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Design and Development of Web-Based Appointment System

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Abstract: Online appointment management system is one of the support tools that can help organization to manage and improve customer services. Due to the limited operation time during the Covid-19 pandemic, the organization was forced to limit their interaction with the client. As a result, appointment systems have become useful tools for managing their clients' appointments and schedules. Thus, in this study, a web-based appointment management system is proposed. The system took into account environmental factors, sequencing rules, and appointment rules (priority rule). The goal of this system is to assist organizations or service providers in maintaining greater operational and staff productivity, by assisting them in maintaining control over the arrival flow and customer traffic on the premises. The functional specifications for the system were acquired through a search of relevant literature and already-existing web-based applications. The prototype was developed based on the specifications. The prototype was then put through a usability evaluation. The results demonstrate that the functionalities for managing appointments supplied by the web-based appointment system were satisfactory to the respondents.

Keywords: *Web Technology, Appointment management system, Web-based system*

1. Introduction

A web application is one of the important tools that support organizations and businesses [1]. Besides the organization, web applications can also be implemented to support individual data management [2], planning, and decision-making [3].

An appointment system is one of the web applications that assists service providers in managing their appointments. Many organizations have employed these solutions to deal with appointment scheduling problems. Previously, appointment-making processes were performed manually, which frequently led to overbooking or failure to cancel an appointment, freeing up time for another to be scheduled in its stead. The issue can cause client wait times to lengthen [4].

An appointment system can be used to enhance scheduling in order to lessen human error brought on by manually setting up appointments [5]. In addition, customers can directly engage with the appointment-making process as they can choose the date and time that suit their preferences [6]. The system may be connected to a queue management system, which enables companies to smoothly transfer customers from online to in-person interactions. Through shorter wait times, it can improve the quality of customer service as well [7].

However, many organizations don't have their own appointment system. This is because creating and

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maintaining a web-based appointment system is quite costly [8]. For certain organizations, lowering operating expenses and achieving efficiency goals are the most frequent obstacles.

Having an appointment system is essential, especially during pandemics when there is a significant danger of viral spread and it is crucial to uphold rigorous safety standards and social distance. Moreover, during a pandemic, many organizations have fewer employees that are actively working.

Hence, a generic web-based appointment management system is suggested in this project, which may be used by any type of business that wants to have its own appointment scheduling system. The system enables account creation for the company so that it may be utilized immediately. It will also include a page for scheduling appointments with organizations based on time availability. The system will automatically send the customer an email confirmation when they have successfully made an appointment.

2. Materials and Methods

This project was established using the five stages of the waterfall development approach. Figure 1 shows the waterfall model's flow.

In the planning stage, the complexity of the customer service operation and the issue the organisation is experiencing are assessed. Then, the actual system needs are evaluated and formalized in the analysis stage. Additionally, the existing online appointment system is also studied to identify typical issues and their corresponding solutions.

In the design stage, all sorts of system designs, such as interface design, database design, and software design, were created based on the specifications stated in the software requirement specification (SRS). In the implementation stage, the application is developed using PHP and a MySQL database.

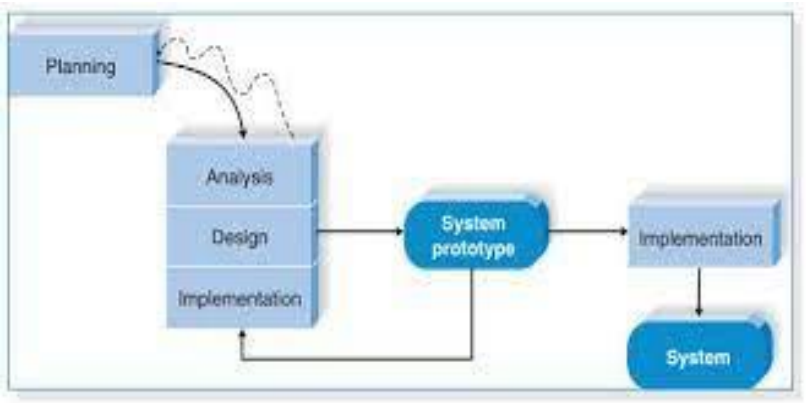

Figure 1. The Waterfall model development methodology

3. Design and Development

The list of the formalized system requirements for this project is shown in Table 1. The requirements are broken down into five main categories: "Register Account," "Login Account," "Manage Account," "Manage Appointment Page," and "Appointment Page."

The requirements are then translated to a use case diagram shown in Figure 2. The diagram described the interaction between the admin organization, the super admin, and the user. The use case of "register an account" is only handled by the admin organization. The use cases of "login account" and "manage account" are both handled by the admin organization and super admin. The use case of "Manage Appointment Page" is handled by admin organizations that already have an account. Admin organizations can create their own appointment pages and share the link with their users. In addition, the admin organization's user can assign appointments by filling in all the details needed in the appointment form.

Table 1. List of Requirements for Web-Based Appointment System

ID	Requirement Description	Priority
1	**Register Account**	
1.1	Account registration requires both personal and organizational information from the admin organization.	Mandatory
1.2	The system will be able to confirm that admin organization filled out all the required information.	Desirable
1.3	Super admins have access to the organization's admin credentials.	Optional
2	**Login Account**	
2.1	With a user ID and password, the administrative organization may log in.	Mandatory
2.2	Super admin must sign in using their user name and password.	Mandatory
2.3	User ID and password validity can be checked by the system.	Desirable
2.4	If an admin organization or super admin forgot their password, they may email for a new one.	Optional
3	**Manage Account**	
3.1	A company's admin can change both their personal and organizational information.	Mandatory
3.2	Admins can access their own personal and organizational information.	Optional
3.3	A login password must be changeable by the administrative organization.	Optional
3.4	Super admin has access to the account for the admin organization.	Optional
3.5	Super admin has the authority to delete the organization's account.	Optional
4	**Manage Appointment Page**	
4.1	Admin organization shall be able to create appointment form details for their organization	Mandatory
4.2	Admin organization can edit appointment form detail for their organization	Optional
4.3	Admin organization can view the recorded appointment list.	Optional

4.4	Admin organization can delete the appointment form details for their organization	Optional
5	**Appointment Page**	
5.1	User shall be able to add personal details, appointment date, time slot, appointment purpose, appointment for self or representative and email for required for appointment notification.	Mandatory
5.2	System can verify the email for appointment notification by end user.	Desirable

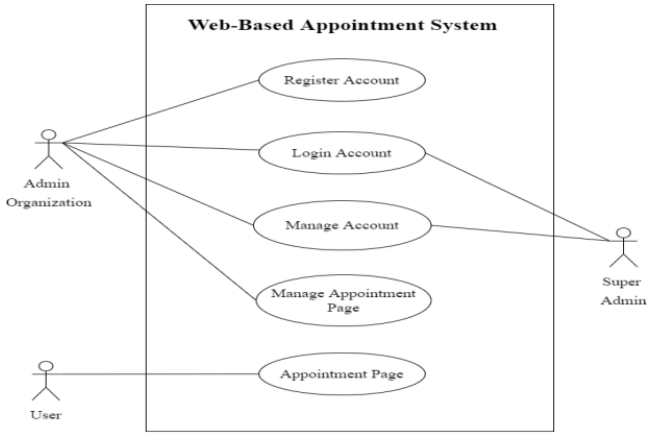

Figure 2. A web-based appointment system's use case diagram.

Figure 3 displays the class diagram for the online appointment system that consists of system's characteristics and functionalities. Fourteen primary classes were found in this study. The figure clearly shows how the classes interact with one another.

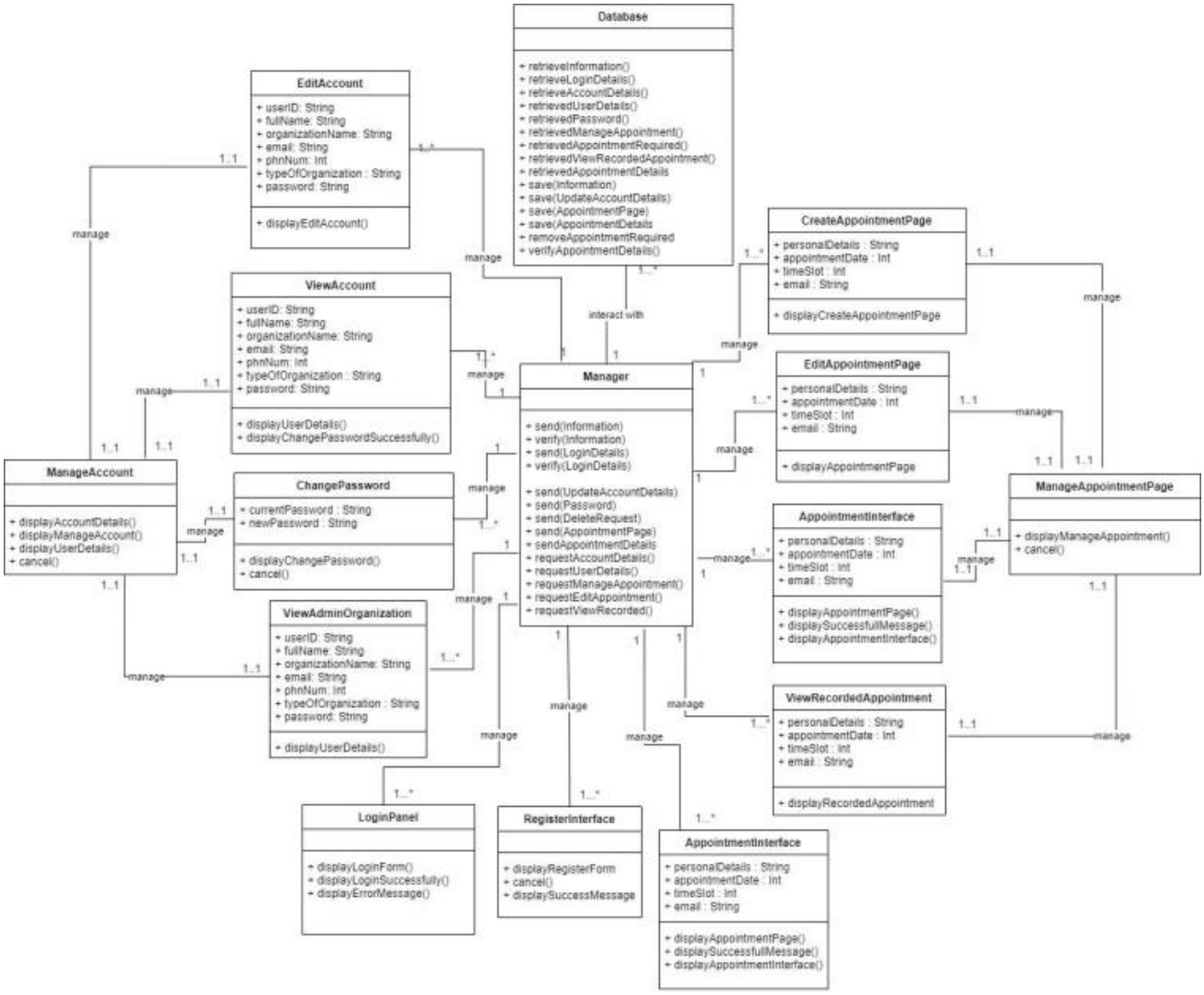

Figure 3. The class diagram of a web-based appointment system

Screenshots of the prototype web-based appointment system are shown in Figures 4, 5, and 6.

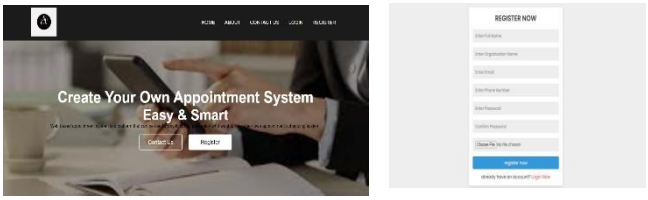

Figure 4. The main interface (on the left) and the register interface (right)

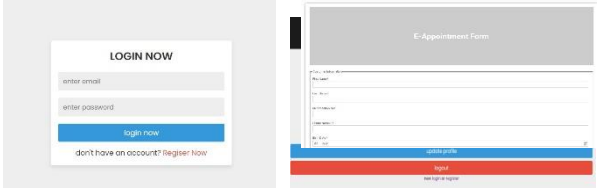

Figure 5. The manage account interface (left) and the login interface (right)

Figure 6. The appointment form (left) and the interface for managing appointments (right)

4. Evaluation

To assess the performance and usability of the system, a usability evaluation was carried out. The evaluation was conducted through an online platform called Google Form. To test the performance of the application, respondents were requested to evaluate the system by testing the functionality of the application and then fill in the questionnaire provided. A total of 20 participants, consisting of leaders of organizations and public users, have been recruited for the evaluation of this system.

During the evaluation session, respondents are required to run the URL link, test and use the application, and finally fill out the questionnaires. The questionnaire included 19 questions, and the questions had been divided into two sections, of which Section B consists of five parts. Table 2 describes both Sections A and B.

Table 2. The items on the questionnaire about previous tasks

Section	**Topic**
A	details about the respondent's history and demographics a predetermined response. total questions: 5
B	The respondent self-rates their perceptions using the System Usability Scale after each activity is shown (SUS) 5-point Likert scale Total questions: 16 (in five different parts)

The results for the 5-point Likert scale used in Section B of the post-task questionnaire are displayed in Table 3. The final SUS score was calculated after taking the points into account.

Table 3. The Agreement Points for The 5-Points Liker Scale

Agreement	**Points**
Strongly Disagree (SD)	1
Disagree (D)	2
Neutral (N)	3
Agree (A)	4
Strongly Agree (SA)	5

A. The Respondent's Demographic Information

According to an analysis of the respondents' demographic data, 13 respondents, or 65% of them, are women, while 35% of them are men (7 respondents). Ages 26 to 35 make up about 50% of the respondents (10 respondents). Six responses (6%) were between the ages of 36 and 45, while twenty percent (20%) were between the ages of 21 and 25. (4 respondents).

Based on the analysis also, the majority of respondents have heard about the Web-Based Management Appointment System, which is 90% (18 respondents), compared to respondents who haven't heard about the system, which is 10% (2 respondents).

B. The Usability of Web-Based Appointment System

Section B gauges respondents' opinions on the usefulness and ease of use of the system. It also assessed respondents' satisfaction and safety with the web-based appointment system. Tables 4, 5, 6, 7, and 8 report the frequency and average of the responses. Most of the respondents gave more than three ratings for usability aspects.

The outcomes of the evaluation suggested that the Web-Based Appointment System (WBAS) is useful and easy to use. Further, the respondents reported they were satisfied with the features of the system that facilitate them in creating and managing appointments.

Overall, an analysis of the respondents' feedback about the specific features offered by the WBAS shows that most of the respondents agree that the registration, login, manage account, and manage appointment pages were straightforward and useful. They also perceived that WBAS could help them create their own appointment page in a more effective way and meet their needs. In terms of the user interface, the respondents reported that the Web-Based Appointment System was easy to use without the need for written instruction, and they could easily remember the way of using the system. Further, the respondents were satisfied with the appearance of the system and agreed that the WBAS is pleasant to use. In terms of security, most respondents agree about the security of the WBAS. But there is only one respondent who disagrees about authenticating users and multiple logins in the WBAS. However, overall, people are preferring to use WBAS.

5. Conclusion

Service providers and organizations alike will profit from the proposed WABS. Utilizing an appointment system will indicate that a company or service provider is always accessible for the client. It's because using an appointment system may provide consumers with 24/7 access to the system at a considerably lower cost than adding a few more employees to handle customer service during non-business hours.

Table 4. Responses from the Respondents about the assessment of a web-based appointment system

Questions	**SD**	**D**	**N**	**A**	**SA**
I am satisfied with the ease of completing this task in overall	0 (0%)	0 (0%)	3 (15%)	5 (25%)	12 (60%)
Overall, I'm pleased with how long it took to complete this task.	0 (0%)	0 (0%)	5 (25%)	6 (30%)	9 (45%)

Table 5. Responses from respondents regarding the value of a web-based appointment system

Questions	**SD**	**D**	**N**	**A**	**SA**
WBAS increases my productivity	0 (0%)	0 (0%)	2 (10%)	10 (50%)	8 (40%)
WBAS brings convenience and control with technology	0 (0%)	0 (0%)	7 (35%)	10 (50%)	3 (15%)
WBAS saves my time when I use it	0 (0%)	0 (0%)	5 (25%)	7 (35%)	8 (40%)

Table 6. Responses from respondents regarding the web-based appointment system's usability

Questions	**SD**	**D**	**N**	**A**	**SA**
WBAS is easy to use	0 (0%)	0 (0%)	2 (10%)	5 (25%)	13 (65%)
WBAS is user friendly	0 (0%)	0 (0%)	5 (25%)	10 (50%)	5 (25%)
WBAS is easy to learn how to use it	0 (0%)	0 (0%)	4 (20%)	14 (70%)	2 (10%)

Table 7. Responses from the respondents on their satisfaction with the web-based appointment system

Questions	**SD**	**D**	**N**	**A**	**SA**
I am satisfied with WBAS	0 (0%)	0 (0%)	6 (30%)	3 (15%)	11 (55%)
I feel I need to have WBAS	0 (0%)	0 (0%)	3 (15%)	11 (55%)	6 (30%)
WBAS is wonderful and pleasant to use	0 (0%)	0 (0%)	3 (15%)	12 (60%)	5 (25%)

Table 8. Responses from respondents on the security of a web-based appointment system

Questions	**SD**	**D**	**N**	**A**	**SA**
WBAS allows user to change their password at any time	0 (0%)	0 (0%)	4 (20%)	4 (20%)	12 (60%)
WBAS authenticates users	0 (0%)	1 (5%)	2 (10%)	12 (60%)	5 (25%)
WBAS allows me login multiple websites with a single credential (i.e.: username and password)	0 (0%)	1 (5%)	2 (10%)	11 (55%)	6 (30%)
WBAS is secure and makes my life easier	0 (0%)	0 (0%)	3 (15%)	11 (55%)	6 (30%)
I prefer to use WBAS	0 (0%)	0 (0%)	6 (30%)	6 (30%)	8 (40%)

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