The Limits to DSS: Supporting Vision, Creativity and Future Thinking

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Summary

This paper explores the limits of decision support systems (DSS) using a case study of fashion purchasing to elicit the range of needs for which support might be required. In particular, it highlights the extent to which issues such as vision, creativity and future thinking are management problems for which systems might be employed. The paper looks at the attributes of vision and relates components of a vision-based decision to the development and use of DSS. Vision is defined, and its constituents, foresight, culture, change and strategic intent, discussed. The needs of senior decision makers and the drawbacks of DSS in supporting vision-based decisions are analysed.

Management techniques suitable as model bases for such DSS are briefly examined. Some are useful for assessing the impact and importance of future developments, yet, currently-available development techniques are more suitable for planning than for supporting of vision-based decisions. An example taken from the fashion industry illustrates the shortcomings of a new, so-called, DSS, already considered indispensable for fashion purchasers and sales managers, with regard to vision support. Finally, a new tool, or hybrid, vision support systems (VSS) is suggested.

Keywords: decision support, vision, creativity

1 Introduction

If business is seeking to use concepts such as vision and creativity as mechanisms for decision support and strategy generation, and if decision support systems (DSS) are intended to provide assistance to senior decision makers in taking complex decisions and formulating strategy, then it is apposite to investigate how DSS may support vision-based decisions.

Most current DSS are more useful for tactics and planning than for production of vision-based decisions. They are successful in supporting decisions used for short-term, incremental, opportunistic moves based on current, rather than future, requirements. Such applications tend to be developed using techniques based on perception rather than prediction and often produce or lead to prematurely obsolete results.

The role of vision as a mechanism for developing or communicating business strategy has received considerable attention, and there is evidence that organisations value and use vision-based decisions and strategies in times of change and turbulence. DSS have not enjoyed significant use by senior decision takers since they are neither built appropriately for such users nor do they address strategic issues in a way conducive to vision-based developments.

Thus, DSS developed to meet *present* objectives and *current* requirements may restrict an organisation's ability to achieve a future strategic position by constraining the breadth of current strategic thinking. Yet, the most fundamental need is for DSS which support less well-defined decisions based on longer-term *vision* rather than short-term opportunity spotting.

2 Support for Strategic and Vision-Based Decision Making

2.1 Support for Strategic Decision Making

While DSS have been used to support strategic decision making, their long-term success has been minimal, though the systems often met the strategic needs of the organisations at the time they were developed. However, the ability to achieve, for example, competitive advantage and the ability to sustain it need different organisational skills (Feeny and Ives 1990). Equally, the attainment of strategic objectives implies more than just competing for a predefined target in a well-understood market with known competitors. Strategy-oriented DSS need to reflect the relationship between the organisation and its environment (Liang and Tang 1991). Further, the nature of strategic decision support in the 1990s may be different from that of the 1980s, perhaps due to shifts in the strategic process towards more complex decision making as a result of the availability of a greater amount of pertinent data at strategic levels (Te'eni 1990). As the rate of change in the environment increases, DSS based on short-term strategic objectives may inhibit rather than support evolving business strategy.

The emphasis of DSS has always been on attempting to support judgmental or non-programmed decisions or tasks. Keen and Scott Morton (1978) recognise that managers are the problem solvers - information must not impose a structure or solution. However, most early DSS either addressed structured tasks or, when aiming to provide support for strategic level decisions, failed.

The technology was such that senior management rarely sustained computer use because 'benefits in decisional terms were not enough to outweigh the cognitive "hassle" involved in their use' (Finlay and Martin, 1989), and, attempts to provide high level, strategic support floundered because DSS developers were not able to design the requisite support tools. This is partly due to a mismatch between information typically available on DSS - quantitative, financial, short term and internal - and that needed by senior managers (Brézillon and Pomerol, 1996; Courbon, 1996). Subsequent work has identified and considered this problem, but DSS development has always lagged behind the current envelope of strategic thinking.

Brannback (1995) claims that DSS can have a strategic worth, but does not provide conclusive evidence as to how this might be achieved, or what exactly is required.

Te'eni (1990) recognises that DSS to support high level decision making need to differ substantially from that embodied in conventional DSS and that this leads to a requirement for unconventional systems. Zmud (1978) argues that senior executives manage issues not people or resources, they create decision situations, work with ill-defined qualitative data and with networks of people not decision models and implement rather than make decisions.

Chung et al (1989) cite King who suggests that strategic DSS require, inter alia, the system objective to be gaining competitive advantage in support of organisational processes or strategic decision making. Hence, systems must directly address unstructuredness and, by implication, support the intelligence and design phrases of the decision process not choice. However, this need is undermined by Bodi and Lee (1989) who maintain that DSS can really only support structured and semi-structured situations for which a model can be developed, and that the failure of management information systems was because they were no help in solving novel, unstructured problems. A DSS to support executives must enhance their mental models, that is, improve the ability to access, combine, present and analyse the model and test the results.

Reagan-Cirincione et al (1991) caution that strategic decision making is a social and political process, not just an intellectual task and that the 'value of decision modelling to strategic thinking is primarily in the cognitive, social and political activity of building the model, rather than in the completion of the model'. It is argued that strategic decisions are improved when the decision makers benefit from the process of model building (Bui and Loebbecke, 1996).

2.2 Support for Visionary Decision Making

Much has been written recently of the need for, or lack of, vision. Tregoe and Tobia (1991) conclude that 'strategy is a vision'. It is the framework which guides those choices that determine the nature and direction of an organisation. These choices relate to the scope of an organisation's products, markets, key capabilities, growth, return on investment and allocation of resources. However, Isenberg (1987) states 'a manager's vision differs from a formal strategic plan. A strategic plan lists goals, which are usually objective, measurable and time-bound'. By contrast a manager's vision of the company's future direction is often general, qualitative, difficult to articulate, and might entail such things as becoming the "best" at a given function'.

Clearly, DSS usefulness is predicated upon the models which they incorporate. Models that are poor in support of vision will inevitably lead to DSS which are similarly lacking. DSS designers do not tend to formulate their systems in accordance with anything other than a rational mode, where a high level of information processing is undertaken resulting in formal strategies and plans, usually written and in which top management tries to consider as much data as possible (Hart 1992). In this respect, the model-bases of many DSS are old-fashioned and overly-rational. Hence, the emphasis on vision as a basis for strategy requires an examination of its nature. The following section illustrates the need for vision by analysis of a retailing case.

3 Need for Vision Support: Fashion Industry Case

AAA is one of the largest department store chains in Europe with about 100 stores of different sizes mainly located in downtown areas. AAA's DSS called FIPS ('Fashion Information and Planning System') is embedded in an overall 'new merchandizing system' which, by itself, is in line with a new integrated logistics concept for fashion and staple goods. The logistics concept has evolved over time; its main focus is on centralizing purchasing power in combination with streamlining the physical distribution of goods. This new logistics concept is dependent on tools to provide decision support and to increase the decision capacity of AAA's purchase managers (Loebbecke, Kronen and Jelassi, 1996).

The 'new merchandizing system' consists of four operational modules (order management, demand poll and distribution, warehouse data processing, good's core data) and the integrated DSS 'FIPS'; together they cover the whole process from ordering goods to delivering them to the stores. FIPS consists of two decision support modules: 'Fashion Information System' and 'Purchase Planning and Control'.

3.1 FIPS Modules

The *'Fashion Information System'* is integrated into an overall information system for fashion and staple goods. It covers all information regarding sales, inventory, and sales price reductions in the stores, and ensures high data consistency, fast and flexible data availability, and easy and secure data input. Standard reports are optimized based on user surveys, resulting in a large amount of information. Additionally, users can request free-flow formats from the IT-user support group.

In spite of difficulties due to fashion trends, the planning of a season's assortment is crucial. Every six months, AAA's central buyers apply the FIPS module *'Purchase Planning and Control'* to plan volumes of inventory sales and the demand on the basis of various categories of goods. The purchase planning is then transferred into AAA's planning of financial data where the volumes are translated into turnover, gross margins, and profits. Central buyers are supposed to plan sales for article groups, sub-categories, and categories for a maximum of ten price categories, i.e. they do not aim to precisely plan colours and sizes.

3.2 Use and Cost

The large number of data transactions - up to 800 data requests access 250 different applications every second - signifies the acceptance of the system as well as need for further optimizing data transmission. A central buyer uses the system for three main decision categories: purchase of regular assortment items, purchases of special promotions (approximately 60 % of turnover in AAA's fashion retailing), and sales price reductions. The embedded assumption of a maximum of 100 sales price reductions, 50 promotion purchases, and 20 regular assortment purchases per month seems conservative (1993 data). For about 170 decisions per month, a AAA central buyer receives, reads, and analyzes about 280,000 information items per month with an information item referring to a cell or field in a report.

The respective figures for a sales manager in one of AAA's top department stores are approximately 460,000 pieces of information for circa 120 decisions (20 sales price reductions, 50 synchronization decisions, and 50 special placements) plus any additional information needs.

This information volume is time consuming. On average, 35 central buyers responsible for fashion goods spend about 4,200 hours per year reading and analyzing the reports that *they have requested.* Sixty regional managers need about 7,200 hours per year, and approximately 910 sales managers require about 87,000 hours per year.

This high level of acceptance and usage is reflected in the FIPS life-cycle cost. The three groups of system users, 'central buyers', 'regional buyers', and 'sales managers' account together for about US$37 million, i.e. about 60% of the total life-cycle cost until the end of the decade. The more data that is fed into the system, the more reports users request, and the more the system is used. To address this, AAA has considered (a) reducing use of the system in terms of hours per day or reports daily, (b) limiting the system access for certain decision makers (e.g. sales managers), and (c) targeting FIPS further towards hierarchical levels, and thus providing appropriate levels of data aggregation and decision support.

3.3 Organizational Impacts

Although tangible benefits are difficult to calculate, several indicative figures are provided by FIPS: the number of goods' core data has increased from 250 to 10,000, a figure which could not be managed without computer-supported decision making. FIPS significantly helps to increase the range of products, and, thus, to improve AAA's competitive position. Lower sales price reductions, reduced inventory, and more complete assortments in the stores and thus higher turnover would not have been possible without an appropriate system. At an organizational level, FIPS has (a) changed the business processes underlying the purchasing and sales functions, (b) strengthened the purchase versus the sales function and streamlined the patterns of distribution within the corporation, and (c) improved the role of AAA's IT-user group.

3.4 Limitations

The AAA case neatly illustrates the limits to DSS and the desire by both DSS users and developers to extend the current range of support to help tackle more creative, uncertain and vision-based issues. Clearly the DSS as described is very well accepted by users, indeed it is considered 'indispensable'. It fulfills various functions of an IS, but in its present form cannot help in deciding what fashion to buy for the following year - it does not support the necessary vision. The issue then, is the extent to which decision support systems could be constructed to assist in such tasks. On the one hand, it might be argued that this decision situation is of a kind that cannot be supported by any system (e.g., one can be creative and develop scenarios for all kinds of fashion, but the scenarios will not provide any hint as to which one will materialise, that is they do not help with the actual decision). On the other hand, support for vision-based and creative decisions may be provided by systems which widen the bounds on thought and supporting insight. Such systems would be valuable and their provision requires an investigation of the nature of vision.

4 The Nature of Vision

Vision can be described in two ways. First, vision as *perception* gives an impression of a current situation and, second, vision as *prediction* forms an image of future events or conditions which relate to a particular context. In the former, vision is seen as 'the process of discovering from images what is present in the world and where it is' (Marr 1992). This goes beyond simply seeing and includes understanding - often of a complex situation - which implies an understanding of what a situation is. However, the way in which vision is usually applied is to develop an understanding of what a situation might be at some future time.

In the second case, vision is described as 'a mental perception of the kind of environment an individual or an organisation aspires to create within a broad time horizon for the actualisation of this perception' (El-Namaki 1992). Business vision may also be a 'description of something (an organisation, a corporate culture, business, a technology, an activity) in the future' (Kotter 1990). A further version of vision is 'a concept for a new and desirable future reality that can be communicated throughout the organisation' (Rowe *et al.* 1986). In this context, vision is about foreseeing specific conditions, but it is also described in other terms, such as the ability to foresee the impact of future events, the effect on and of organisational culture, and the relationship between change (in the environment) and intention (of the decision or the strategy).

The difference between the two definitions of vision is striking when related to the models typically used in DSS. The first relates to the way in which traditional development takes place. This approach implied by most development methods follows the metaphor of perception quite closely. The aim is to identify and to understand a *current* situation by revealing its attributes progressively at increasing levels of detail. This enables the building and use of a decision support model.

The problem is that, in modelling the decision situation as it is now, such systems fail to encompass the requirements of the environment as it may be or should be at some time in the future. This has two detrimental effects. First, changes in the business environment over time cause a drift away from the original model. Second, these models miss the opportunity to be proactive (as in the fashion case) in shaping the decision situation/business in line with plans for the future and may therefore inhibit rather than enable change in decision procedures, business processes and even strategy. Thus, a DSS design incorporating vision as perception likely leads to:

- insufficiently flexible systems, rendered obsolete by minor changes in business processes or decision environments which cannot be predicted or prevented;
- inaccurate analysis and capture of requirements and rules due to inadequate practitioner skills and methods, or due to an intrinsic difficulty in defining the needs of the organisation;
- systems based on a logical model representing current business processes decision environments, rather than a scenario which will benefit the firm at some future time, and towards which it may be moving.

The first two problems are recognised, and may be corrected by improved technology and skills. However, the third requires methods which would link DSS development and visionary strategy to foresee the future environment. The key issue, then, for DSS is the extent to which this can be done. If the limits to DSS are such that they are unable to support vision or creativity, then DSS will never become true management support tools.

The following sections discuss aspects of vision and vision support to assess the needs, the tools and ultimately the likelihood of DSS being able to support vision.

4.1 Vision and Foresight

Some researchers compare vision with foresight, concluding that vision is essentially abstract and broad, whereas foresight is specific and more narrowly focused.

Examples indicate that a focus on a single target may place artificial constraints on an organisation's vision. In particular, strategy based on competition with a single major rival is identified as a cause of strategic myopia and inflexibility. Clearly, richness of input is an important attribute of foresight, and is unlikely to be introduced into DSS models where a competition framework (e.g. Porter's (1980) model) or a method based on a strategic thrust towards a single target (e.g. Wiseman's strategic options generator) are concerned.

4.2 Vision and Culture

Strategic decisions in a period of change require the development of an explicit statement of direction which guides the search for a new set of values to achieve success under a different set of circumstances. A corporate vision is necessary for promoting creativity in developing pre-emptive and proactive (rather than reactive) decisions (El-Namaki 1992) which have an important place in frameworks to support strategic flexibility (Evans 1991). Strategic decisions based on reaction and opportunism are increasingly unsuccessful in an environment affected by 'coincident waves of information technology (IT) developments which tend to drive business innovation in competitors and partners' (Mui 1992).

4.3 Vision and Change

The incorporation of a particular view of the future into the planning process is an important component of decision making. This view guides the formulation of strategic decisions by which the organisation will seek to achieve its long-term goals. Norton (1987) contrasts the softness of the concept of vision with the hardness or precision of other terms. He concludes that vision is associated with a manager's ability to 'formulate future business direction' and believes that a concentration of interest in the topic among managers is an appropriate response to a 'period of cultural and economic instability...when new courses are being charted'. Norton (1990) points out that, 'for the foreseeable future change will be constant'.

One response to environmental change is a piecemeal approach using a short-term, opportunistic process termed 'bricolage' (Ciborra, 1991) which implies a series of small, incremental changes. Walsham (1991) identifies a dichotomy between long-term and incremental planning approaches and describes the situation as a conflict between vision and rationality.

4.4 Vision and Strategic Intent

The concept of vision is included in discussions of strategic intent - a form of corporate ambition - defined as a long-term obsession with the achievement of a particular set of objectives. 'On the one hand strategic intent envisions a desired leadership position and establishes the criterion the organisation will use to chart its progress' (Hamel and Prahalad, 1989). This approach is described as a part of a 'currently fashionable prescription' in which 'top management identifies a specific "stretch target" (typically defined in competitive terms) and drives the organisation toward that goal through a series of operating challenges' (Bartlett and Ghoshal, 1994). This is similar to bricolage in that incremental progress is made toward a long-term goal.

5 VSS: DSS in Support of Vision

The previous discussion has highlighted the need for new decision support tools incorporating the concept of vision - vision support systems (VSS). Such a system should provide managers with the type of information which could support strategic decision making in uncertain and/or changing business environments. Above all, the requirement seems to be to avoid formulaic approaches.

In terms of the model (Figure 3) developed by Finlay and Martin (1989) (based on Earl), VSS encompass scenario development systems, insight systems and exploratory systems, but their prime role must be the former. However, vision is more than simply the development of scenarios. These issues can readily be seen in the requirements for a DSS to support the AAA fashion buyers. It is also clear from the discussion that enhancing decision makers' vision capabilities goes beyond being uncertain about the range of potential outcomes since one necessary element of a VSS is the development of those outcomes. Thus, the identification of the need for VSS is a step further forward than most current discussions on the potential role of DSS.

Uncertainty about cause/effect	**Uncertainty about outcomes**	
	Low	**High**
Low	DP systems	Decision insight systems
High	Exploratory systems	Scenario development systems

Figure 1: Potential VSS components (Finlay and Martin, 1989)

5.1 VSS Requirements

Requirements for a VSS might include the need to change organisational culture, the need for creativity, and eventually the need to absorb environmental turbulence.

The concept of the agile company (Demarest 1995) involves overturning a rigid, conservative organisation culture and replacing it with an IT culture which is both flexible and responsive to change and opportunity. Decisions based on creation and innovation are identified as being of critical importance currently. Such decisions have superseded competitive thrusts based on analysing and reacting to rivals' strategies. It is 'creative visions, and derived [decisions and] strategies, that provide a longer term view of what customers and end users really aspire, that hold the key to the industries of tomorrow' (El -Namaki 1992).

There is recent research which attempts to produce creativity support systems. Massetti (1996) reviews these and tests their effectiveness. She argues that creativity is a fundamental organisational resource as the environment changes. Creativity support systems (CSS) (Abraham and Boone, 1994) are a tool which tries to enhance boundary breaking and insight. Little empirical study has been undertaken of CSS - they are seen to increase the quantity of ideas but the effects on idea quality are unknown. Massetti's own work suggests that those using CSS do not generate more ideas than those using standard software or no software. However, there is limited evidence that the ideas produced by those using CSS are more creative than the others.

One feature of a business environment which is subject to a high degree of instability is the need to regain direction after unforeseen events have had a major impact (Ribeiro, 1994). Recovery and turnaround from a potentially catastrophic episode require the development of a 'sense of direction and a visualisation of the kind of organisation...markets accommodate in the longer term' (El-Namaki 1992).

5.2 Potential VSS Model-bases

5.2.1 Scenario modelling

The range of development techniques which could be used to support a vision-based strategy can be categorised into those which are predictive in nature, and those which examine cause-effect relationships. These methods are descriptive or prescriptive, as they prescribe or predict a relationship between an organisation and one or more aspects of its environment (Earl 1989). The techniques which show promise attempt to create ideas, guide decision-making and provide order-of-magnitude forecasts in the areas of modelling.

One possible technique, suggested above, with a long history is scenarios. Bunn and Salo (1993) point to the widespread use of scenarios; over half of large US organisations use them. They identify the difference between exploratory and anticipatory scenarios. An exploratory scenario has as its starting point the present whose consequences are unfolded into the future. The resulting scenarios are likely to be realistic and not very surprising and, thus, may neglect occurrences that can arise in ways other than from a single identifiable cause. On the other hand, anticipatory scenarios are built by searching for possible causes which could lead to a given future state. There is more emphasis on goals and explanations rather than consequences (Loebbecke and Bui, 1996). An alternative classification is deductive and inductive scenarios. Deductive scenarios are created by setting overall theme (pessimistic, optimistic etc.) and setting of variables accordingly while inductive identify key factors and their possible outcomes and then elaborate plausible outcome combinations. Thus, deduction generates a small number of scenarios but these are internally consistent while induction gives a more comprehensive number but may omit major factors. There is a danger of looking at scenario development as one of modelling uncertainties in that it induces a passive, reactive perspective - there are no goals or decision making entities. In developing scenarios cognitive biases are particularly likely to operate when there are many element factors to be considered and the environment is inherently complex and uncertain. However, cognitive feedback tackling cognitive bias and supporting creative and consistent thinking may be embedded in the scenario design methodology (Bui and Loebbecke, 1996). Scenarios emphasise a range of different future outcomes thus they counteract the bias of underestimating uncertainties. A consistent scenario will make explicit causal relationships and a coherent one will use a sound theoretical framework (Loebbecke and Bui, 1996).

5.2.2 VAR Extensions

A second possible development technique could follow something like VAR. VAR (Liang and Tang, 1991) uses value analysis, advantage analysis and risk analysis in combination and, as such, it has a breadth of coverage missing in many other techniques but it does not really support vision as identified by this paper.

5.2.3 Creativity Support Systems

Massetti investigates two types of creativity support systems. Generative ones which encourage divergent ways of thinking, remote association and pattern switching. IdeaFisher is a piece of software which attempts to provide this by giving access to an idea bank of over 700,000 possible associations of topics, phrases and words. The software also contains a question bank designed to support such thought processes as flexibility, memory retrieval and pattern switching. The other category of systems is exploratory which involves elaboration or successive refinement of ideas. The example used here is Ideatree which allows users rapidly and easily to detail, arrange and co-ordinate ideas. In view of the analysis of vision, these sort of systems appear to offer more potential and more support than the two foregoing model bases.

5.2.4 Heuristic Information Systems

A VSS might share characteristics with heuristic information systems (Lundberg, 1990). A heuristic IS is used as an 'advisory system' which can support a user in performing a task and therefore, should not be used as an autonomous task-performing system. In this case, the system is used as an alternative-generating system; i.e. the results of the system are considered as *one* source of information in making a decision.

6 Conclusions

This paper has argued that DSS which seek a place as supports to senior managers need to be able to provide assistance with the development of vision. The paper illustrates how, while successful in a structured environment, a DSS used by a major retailer is insufficient in supporting a further range of tasks. These are creative and vision-based. The paper then identified the nature of this vision which requires support, and investigated the components of a vision support system. Few current candidate systems exist but three which may have potential are discussed.

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