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YST007 - AUTOMATED NURSE SCHEDULING BY USING 0-1 INTEGER LINEAR PROGRAMMING

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ABSTRACT

Efficient nurse scheduling is essential to maintaining optimal healthcare services. However, in many healthcare institutions in Malaysia, nurse scheduling is still performed manually—a method that is not only time-consuming but also prone to human error and bias. This innovation addresses the urgent need for a more reliable, systematic, and user-friendly scheduling solution by introducing an Automated Nurse Scheduling System developed using Microsoft Visual Basic for Applications (MVBA) within Microsoft Excel. This system is designed to streamline the complex task of scheduling nurses while adhering to institutional rules, labor laws, shift preferences, and fairness in shift distribution. It leverages the power of MVBA to automate the scheduling process, significantly reducing the time required for planning and eliminating the inconsistencies often associated with manual scheduling.

Keywords – Automated Nurse Schedule, Microsoft Visual Basic for Applications.

INTRODUCTION

In the current Malaysian healthcare landscape, nurse scheduling is predominantly done manually. This conventional method is not only labor-intensive and time-consuming, but it is also highly susceptible to human error, bias, and inefficiencies (Ramli et al., 2016). These issues often result in staff dissatisfaction, unequal workload distribution, and disruptions in healthcare delivery. Recognizing the urgent need for a more systematic and reliable solution, this project introduces an Automated Nurse Scheduling System developed using Microsoft Visual Basic for Applications (MVBA) within Microsoft Excel. The motivation behind this innovation stems from the need to optimise workforce management, improve scheduling accuracy, and reduce administrative burdens without requiring high technical expertise or expensive software. By integrating automation into an accessible platform, this innovation aims to significantly enhance operational efficiency within the healthcare sector.

OBJECTIVE

The primary objective of this innovation is to develop a user-friendly, automated nurse scheduling system utilising MVBA in Microsoft Excel, which reduces manual effort, minimizes scheduling errors, and promotes fairness in shift distribution. The system is designed to generate accurate and efficient work schedules that comply with institutional rules and staff preferences, ultimately improving workforce management in healthcare facilities.

DESCRIPTION OF THE PROJECT

The Automated Nurse Scheduling System is a scheduling tool built using Microsoft Visual Basic for Applications (MVBA) within Microsoft Excel. This system is designed to automate the complex process of nurse shift scheduling by integrating institutional rules, staff preferences, and shift constraints into a customized algorithm.

One of its key features is the ability to generate multiple scheduling outputs in a single execution, giving users various options to choose from based on their needs. The system also includes parameters to ensure compliance with labor regulations, such as minimum rest periods, maximum working hours, and balanced workload distribution.

Functionally, the system allows users to input staff details, define scheduling rules, and automatically produce optimized shift rosters with minimal manual intervention. The use of Microsoft Excel ensures easy accessibility and a familiar interface, eliminating the learning curve often associated with specialized scheduling software.

In terms of usefulness, this solution addresses the inefficiencies of manual scheduling by significantly reducing the time required to produce fair and accurate rosters. It also helps to prevent human error, reduce administrative workload, and improve staff satisfaction through transparent and unbiased shift assignments.

The system's practicality lies in its cost-effectiveness, flexibility, and adaptability. It does not require any additional software installation and can be easily tailored to fit the specific needs of different hospital departments or healthcare institutions. This makes it an ideal tool for small to medium-sized healthcare facilities that lack access to expensive or complex workforce management systems.

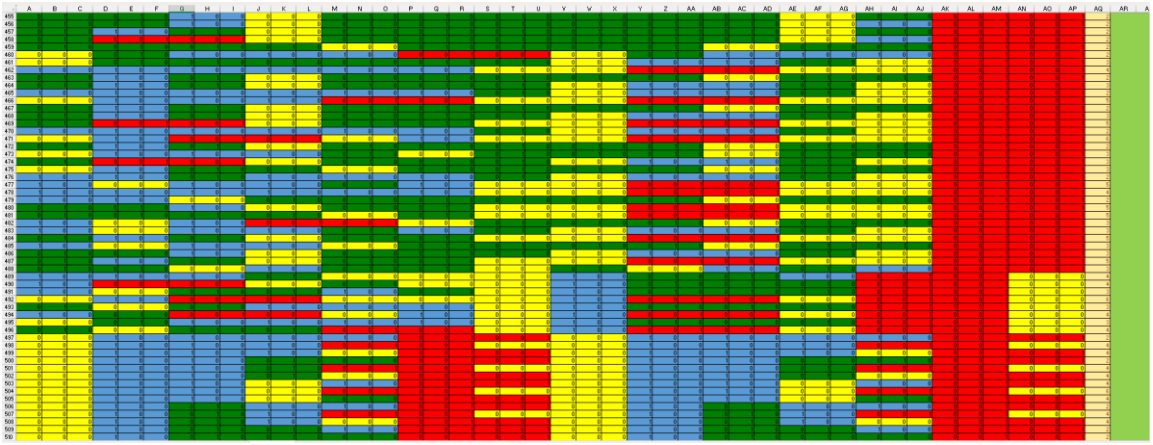

Figure 1: Shift Pattern

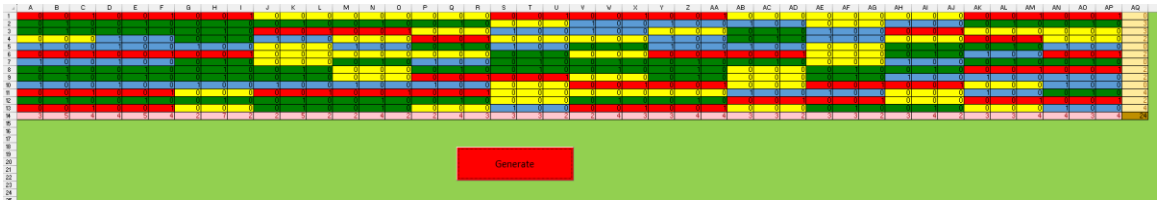

Figure 2: Nurse Schedule

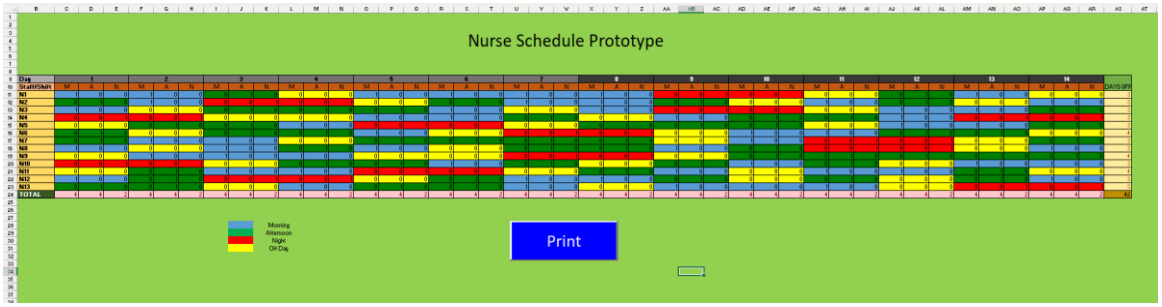

Figure 3: Nurse Schedule Prototype

NOVELTY

The novelty of the Automated Nurse Scheduling System lies in its innovative use of Microsoft Visual Basic for Applications (MVBA) within the widely accessible Microsoft Excel platform to solve a real-world operational challenge in the healthcare sector. While many workforce scheduling tools exist, most require specialized software, subscription costs, or technical expertise, making them less accessible to smaller healthcare institutions.

This project takes a unique approach by embedding scheduling logic and automation directly into Excel—a tool already familiar to most administrative staff, thereby eliminating the need for additional software training or purchases. The system integrates customizable scheduling rules, staff preferences, and regulatory constraints, all within an easy-to-use interface, offering a high degree of flexibility that is rarely available in similar low-cost solutions.
Moreover, unlike traditional manual scheduling or basic Excel templates, this innovation allows for the automatic generation of multiple valid scheduling options in a single run. This enables users to compare and select the most suitable schedule based on their staffing needs and organizational goals.

The originality of this method is further reinforced by the lack of existing MVBA-based scheduling solutions specifically tailored for the Malaysian healthcare context, making this product a pioneering step towards localized, cost-effective digital transformation in nurse scheduling.

CONCLUSION

The Automated Nurse Scheduling System using Microsoft Visual Basic for Applications (MVBA) presents a practical, innovative, and efficient solution to the challenges faced in manual nurse scheduling. By automating the scheduling process through a familiar

platform like Microsoft Excel, this system significantly reduces time consumption, minimizes human errors, and ensures fair and balanced shift assignments. Its ease of use, low implementation cost, and flexibility make it highly suitable for healthcare institutions, especially those with limited access to advanced scheduling tools. This innovation not only improves administrative efficiency but also contributes to better workforce management and staff satisfaction in the healthcare sector. The system has strong potential for future development, customization, and wider adoption, positioning it as a valuable tool in supporting digital transformation in healthcare operations.

REFERENCES

Ramli, M. R., Hussin, B., Abas, Z. A., & Ibrahim, N. K. (2016). Solving complex nurse scheduling problems using particle swarm optimization. *International Review on Computers and Software (IRECOS)*, *11*(9), 834. https://doi.org/10.15866/irecos.v11i9.9881.