



Management Reporting Dashboards for SingHealth's Operating Theatres

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Industrial & Systems Engineering

Project Introduction

Problem description: Rising costs and demand for healthcare has led to a shortage of Operating Theatres (OTs) across Singapore. In our project, we help SingHealth to develop a Business Intelligence (BI) tool that will give the organisation a greater awareness of OT performance, and hence empower them to make informed decisions that will lead to more efficient utilisation of their OTs.

4 Objectives



CREATE
awareness of the utilisation of OTs available.



TRACK
KPIs through standardised approach for effective reporting.



COMPARE
performance across selected benchmarks with direct visualisation.



EMPOWER
stakeholders to drive improvement efforts and initiatives.

Problem Investigation

To investigate the root cause of the problem and identify potential areas of improvement, organisational stakeholder engagement was conducted, including:

- ❖ Preliminary Focus Group with OT task-force.
- ❖ Online Survey to all heads of departments.
- ❖ Face-to-Face Interviews with ground staff.

4 Major KPIs



UTILISATION
Are OTs utilised efficiently?



LISTING ACCURACY
Are surgery durations estimated accurately?



TIMELINESS
Are surgeries starting on time?



CANCELLATIONS
What are the factors affecting cancellations?

Current System

- ✗ Manual output (Excel+PPT)
- ✗ Single indicator (Utilisation)
- ✗ Reporting on request
- ✗ Only available to Senior Management

Proposed System

- ✓ Automated
- ✓ 13 standardised KPIs in 4 major categories
- ✓ Regular reporting
- ✓ Accessible to all OT users

Implementation Steps

Stakeholder Engagement:

Extensive stakeholder engagement was conducted to develop standardised KPIs that are endorsed and supported across the entire organisation

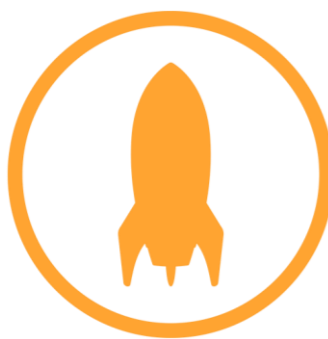


Prototyping: Rapid prototyping of the data cleaning process was done in R, in order to reduce the cost and lead-time involved in setting up ETL layer.

Validation: Multiple rounds of validation were conducted to ensure that KPIs are computed accurately.



Early Launch: The BI tool was launched early and reports were disseminated for 2 months, to allow feedback collection and modification.



Documentation: All technical information including data cleaning methodology and Tableau Implementation were documented for later reference.

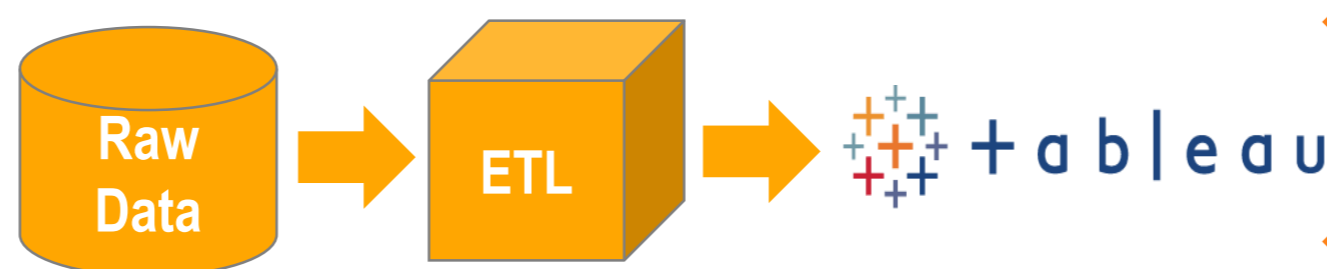


Training: Training programmes were conducted with ground staff to ensure successful handover of the system to SingHealth personnel.



Technical Implementation

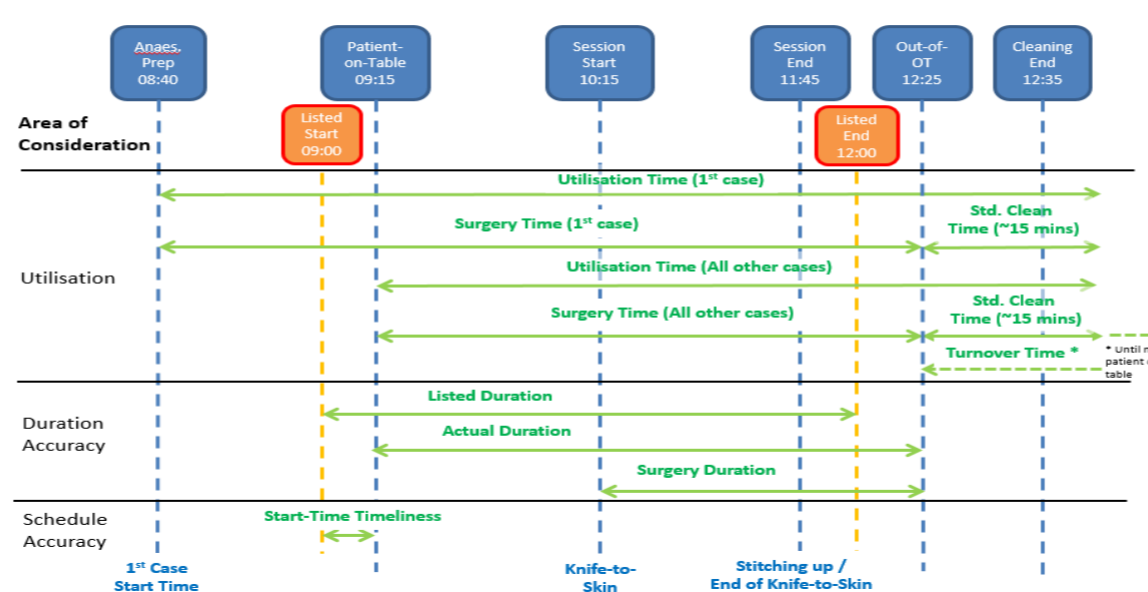
Designed System Workflow



- ❖ Raw Data is drawn from multiple enterprise systems across SingHealth.
- ❖ ETL layer cleans data, including merging from multiple data bases, accounting for multiple record versions and correcting errors.
- ❖ Tableau is used to produce dashboard visualisations of the KPIs with clean data.

Based on the system design, two processes are carried out simultaneously to ensure efficiency.

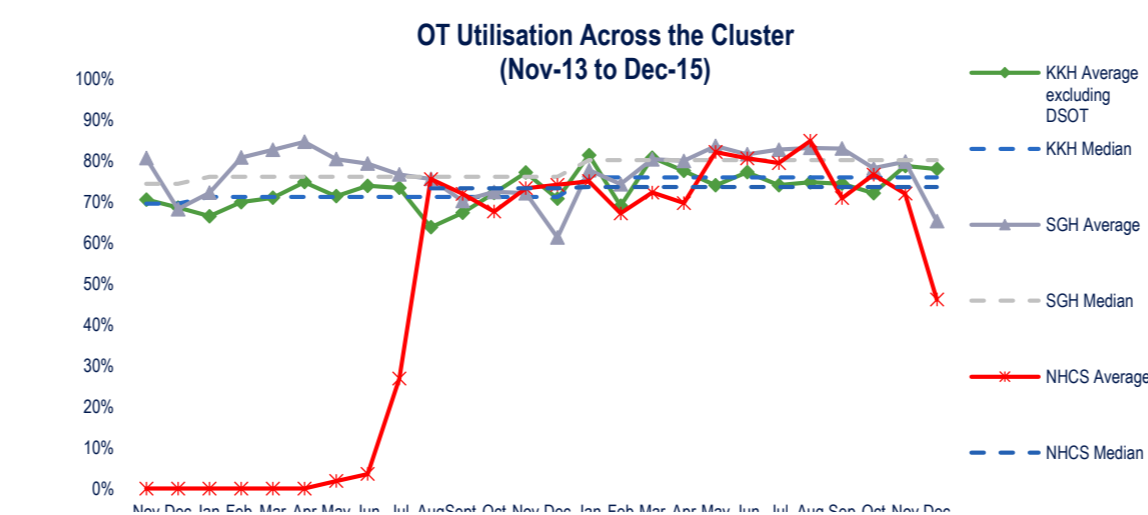
Data Processing



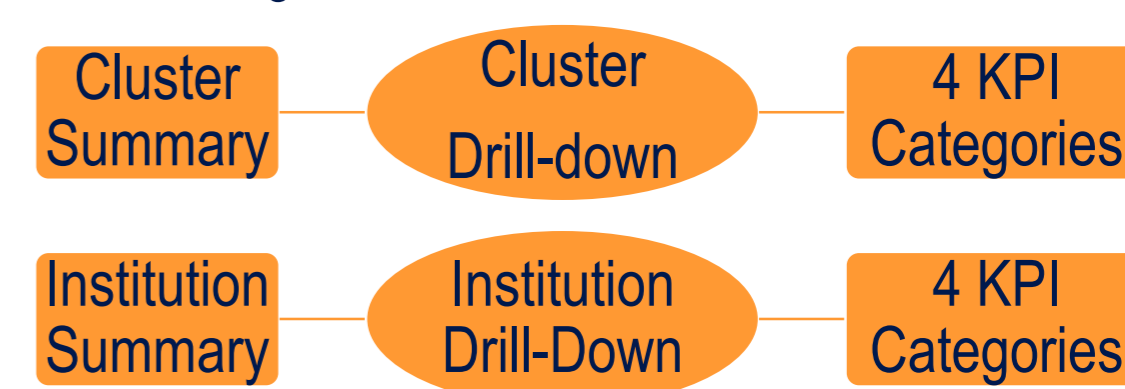
Dashboard Design



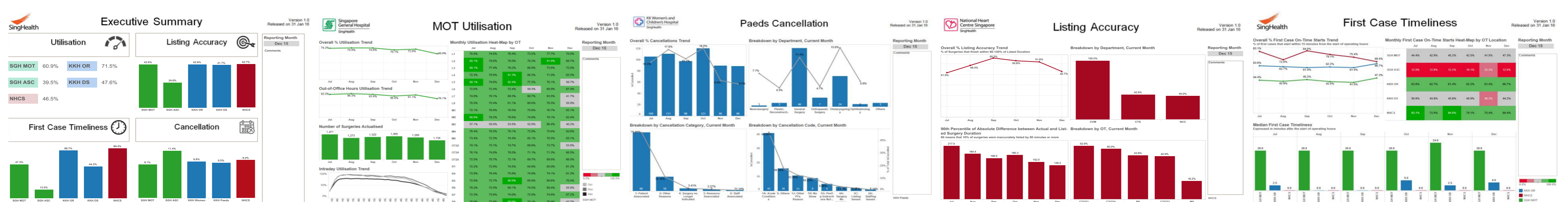
- ❖ The OT operation process is charted to clearly define the formula for the calculation of KPIs.
- ❖ Calculation algorithm is implemented through R programming to accommodate different raw data systems.
- ❖ Algorithm is tested with past data and results compared with existing records to verify the correctness and accuracy of algorithms under different circumstances.



- ❖ Through stakeholder engagement and prototyping, different visualisation tools are used to emphasise the required information.
- ❖ Layout and colour design of dashboards are carefully crafted to avoid confusion.
- ❖ "Drill-down" capability is internalised, allowing user to break-down a single indicator to obtain more detailed information with a single click.



Product & Impact



- ❖ Detailed monthly reports of OT performance, disseminated to over 200 C-Suite executives, administrators, and head of departments across 3 institutions.
- ❖ Enable more informed decision-making to utilise limited resources for greater contribution to the health of general public.

* Data presented on this poster are fabricated for demonstration purpose only.