

E-Café: An Innovation for Providing Safe Services in a Dine-in Restaurant during the New and the Next Normal

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Abstracts

Due to the spread out of COVID-19, the global restaurant industry was highly impacted. The number of sit-in customers dropped out to zero in many countries. To fulfill the requirements of restaurant operators in operating the dine-in services during the spread out of COVID-19 and to restore the customers' confidence in dine-in services provided by the restaurant operators, the objectives of this research and development are 1) to develop a responsive web-based application used for supporting the services in the dine-in restaurant and 2) to evaluate the opinions and satisfaction of both restaurant operators and customers toward the system prototype. The system development tools are Visual Studio Code, PHP, HTML, and Bootstrap Framework. The development life cycle of the system prototype was divided into 4 phases, which are 1) system requirements specification 2) system design 3) system implementation and 4) system prototype evaluation. The implemented system prototype consists of 7 functions, which are 1) To Manage User Account 2) To Manage Menu 3) To Manage Food Order's Status 4) To Browse Menu 5) To Order Food 6) To Track Food Order's Status and 7) To Calculate the Food Cost and Service Fee. In the final phase of system development, the system prototype was evaluated by the dine-in service stakeholders. The 2 restaurant managers and 8 waitpersons from the supportive restaurant were invited to participate the group interview. The interview results indicated that the proposed system prototype enabled the restaurant operators in providing dine-in services safely and effectively. The system prototype helped waitpersons and customers to avoid unnecessary contact. Moreover, 32 customers were invited to evaluate the system through an e-questionnaire by giving satisfaction scores in 3 aspects (i.e., the appropriateness of user interface, the system efficiency and effectiveness, and the overall satisfaction of self-preventive practices by using the system prototype). The customers' total satisfaction score towards the system prototype is 4.45 (S.D. = 0.59), which means very satisfied. The evaluation results, overall, showed that the proposed system prototype successfully supported the operations relate to dine-in services. The system prototype, additionally, satisfied the need of social distancing and reducing personal contact.

Keywords: E-Café; Responsive Web; Web-based Application; Innovation for Dine-in Services; Providing Safe Services

Introduction

After the spread out of COVID-19 in 2020, the global restaurant industry was highly impacted. Due to the social-distancing restrictions and lockdown policies formulated by the government, the full dine-in restaurants were severely stressed. The number of sit-in customers dropped out to zero in many countries. Even though, the revenue from food delivery and takeaway sales significantly increased, especially in Thailand which the growth of food delivery sales proportion increased over 30 percent during the lockdown, it was not enough for running the business (Kasikorn Research Center, 2021 : online). Consequently, this caused a high loss of employment and revenue (Dube, Nahmo, Chikodzi, 2021 : 1487-1490; Research Center, 2021 : online). In addition, the previous research found that the sit-in customers will not come back immediately after reopening the restaurants. Therefore, in order to restore the customers' confidence in dine-in services provided by the restaurant operators, the substantial changes in their operations; especially in safety and health protocol, must be launched (Dube, Nahmo, Chikodzi, 2021 : 1487-1490). These attempts were represented in many ways, such as online food delivery services serving robots information system for dine-in services and take-out or drive-thru services

In Thailand, the restaurants were closed from the government's lockdown policy declared in the mid of the year 2020. Although the full dine-in restaurants were allowed to reopen in the last quarter of 2021, self-preventive practices (e.g., social distancing, personal contact avoidance, hand washing, masking, and antigen test) have been strongly suggested to restaurant operators. The restaurant operators need to provide dine-in services under the conditions of COVID free environment, which involves a quality ventilation system, restaurant cleanliness, reducing personal contact, self-monitoring and antigen testing of service providers, and ensuring social distancing. Therefore, in order to enable restaurant operators in operating safe dine-in services (e.g. avoiding or reducing personal contact, keeping social distancing), a framework for developing a responsive web-based application for supporting dine-in services was proposed. The proposed system provides a group of functions that supports the processes of dine-in service operated by the restaurant operators, such as menu browsing, food ordering and cancellation, and food order status tracking. Moreover, the concept of responsive web design was applied in order to allow users to use the application from a variety of devices with different screen sizes (e.g., desktops, tablets, mobiles). The web pages would be resized or adjusted automatically to make them look good (or fit) on all devices (W3Schools, 2022:online). With the support of the proposed system prototype, the restaurant's operators can avoid or reduce the personal contact between the customer and the waitperson. After getting in the restaurant, customers can log into the application through their mobile devices by using the user accounts and passwords provided. Additionally, menu checking, food ordering, food order status tracking, and bill asking can be performed through the application by the customers.

Research Objectives

The objectives of this research and development are as follows:

- 1) To develop a responsive web-based application used for supporting the services in the dine-in restaurant.
- 2) To evaluate the opinions and satisfaction of both restaurant operators and customers toward the system prototype.

Research Methodology

Research Population and Sampling

1) Population:

The restaurant operators who provide the dine-in services and the customers who receive the dine-in services in the restaurants

2) Sampling:

Based on the purposive sampling technique, 2 restaurant managers and 8 waitpersons from a supportive restaurant were invited to evaluate the system prototype through the group interview. Additionally, based on the simple random sampling, 32 restaurant customers, who received the services in a dine-in restaurant through the system prototype, were invited to evaluate the system prototype.

Research Instruments

1) Software Developing Tools:

The tools used for developing the system prototype are Visual Studio Code, PHP, HTML, Bootstrap Framework, and MySQL.

2) System Prototype Evaluation:

At the final phase of system prototype development, the tools used for system evaluation are (1) the interview questions used for evaluating the opinions of the restaurant operators on the system prototype and (2) the e-questionnaire used for evaluating the satisfaction of restaurant customers towards the system prototype. All questions shown in these tools were validated by 3 domain experts in the area of software development. The index of Item-Objective Congruence (IOC) of all questions are rated from 0.67 to 1.00, which indicated that all questions clearly measured the identified objectives.

Software Development Processes

Phase 1: System Requirements Specification

In order to identify the system scope and operations clearly, 3 representatives from supportive restaurant (i.e., one restaurant manager and 2 waitpersons) were invited to participate the group interview. The group interview was set up to identify users' requirements, criteria of operations, and procedures of dine-in services. The interview questions were prepared and sent to the interviewees 2 weeks before the interview session. After group interview, the identified system functions, which were determined by 3 groups of system's target user, were listed in Table 1. The use case diagram, as shown in Figure 2, then, was created to represent system functions (or use cases) and related actors.

Table 1 System's Use Cases

No.	Use Cases	Description	System's Target Users		
			Restaurant Manager	Waitpersons	Customers
1	To Manage User Account	To manage (i.e., create, edit, and delete) the user accounts of all groups of user.	✓	-	-
2	To Manage Menu	To manage (i.e., create, edit, and delete) the restaurant's menu.	✓	-	-
3	To Manage Food Order's Status	To update the food order's status or to cancel a food order.	✓	✓	-
4	To Browse Menu	To show a list of the dishes or drinks offered by the restaurant.	✓	✓	✓
5	To Order Food	To get or cancel customers' food orders.	✓	✓	✓
6	To Track Food Order's Status	To track the status of food orders.	✓	✓	✓
7	To Calculate the Food Cost and Service Fee	To summarize the food orders and calculate the food cost and service fee when customers have finished eating at the restaurant.	✓	✓	✓

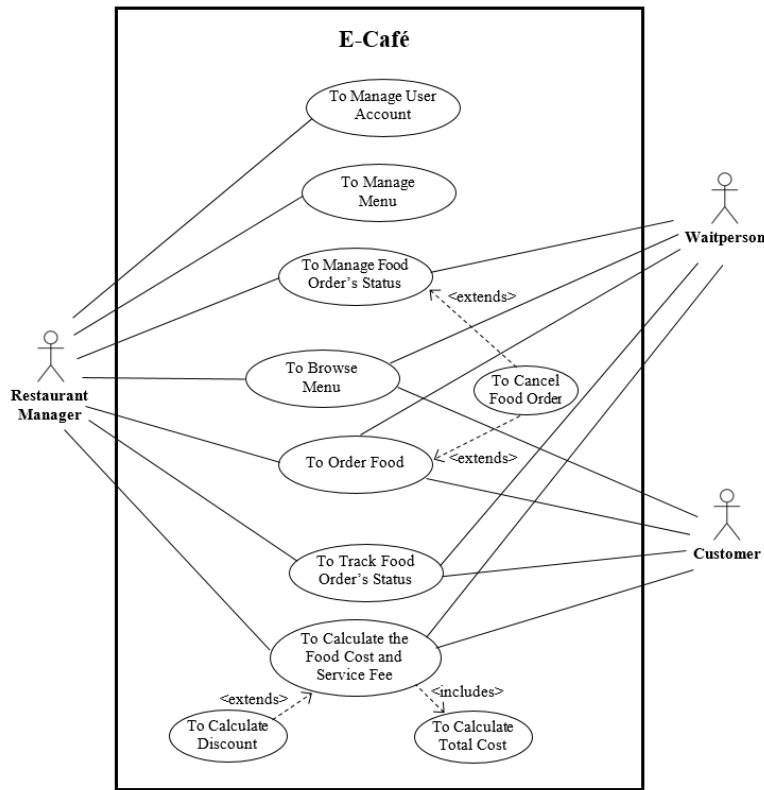


Figure 2 A Use Case Diagram for the System Prototype (E-Café)

Phase 2: System Design

To support a variety of customers' mobile devices, the proposed web-based application, called E-Café, was developed as a responsive web-based application. The responsive design enables web contents to display properly on any screen size of the user's mobile device. The mock-up screens of E-Café were designed and created, as shown in Figure 3 - Figure 5.

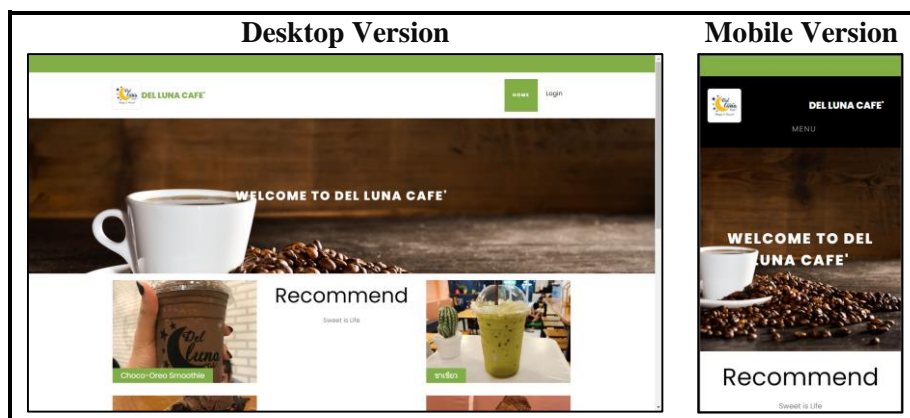


Figure 3 Home Page of the System Prototype (E-Café)



Figure 4 Mock-up Screens for Managing User Accounts and Menu

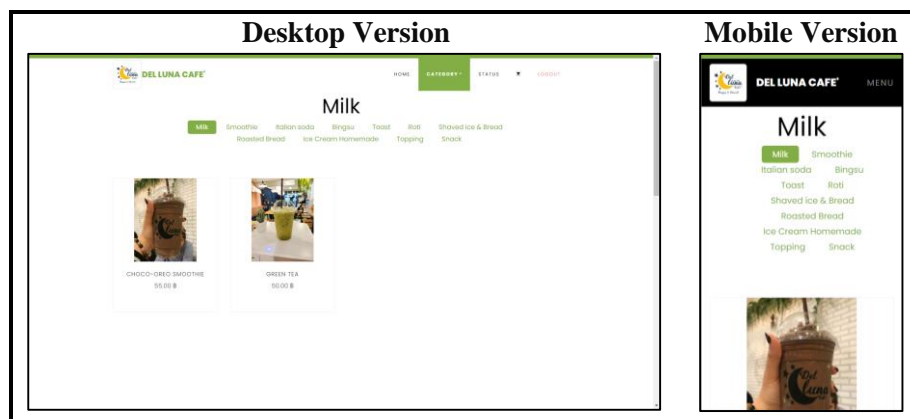


Figure 5 Mock-up Screens for Menu Browsing

Phase 3: System Implementation

Based on the system design blueprints drawn up in the previous phase, the system prototype was coded. Visual Studio Code, PHP, HTML, and Bootstrap Framework were used in this phase. The system prototype was tested to confirm the correctness of system operations. After debugging the identified errors, 3 system target users (i.e., one restaurant manager and 2 waitpersons) were invited to participate in the process of the User Acceptance Test (UAT) in order to reconfirm the appropriateness and correctness of the system prototype. The users' opinions on user interface and system operations were gathered and used as the guidelines for final adjusting the system prototype.

Phase 4: System Prototype Evaluation

After system implementation, the restaurant operators (i.e., 2 restaurant managers and 8 waitpersons) from the supportive restaurant were demonstrated and trained how to work with the system. Afterward, the trained users were invited to evaluate the system prototype through the group interview. Additionally, based on a simple random basis, 32 customers were invited to evaluate the system prototype. They were requested to give satisfaction scores in 3 aspects (e.g., the appropriateness of user interface, the system efficiency and effectiveness, and the overall satisfaction of self-preventive practices by using the system prototype) through the e-questionnaire.

Research Conceptual Framework

Based on the concept of Systems Development Life Cycle or SDLC, which divide the software processes into phases (Dennis, Wixom, & Roth, 2021 : 5), the conceptual framework of this research and development was illustrated in Figure 1.

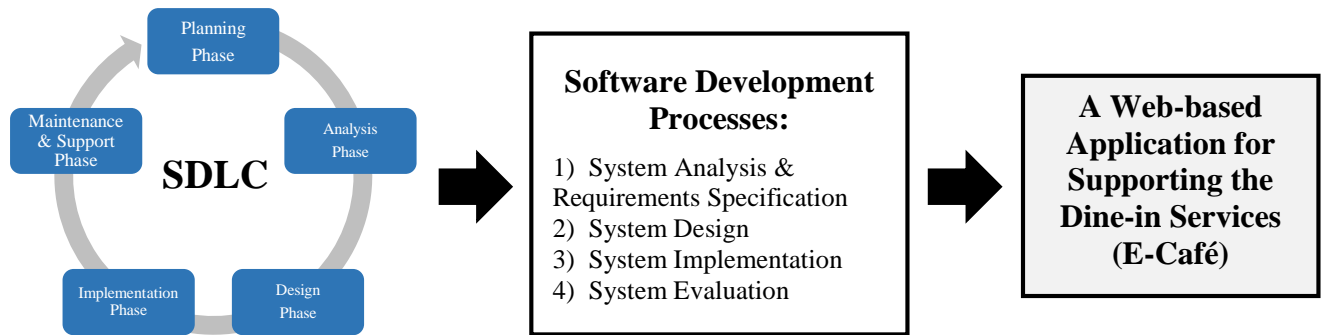


Figure 1 The Conceptual Framework

Results

1) The results of system development

The implemented system prototype is a responsive web-based application, which consists of 7 main functions (i.e., To Manage User Account, To Manage Menu, To Manage Food Order's Status, To Browse Menu, To Order Food, To Track Food Order's Status, and To Calculate the Food Cost and Service Fee). Some of the system functions were shown in Figure 6 – Figure 9.



Figure 6 Menu browsing

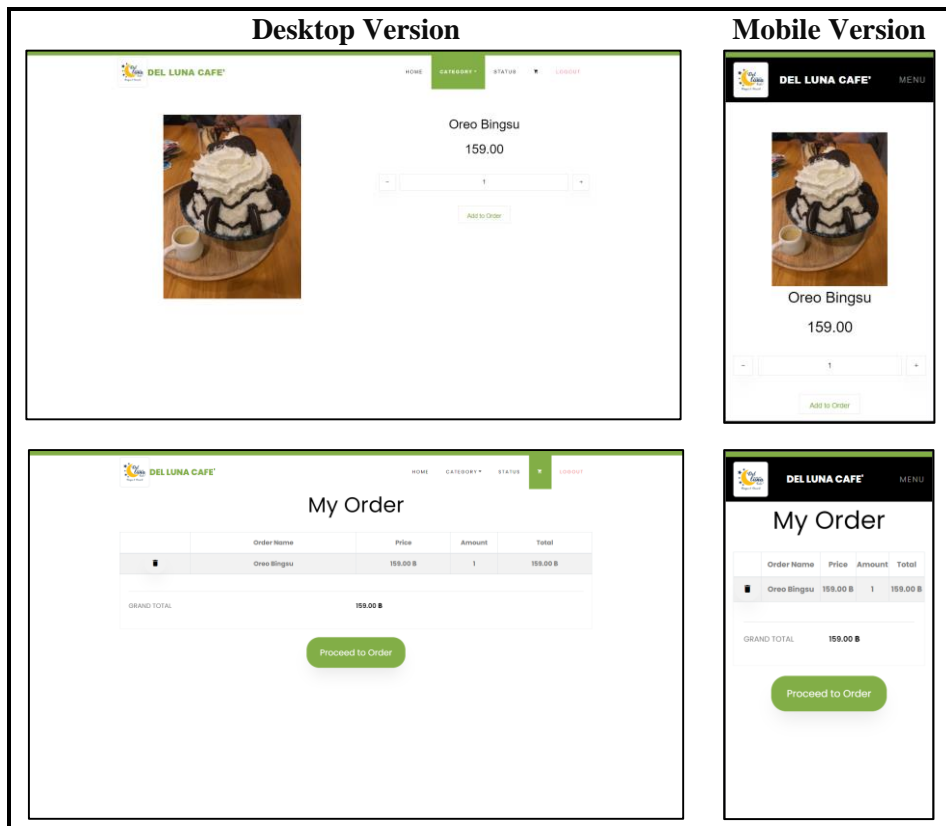


Figure 7 Food ordering and cancellation

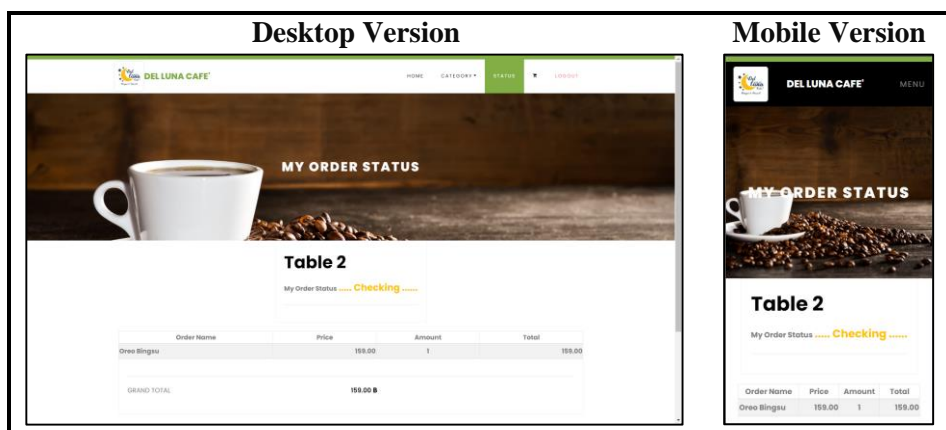


Figure 8 Food order tracking

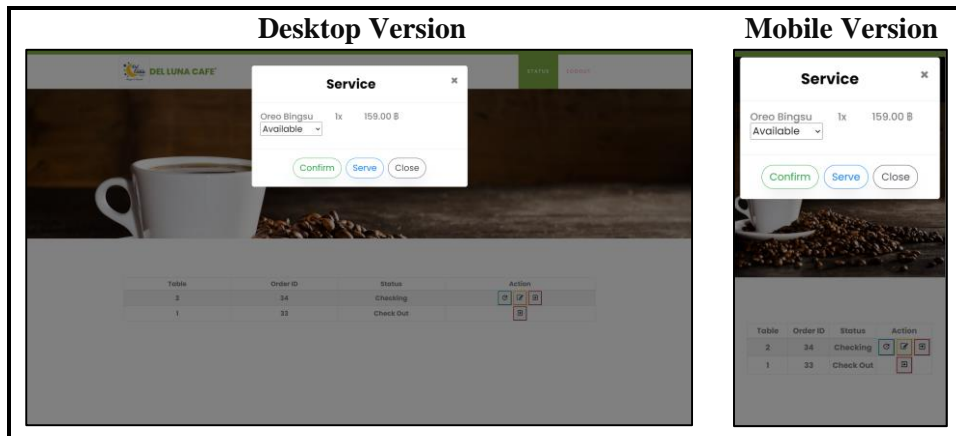


Figure 9 Managing food order's status (by restaurant operators)

2) The results of the system evaluation

After system demonstration and training, 2 restaurant managers and 8 waitpersons were invited to evaluate the system prototype through the group interview. The validated interview questions were used in this process. The interview results indicated that the system prototype satisfied restaurant operators. It outperformed the restaurant operations and enabled the restaurant operators in providing the dine-in services safely and effectively. The system facilitated dine-in customers to have the services without the waitperson's assistance, e.g. checking the menu from the application, tracking the food order's status, and calculating the food cost and service fees before billing. Therefore, the system allowed waitpersons and customers to avoid or reduce unnecessary contact. This can be concluded that the system prototype satisfied the need of social distancing and helped reducing/avoiding personal contact. It's found that the customers provided positive feedback after using the digital menu, the food ordering function, and the food order tracking function. Moreover, with the support of the system, the waitpersons stated that they have more time to manage customer orders which finally leads to providing the faster service, and increasing the dine-in customers' satisfaction. In addition, 32 customers, who received the dine-in services through the system prototype, were invited to evaluate the system by giving system satisfaction scores in 3 aspects (e.g., the appropriateness of user interface, the system efficiency and effectiveness, and the overall satisfaction of self-preventive practices by using the system prototype) through the e-questionnaires. The demographic statistics of the respondents and the system evaluation results are shown in Table 2 and Table 3.

Table 2 The demographic statistics of respondents

	Frequency	Percentage
Gender		
Male	15	46.9
Female	17	53.1
Total	32	100.00
Age (by years)		
20 or below	6	18.75
21 - 30	19	59.38
Above 30	7	21.88
Total	32	100.00
Degree of Education		
Bachelor (or lower)	21	65.63
Master	8	25.00
Ph.D.	3	9.38
Total	32	100.00
Occupation		
Student	10	31.3
Office Worker	15	46.9
Business Owner	4	12.5
Government Officer / State Enterprise Employee	3	9.4
Total	32	100.00

From Table 2, the demographic statistics of respondents indicated that the majority of respondents were male (53.1%) and were between 21 to 30 years old (59.38%). Most of them were the office workers (46.9%) and had a bachelor’s degree (65.63%).

Table 3 The customers’ satisfaction scores for the proposed system prototype

Questions	Mean	S.D.	Level of Satisfaction
The appropriateness of the user interface			
1. The appropriateness of screen layout	4.19	0.64	Very Satisfied
2. The appropriateness of font style and size	4.53	0.57	Extremely Satisfied
3. The appropriateness of color and image size	4.62	0.61	Extremely Satisfied
4. The clarity of system feedback and displayed output	4.31	0.69	Very Satisfied
5. Ease of use – Intuitive User Interface	4.28	0.68	Very Satisfied
<i>Average</i>	4.39	0.64	Very Satisfied
The system efficiency and effectiveness			

Questions	Mean	S.D.	Level of Satisfaction
6. The efficiency of product searching and output representing	4.47	0.51	Very Satisfied
7. The effectiveness of product searching and output representing	4.69	0.47	Extremely Satisfied
8. The effectiveness of food order tracking	4.47	0.72	Very Satisfied
9. The correctness of food and service fee calculation	4.81	0.40	Extremely Satisfied
10. The correctness of system operations when user performs action through the system command buttons	4.66	0.48	Extremely Satisfied
<i>Average</i>	4.62	0.52	Extremely Satisfied
The overall satisfaction of self-preventive practices by using the system prototype			
11. With the support of the system, the customer gained the flexible services without personal contact	4.34	.70	Very Satisfied
12. With the support of the system, the customer restored the confidence in getting back to the full dine-in restaurants.	4.16	.68	Very Satisfied
13. With the support of the system, the dine-in customer can avoid or reduce the personal contact.	4.44	.56	Very Satisfied
14. With the support of the system, the customer gained the appropriateness of social distancing.	4.12	.71	Very Satisfied
15. In overall, the customer evaluated that the system is one of a useful tools for reducing or avoiding unnecessary personal contact which helps curbing the spread out of the virus.	4.53	.51	Extremely Satisfied
16. In the future, the customer intends to use the system during dining in the restaurant.	4.63	.49	Extremely Satisfied
<i>Average</i>	4.37	0.61	Very Satisfied
Total Average	4.45	0.59	Very Satisfied

As shown in Table 3, the average satisfaction score of (1) *the appropriateness of the user interface* is 4.39 (S.D = 0.64), which means very satisfied. Meanwhile, the average satisfaction score of (2) *the system efficiency and effectiveness* and (3) *the overall satisfaction of self-preventive practices by using the system prototype* are 4.62 (S.D. = 0.52) and 4.37 (S.D. = 0.61), which means extremely satisfied and very satisfied respectively. Moreover, the total average score of customers' satisfaction is 4.45 (S.D. = 0.59), which means very satisfied. The evaluation results from e-questionnaires indicated that the system prototype successfully supported the operations of the dine-in restaurant. Additionally, the evaluation scores indicated that the system prototype can be used as an effective and efficient tool for supporting the dine-

in services and restoring the customers' confidence in getting back to the full dine-in restaurants.

Discussion

Based on the software development processes (i.e., system analysis & specification, system design, system implementation, and system evaluation), the prototype of a responsive web-based application used for supporting the dine-in services in a restaurant was developed. The system consists of 7 functions, which are 1) To Manage User Account 2) To Manage Menu 3) To Manage Food Order's Status 4) To Browse Menu 5) To Order Food 6) To Track Food Order's Status and 7) To Calculate the Food Cost and Service Fee. These functions enabled the dine-in restaurant operators to provide safe, efficient, and effective services to the dine-in customers. According to previous research (Kurniawan, Sutawan, & Amalia, 2020 : 32-40; Maingi & Obonyo, 2022 : 1-23; Wang, 2012 : 9), the restaurant operators stated that the dine-in customers provided positive feedback to the system used for supporting the dine-in service; especially the function of the digital menu and food ordering. It can be concluded that the linkage between the digital menu and the food ordering function allowed customers to seek out the required dishes through mobile devices and, then, place their orders immediately and accurately without waitpersons' assistance. This process fulfills the requirements of customers in avoiding/reducing personal contact and keeping social distancing during the spread out of COVID-19 (Jeong, Kim, Ma, & DiPietro, 2022 : 836-858). And, public awareness of social distancing, avoiding/reducing personal contact, and self-cleanliness still remain, though the situation of COVID-19 pandemic is recovering. Therefore, by reopening the dine-in restaurant after the COVID-19 pandemic, the dine-in restaurant operators can use the proposed system as a strategic tool for restoring the customers' confidence in getting back to the dine-in services. Similar to the previous research findings (Intal, Payas, Fernandez, & Domingo, 2020 : 1054-1059 ; Kurniawan, Sutawan, & Amalia, 2020 : 32-40), the digital dine-in services allowed customers to have some services without waitpersons' assistance, e.g. tracking of food order's status. Then, the waitpersons were released to have more time for dealing with customers' orders and the back-end services. Therefore, the service quality and the serving promptness of waitperson are increased. This, finally, leads to an increase of customer satisfaction. Although the COVID-19, which has been a global threat, has changed from pandemic to endemic, seeking out the solutions to cope with it or to adapt to live with it is a challenge for the mankind to make a complete and safe transition from the new normal to the next normal.

Recommendations

1) Based on the research framework, a responsive web-based application, which is called E-Café, was developed. In order to support the dine-in services and to avoid or reduce the personal contact between the waitperson and the customer, the implemented system consists of 7 functions, which are 1) To Manage User Account 2) To Manage Menu 3) To Manage Food Order's Status 4) To Browse Menu 5) To Order Food 6) To Track Food Order's Status and 7) To Calculate the Food Cost and Service Fee. The evaluation results indicated that the implemented system outperformed the operations in a dine-in restaurant. It, moreover, can be used as a strategic tool for restoring the customers' confidence in getting back to the dine-in services.

2) To completely fulfill the restaurant operations related to dine-in services, a few functions, as follows, are suggested for the further study and development.

- *Online Billing (or e-Payment):*

The customers are allowed to make online payment by themselves after finishing up the meal. This function enables customers and waitpersons to avoid personal contact.

- *Online Reservation:*

The customers are allowed to reserve a table at the restaurant or to ask for a table reservation from the restaurant operators. This function enables restaurant operators to manage the traffic at restaurant effectively.

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