Increasing Customer Satisfaction Index Through Integrated Restaurant Operational System

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Abstract

The operational system is an important thing that needs an organization in large scale industries to small scale like a restaurant. It can lead to positive things such as good service quality, standardized food quality, a well-recorded flow of food purchases, and other aspects, leading to a high profitability level. In the culinary industry, such as restaurants, enhancing the operational system's quality in industrial 4.0 is always accompanied by a computer-based system. There have been many studies on computer-based operational procedures in the culinary industry. Still, most of these studies only focus on one and two areas, such as food supply, dining room service, or table ordering, so that it is not well integrated. The study we conducted combines the dining room's service process, making food in the kitchen, and the cashier's payment process becomes an integrated system and is interconnected seamless. An integrated approach will facilitate the restaurant in communication, accurate data management, and speed in the service process. All processes are computerized and integrated to speed up the current job. The customer assessment can be seen in a service rating when making payments, which shows that their satisfaction in restaurant operating standards is close to 90% of customers. Systematically, a test is also carried out, which states that the system being built can synchronize data between the processes carried out and make the process well organized and fast. Finally, our study also suggests that further studies should be carried out by developing this system to be used in multi-branch restaurants and using cloud-based technology to reach restaurants with minimal funds to invest in information technology.

Keywords

Computer-based operational systems, Integration, Restaurant management systems

1. Introduction

The operational system is a series of activities carried out to produce goods or services. The system is an important part needed in an organization, both in large and small scale industries. There are currently many industries in the culinary field and are very diverse in food or service. The role of creativity in the culinary industry has played a vital role in culinary change and evolution (Lin and Baum 2016). The invention in service generally presents a challenge because of the multitude of the action itself's intangible nature. In an operational restaurant system, serving customers' speed is one of the top priorities in a restaurant (Susanto et al. 2020). When the restaurant is crowded with customers, waiters must work quickly to serve customer orders and deliver orders. An excellent operational system for customers in restaurants is an efficient service and makes it easier for customers to place food orders (Espino 2017). Service quality plays an essential role in making customers happy and forcing them to revisit the restaurant, which in the end will increase customer satisfaction index (Aftab et al. 2016).

Computer-based operational systems will undoubtedly be different from the conventional ones usually carried out by a restaurant. The service provided by restaurant employees is more elongate than using a computer-based operational system. The resources needed when using manual services will be more than those that are computer-based. Here are many advantages that can be obtained from using computer-based operating systems, including increasing restaurant income (Gavrilova 2017) and minimizing cashier fraud (Documents 2018). The benefits obtained from a computer-based operating system are not only for restaurants, but these benefits can also be felt by customers, including the speed in serving food (Khan, Hussain, and Yaqoob 2013).

There have been many studies on computer-based operational systems but only focus on one and two areas, such as ordering food and drinks (Kapoor and Vij 2018)(Alalwan 2020). The study we conducted combines the dining room service process, making food in the kitchen, and making payments at the cashier into an integrated and seamless system. An integrated operational system will provide more benefits, one of which is that the waiter will be more organized and increase service speed (Tan and Netessine 2018). This integrated system is that the waiter gives the menu book to the customer and records orders on the tablet. Then the order data sent to the kitchen. Order data is displayed on the kitchen system, and the kitchen operator presses the process button, which means the food is being made. This information is displayed on a dashboard that can be seen by customers. When the food is finished, the kitchen operator presses the finish button, and the order data is moved to the cashier. This computer-based operating system is integrated and seamlessly connected. That way, it will make it easier for the parties involved in the restaurant. Data communication is more accurate and easier to manage. This research tries to answer the existing gap and create an integrated operational system to increase the customer satisfaction index.

2. Research Method

We conduct this study by collecting data before moving on to the design, development, and implementation stages. Data collection has been touted as one of the critical elements of software engineering, and it consists of interviews and observations. The interview process took place at Ramen AA Cimahi, West Java, Indonesia, and was conducted on the 14th of January until 16, 2020; next on February 8 and 19, 2020; and on the 12th of March, 2020. Each interview took an average of 2 hours. Interviews were conducted with the supervisor of the Kerkof branch of Cimahi City. We highlight various topics, such as business processes, organizational profile, structure, vision, and mission. Furthermore, we also address problems or needs in the process that need to be addressed, actors, roles in the process, and precisely define the flow of information between them throughout the process. Besides interviews, we also conduct observations simultaneously from the 23rd until the 27th of March 2020. We observed the activity closely and witnessed the problems in the restaurant. Observations were made by visiting Ramen AA Kerkof in Cimahi City and seeing the process of ordering food to pay. This event highlighted more findings that were not mentioned by previous sources. We recorded and summarized our findings and validated them to informants before deciding to place them as research facts.

2.1 Business Process Identification and System Objective

Identifying a business process is the first step towards business process improvements. As we would like to improve the current business process using a new monitoring system, we need to conduct this stage before moving on to the other. The business process at Ramen AA starts when customers come to the restaurant and order food. The order is recorded by the customer on the paper given by the waiter. After that, the customer calls the waiter to provide a list of orders. The waiter gives the form to the kitchen attendant. After the food is made, the waiter delivers them to the customer and gives the order paper to the cashier. The cashier input the list of food that has been ordered. The customer pays the cashier, and the cashier looks for customer order data with a table number. We identify gaps or problems in identifying business processes, as illustrated in Table 1.

Table 1. Problems Found during Business Process Identification

No	Problems Found	Description
1.	Lack of information for ordering food	Customers often ask how to order.
2.	Changing the menu book when there is newness	Restaurant managers must replace the menu book with a new one when a new menu is added, and a menu is not in the restaurant.
3.	Difficulty finding information on customer service satisfaction	Restaurant managers have difficulty finding information about service satisfaction provided to customers.
4.	Make a listing order two times.	Since order notes must be given to the kitchen and sent immediately to the cashier for input, the waiter must record the same order list on two different papers.
5.	Difficult to provide detailed food	The menu book does not provide food details. When customers want to know what their food is like, often the

	descriptions.	waiter has to explain the details of the food one by one.
6.	Customer complain	Customers often ask the waiter whether the food is finished or not. The length of time waiting in service.
7.	Data is scattered	A lot of order data is stored carelessly when the paper arrives at the kitchen.
8.	Unclear financial reports.	The system has used financial reports, but the system is still not safe to store reports using the collected order paper.
9.	Long order input process	To make a transaction, the cashier must first enter the order, hence taking a long time.
10.	No food availability information.	Customers often order food that is out of stock. This information was just found out in the kitchen. The waiter must return to the customer to let know the order is out of order or is empty.

We set up objectives using the S.M.A.R.T approach from this problem found during business process identification (Ogbeiwi 2018). It is a framework of purpose used to help guide goal setting. S.M.A.R.T. is an acronym that stands for Specific, Measurable, Achievable, Realistic, and Time-Bound. Therefore, a SMART goal incorporates all these criteria to help focus the efforts of making a sound system and increase the chances of achieving that goal. Our interpretation of objectives based on the S.M.A.R.T. approach can be seen in Table 2 below.

Table 2. S.M.A.R.T Objectives of the Integrated Restaurant Operational System

No	Objective Type	Objective Description	Solving Problem No-
1.	Specific	The system's goal is to create a clear flow of information, facilitate services, and manage data well.	1, 2,4,5,6,7,9,10
2.	Measurable	To minimize cheating at the cashier and find out the value of service satisfaction.	3,8
3.	Achievable	To speed up the service and provide the information needed by customers.	1, 4, 5, 6,10
4.	Realistic	This integrated restaurant operational system can facilitate data transfer from one module to another.	4,7,8,9,10
5.	Time-Bound	To be used in 2020 and measured after 30-days of use.	-

We develop an integrated operational system with a computerized and integrated web-based system with the waterfall method approach, which is expected to help optimize existing operational systems in restaurants. Here are the stages of the Waterfall model:

1) Analysis and definition of system requirements are to understand existing problems and objectives determined by the user, which are then defined in detail and function as system specifications (Bahrani et al. 2019).
2) System design changes the need for representation in the form of a software "blueprint" before coding begins. The design must be able to implement the existing requirements (Buchori et al. 2017).
3) Implementation. In this phase, coding begins according to requirements. In this phase, the development starts to do its work. The database administrator starts to make the database programmer start coding the functions or say the front end developer project and stat modules develop interactive GUIs according to software requirements (Grizeau, Vaillant, and Bègue 1998).
4) Testing. In this phase, we test the software to function as expected or not. We also inspect SRS that the software meets all the client's requirements at the time of the agreement.

5) Deployment and Maintenance. After the testing phase, the application is now ready for deployment when the application has been thoroughly tested and verified. When stakeholders experience technical problems, software maintenance is carried out at this stage (Kramer 2018).

2.2 System Design

System design deals with planning the operational system's development by understanding and specifying what a system should do and how its components should be implemented and work together. System analysts solve business problems by analyzing operational systems' requirements and designing such systems by applying analysis and design techniques. The design emphasizes a *conceptual solution* that fulfills the requirements, rather than its implementation (Berry et al. 2016). For example, in this study, a table structure of the product, orders, and payments is described. (Our three most important tables in the system) can be seen in tables 3, 4, and 5 below.

Table 3. Table of product

No	Field Name	Type Field	Size Field	Key
1.	Product_id	int	11	*PRIMARY*
2.	Product_name	varchar	100	-
3.	desc_product	text	-	*FOREIGN*
4.	figure_product	text	-	*FOREIGN*
5.	status	varchar	8	-
6.	price	int	12	-
7.	id_category	int	11	-

The product table is used to store product data and tasks that restaurant managers must perform, such as adding, updating, and deleting product data. In the product table, a product_id is used as the primary key that can be used to connect the product table with other tables. In the table, there is also a desc_product field and a figure_product with a Foreign key. These fields are used to relate to fields in other tables.

Table 4. Table of order

No	Field Name	Type Field	Size Field	Key
1.	Order_id	int	11	*PRIMARY*
2.	Order_code	varchar	25	-
3.	Order_date	date	-	-
4.	User_id	int	12	-
5.	Customer_name	text	-	*FOREIGN*
6.	table	int	11	-
7.	status	enum	-	-
8.	read	enum	-	-
9.	qty	int	11	-
10.	made_status	enum	-	-

The order table is used to store order data and tasks that waiters must perform, such as recording table numbers and a list of orders. This order table is related to the payment table so that when the order data is completed, it is sent to the cashier. The identity or identity as the primary key here is order_id. There is a customer_name attribute that becomes a foreign key to connect to fields in the payment table.

Table 5. Table of payment

No	Field Name	Type Field	Size Field	Key
1.	Payment_id	int	12	*PRIMARY*
2.	Order_id	int	12	-
3.	User_id	int	12	-
4.	total	int	12	-
5.	status	enum	-	-
6.	Date_created	date	-	-

The payment table is used to store transaction data and tasks performed by cashiers, such as printing bills. This payment table is related to the order table so that when a customer makes a payment, the cashier only enters the table number or the name of the order. The identity or primary key here is payment_id. There are attributes order_id and user_id in the table because the table retrieves data from the orders table and the user table.

2.2.1 Actor's Identification.

Identifying actors is one of the first steps in use case analysis (Kurniadi et al. 2018). An actor represents each type of external entities with which the system must interact. We define actors within our systems and can be seen in Table 6.

Table 6. Table Actor Identification

No.	Actors	Descriptions
1.	Restaurant Manager	Access right to view financial reports, view the results of ratings given by customers, restaurant dashboards, add and delete menu data
2.	Waiter	Access rights to view menu list to record orders. Kitchen operator Access rights to view order details, manage order status, and manage food availability status.
3.	Kitchen operator	Access rights to view order details, manage order status and manage food availability status.
4.	Cashier	Access rights to view the cashier dashboard, make payment transactions.

2.2.2 Functional Analysis.

Modules, functions, and features of a system are derived from the interpretation of objectives, as shown in table 7.

Table 7. Functional Analysis of the System

No.	Module(s)	Description of Functionalities	Objective No-
1.	Manage reports	Manage reports: View reports and print reports. This function is used for monthly reporting to branch heads.	1
2.	Manage menu data	Manage menu data: View, add, change, and delete menu data. This function is used to control menu data if there are a new menu and a menu that does not exist in a restaurant.	1
3.	Order recording	This order recording function records a list of customer orders and sends order data to the kitchen.	2
4.	Manage menu availability status.	This function is used by the kitchen to change the status of the menu that has run out.	3
5.	Manage order status	This function is used by the kitchen to change the status of an order that is being made.	3
5.	Manage Payments	This function is performed to make payment transactions.	4

From each module in the table, four user groups in the restaurant are used. Restaurant managers use the manage report module and manage menu data. While the waiter uses the order recording module and module to manage menu availability status and manage kitchen operators use payments.

2.3 System Development

In this study, we implemented the web-based software based on the PHP programming language with the editor in Visual Studio. It uses the MySQL database and Apache Web Server that is in the XAMPP application, Google Chrome / Mozilla Firefox as a Web Browser media.

3. Results and Discussions

We have managed to make the base software in 40 days and did several tests and measurements. Two significant evaluations were conducted. The first one was an internal test to compare the objectives set at the beginning with the implementation result. The second test was using the actors to measure their acceptance of the systems.

3.1 The Monitoring System

Implementation of the software interface results from the design concept or design created in the previous stage (Morschheuser et al. 2018). Interface design or mock-up helps developers make good designs in building monitoring systems to manage youth activities. To enter the system based on the user level, restaurant managers, waiters, kitchen operators, and cashiers. Each user must first fill in their username and password, as depicted in Figure 1. (Maudet et al. 2017).

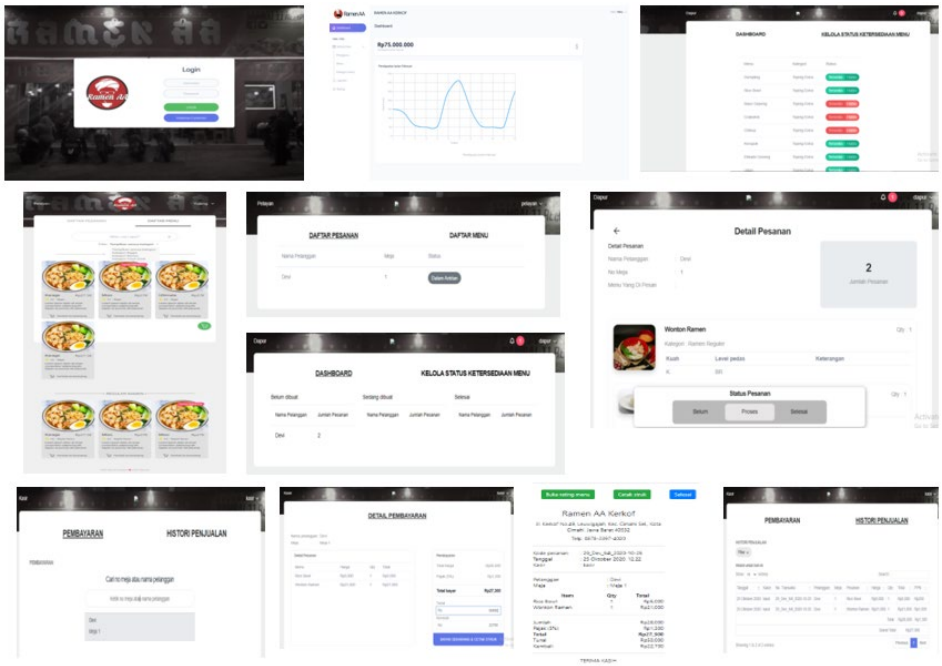

Figure 1 The Restaurant Operational System

Restaurant managers use the admin dashboard page. On this page, to manage menu list, menu categories, and report. The menu list function is used to add, modify, and delete food data in the restaurant. The menu category function is used to change and add to the food categories available in the restaurant. The report function contains reports in the form of the number of menus purchased and the sales results. The cashier page is for managing payments. The payment function displays a list of subscribers. The service page is for managing order recording. The order recording function is used to add, modify, and delete orders. The kitchen page is used to view a dashboard that displays incoming orders and manages menu availability status. The menu availability status management function is used to change the menu's status out of stock or available.

3.2 The Acceptance Test

To find out that the needs of users have been fulfilled, we conducted a user acceptance test. The test was made with 40 test scenarios for four types of users: (1) restaurant managers, (2) waiters, (3) kitchen operators, and (4) cashiers. UAT results can be seen in Table 8.

Table 8. Table of acceptance test

No	User/Tester	Acceptance Rate	Notable comments
1.	Restaurant managers	(7 out of 8) 87,5%	"The management of reports is directed, and good data visualization is understandable."
2.	Waiters	(16 out of 18) 88,89%	"Recording orders is made easier, and when the stock menu runs out, it can be seen on the existing menu list."
3.	Kitchen operator	(8 out of 10) 80%	"More comfortable with order details but no incoming order notification sound."
4.	Cashiers	(4 out of 4) 100%	"It makes it easier and faster because data is not entered manually, but data is entered from orders that have been processed by the kitchen section."
	Average Acceptance	**89,17%**	

From the table above, each user provides an important note. Restaurant managers like the data visualization created, but out of the 8 test scenarios, only 7 passed the test because one function still lacked. When printing reports in excel format, there should be a pdf. The waiter finds it easier to do his job and can see the stock is running out. Before the system, to find out the menu stock is out, the waiter must first ask the kitchen, but out of 18 test scenarios, 15 passed the test because the function in the menu search function if the menu is empty still displays all menu. The function of recording when input table numbers can yet be inputted all table numbers even though the table has been ordered. It is easier for kitchen staff to see the list of incoming orders. Out of the 10 test scenarios, 8 passed the test because the notification function did not make a sound. The function of managing the status of food availability has no button back to the previous page. The cashier does not need to enter order data, and this reduces the queue of payments.

3.3 Rate Customer

We create a small survey to determine the satisfaction of service to customers. A satisfaction score is carried out using four aspects of assessment: (1) The service provided is in the dining room, (2) Information displayed on the dashboard, (3) Service at payment; and (4) Speed in service. The results of the customer assessment can be seen in Table 9.

Table 9. Table of Rate Customer

No.	Assessment Aspects	Number of Customers giving Rate	Rate
1.	How satisfied are you with the service in the dining room?	9 people with a rate of 5 15 people with a rate of 4 3 people with a rate of 3	(4,22 out of 5) 84,4%
2.	How satisfied are you with the order status information displayed on the dashboard?	14 people with a rate of 5 13 people with a rate of 4	(4,52 out of 5) 90,4%
3.	How satisfied are you with the waiter when making payments?	12 people with a rate of 5 5 people with a rate of 4 10 people with a rate of 3	(4,14 out of 5) 82,2%
4.	How satisfied are you with the speed of service provided?	16 people with a rate of 5 4 people with a rate of 4 6 people with a rate of 3 1 person with a rate of 2	(4.27 out of 5) 85,4%
		Average Rate	**85,6%**

The table above shows that 27 people rated service at the restaurant after using a computer-based integrated operational system. In evaluating the dining room service, the 27 people gave a rate of 3-5 from a maximum rate of 5. The rate result was considered large because it reached 84.4%. The evaluation aspect of the customer's information on the dashboard produces the highest rate among the other aspect rates. The 27 people give a rate of 4-5 from a maximum rate of 5 with a rate of 90.4%. The aspect of service assessment when making payments produces 82.2%, the same as before, the customer's rate is 3-5 from the maximum rate of 5, but here the one giving rate 3 is more than the one giving rate 4. Our last assessment produces an 85.4% satisfaction rate. All aspects that are assessed get a rate above 80% so that, on average, the rate obtained is 85.6%. With the average rate accepted, customers can experience good service, get exact information, and speed in service.

4. Conclusions

This study can conclude that the system helps in the existing operational processes at the restaurant. This system can increase the customer satisfaction index for restaurant services. Also, it can help restaurant managers to fix inaccurate data management. Finally, our study also suggests that further studies should be carried out by developing this system to be used in multi-branch restaurants and using cloud-based technology to reach restaurants with minimal funds to invest in information technology.

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