USER PERSPECTIVE ON DECISION SUPPORT SYSTEMS FOR FARMS THE CASE OF AGRIWISE

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ABSTRACT

Many IT-based decision support systems (DSS) have difficulties in reaching high user numbers. One reason may be that the developers have a developer perspective instead of a user perspective. In this paper we base a discussion of IT-based DSS on users' experiences of a specific existing database, Agriwise. It is a database available on Internet for analysis and planning of farms. The results show that different user situations should be identified, and information generators developed for each. The generator should present relevant information sorted out from the database, such as reference material for efficiency analysis of a fattening pig batch. It could also be more advanced processing of the data, such as enterprise budgeting, investment calculation, farm organization planning, or feed planning. It is also important to present the differences between the forecasted operations and the current, because the current operation is the decision maker's reference point.

Keywords: Database; Decision support systems; Internet; Farm management.

INTRODUCTION

How should information from a database or another DSS be presented to the users to reach high user numbers? Which information is needed and in which form? To answer these questions we will review literature about how information is used in farmers decision making and discuss a few users' experiences from an existing database for farm planning developed and managed by Department of Economics, Swedish University of Agricultural Sciences. The database contains around 600 tables of data about prices, yields, technical coefficients, incomes and costs. It also contains enterprise budget applications that use these data. The aim is to provide data needed for analysis and planning of farm. These data are collected from other university departments and from the market. The database has previously been published as a book and the enterprise budgets as reports for more than 40 years. Now they are made accessible on the Internet. Its users are mainly advisors, consultants, teachers, administrators, analysts and researchers, but also farmers. The user can read the database via www, search for specific data and generate around 400 different enterprise budgets. The user can save the enterprise budgets in a file at the local PC for further calculations in a spreadsheet program such as Excel. An application for farm organization planning has just been developed and is going to be launched in June. It is based on the enterprise budgets and a calculation of fixed costs. The user pays a yearly fee for getting access to the database and enterprise budgets, which currently finance around 50 % of the costs. The staff consists of 2.5 persons.

LITERATURE REVIEW

Orasanu and Connolly (1993) claim that most research on decision making has focused on the decision event, not the process. Johnson (1987) argues that the concept of expected utility has been emphasized to the neglect of other aspects of optimization, such as problem definition, learning, analysis, other decision making rules, etc. (In this context, the concept of problem includes opportunities.) While the decision event is critical to good decisions, it is limited in scope. The full decision model also includes: assessment of the situation, context and nature of the problem; sequential evaluation of single options rather than a range of options; evaluation done through mental simulation of outcomes; and options accepted if they are found satisfactory rather than optimal (Orasanu and Connolly). Dynamic, real-time decision making is more accurately described as "a matter of directing and maintaining the continuous flow of behavior toward some set of goals rather than as a set of discrete episodes involving choice dilemmas" (Brehmer, 1990, p. 26).

Farmers' decision making is mostly viewed as a series of linear steps. Johnson et al (1961) identify six steps of decision making: problem definition, observation, analysis, decision, action and responsibility bearing. A standard section in most farm management texts is a list of five to eight decision making steps (Bradford and Johnson, 1953; Castle et al., 1972; Boehlje and Eidman, 1984, Castle et al., 1987; Kay and Edwards, 1994. The decision making process has been studied in more detail in a Swedish research program (Öhlmér, Brehmer and Olson, 1997; Öhlmér, Olson, and Brehmer, 1998; Öhlmér 1998). They identified four separate functions (but not steps) of decision making (table 1):

- problem detection, resulting in detection of a problem or not;
- problem definition, resulting in choice of options for further development;
- analysis and choice, resulting in choice of one or more options;
- implementation, resulting in output consequences and responsibility bearing.

Each function consists of four subprocesses:

- searching information and paying attention to relevant information;
- planning, which was included only in the phase of analysis and choice of option, and forecasting consequences of the new information;
- evaluating consequences and choosing alternative;
- bearing responsibility of the choice.

At this level of detail we can see that search for and paying attention to information is included as a subprocess in all the functions. The information is used for estimating consequences and evaluating them. In problem detection, consequences of differences between expected and observed information are forecasted. In the other functions, consequences refer to broad consequences of option ideas, more detailed consequences of an option, and consequences of differences in planned and forecasted outcomes, respectively. The farmers needed different information in the different functions of the decision making process.

TABLE 1. Conceptual model of the decision making process (Öhlmér et al., 1998)

Function	Subprocess			
	Searching & paying attention	**Planning & forecasting**	**Evaluating & choosing**	**Bearing responsibility**
Problem detection	Information scanning; paying attention	Forecasting consequences	Consequence evaluation; problem?	Checking the choice
Problem definition	Information search; finding options	Forecasting consequences	Consequence evaluation; choice of option to study	Checking the choice
Analysis & choice	Information search	Planning & forecasting consequences	Consequence evaluation; choice of option	Checking the choice
Implementation or action	Information search; Clues to outcomes	Forecasting outcomes and consequences	Consequence evaluation; choice of corrective action(s)	Bearing responsibility for final outcome; feed forward information

USER EXPERIENCES OF AGRIWISE

The users

So far, we have collected the experiences of five users: one investigator who is estimating compensation to farmers for land used for roads, one high school teacher, and three consultants (or advisors). They are all rather experienced Internet users using Internet several times per day and email from once per week to several times per week. Their use frequency is increasing. The users have no experiences of the application for farm organization planning because it has not been available for them yet.

Information need and supply

The users' information need and supply is examined in relation to two hypothetical situations:
1. Increasing effectivity by an organizational change, e.g. conversion to organic production;
2. Increasing efficiency by investing in new technology, e.g. new feeding equipment.

The users suggested that the problem motivating the organizational change could be low profits or a possibility to improve profit. The information needed for detecting the problem would be a combination of accounting reports and various market signals. The farmer's expressed interest would affect the choice of option for further studies.

The problem motivating the technological change could be the same but based on other information sources such as neighbors, colleagues, journal articles or farming fairs.

To analyze both types of actions, information would be needed about production technology, incomes and costs, prices and financing. In the organizational change situation, information on market and risk was more pronounced than in the other situation. In both situations, the

information sources with highest priority were experts (or advisors) and colleagues. The ranking of the information sources after that differed between the situations. At organizational change, the next source was journal articles and then Agriwise. At technological change, the next source was Agriwise and then journal articles and technology deliverers.

In estimating consequences of the actions, it would be less calculation in the organizational change situation than in technological. In the first situation it would be just a rough estimation of incomes and costs, and in the second from the same rough estimation to a calculation of incomes and costs to further calculations about the working environment and similar. In both situations, the actions were judged by comparing the estimated consequences to the achievements at the current organization and technology.

The Agriwise users had met this type of organizational change in their work. Other types of organizational changes met by them were transfer of the farm to the next generation, and buying more land. The most important type of information in all these situations was enterprise budgets.

Experiences of the current Agriwise

As mentioned, Agriwise consists of both data in a database and information in the form of enterprise budgets based on the database. The users said it was technical and logical simple to use both the database and the enterprise budgets. It was a little easier both technically and logically to use the enterprise budgets. They regarded both the database and the enterprise budgets to be very useful, and that the enterprise budgets were the most useful. They said that using Agriwise was worth the cost for it. Some said that there was competing information and other that there was not. Competing information could be provided through journals and personal contacts. Answering a question about hindrances for using Agriwise, the users listed: too old data, irrelevant data, and technical difficulties.

DISCUSSION AND CONCLUSIONS

The user experiences are collected from only five users, so the conclusions can only be in the form of hypotheses for further testing.

Too old data and information.

The users indicated that the data and information should not be too old. However, each updating of data costs a lot, so the frequency of updating should be exactly what is needed, neither less nor more. Data used for analysis of problems within the year may need to be updated several times per year, but in long run decision making it may be enough with data describing the development over years, so such data could be updated just once a year.

Relevant data and information.

In a perfect world, researchers could foresee future information need and have relevant information available when needed. The world is not perfect so we need a system to catch the users' signals about information that is needed but not found. Such a system means a channel from the users to the university that could affect the research.

Another aspect is that the data and information should be valid for the specific farm to be relevant, which means that they should be as local as possible, such as adapted to local conditions in the form of soil type, climate, etc.

Which form of data and information?

The users regard the enterprise budgets as easier to use technically and logically than the database. It is easy to use one of the database tables, but the data is fragmentary meaning that you have to use many data tables to get the same information as from an enterprise budget. It is easier if all information needed in a specific situation is presented in one report. So, user situations should be identified, and information generators developed for each situation. The user should be offered a menu of user situations. The generator should produce a presentation of relevant information sorted out from the database, such as reference material for efficiency analysis of a fattening pig batch. It could also be more advanced processing of the database information, such as enterprise budgeting, investment calculation, farm organization planning or feed planning.

Which concepts for presenting data and information?

Given the limited processing ability of the human being, it is natural to define a reference (or anchoring) point and think in terms of differences from this reference point (Hogarth, 1987; Orasanu and Conolly, 1993). When analyzing a farm, the current conditions, organization, and achievements are the reference points. The Agriwise users evaluated the change actions in terms of comparing the forecasted consequences to the current achievements. So, such differences should be presented to the users, preferably in terms of fulfillment of relevant goals.

Taking enterprise budgets as an example, they should be calculated for both the current situation and the situation after the change action, which can be done with the existing application. Then these two situations should be compared and the differences presented, which could be done with a new application. A synthesis at this level is especially important if the advisor/consultant using Agriwise should present the information for an intuitive decision maker (Öhlmér, 2001)
The application for farm organization planning is producing the planned farm results in the form of a profit and loss statement and a balance sheet, which can be compared to corresponding information from the current business.

Conclusions

The discussion could be summarized in the following hypotheses:

- The frequency of updating the database should be exactly what is needed, neither less nor more;
- A system to catch user signals on lacking data and information should be included;
- The data should be as specific as possible, i.e., valid for a specific farm if possible.
- The most common user situations should be identified and information generators developed for each;
- Information about change actions should be presented as differences from current operations and achievements.

This type of investigation is part of the Total Quality Management of Agriwise to be a basis for the continual improvements of the services.

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