self-evaluation.

#### 4. Conclusion

Most of the existing health-care system prioritize IoT modules for screening purpose or sensor [5] to extract the real-time data. By thinking back to square one, services are definitely one of the important elements in healthcare, and not everybody will have the financial ability to utilize those new technology due to absurd charges even just one time of screening. WI Care might not have the most advanced technology on hand, as trade off we had successfully developed a website that attracts most of the medical specialist. The website had released appointment portals is to ensure to reduce the workload especially for those GPs that prefer work individually.

As the appointment involved GPs, appointers are also the end-user that use the appointment system interact with GPs. Despite appointers only need to submit a form, and so besides submission, it is important to let appointers to join WI Care as part of community instead of just merely customers that come once and never return. So, within the website, I have established several information to let the users track our team progress on what our vision and mission is all about, which includes our medical services as well.

Lastly, only 57% of the adults using desktop or laptop compared to 97% of adults that uses smartphone as their main source of connection between other people [6]. It is important that WI Care system should enable phone user to have an access for all function, as I had implemented

multiple framework that supports vertical view and buttons that able to hide certain views to fit the vertical screen, especially applies for the appointment system. Although overall system is not robust enough, but by achieving all of these objectives, which leaves the very first version of WI Care provides a good experience for accessing more opportunities to study, develop and learn from other developers as part of our milestone to become a better developer.

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#### Authors Introduction

##### Mr. Siah Cheong Lin



He is pursuing his Bachelor of Computer Science (Honours), UCSI University, Malaysia, currently.

##### Dr. Heshalini Rajagopal



She received her PhD and Master's degree from the Department of Electrical Engineering, University of Malaya, Malaysia in 2021 and 2016, respectively. She received the B.E (Electrical) in 2013. Currently, she is an Assistant Professor in UCSI University, Kuala Lumpur, Malaysia. Her research interest includes image processing, artificial intelligence and machine learning.

Dr. Thong Chee Ling



Chee Ling Thong is an Associate Professor at Institute of Computer Science and Digital Innovation, UCSI University. Her research interests include IT Innovation in solving real-life problem. She has received three research grants from UCSI University Malaysia as Principal Investigator for projects entitled 'Android-based

Time Tracker for Shuttle Bus', 'iOS Time and Location Tracker for Shuttle Bus' and 'Mobile Car App for Travel Agency'. These projects are fully copyrighted by Intellectual Property Corporation of Malaysia (MyIPO). In 2021, Thong was awarded the "Product Innovation and Commercialization Award" by the university.

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