Group decision support for IT system procurement

The use of multiattribute group decision support in the NHS

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A group decision support process and a multiattribute decision making software package have been developed at Manchester Business School. This article describes the process and software, and their use in the facilitation of a major IT procurement decision task in the NHS. The task described is novel in that it involves both group and longitudinal decision making. The article concludes by describing some of the benefits of this approach from the point of view of the managers at the hospital concerned, and the authors' research interests.

Background

One of the results of the current wave of NHS reforms is that hospitals are becoming more autonomous, with decision making (including IT procurement decision making) being delegated to local level. At the same time, national level information management initiatives are encouraging hospitals to purchase major IT systems (comprising both hardware and software) to manage patient data. The combination of these two factors results in already busy hospital managers and clinicians being called upon to make increasing numbers of complex IT procurement decisions. Decision support is therefore potentially very valuable in increasing the effectiveness and efficiency of the decision making process. As always with complex one-off decision making, assessment of decision effectiveness in terms of achieving the 'best' outcome is difficult or impossible. However the efficiency of the decision making process can be increased by the use of structured group decision support and decision analytic techniques, increasing the depth and evenness of analysis, and enabling rapid focusing on critical issues.

IT procurement

The procurement of a major IT system involves large capital outlays and commitment to considerable annual operating costs. Such a system will have impacts on many different functions of an organisation and may be expected to work with existing IT systems. The situation in a particular organisation, for example at a particular hospital site, brings a unique combination of local factors to the decision task. The interest in major IT systems developing in the NHS has produced a specialised health IT market supplied by divisions of several of the large IT companies and some smaller companies. These companies have developed specialised systems, such as patient case-mix management systems and nursing management systems, which can be tailored to the specific needs of individual hospital sites. Once a hospital has decided to procure a system to perform a particular function, the major decision task is therefore that of selecting the most appropriate system for the local situation from those offered by suppliers. Some work on similar types of studies is described in Lockett and Naudé (1991).

A typical NHS IT procurement consists of a number of distinct stages over which the number of alternative systems under consideration is reduced. Each stage of the decision making process requires regular progress and review meetings. Between meetings information about suppliers and their systems are gathered through examination of submissions from suppliers, demonstrations by the suppliers, and visits to other sites using the systems. At the end of each stage the decision makers must agree that a satisfactory conclusion has been reached in order for the next stage to commence. Since the introduction of the IT system will have effects across the organisation, the decision making group is made up of representatives from many different functions. It is of key importance that factors affecting the decision are clearly defined and understood and that the opinions and judgments of each of the group members are recorded and taken into account.

Decision support for IT procurement

For this type of decision task, requiring the comparative analysis of and choice between a number of concrete alternatives, we consider multiattribute decision making (MADM) to be the most appropriate
technique. Before multiattribute methods can be used, a decision problem must be structured by the elicitation and definition of distinct attributes. We perform this structuring using the initial steps of the Nominal Group Technique (Van Grundy, 1981). Managers form individual lists of decision factors which are then pooled and grouped through team discussion. These groups are labelled to form attributes. We consider around seven or eight attributes appropriate to provide sufficient detail without introducing a confusing amount of detail. The ‘magic’ properties of 7±2, discovered during studies of human information processing (Miller, 1956) support this. Each attribute label is a heading for a list of aspects of the problem. Any of the attributes can of course be split into its elements to form another level of attributes in a hierarchical structure, though at the cost of greater complexity and decision making time.

The basic weighted-additive MADM model is as follows:

\[ S_i = w_1s_{i1} + w_2s_{i2} + \ldots + wNs_{iN} \]

where \( S_i \) is the overall relative score produced for alternative \( i \), \( w_j \) is the weight assigned to attribute \( j \) and \( s_{ij} \) is the relative score of alternative \( i \) on attribute \( j \). The attributes are assumed to be independent. This model provides a straightforward, transparent and easily comprehensible structure. Despite its mathematical simplicity, this model is generally regarded as robust and it was considered that the construction of more complex representations, which rarely outperform the above simple model (see for example Fishbein’s ‘extended model’ in Fishbein and Ajzen, 1975), was not justified in this case.

A MADM software package for PCs, the Judgmental Analysis System (JAS), has been developed over a number of years at Manchester Business School. JAS uses pairwise comparisons to elicit user’s subjective judgments of the relative importance of the attributes and the performance of the alternatives on the attributes. Mathematical routines based on geometric least squares convert these judgments into preference data. The interested reader should refer to Islei and Lockett (1988, 1991) for more details.

Most major decision tasks, including the procurement of major IT systems considered here, are made by groups of people rather than single decision makers. There is, of course, no ‘optimal’ way to mathematically combine each individual’s preference data. JAS can be used in a group setting by providing clear elicitation of each individual’s preferences in a form in which they may easily be compared and understood. This provides a starting point for discussion. In the JAS group decision support process the decision making group uses a common decision structure, ie they use the same attributes so they have a common framework (they are ‘speaking the same language’), but form their own attribute weights, ie they use their own decision models. Each decision maker therefore uses the JAS package separately to assess their judgments of attribute importance and supplier scores. The assessment of the importance of the attributes and the scores for the alternative systems made by each member can be compared to highlight sources of agreement and disagreement within the group. Managers may view the decision task from different perspectives since they have different areas of responsibility in the hospital organisation. Since they are members of the decision making team precisely to represent these different areas, they are encouraged to reflect these different points of view during the process. Comparing their different judgments within the common framework of the structured problem can clearly identify these different perspectives or biases. By helping to recognise and understand differences of opinion, the results provide a basis for discussions between group members.

The procurement process outlined above is also longitudinal rather than being a one off comparison and selection task. Such longitudinal processes can be supported by a series of decision sessions using JAS spread over the timescale of the decision task (weeks or months). During ‘preference’ sessions users develop an understanding of the process, software and decision task, and preferences between the alternative IT systems are developed and explored. The problem may be restructured by changing the attributes at the beginning of any JAS session. Periodically, as demanded by the decision timescale, the results of some ‘choice’ sessions are used to select the most promising alternatives in order to reduce the number under consideration and allow more detailed examination.

**Feedback**

After the group has used JAS, they are provided with feedback of the results from all the group members. The production of numerical data, whilst perhaps losing some of the ‘richness’ of qualitative data, more than compensates for this by providing a clear elicitation of the perspective or ‘bias’ of each manager. Rather than trying to hide or suppress bias in order to produce ‘consensus’, the aim is to make it explicit.

The numerical output is used for decision support