8-15-1997

PROPERTY DEVELOPMENT: AN EVALUATION OF DECISION SUPPORT SYSTEMS

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Abstract

Although there are a number of development approaches proposed in the decision support systems (DSS) literature, there appears to be a preference for prototyping over structured approaches. This paper describes the analysis stage of a DSS for the Property Development Department (PDS) at the Palmerston North City Council, New Zealand. The PDS role involves many ill-structured decisions with a large number of stakeholders. The paper describes the selection process for the methodology, analysing criteria for selection, and proposes a structured process for this analysis. The paper provides insights into when structured approaches are more appropriate for the development of DSS based on the type and complexity of the decisions supported.

The Challenge of DSS

The effectiveness of decision making at managerial levels has implications for organisations and for the successful achievement of objectives. Consequently, effective DSS are vital to enhance the decision making processes. In spite of the increased acceptance of technology by managers, the provision of effective DSS is still a challenge (El Sawy, 1985). While there are examples of successful DSS in various contexts, in general these tend to focus on limited, well-structured processes. However, when supporting ill-structured decision processes over time with competing and changing issues, multiple sources of information, and many stakeholders the number of successful examples is much more limited.

Previous research suggests a direct relationship between the DSS development approach and the success of the system. Sprague and Watson (1993) advocate the use of prototyping approaches for the development of DSS in order to design successful systems. However, other authors justify the use of more structured approaches based on the complexity of such systems, on the necessity of documenting manager's cognitive processes, and on the need to provide information at the appropriate level of detail, presented in such a way that the implications are clear and available when needed (Brookes, 1986).

The development methodology followed here is based on a modified version of Brookes' (Brookes, 1986) architecture of DSS (see Figure 1). The methodology aims to ensure the functionality of the system by its capability to deal with ill-structure decision processes and with soft information. This is reinforced by the capability to support problem finding using alerting techniques based on inference rules and models to detect unusual trends. This methodology adds to the Brookes' in order to reflect the structureness of the approach in the tasks supported by the DSS function.

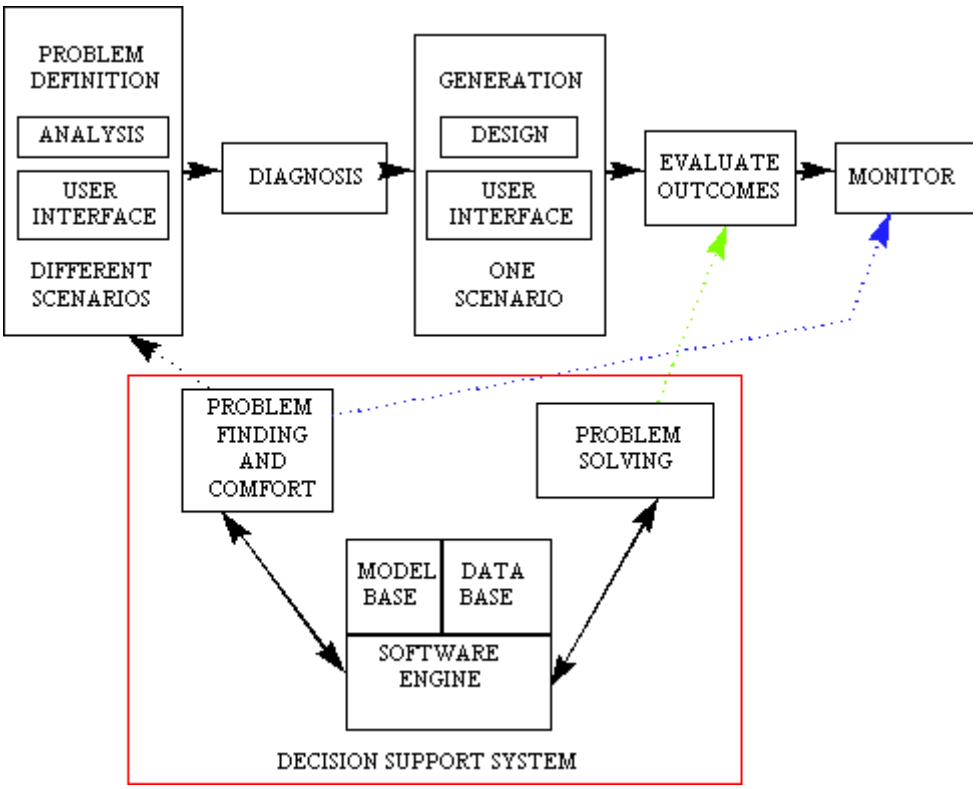

Figure 1. Development Methodology and System Architecture

This more structured development methodology for the development of the PDS has been chosen mainly due to:

the difficulty for prototyping approaches to consider all variables involved in complex decisions;

the difficulty for prototyping approaches to develop a system which satisfies a large number of stakeholders prior to any development;

the difficulty for prototyping approaches to define *soft information* for the system.

The design for the database/modelbase (Figure 1) follows the model proposed by Sprague and Carlson (1982). They proposed a data base, a model base, and a software engine which links the user to each. The software engine has three main components: model base management, data base management, and user interface. The DSS generic objectives are:

to support the intelligence, design, choice, and implementation phases (Janssen, 1991; Sprague and Carlson, 1982) of the decision making process;

to facilitate the decision making process with emphasis on semi and un-structured decisions;

to improve the effectiveness of the decision making process (Keen and Morton, 1978);

to cater for the changing patterns in the environment;

to cater for the changing needs of the manager.

These generic objectives are based on the principle that all information reported by the PDS ought to be provided in different phases of the property development manager's decision making processes (Carlson, 1983).

The Property Development System (PDS)

The Property Development Department (PPD) at the Palmerston North City Council (PNCC) has, as its major objectives, to effectively manage city properties. Decision making at the PPD addresses a variety of national and regional socioeconomic and infrastructural concerns, such as performance improvement of city properties, debt management, promotion of the city, promotion of small and medium industries, allocation of resources to social objectives, etc. Most of the responsibility rests with the Property Development Manager, although the decision making process involves debate and group discussion with the different stakeholders involved. The process requires preparation of position papers and studies, and is subject to public accountability and media attention. A simplified view of the decision making process, identifying the key stakeholders is shown in Figure 2.

In order to support effectively the decision making process, the PDS provides independent analysis for each area. Although the system is able to automatically re-adjust the percentages, the property development manager may, as well, to provide a *subjective percentage of influence* for specific areas. This facility provides flexibility in cases where the value of properties could be influenced by subjective appreciations. For instance, in order to determine the geographical value of the property, an algorithm is defined which comprises different econometric aspects and positive and negative popular submissions; however, it is difficult to determine how this value should relate to the economic and cultural values, hence the necessity to introduce the subjective percentage of influence. This feature attempts to ensure flexibility and change in social patterns. The system of weighting values, and percentages per area is based on Giaoutzi and Nijkamp (1993) who designed a similar DSS for sustainable development planning.

The different areas defined by the PDS are:

Geographic Value, this provides the value of the property based on its geographical situation.

Economic Value, this focusses on the specific value and potential economic return of the property in comparison with another City Properties.

Cultural Value, provides an assessment of the property's cultural assets.

One of the major challenges is the combination of these hard and soft elements to provide an overall value of the property. The inclusion of the subjective percentages provides a key tool to adapt the DSS to the specific preferences of the current management team at the PNCC. The importance of each area in respect to another is seem differently by managers, and therefore, the overall value of the property is affected by these different views. For instance, some managers have provided a stronger influence to economic factors (ie, geographical economics, net income, etc), others have provided it to social factors (ie, emotional value, historical value, submissions, etc), while others have provide it to a combination of both. These preferences produce different scenarios, and subsequently, different overall values for the properties. This feature of the system has been recognised as one of the most powerful ones by the management team; this is due to the possibility of developing scenarios based on different managerial subjective perceptions about the value of a property.

Conclusion: An Structured Approach

A major concern raised by the management team was the improvement of productivity during the development of the system. Some writers advocate the use of prototyping approaches in order to increase user involvement (Connell and Brice, 1984) and the use of fourth generation languages (Gremillion and

Pyburn, 1983) to improve the productivity of the development process. The main points concerning the productivity of the development process are delays in the delivery of systems to users until the last stages of the development process (Berrisford and Wetherbe, 1979) and the creation of communication problems (Mittermeir et al, 1982). However, documented studies (Douglas and Gosselin, 1987; Watson and Felix, 1977; The Yourdon Report, 1977; Kraft and Weinberg, 1975) show that structured development processes are cost effective. Facing this dichotomy, further examination is required to justify the selection of structured versus prototyping approach in this particular case. As discussed, the system under study is characterised by a large number of stakeholders (City Council, Valuation Department, Department of Statistics, Central Government, Industry, and Citizens). All the stakeholders have specific inputs into the system, and request specific information from the system. At the same time, the system has to cater for ill-structured decisions, largely based on personal perceptions of the Property Development Management and the Councillors.

During the development of the system, the more structured approach provided good project management planning and therefore, an important reduction in the time required from the manager. The structured approach provided, as well, an effective communication tool among different stakeholders; a review process was established in which different versions of the system were reviewed by different stakeholders until final agreement was obtained. As observed in figure 2, a different range of *external* systems is needed in order to obtain the data necessary for effective decision making. Different conceptions about what information is relevant for the decision process provided different information retrieval from those systems; it was therefore imperative to obtain an agreement from stakeholders before different interfaces for the system were designed.

The selection criteria based on the number of stakeholders, on the number of sources of information, and on the structureness of the decision making processes can be as represented in Figure 3.

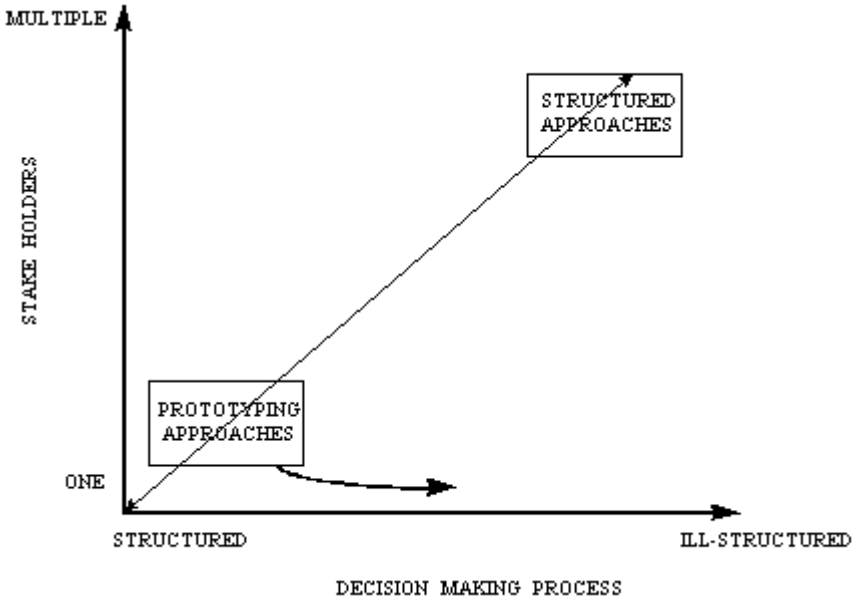

Figure 3

Based on the lessons provided, we can say that the selection of an structured approach is appropriate when facing cases with a large number of stakeholders, ill-structured decision making process, and a large number of sources of information. Prototyping approaches have the potential only in the case of reduced number of stakeholders, sources of information, and with structured decision making processes. The authors, however, recognise the limitation of the previous statement based on a particular case; further research should address its validity.

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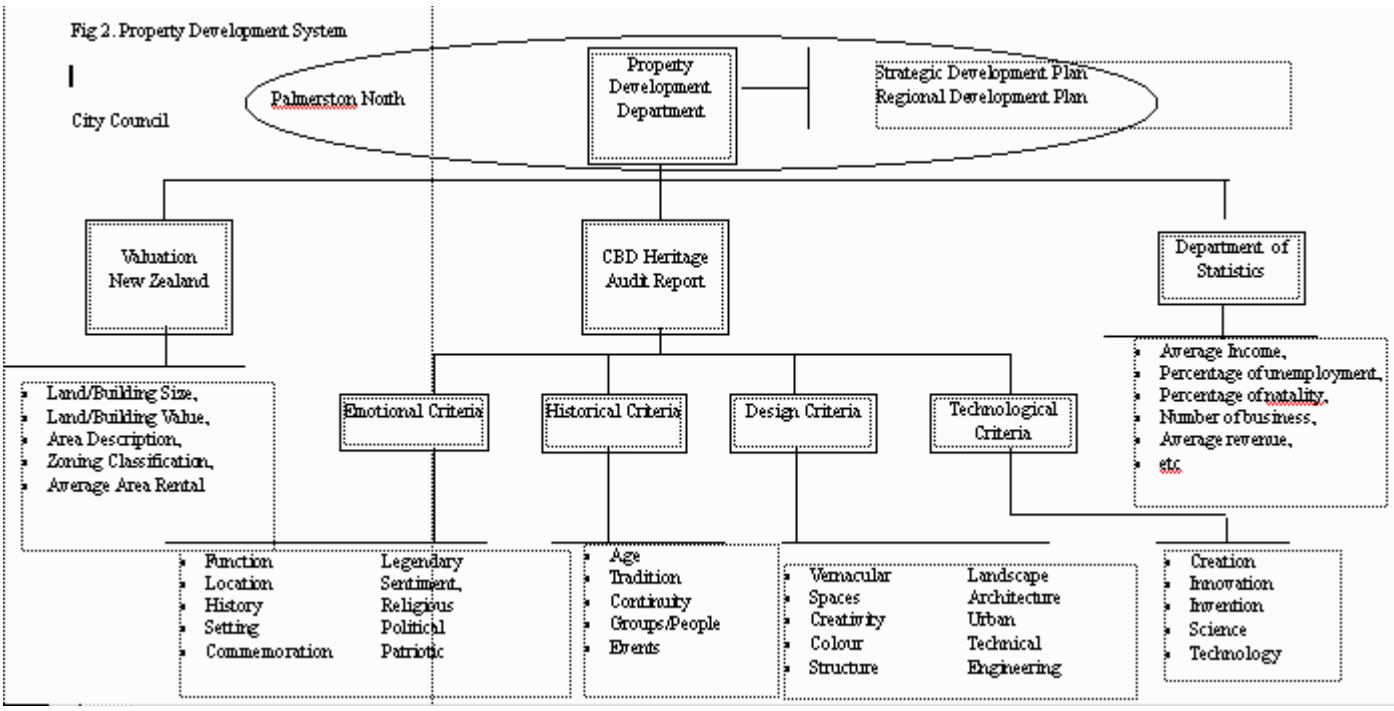
Fig 2. Property Development System
Palmerston North
City Council
Property Development Department
Strategic Development Plan
Regional Development Plan
Valuation New Zealand
CBD Heritage Audit Report
Department of Statistics
Land/Building Size,
Land/Building Value,
Area Description,
Zoning Classification,
Average Area Rental
Emotional Criteria
Historical Criteria
Design Criteria
Technological Criteria
Average Income,
Percentage of unemployment,
Percentage of natality,
Number of business,
Average revenue,
etc
Function
Location
History
Setting
Commemoration
Legendary
Sentiment,
Religious
Political
Patriotic
Age
Tradition
Continuity
Groups/People
Events
Vernacular
Spaces
Creativity
Colour
Structure
Landscape
Architecture
Urban
Technical
Engineering
Creation
Innovation
Invention
Science
Technology