

Decision Support Systems in Small Businesses

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INTRODUCTION

Decision support systems (DSSs) are widely used in many organisations (Arslan et al., 2004; Belecheanu et al., 2003; Dey, 2001; Gopalakrishnan et al., 2004; Lau et al., 2001; Puente et al., 2002). However, there is a common tendency to apply experience and techniques gained from large organisations directly to small businesses, without recognising the different decision support needs of the small business. This article aims to address the issues related to the development and the implementation of DSSs in small business firms. Our arguments are based on evidence drawn from a large body of DSS literature and an empirical study conducted by the authors in the UK manufacturing sector.

BACKGROUND

Early DSS were developed in parallel with management information system (MIS) in the 1970s. MIS is developed to primarily generate management information from operational systems, whilst DSS as defined by Gorry and Scott Morton (1971) is information systems that focus on supporting people in the unstructured and semi-structured decision-making process. A typical DSS consists of four main components: the database, the model base, the user interface and the users. Central to the DSS are the models and analytical tools that assist managers in decision making and problem solving. Concomitant with advances in the technology of computing, most DSS provide easy access to data and flexible control models with a friendly user interface design; some DSS also incorporate a variety of analytical tools and report/graphic generators. The main purpose of DSS is not to replace managers' ability to make decisions, but to improve the effectiveness of managers' decision making.

DSS in practice can hardly be separated from other types of computer-based systems, as it is often integrated with those systems, for example operational databases, spreadsheets, report generators, and executive support systems. Thus the boundary of DSS has now been ex-

tended, and DSS broadly refers to any computer-based information system that affects or potentially affects how managers make decisions. This includes data and model oriented systems, reporting systems, executive support systems, expert systems and group decision support systems.

The success and continued growth of small and medium sized enterprises (SMEs) are critically important to local and national prosperity, but their problems are not always accorded the same importance as those of larger organisations. Compared to the research devoted to large organisations on the use of information systems, SMEs have attracted much less attention. It is also the case that the problems inherent in providing support for small business management are more commonly studied from a social or economic viewpoint. Very few studies indeed have addressed decision support needs in the context of the use of information technology.

Managers of small businesses have often been disappointed with software packages because of the inability of these to adapt well to their needs (Heikkila et al., 1991). There are dangers in seeing small businesses as miniature versions of large businesses; many problems differ, and even similar problems require different solutions. Small enterprises normally have limited resources and less skilled managerial staff. They have higher failure risks and commonly do not have suitable access to the information they need.

DSS IMPLEMENTATIONS

Small business may represent a productive domain for attempts to introduce greater levels of computer-based decision support. Ray (1994) suggests that small business managers and their staff have positive attitudes towards the use of computers in business. Cragg and King (1993) report that many companies have plans to increase their use of computer applications, and found that the wish for better information was the motivating force in all case studies conducted. In the majority of the firms studied by Khan and Khan (1992), managers believed that

a computerised system improved their performance in selected areas, but that there is still room for significant further development.

Gordon and Key (1987) point out that if small business managers' problem-solving skills are deficient in any of the critical areas of management decision-making, then they must improve those skills through the use of appropriate educational programmes, consultants, decision support tools, or some combination of these. Unfortunately, the owner-manager (because of involvement in the day-to-day operation of the firm) has not the time, resource or expertise needed to evolve an appropriately analytical approach (Raymond et al., 1989, cited in Naylor & Williams, 1994). There would seem to be as strong a case for the potential benefits of DSS to the smaller business as for its larger counterpart, provided suitable software is available, and it is effectively used by the managers concerned.

Limited research has investigated the success factors for the use of information technology (including DSS) in small businesses (Delone, 1988; Lai, 1994; Raymond & Bergeron, 1992) and the design and development of specific DSSs for SMEs (Chaudhry et al., 1996; Houben et al., 1999). Some work has been done specifically to identify those areas that have not been adapted to DSS, but show potential for its introduction for the small business (Duan et al., 2002). Most research (Levy, 1999) indicates that computer use is still confined to operational activities, although a few studies (Naylor & Williams, 1994) found that some SMEs have realised the value of their information systems as decision support tools and had begun to use them for more complex activities. Other researchers suggest that there are many areas in which DSS can be better developed and utilised to help managers in critical decision-making processes, such as marketing, sales promotion, cash-flow management and customer services. It has been argued that small businesses can improve their organisational performance and increase their competitiveness with appropriate information systems (Levy et al., 1999). The increasing emphasis on competitiveness in small business has led to a new focus on the competitive advantage promised by appropriate use of information technology (Levy et al., 1999; Lin et al., 1993).

A study conducted within the UK manufacturing SMEs by Duan et al. (2002) shows that the extent of DSS use is generally limited and the use of DSS varies considerably among the firms surveyed. However, even where there was a reported low level of DSS use, managers' satisfaction was relatively high. The applications with which managers were most satisfied were: cash management, budget preparation and materials requirements planning. Despite the relatively low usage of DSS generally, the majority of SME managers indicated that they use computers personally to aid business decisions; this

suggests that there is, at least, widespread use of desktop computing in managers' offices.

Regarding the inhibitors to the greater use of DSS, lack of staff time to analyse needs and identify solutions is the most significant factor identified. Lack of finance for systems purchase or development, lack of experience of systems development, lack of information on available DSS packages, and unavailability of appropriate software were other factors commonly cited (Duan et al., 2002).

DSS DEVELOPMENT METHODS

DSS for small businesses can be developed and implemented in different ways. Four routes were identified, such as:

- Off-the-peg - purchase of a commercially developed package;
- Bespoke - designed by a software house for the specific application;
- In-house - developed by the firm's own specialist staff;
- User - developed by managers as users.

Research (Duan et al., 2002) shows that the majority of DSS were purchased as commercially developed packages; other systems were developed by managers as users, developed by in-house specialists or developed as bespoke systems by software houses. In view of the normally limited resource base for IT development (Heikkila et al., 1991), it is not surprising that most small firms choose to purchase commercially developed, ready-to-use DSS software. By breaking down the development methods into three decision-making levels, it shows that commercial packages are more commonly used at the operational level (60%) than at the strategic level. In contrast, user-developed DSS are more commonly used at the strategic level than at the operational level.

Research on *in-house* and *user* development methods in small firms is scarce. The evidence from the Duan et al. (2002) survey suggests that small business managers are capable of developing their own DSS, and that a certain proportion do so. Research in Canada by Raymond and Bergeron (1992) found that user-developed DSS in small businesses are more successful than any developed by other means. A study by Lai (1994) in the USA, however, revealed no link between the method of system development and DSS success.

By far the most commonly used DSS in small manufacturing firms are commercial packages purchased off the shelf for operational decision making. The readiness of small business managers to purchase commercial pack-

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