Department of Industrial Systems Engineering & Management
IE3100R Systems Design Project AY2024/2025

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AUTOMATED COURSE SCHEDULE MANAGEMENT

Problem

The National University Hospital (NUH) Nursing Administration team manages the onboarding course scheduling for new nurses, with approximately 300-400 nurses joining each year, spread across 2 intakes per month.

Currently, the Nursing Administration team manually schedules courses with Microsoft Excel, amounting to 38 days of work in a year. These 38 days consist of scheduling (24 days) and rescheduling of nurses due to changes to their availability and double-booking caused by human error (14 days). Excessive rescheduling negatively impacts productivity and incurs extra cost, such as those arising from an underutilisation of course slots. Additionally, coordination across the 3 stakeholders, Human Resources (HR), Nursing Administration and Nursing, is fragmented, leading to further complications.

Objectives

- Nursing Administration:
  - Minimise manual effort in updating the course schedule across the department
  - Reduce rescheduling instances and time taken to reschedule
- Nurses:
  - Reduce the number of instances of course rescheduling caused by double-booking

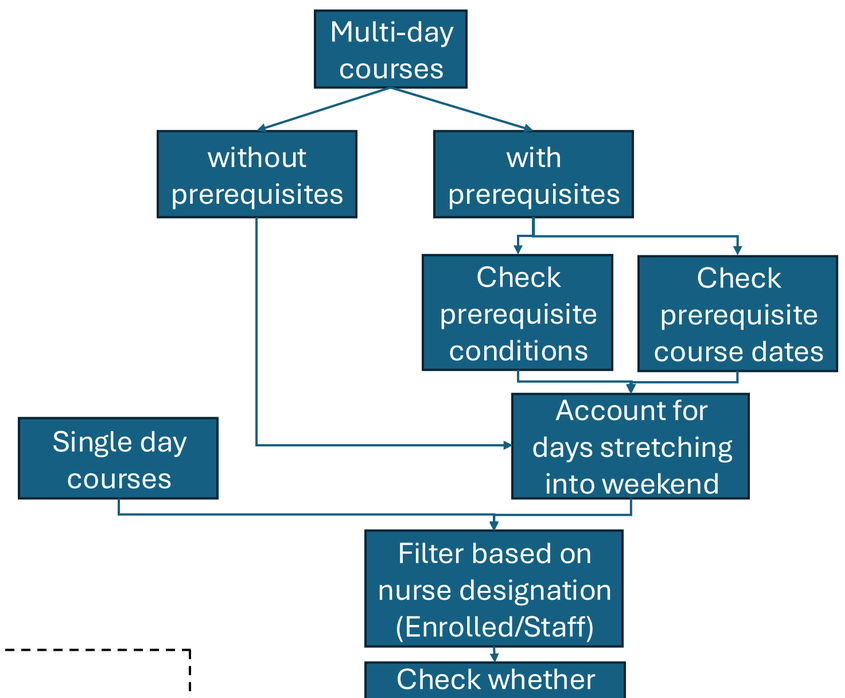
Key Performance Indicators

- Time saved yearly (Scheduling + Rescheduling)
- Reduction in reschedule occurrences

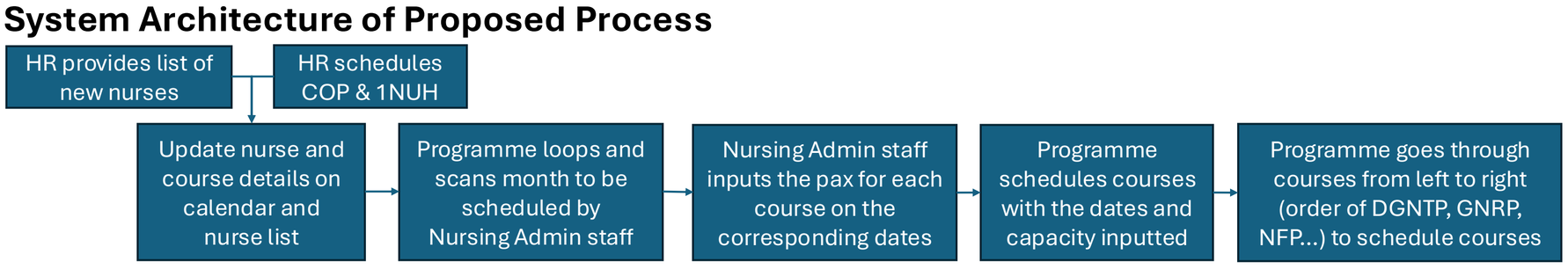
Methodology

1. Analysed current SOP, course hierarchy, pre-requisites and scheduling logic
2. Proposed Python solution with cell referencing, Power Automate and VBA. VBA was chosen due to proprietary nature of the information
3. Built and back tested proposed VBA solution on data from 2024
4. After prototype testing with Nursing Administration team, improvements were made, such as the addition of indicator columns
5. Finalised VBA code unifies course calendar and the scheduling into one VBA file
6. Analysed time saved and statistical improvement to number of rescheduling occurrences

System Architecture of Current Process

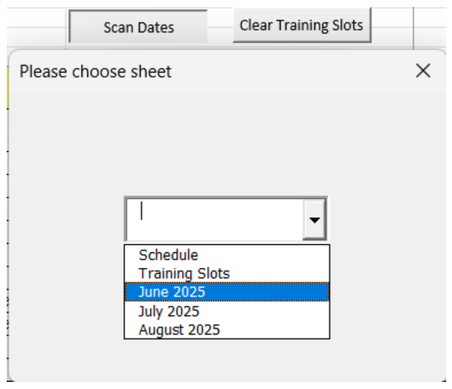


System Architecture of Proposed Process



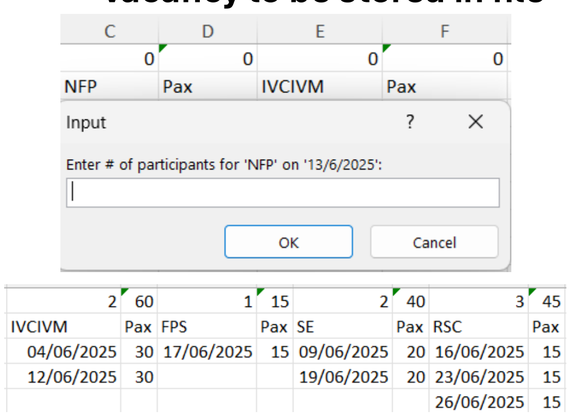
VBA Interface for Nursing Admin Staff

1 Nursing Admin scans dates for each month



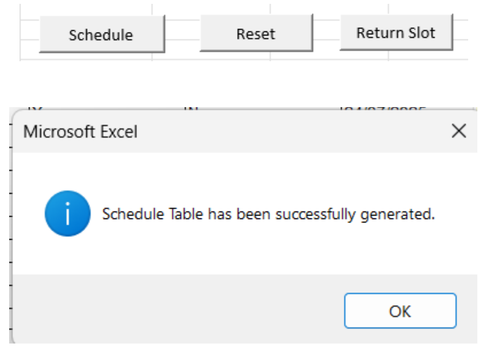
Nursing Admin staff imports the Nursing Course calendar into the programme and uses Scan Dates to read sheets within the file. After pressing OK, they enter the capacity for each course.

2 Nursing Admin inputs vacancy to be stored in file



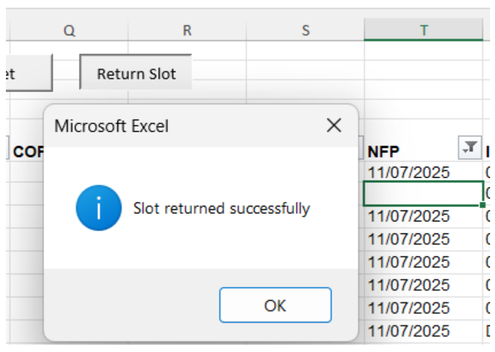
Nursing Admin staff inputs the participant count based on the vacancy of the respective courses. This generates a date corresponding to the calendar and a respective pax count in the Training Slots sheet.

3 Nursing Admin schedules course dates for nurses



Nursing Admin staff presses the Schedule button to allocate course dates for all nurses and generate the schedule table.

4 Return Slot button to handle rescheduling



The Return Slot function is created for the Nursing Admin staff to return course slots to the Training Slots sheet. This enables the slot to be scheduled to another available nurse.

Evaluation and Estimated Improvement

Scheduling Time Reduction

- ≈ 50% reduction in scheduling time, from 1 to 0.5 working days per batch, hence from 24 to 12 working days annually

Rescheduling Time Reduction

- 100% reduction in reschedules due to human error, from 47 instances of reschedules due to human error to 0 instances
- ≈ 35.2% reduction in rescheduling time after workflow improvement and human error reduction, from 14 to 8.83 working days

Overall Time Reduction

- ≈ 45.2% reduction of total scheduling time from 38 to 20.83 working days annually

Future Implementations

- Power Automate can be used to improve email workflows for notifications and updates between HR, Nursing Admin and nurses as considerable time is required for this aspect
- VBA can be used to create rosters for every course session
- VBA can be used to schedule courses managed by HR

Skillsets Acquired

Technical Skills

- VBA
- Algorithmic Application
- Process Analysis
- Programming Methodology

Soft Skills

- Stakeholder Management
- Project Management
- Teamwork