Automated Trending Report for the Bed Management Unit in SGH

Francis Nguyen[1], Ng Qi You[2],Chen Shihong[3], Nur Diana Binte Abdul Rashid[3], Low Seng Kee[3] , Tan Kar Way[2], Lam Shao Wei Sean[1]

1 Health Services Research Centre, Singapore Health Services
2 Singapore Management University
3 Bed Management Unit, Singapore General Hospital

Background

The Bed Management Unit (BMU) of the Singapore General Hospital (SGH) generates a trending report monthly which contains key performance indicators (KPIs) and measures presented in tables and charts for the hospital and its Management to manage, monitor and keep abreast with the bed situation on the ground.

Aims

We aim to develop an automated trending report generation process so as to reduce the effort and time required for report generation.

To REDUCE the man day needed to generate a trending report
To SHORTEN the report generation time
To LOWER the error rate and discrepancy
To PROVIDE a cost-effective and sustainable solution

Result

After the implementation of our solution, the steps from data consolidation to reporting have been automated with R scripts. Time taken has dropped **from 4-7 days to 3-5 hours**.

R program was used for its computing power and multi-platform efficiency. **Tableau Business Intelligence** analytics visualization system was utilized to present the relevant information. The workflow changes were accompanied by minimal disruptions to existing operating procedures.

Improvement in time taken for data consolidation

4-7 days → 3 to 5 hours
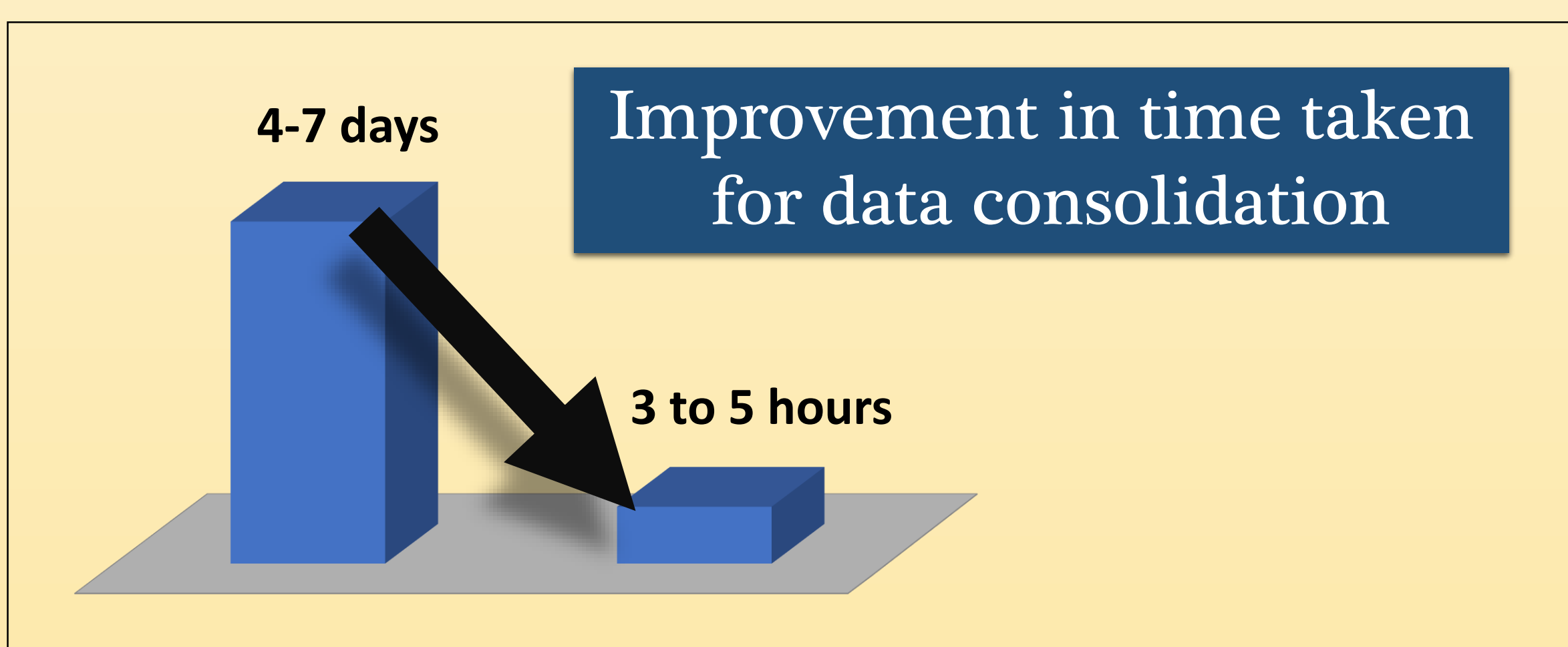
Methodology

The SGH Bed Management Unit (BMU) Trending Report Generator* deploys the DMAIC data-driven improvement cycle:

DEFINE   MEASURE   ANALYZE   IMPROVE   CONTROL

Define: Identify business problem, set project scope and goal
Measure: Establish baseline for improvement
Analyse: Identify, validate and select root cause for elimination
Improve: Identify, test and implement solution to the problem
Control: Ensure improvements made are sustainable

*BMU utilizes data collected from various systems – Bed Management System (BMS), Singhealth-IHiS Electronic Health Intelligence System (eHINTS) and Accident & Emergency database (EMERGE), to tabulate the tables and generate the chart for the report
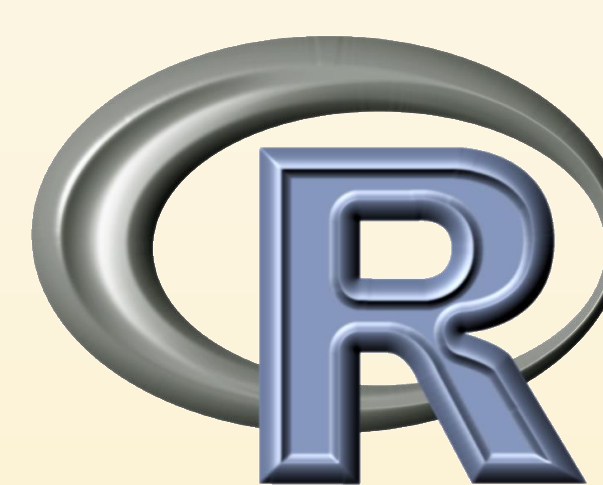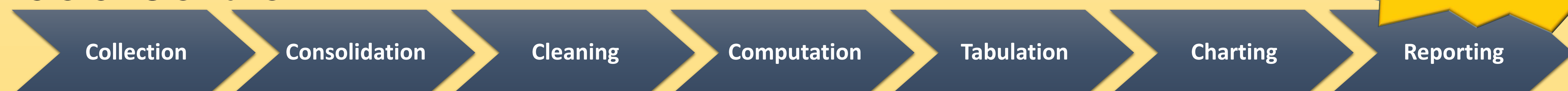
- Able to perform tasks done manually in Excel automatically i.e.. Pivot Table, Aggregation, Filtering
- Programming language for statistical computing and data analysis
- Open source software (free-to-use)
- Multi-platform compatible
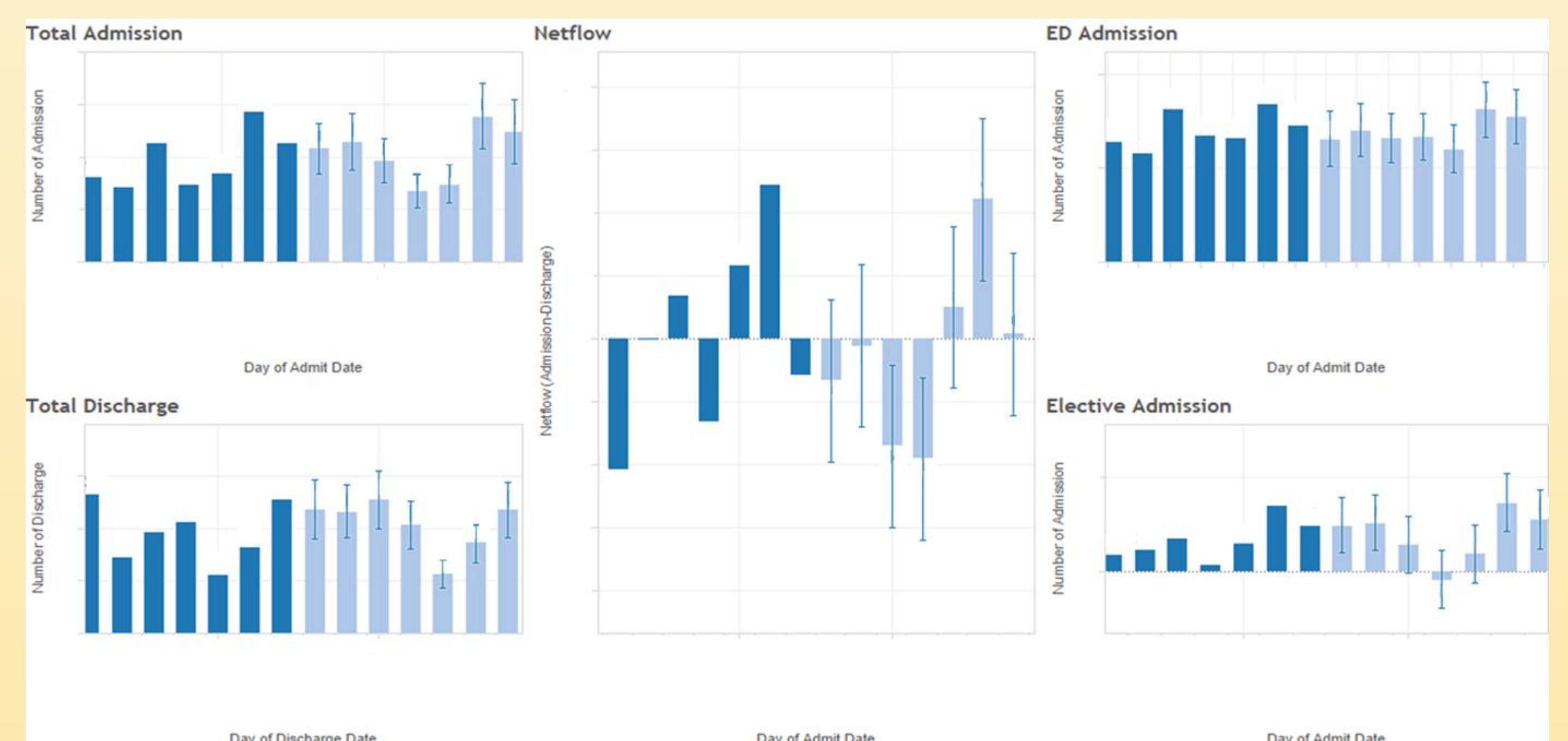
Procedure before automation

1. **Collection**: Records for the month are exported and collected from the respective systems
2. **Consolidation**: Records in daily or weekly interval are consolidated into datasets of monthly interval
3. **Cleaning**: Datasets are cleaned and filtered to keep only the relevant columns and rows
4. **Computation**: Statistical computations (Sum, Average or Median) are performed
5. **Tabulation**: Results are copied and pasted into the respective worksheets within the trending report
6. **Charting**: Charts are updated incorporating results from the latest month
7. **Reporting**: Tables, charts and findings are put together and organised by KPI/measure

The entire process is manual → Area for improvement

Before Automation

Collection → Consolidation → Cleaning → Computation → Tabulation → Charting → Reporting

After Automation

Collection → Consolidation → Cleaning → Computation → Tabulation → Charting → Reporting

Manual
Automated

Conclusion

DMAIC had helped us gain a concrete understanding of the problem and issues faced by our colleagues at BMU generating the trending report every month. Through its application, we proposed and implemented a Tableau based BI solution which has been implemented by the user (SGH BMU) and its sustainability was ensured by providing post-deployment support. The data management framework was built with R, a leading tool for statistics and data analysis, together with the Tableau BI system.