Business Decision Making, Managerial Learning And Information Technology

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Abstract

Significant recent research in the decision support area has been concentrating on the human side of the person-technology relation. Knowledge, perceptions, beliefs and experiences have been researched in a number of works. The author has used individual interviews with business decision makers to find out their attitudes towards factors influencing the quality of business decisions. The issues discussed included features of actual right and wrong decisions, role of information sources and analytical tools, factors influencing creativity, and the role of information technology. The findings have shown that in the decision making process, available knowledge is used and new knowledge is created, and these processes are preferred to be supported by simple yet efficient support tools.

Keywords: business decision support, business users, knowledge use.

Introduction

In the field of business decision support, more and more recent research has been concentrating on the human side of the person-technology relation in decision making. It has been shown in a variety of works that business decision making environment is a unity of decision makers' experience, beliefs and perceptions on one side, and decision support tools and techniques – on the other side.

The information environment surrounding business activities and decisions is getting increasingly complex due to growing volumes of information of potential relevance to certain business activities; increasing number of sources of such information; and multiplying technologies for accessing and handling data and information. The expected role of information technologies (IT) is to filter and direct relevant information flows and to provide reliable and flexible support. At the same time, every case of decision making

for a problem situation tests the existing support mechanisms and provides valuable information for future situations, thus creating new knowledge and experience for participants involved, and in the case of right decision increasing confidence in future actions.

Alongside with technologies for handling data and information, lately much attention has been given to knowledge management (KM) models, their relevance to decision activities (Choo 1997) and relations between data, information and knowledge. In knowledge-intensive activities, such as decision support, these relationships are important in terms of efficient utilization of information resources, and especially those supported and facilitated by IT with its present capabilities, so it has been considered worthwhile to take a look at the role of data, information and knowledge in the context of managerial decision making, and professional learning and experience. Existing types of relations between data, information and knowledge, as well as use and efficiency of related technologies are discussed on the basis of surveys and interviews, conducted among small and medium enterprise (SME) decision makers in Lithuania in 1997-1999.

The aim of this paper is: to learn more about the requirements, beliefs and perceptions of real-life business decision makers towards computer-based decision support and the role of knowledge, by combining face-to-face interviews and existing research on the subject.

Existing Research

It has been stated that decision support systems (DSS) and technologies can be used to facilitate and improve the quality of decision making by reducing information overload and by augmenting the cognitive limitations and rationality bounds of decision makers (El-Najdawi, Stylianou 1993). To be effective, a DSS demands a symbiosis between the users and the system (Borch, Hartvigsen 1991). One of the reasons for this is that the applications in management and administration are much less clearly defined than in domains such as medicine or engineering (Edwards 1992). However, if the use of IT tools manages to satisfy analytical needs of business management, it is shown to improve one of the main assets of business: flexibility (Levy 1998). In order to respond better to the analytical and decision support needs, various kinds of support technologies and systems have been proposed: computerized cognitive support aids (Thomassin Singh 1998); adaptive systems including adaptive interfaces, adaptive problem domain knowledge and adaptive help systems (Chuang 1998); managerial intuition support aids (Kuo 1998); criticizing systems or conversational framework for decision support (Angehrn 1993).

The biased nature of human decision making, and business decision making in particular, suggests that initial beliefs of a decision maker may lead to a biased search for a decision (Jacobs 1990); therefore, IT aids that can challenge those initial beliefs and stimulate creativity should have a potential to improve decision quality. D.Thomassin Singh (Thomassin Singh 1998) suggests that DSS should utilize individuals' particular strengths and neutralize their inherent weaknesses. Although IT is limited in supporting multiple senses needed for managerial intuition, advances in interfaces and presentation modes may soon be a viable medium for human intuitive perception and action (Kuo 1998).

Summing up the research work on the human side of IT management decision support, there seems to be agreement that IT should act as:

- an enhancing instrument for decision search and analysis as a high-level and knowledge-intensive management activities,

- a creativity stimulation and managerial learning tool,

- an instrument for reduction of biased attitudes as well as insurance from making fatal decisions,

- an instrument for maintaining, managing and developing the explicit part of knowledge on decision making – models, situations, scenarios, case studies etc.

These guidelines have served as a basis for conducting the interviews whose results are presented further.

Decision-Making Environment.

In making important decisions, any information sources that contain relevant important information are going to be accessed and used, if possible. As pointed out in (Saunders, Jones 1990), the decision maker uses the whole network of information sources and variety of available media. In most cases it is impossible to access or produce all required information, so decisions are made under circumstances of uncertainty and incomplete information. Business decision support seems to have common ground with other areas containing significant analytical work: scientific research, military and political intelligence, or criminal investigation – in all cases, there are:

- a problem situation which requires analysis in line with general strategy and goals,

- assumptions,

- deficit of information (and time in many cases),

- certain (usually big) amounts of diverse empiric data which is chaotic in its nature and has to be processed in some way for relevant facts and findings,

- field knowledge is required to extract these facts and findings,

- the calculated facts and findings are carefully evaluated against wider context - political, social, ethical etc.,

- growing IT support.

Apart from needs for data and information and their availability, knowledge possessed or required by the decision-making subject is an important part of the decision environment. The most commonplace understanding of relations between data, information and knowledge is **Data → Information → Knowledge**. In other words, data is processed into information, which is evaluated against existing knowledge or stimulates creation of new knowledge in a sense that missing links in the decision model are produced and put in place ("the pieces finally fit"). There is existing recent research (ex., Zhang 2000) suggesting to look at other relations or sequence chains between data, information and knowledge with the idea that better understanding of these sequences might help producing better support for problem situations. A few examples:

Knowledge → Information → Data: this sequence might be based on having the knowledge to look for information and then turn it into data. For instance, in a problem situation general and professional knowledge can point to what information is needed to make the right decision, what information is readily available, and what information must be produced from some sources. This information is then worked into decision data – prices to be set, planned investment, resource distribution and redistribution, budget structure and so on.

Data → Knowledge → Information: knowledge is required to process data into information. Another possible case: the content of data suggests ways (or produces new knowledge) to extract information out of this data, e.g., group or query the data by some criteria which carry business logic or other rationale.

Information → Knowledge → Data: knowledge is required to get data from information, where data amounts to final decision criteria: buy – don't buy; accept proposal – reject proposal; set the price etc. From the need for simple outcome the situation can be worked backwards to track what information would be needed to, for instance, estimate the price, and what knowledge precedes the definition of this information, its sources, completeness, Such decision disassembly might help to explain better what exactly should be supported and how to do it best.

Knowledge → Data → Information: probably this path is possible only conditionally if we admit that having knowledge we know where to look for data to produce required information.

Information → Data → Knowledge: the ending phase of a decision where decision information is processed and discussed into a decision which might be in a form of data – a simple figure, a set of figures, text, choice, but it carries the load of preceding decision information, concepts and models, and its emergence leads to new knowledge added to existing body.

In all cases, the components of these sequences take some of the following forms:

1. Data:

- initial, "raw" unprocessed empiric data;
- data available from previous experiences;
- data as a decision result.

2. Information:

- readily available at the start of decision process;
- obtained from processed data or other information;
- available outside the organization.

3. Knowledge:

- possessed at the start of the decision process;
- "know-how" of adding decision value: converting raw data into information, or extracting final data from information;
- newly acquired in the decision making process.

These relations are important in a sense that the most valuable asset in decision making situation is knowledge, and any support for expanding the existing knowledge, regardless of the sequence, is adding value and quality to the decision making process.

Interview Results

The ten interviewed decision makers have been presented a set of open questions in a personal conversation. The central idea of the interview has been to clarify the issues of management decision support in the two dimensions of "how much coverage" (that is, how many decision support functions and activities use or benefit from IT), and "in what way" (the actual manner of use, as compared to the research forecasts). The questions have been organized into 7 groups covering the following topics:

1) attributes of actual good or well-prepared decision,
2) attributes of actual wrong decisions,
3) role of information sources for the above,
4) role of analytical tools for the above,
5) issues that stimulate creative thinking,
6) role of IT in decision making,
7) decision maker's idea of an ideal environment for decision making.

1. On the **attributes of actual good or well-prepared decision** the responses have been quite unanimous: the responders have more or less pointed to the same issues:

   1.1. Key factual information presented or available. This information has to possess the features attributed to user quality: timely and current, correct, complete, relevant, accurate, easy to use etc.

1.2. "Soft" information available and utilized for clear understanding of the present and future environment. Here the responses have not been as uniform as in the case of factual, or "hard" information. The most important points regarding "soft" information can be summarized:

- *Filtering* - the decision maker selects the most important and reliable information of this type;

- *Transformation* - the decision maker transforms soft information into hard data and rules by own judgment, or by the existing rules (e.g., laws and other legal acts which can govern translation of "soft" information into "hard" data);

- *Integration* – the decision maker compares one available information against other, looking for matching pieces, confirmations or denials;

- *Testing* – received "soft" information helps to challenge formal information or come back to the formal model with new assumptions;

- *Stimulation* – received "soft" information may stimulate creativity (if presented in a symbolic view).

1.3. Clear alternatives. The responses have been quite uniform that in cases with a well-defined set of alternatives the expectations of the good or right decisions are much higher, and apart from this, the decision making process itself takes much less time.

1.4. Existence and use of analogies. The majority of responses indicated that the availability of appropriate and well-understood analogies certainly helps to make good decision. One critical point has been expressed towards using the analogies: their use might limit creativity by fixing the attention on stereotypes.

1.5. Analytical tools with capabilities of different scenarios or "what-if" analysis. Here "analytical tools" have meant any formal methods, approaches, models and their software, if used, to be applied to solve a decision problem. Though the respondents had almost unanimously pointed out that analytical tools boost the decision quality if used in appropriate cases, the indicated modes of using analytical tools have been quite different.

The important points made here by the respondents have been:

- **Existence** of an analytical tool that is problem-specific or suitable for the required kind of problem; also its 'reputation', meaning that his tool has been used and accepted by solvers of similar problems;

- **Convenience** of use, when an analytical tool can be used without specific training or considerable consulting services;

- **Clear relations** between data describing the problem situation;

- **Ability to reduce information chaos** to a manageable set of key data or introduce required relations between data in problem environment.

1.6. Other attributes, specified separately and indicated by the responders as important. Here, the responses have been mixed, though a majority of respondents have indicated intuition and experience and key attributes to a good decision. Apart from these, the following attributes have been pointed out:

- time committed;

- good teamwork or availability of a support team;

- personal decision style;

- environment – constrained and hostile, or relaxed and friendly; though influence of this attribute has been stated as controversial – hostile environment has been regarded as having negative influence on decision quality in some cases, and positive – in other cases.

2. **Attributes of actual wrong decisions**. The need to admit, recall and characterize examples of wrong decisions has yielded quite diversified answers which have been not easy to divide into groups. Some of the better-articulated answers are:

- too much of self-confidence, which can be translated into conscious use of limited problem model;

- serious external factors omitted;

- low quality advice from outside advisers;

- wrong "soft" information which was supposed to be trusted;

- misformulated problem – a symptom mistaken for a problem;

- not using information, tacit and explicit, to make an informed decision.

The named factors of wrong decisions might be grouped into two general groups:

- Information factors – lack or misuse of important information about the problem situation;

- Political factors – override of formal reasoning by power. Here, it has to be noted that the political factors are assumed to be as well based on some specific information available to deciding authority, but most often unavailable to the participants involved in the formal reasoning.

3. **Role of information sources** for both right and wrong decisions has drawn quite uniform responses from the responders in stating that information sources, their variety, quality and ease of access is most important for producing quality decisions. Regarding the role of IT, the importance of internal and external IT-supported sources (own, public and commercial databases, Internet etc.) has been facilitated by improving user interfaces and convenient mechanisms for information search and querying. The important point here is that growth of information volumes available does not go in hand with the growth of quality sources, and it does not necessarily lead to the growth of the body of knowledge. Decisions also have been influenced by the mechanisms for information and knowledge sharing, and for capturing experiences.

4. **Role of analytical tools** (modeling software packages and functions) has been indicated as being minor to moderate. This attitude can be attributed to the following factors:

- problem-specific nature of the analytical tools; the author has published earlier (Skyrius, Winer 2000) the results from a survey on decision support tools and techniques, having taken place in Lithuania and the USA in 1997-1999. The results state that, among other things, it is not easy to apply same tools to different problems, which directly affects user training, and as well it is not easy to combine decision information from different sources into an integrated model;

- decision making style based on the use of decision information in its initial, unprocessed form; quite often for a decision-making entity the sheer availability of the relevant facts and figures having undergone simple, if none, processing and aggregation is considered sufficient.

The different responses pointing to the significant importance of analytical tools have been related to the situations where the use of analytical tools or other formal methods has been commonplace or required by existing legislation. Examples are public procurement tender evaluation, auction pricing. In such cases, analytical tools had to provide required quality for hard data.

It has also been noted that in the cases of political decisions, whether right or wrong, the quality of analytical work did not matter. The use of analytical tools has the potential to challenge the decision makers' assumptions and beliefs, and this might help as well as create controversy.

As the interviews had shown, one popular exception is use of spreadsheets as a universal analytical tool for a number of decision situations. The reasons of this are obvious: ease of use, minimal training, flexibility, freedom of experiment, to name a few.

Regarding the use of analytical tools, another controversy might be taking place. The seasoned managers believe they can succeed with their own experiences and intuitive approaches, and the current graduates are well familiar with quantative analysis, but are short on experience with real-life processes and operations.

5. **Factors stimulating creative thinking**. Although widely regarded as one of the key ingredients for making a right decision in an unstructured situation, creativity has been one of the most difficult things to talk about. The decision making cases involving creativity have been encountered by every respondent, but the very definition of creativity and factors that influence it has been rather vague. Generally, "creativity" has been regarded by most respondents as an approach which allows them to find alternatives or courses of action that are outside conventional reasoning for a certain situation. The responders also indicated that creativity has been most needed to generate more alternatives in the decision design stage of the decision making.

The factors that stimulate creativity in decision making, as indicated by the actual responses, can be grouped into three groups described below.

1. Independent view.

- Unbiased thinking – a situation concept or model without implicit limitations (for example, suppressing attitudes like "we don't do it this way here").

- "Bird's-eye view" – an ability to view the situation in a wider context than has been initially adopted.

- Facilitating "soft" or seemingly irrelevant information – information which can trigger a new idea or a fresh angle.

2. Decision manipulation tools and techniques

- Brainstorming – a session to generate ideas (usually within a group).

- Idea exchange and idea testing – group techniques to exchange ideas efficiently and to test them on the spot (technology permitting).

- Extra dimensions – introduction of additional factors, variables or considerations into the problem model; also easy switch between action courses in decision development.

- Information grouping and categorization – tools to manipulate data for the detection of issues that were unnoticed before.

3. Underlying environment

- Company culture – how well it supports generation and testing of new ideas.

- Unit integrity – teamwork strength in a group of people involved in problem solving.

- Growing sophistication of work styles – an individual's or group's ability to adopt new tools and techniques eventually becoming a natural part of the work environment, the result being more activity scope.

4. Other factors

- Time pressure which served as a controversial factor – for some situations, it has been attributed a creativity stimulating potential, while in other cases the time deficit has been indicated to suppress creativity.

- Idea generation support – use of tools to capture, store and manage ideas. Such tools, for instance, have been described in (Raghavan 1991) as models with flexible relationships between variables, or defined schemes to provoke thoughts and to group, prune or synthesize ideas. Angehrn (Angehrn 1993) had described an experimental conversational decision support technique, based on specific system modules – stimulus agents who interactively suggest, inform or criticize the decision maker.

Some authors (ex., Hamscher 1995) suggest use of qualitative reasoning for creativity stimulation in problems having less information than would be sufficient for traditional mathematical formulation, but admit at the same time that more research needs to be done to develop decision-making tools that utilize qualitative reasoning and can be used for analyzing large-scale (realistic) problems.

6. **Role of IT in decision making** has drawn different opinions – from "minor" to "vital". The majority of responders had agreed that this role very much depends upon the nature of the problem. Several responses indicated the importance of both the IT-supported information sources and analytical tools. Other responses worth noting here are:

   - IT helps reducing uncertainty;

   - IT can transform decision data volumes into manageable levels;

   - IT has a potential to boost confidence and insure from fatal decision mistakes;

   - the rigid structure of IS in operation is a counter-productive factor in providing decision support;

   - IT is vital, but can hurt even more than help.

7. The question on **the decision maker's idea of an ideal environment for decision making** has been expected to provide some insight on what is really needed for a decision-making environment. The respondents had pointed to a number of features, among whom the most common have been the following:

   - Key information sources are available and easy to use. The term 'key information' means information on: own activities, close environment, macro environment;

- Available analogies or access to knowledge on possible analogies;

- Tools to test and discuss ideas and decisions. One specific response had indicated a request for decision modeling 'undo' feature, allowing not only to reverse modeling actions in the experiment, but also to test and evaluate the reverse of the real-life decision, had it for some reasons proved erratic;

- Good support team;

- Stable legal framework;

- Technology always "up" and accessible.

Conclusions

The above interview's set of questions, though far from being complete in a sense of their conformance to some well-defined conceptual schema, has had as one of its main purposes to extract the decision makers' articulation of their attitudes towards decision requirements, role of various decision attributes, and the role of information technology in particular. The interview deliberately avoided explicit questions on the role and use of knowledge; however, the general impression from the interviews is that the use of information in the decision making process by decision makers is shaped by the multidimensional context of their professional and personal expertise and experience, practices, beliefs, political and social backgrounds – very much intersecting with what is regarded as knowledge. In other words, the decision maker has to develop sufficient **knowledge** on the situation to make a confident enough decision, and that eventually **knowledge**, not **information or data** alone, is used in decision making. This knowledge must possess completeness, as opposed to fragmented pieces gained in separated situations which might be having very little in common; completeness is also reflected in a decision process where the deciding entity performs an iterative buildup of decision support points towards a sufficient set to make a decision.

The role of IT, as presented in the responses, draws a slightly controversial impression at first sight – the confidence and expectations are high, and the actual usage at the same time is somewhat reserved. Eventually, the conclusion is that decision makers prefer simple and trusted tools and techniques to achieve more with less – the job of the technology is to provide guiding and informing points to stimulate the decision makers' concentration instead of interfering with it. IT is recognized to be helpful in basic tasks – organizing and managing data and information, querying databases, sharing and propagating information,

manipulating flexible models, presenting information in a convincing manner. Regarding the simple support tools and techniques, and decision makers' ideas on the ideal decision environment, a concept of "information control center" can be developed for a decision making environment, where the key information sources and most often used support tools are always up and accessible just by few mouse clicks.

The possibilities of IT in facilitating problem solving creativity are an important issue in itself; here the technology has some proven points – idea generation, exchange and testing mechanisms; growing sophistication of work styles; support of teamwork and communication. This issue is deserving special attention and is going to be a part of further research.

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Biography

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