Effective visualisation using cost data as an example

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While hospital funding models are being enhanced for better performance, the evolution often comes at the cost of interpretability. This lack of transparency can be a problem in the healthcare sector, which involves various stakeholders who may not be literate in data analytics. When appropriately designed, data visualisation can enable the audience to observe hitherto unseen patterns in underlying data.

This paper will explore emerging and effective techniques among data visualisation practitioners – including, but not limited to:

- reality imitation (simulation): to facilitate understanding of phenomenon underlying data
- linking views: to provide multiple perspectives on interactive data visualisation
- animation: to describe transition from one stage to another.

This paper will present a case study on how these components were applied to a costing study. Previously, this model was communicated via data in table formats and written explanations. But the health service provider wanted to have a robust understanding about how input data and assumptions are integrated into the data processing, so that it can be seamlessly shared with relevant parties to allow productive discussion for fine-tuning the model.

Firstly, an interactive Sankey diagram was developed to illustrate flows of a) mapping of cost items in the ledger to meaningful cost categories, b) processing of these categories to secondary and tertiary system, and c) allocating each cost item to different facilities. In each step, a supportive viewpoint was provided to allow users to inspect specific logic. For example, if a user highlights the step allocating the salaries and wages (S&W) cost item to facilities, the relevant allocation statistic – in this case full time equivalent (FTE) – was shown as a stacked bar chart in the supportive viewpoint. Also, a Javascript based tool called Data-Driven Document (D3) was used to intuitively describe final costing and analysis. For example, a) cost allocation was translated into cost of the health service in each facility, b) the resultant costs were grouped based on adjusting factors such as rurality measured by Modified Monash Model (MMM), and c) sensitivity analysis was done to show how significant rurality affects the cost. Each of these steps was illustrated by animation of varying formats – bar chart being split, the bars transitioning to points, and the points were appropriately grouped to form a box plot showing the sensitivity.

One practical challenge was deployment. Tools such as R Shiny provide good performance and flexibility, but data need to be sent to a cloud environment, which is often not acceptable when the data involves patients and healthcare services. Alternatively, Javascript-based tools output standalone webpages, which can be easily shared, but the functionality is relatively limited. Hence, the balance between performance and deployment should be considered in advance, based on the purpose of the data visualisation.

Overall, visualisation techniques employed in this project could be used for different aspects of activity based funding, including activity analysis, quality and forecasting. As there is no one-size-fits-all solution, careful design in terms of purpose and audience would be required.