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(14 AUGUST 2020)

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ABSTRACT

Rosters are schedule which gives details of the order in which different people have to do a particular job. This is used in the service industry such as hospitals and restaurants. The current roster scheduling in hospital wards are still handled manually. This report describes a study on developing a Hospital Ward Roster Scheduling System. The current rosters are made up by ward in-charges of each wards. They find difficulty in the current system as it is time consuming, unable to share created roster to staffs efficiently or in a timely manner. Ward in-charges are also responsible for keeping track leaves which include allocated annual leave and public holidays that have been gazetted by the hospital administration. Therefore, this Hospital Ward Roster Scheduling System is proposed to overcome their problems. This system has three type of users which are staff nurses, ward in-charges and admin. It provides function for staff nurses which are viewing their balance or unclaimed leaves and view published rosters. While for ward in-charges, this proposed system provides functions for creating rosters, tracking the staff leaves and also the same functions as the staff nurses. In addition, admins can manage user accounts by adding, editing and deleting accounts as well as manage gazetted PH lists. System testing and user testing are conducted, and the overall user satisfied with the proposed system.

ABSTRAK

Jadual kerja memperuntukkan tugas yang sesuai untuk pekerja dan kakitangan dalam suatu organisasi. Jadual kerja amat penting terutamanya dalam sektor perkhidmatan seperti perubatan dan restoran. Jadual kerja untuk hospitals masih dibuat secara manual pada zaman teknologi ini. Laporan ini menerangkan kajian membina Sistem Penjadualan Wad Hospital. Penjadualan wad kini diperuntukkan oleh ketua jururawat wad masing-masing. Ketua jururawat mengalami kesukaran atau masalah memperuntukkan jadual kerja dalam sistem semasa iaitu secara manual kerana ia mengambil masa yang lama dan tidak dapat berkongsi jadual kerja baru dengan jururawat wad secara berkesan dan sistematik. Mereka juga diberi tanggungjawab untuk mengawas cuti tahunan serta cuti umum yang diwartakan oleh pentadbiran hospital. Oleh itu, Sistem Penjadualan Wad Hospital ini dicadangkan untuk mengatasi masalah yang dialami sekarang. Sistem Penjadualan Wad Hospital mempunyai tiga jenis pengguna iaitu jururawat wad, ketua jururawat wad dan admin. Sistem ini akan memudahkan perkongsian jadual kerja baru yang diperuntukkan oleh ketua jururawat wad. Sistem ini menawarkan fungsi mengawas pengambilan cuti umum dan tahunan untuk jururawat wad serta memaparkan jadual kerja baru. Manakala, ketua jururawat wad ditawarkan fungsi untuk membuat jadual kerja, berkongsi jadual baru serta mengawas cuti tahunan serta umum jururawat wad masing-masing. Selain itu, fungsi yang ditawarkan untuk admin adalah mengurus akaun pengguna sistem seperti pendaftaran pengguna baru, edit dan memadam akaun pengguna. Tambahan itu, admin sistem juga diberi tanggungjawab untuk mengurus cuti umum yang diwartakan. Ujian sistem telah dijalankan dan pengguna berpuas hati dengan system yang dicadangkan.

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LIST OF ABBREVIATION

Abbreviation	Word/Phase
RN	Registered Nurse
AN	Assistant Nurse
ACN	Associate Charge Nurse
Sr	Sister
AL	Annual Leave
PH	Public Holiday
ID	Identification
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets
PHP	Hypertext Preprocessor
C#	C-Sharp
SQL	Structured Query Language
SDLC	Software Development Life Cycle
UML	Unified Modeling Language

CHAPTER 1: INTRODUCTION

1.1 Background

Productivity and efficiency play a vital role in medical care. To demonstrate, scheduling consecutive shifts to best employees might make them experience fatigue-related illness which consequently lead to understaff issues during operational hours.

A good roster plan benefits the business operation by ensuring that every shift has adequate employees with sufficient skillset to keep things running smoothly. It prevents employees getting into accidents at work due to exhaustion because good roster planning helps in reinforcing the safety and health of employees.

In the medical field, rotating rosters allow ward in-charges to schedule all workers for day shifts, mid shifts and night shifts each week, rotating the staff through the various shifts. This type of schedule is highly important in hospitals to develop more versatile nurses and to balance the skills of nurses during different day parts or shifts such as Registered Nurse (RN) and Assistant Nurse (AN). Therefore, roster scheduling needs to be efficient and systematic as possible to avoid confusion and problems among the staffs. However, roster scheduling is still handled manually in hospitals which can be strenuous to ward in-charges. Hence, a system for scheduling roster would be very helpful and increase efficiency.

1.2 Problem Statement

Ward rosters in most hospitals are still created manually by the ward in-charges. Staffs only can view this if the ward in-charges printed and displayed on the notice board. Therefore, conflict might occur if the ward in-charges forgot or delayed to do so. Tracking of annual leave and owed public holiday (PH) is still done manually, whereby the ward in-charges need to look

up at previous rosters to calculate the remaining annual leaves and PH of their staffs. This can cause inaccuracy and be subjected to human error. Hence, a system to schedule, display roster and keep track of leaves is proposed to overcome these issues.

1.3 Objectives

- i. To study the basic requirement and rules of roster scheduling applied in hospital wards in order to provide a suitable computer software from their current manual process.
- ii. To develop a system for ward roster scheduling for hospital ward in-charges that includes adding, editing, deleting and creation of ward roster.
- iii. To enable staffs to track their annual leave, owed public holiday offs and display of roster.

1.4 Project Scope

The targeted group of this project is the hospital ward in-charge and the ward nurses. For this project, it is proposed to focus on only one hospital ward with one ward in-charge and around 20 staff nurses consisting Registered Nurses (RN) and Assistant Nurses (AN). The system allows the ward in-charge to create duty rosters and conveniently share them with their respective staffs. It also allows both ward in-charges and staffs to keep track of their annual leaves and owed public holidays (PH) leaves. There is also Administrator view of the system that will function as registering new users into system and deleting existing ones from the system. In addition, they are also able to manage PH list.

- **Staff nurses:** This set of users need to be registered by the administrator. Registered user can log in to the system to view their details and scheduled duty roster and track annual leaves and owed PH.
- **Ward in-charges:** This set of users also need to be registered by the administrator. Registered users can log in to the system to create rosters, view staff details, track annual leaves and owed PH and view roster.
- **Administrator:** Administrators can register users to log into the system and manage gazetted PH list.

However, ward in-charges still need to input their duty rosters. Nevertheless, the system eases the sharing of created roster and automatically tracks leaves for the ward in-charge.

1.5 Methodology

System development methodology refers to the framework that is utilized to plan and control the method of creating computer system (Dubey & Dora, 2013). In this project, Waterfall model is proposed to complete the system development. This models after linear sequential flow which means any step in the layout starts after completion of the previous stage (Bassil, 2012). A typical phase is requirement analysis, system designing, implementation, testing, deployment and maintenance (Bassil, 2012).

In analysis phase, the requirements and expectations of the target group or user is defined. Information on the business needs and processing needs are gathered, analysed and validated. This information is gathered by conducting interview and distributing questionnaire to the end user such as the ward in-charge and several nurses. By conducting this phase, a clearer picture of the system's requirement and the users' expectations will be unveiled.

The next phase is the system design phase where the requirements and information gathered in the first phase is studied and the system is designed. It largely covers technical design requirements such as data layers, programming language and more. This helps in identifying hardware and system requirements that eventually defines the overall system architecture.

Once the system design is completed, the next phase is implementation of the software. The system is developed in small units which are then integrated in the next phase. this is also the vital development stage where the actual coding of the system takes place.

The next phase is testing. This includes system integration and testing of programs and procedures. All the small units developed in the implementation phase is integrated and tested. This phase ensures that the design meets the user expectation and business goals. A test report which contains errors is prepared through test plan that includes test related tasks.

Deployment of the system is the next phase in Waterfall model. Retesting is done until the point at which the software is as per the client's expectation and soon deployment of the software is done. If the client finds the application as expected, then the developed software is implemented in their day to day business operations.

Lastly, the final phase is the maintenance of the software. This involves making modification to the system or alter individual attributes that are due to changes requested by the client or issues that may come up in the client's environment. The client is provided with regular maintenance and support for the developed software.

1.6 Significance of Project

This proposed project benefits the ward management especially the ward in-charges and staff nurses. It helps improve management control in managing duty roster better and avoid human error. For example, overlooking manpower fulfilment and miscalculating off days. With

this proper planning, staff morale will get better. The system can also lead to an improved quality of service. This is especially vital in the healthcare sectors. It is less likely to have an under-staffed shift. This helps nurses to meet the needs of patients or customers.

1.7 Project Schedule

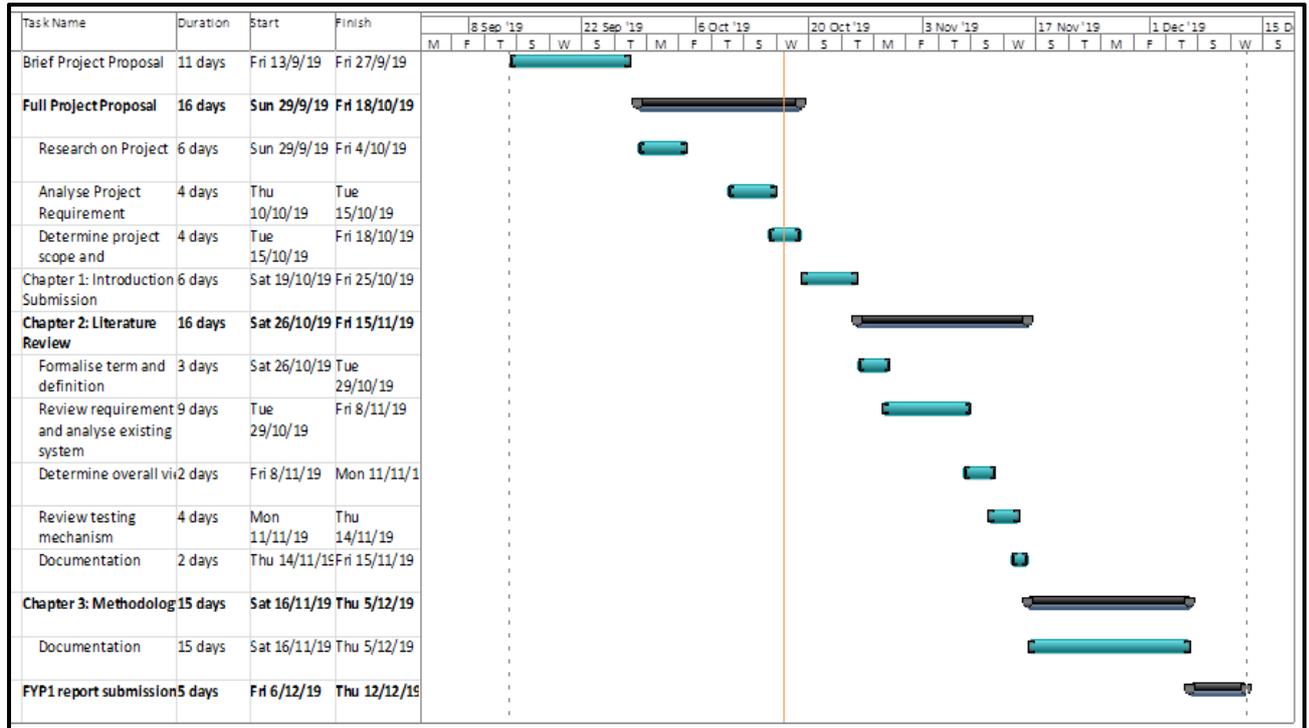


Figure 3.1: Project Schedule

1.8 Expected Outcome

- A system that eases the scheduling of duty rosters in hospital wards that would help ward in-charges to do roster more efficiently and systematically.
- Ward in-charges can share or publish created rosters to their ward staff in a timely manner.
- A system that can display monthly roster for staffs, track their annual leaves and owed public holiday offs.

1.9 Project Outline

The project outline consists of six chapters. In Chapter 1, introduction of the system is briefly explained. The problem statement, objective, a brief of methodology, project scope, project significance, project schedule and project outcome is discussed in this chapter.

In Chapter 2, three existing was compared to have a clear idea for the proposed system. The review of the systems is discussed in chapter 2. The comparison between the functionality and technologies of existing system will help improve the propose system.

In Chapter 3, the phases of methodology are discussed comprehensively. For this project, agile methodology is suggested. There are five phases in the methodology which are requirement analysis, designing and software development, testing and delivery.

Chapter 4 provides a thorough details of the implemented system which includes a detail description of screenshots of the interfaces. It also explains the functional and non-functional testing were implemented throughout the testing phase.

In Chapter 5, testing performed on each feature to ensure the functionality of the system is explained.

Finally, Chapter 6 discusses conclusion and future work. The lessons learnt throughout the project is presented with examples. In future works, the improvisation of the project is discussed for further enhancement.

1.10 Summary

In summary, an overview of the proposed project is explained. The problems that instigated the proposal of the project and the objectives to overcome it was identified. Methodology to develop and abide for the proposed system was briefly discussed and the outline of the expected outcome from this project was also stated. Scheduling of the object is also done in this chapter to help and guide in completing the project on time.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 2 discusses and reviews the current existing system and proposed system that would involve the process of comparing and contrasting the functionalities and features available of these systems. Consequently, determine the direction of the proposed system.

2.2 Review of Similar Existing Systems

There is many scheduling software available in the market now. It is important to compare and review systems to find the most suitable fit for business operation as this could avoid loss of time, money and resources. For this project, it is important to review the systems to determine the important functionality and requirement the proposed system should take. The list of systems reviewed in this section is the current scheduling system used in hospitals, *Findmyshift* by *Findmyshift Ltd*, *When I Work* by *When I Work, Inc.* and *Humanity: ShiftPlanning*.

2.2.1 Findmyshift by Findmyshift Ltd.

Findmyshift enables to create and share employee schedules in any web browser (Findmyshift B. V., 2019). It features include drag and drop scheduling, shift reminders, payroll management, shift swapping and reporting.

Managers can add employees' basic details such as name, job title, email, vacation allowance, sick allowance and set access permission to the system. Managers can create roster by clicking on the day and typing the start time and end time of shift for the employees.

Repetitive shifts can be copied and paste or dragged and dropped to other days. *Findmyshift* allows managers to set setting on the display of roster such as show job title, show payroll IDs, option to see changes automatically and others. It also allows managers to set filters such as employee name, job title, department and more. The created schedule is shared to all employees by printing out the roster, via email and uploading the roster in the uploads section of the system.

Overall, according to a review in Capterra.com, the first business software site that provides a hub to recommend and review free software and resources available in the market, *Findmyshift* is the easiest system to use with clear and user-friendly interface compared to the other reviewed system. It is also the easiest system to make rosters with its copy and paste function. Although one of its weakness is that *Findmyshift* seems more catered towards office hours compared to 24 hours, 7 days a week business.

The screenshot shows the Findmyshift interface with a roster for 10 employees (Laura, Thomas, James, Matthew, Sophie, Charlie, Charlotte, Luke, Sarah, Nick) from Monday, October 2nd to Sunday, October 8th. The interface includes a navigation bar with options like 'Create a rota', 'Demo', 'Pricing', 'Help', and 'Log in'. Below the navigation bar, there are tabs for 'Staff view', 'Facility view', 'Staff', 'Facilities', 'Notice board', 'Time off', 'Outbox', 'Send a message', 'Timesheets', 'Reports', and 'Settings'. The main area displays a grid of shifts for each employee, with columns for each day of the week. Shifts are color-coded: yellow for 'On Call', light green for 'Rostered Day Off', and light blue for 'Ski Holiday' or 'Weekend Off'. Shifts include job titles like 'Kitchen', 'Bar', and 'Training' along with specific time ranges and breaks.

	Mon. Oct. 02	Tue. Oct. 03	Wed. Oct. 04	Thu. Oct. 05	Fri. Oct. 06	Sat. Oct. 07	Sun. Oct. 08
Laura	Kitchen 12:00pm-6:00pm	Kitchen 12:00pm-6:00pm	Kitchen 12:00pm-6:00pm	Kitchen 12:00pm-6:00pm	Rostered Day Off	On Call	
Thomas	Kitchen 8:00am-1:00pm	Kitchen 8:00am-1:00pm	Kitchen 8:00am-1:00pm	Kitchen 8:00am-1:00pm	Kitchen 8:00am-1:00pm		
James	On Call	On Call			On Call	Kitchen 9:00am-2:00pm	Kitchen 10:00am-3:00pm
Matthew	Bar 8:00am-1:00pm	Bar 8:00am-1:00pm	Bar 8:00am-1:00pm	On Call	Bar 12:00pm-6:00pm	Kitchen 1:00pm-6:00pm	Kitchen 1:00pm-5:00pm
Sophie	Bar 9:00am-6:00pm 1 hour break	Bar 9:00am-6:00pm 1 hour break	Bar 9:00am-6:00pm 1 hour break	Bar 9:00am-6:00pm 1 hour break	Kitchen 12:00pm-6:00pm	On Call	
Charlie	Ski Holiday	Ski Holiday	Ski Holiday	Ski Holiday	Ski Holiday		
Charlotte	On Call	On Call	On Call	Bar 8:00am-1:00pm	Bar 8:00am-1:00pm	Weekend Off	Weekend Off
Luke	Kitchen 9:00am-6:00pm 1 hour break	Kitchen 9:00am-6:00pm 1 hour break	Kitchen 9:00am-6:00pm 1 hour break	Sick	Kitchen 9:00am-6:00pm 1 hour break		On Call
Sarah					Training 10:00am-4:00pm	Training 9:00am-2:00pm	Bar 10:00am-3:00pm
Nick	Training 10:00am-4:00pm	Training 10:00am-4:00pm	Bar 10:00am-4:00pm	Bar 10:00am-4:00pm	Bar 10:00am-4:00pm	Bar 1:00pm-6:00pm	Bar 1:00pm-5:00pm

Figure 2.1: Schedule interface of Findmyshift

2.2.2 When I Work by When I Work, Inc.

When I Work is a free employee scheduling software available in the market. Over 100,000 workplaces run on *When I Work* (When I Work, 2019). It was built to serve the employee scheduling and communication needs of workplaces across a wide range of industries. Its features include time off availability, resource management, easy leave management, fast and reliable communication.

In the dashboard view, managers can view today's schedule which they can sync with Google calendar and forecast of scheduled hours for all employees. In the scheduler view, managers can create new shift for employees by clicking on the day and creating a custom shift for usual shifts by setting up the shift time and assign it to an employee group such nurse or ward in-charge. This allows the manager to easier assign the shifts to employees without typing each shift time. The created roster can be shared to all employees with a single click on the publish button. The roster is sent to all employees via email.

Overall, it is relatively easy to create a schedule and assign employees, and all of the features are very easy to work with and aesthetically pleasing. *When I Work* has the easiest feature to add leave or time off for employees compared to other reviewed system.

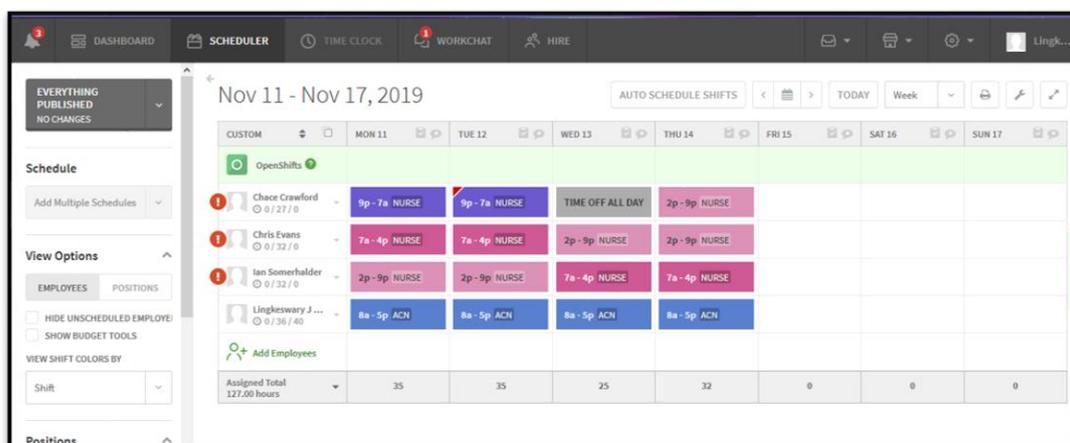


Figure 2.2: Schedule interface for When I Work