Information Technology and Decision Support in Small and Medium Companies in Lithuania

Rimvydas Skyrius

Associate Professor, Ph.D.
Department of Economic Informatics
University of Vilnius
Sauletekio al. 9, 2040 Vilnius
Ph.: (370–2) 36 61 39
Fax: (370–2) 36 61 27

Under the conditions of transition economy a lot of newly emerged businesspersons and businesses, small and medium companies in particular, keep encountering various activity problems and problem situations up to the matter of their survival. These situations are influenced by various internal and external factors. Under such conditions, the management of activities requires substantial flexibility and agility. For these purposes, numerous management resources and methods are put into use, information technology (IT) being one of the most widespread and important.

The aim of this article is to examine the results of a survey conducted in small and medium companies and organizations in Lithuania and USA, allowing a closer look into the problems of IT use, with special attention given to supporting decisions in problem situations and unstructured conditions. This examination facilitates definition of influences on the use of decision support technologies in management activities of small and medium companies. The article covers various aspects of IT use – applications in use, critical activities and problems, sources of decision information, processing modes, convenience of decision support software. The article is concluded by the possible research directions in this area.

Introduction

Currently the Republic of Lithuania is experiencing a period of transition to a market economy. In the course of this process, large numbers of freshly-emerged entrepreneurs and businesses encounter all sorts of management challenges, from everyday sales to sheer survival of their businesses. With some variations in the degree of reform development, this situation might be considered similar if not typical for all Central and Eastern European countries.

The role of small and medium businesses, or, as they are more often called, small and medium enterprises (SME) in this fundamental economic and social restructuring is widely and explicitly recognized. However, to boost momentum in SME contribution to the development of transition economies it is necessary, as a recent study (Smallbone 1997) puts it, "to take steps to improve small business

survival rates and also to increase the growth performance of those firms that are able to survive" The survival rates of new businesses are low even in developed Western economies, and much lower in Central and Eastern Europe: in Estonia and Lithuania only 25 percent of firms on the Business Register in 1991–1992 were still in business in 1995 (Smallbone 1997).

As the absolute majority of SMEs in Lithuania are established after the political changes in the region took place, they are fresh and inexperienced businesses acting in a hostile external environment. Among the hostile external factors affecting the survival of SMEs some of the more important are presented below:

- Young firm age (and low maturity)
- Hostile market environment
- Unfavourable macroeconomic conditions
- Complicated legal environment
- Lack of financing supply
- Lack of management and professional skills in the labour market
- Poor business support services
- Tax policies
- Low purchasing power

Coupled with internal problems, such as lack of business focus, immature strategies, inadequate management and professional skills, scattered resources over critical and second-rate activities etc., such a set of hostile factors presents quite a challenge to the management of SMEs. Small businesses aiming at survival and development have to have rather flexible strategies and management styles to cope with this challenge. Under these circumstances, assorted management resources and competitive techniques are put into use, information technology being one of the most prominent and widespread of them.

1. Information technology and management information needs

Since the spreading availability of personal computers (PC) in Lithuania, which started in the second half of the eighties and coincided with arrival of first elements of market relations, more and more small businesses have computerised their activities in one or other way. As of now, virtually every company, regardless of its size, is using computers and information technology (IT) for core and/or support activities. Having started from clerical applications (mostly word processing) or immature business applications (accounting systems, order entry and tracking), companies gradually adopted newer, more sophisticated technologies. This process has been accelerated by the falling prices and unlimited access to hardware and software in the open markets, as well as by willingness of business community to stay in line with up-to-date business technologies.

The benefits (or, rather, estimation thereof) of using IT in business still remain a subject for discussion in IS research community worldwide. However, the implicit benefits are more or less well agreed-upon: improved bottom-line activities, integration of data flows and procedures, improved planning and coordination, reduced transaction processing times, etc. Still, did the computer become the management support (including decision building and achieving) tool that it was

supposed to be? The technology development trends seem to have created serious foundations for this role, going all the way from user-unfriendly and remote mainframe batch-processing technologies to the desktop proliferation and ubiquitous connectivity of today. Our question would be about how important the information technology has become for the small and medium business management activities, regarding in the first place decision support.

In the numerous definitions of management information systems, decision support systems and other kinds of information systems for management uses, one thing is common: their primary role is to satisfy assorted management information needs and, as an enabling technology, to extend intellectual and entrepreneurial capabilities of the individual and corporate users.

The information needs for all levels of management can roughly be divided into:

- simple needs for situations with little uncertainty;
- sophisticated needs for less structured situations.

Simple needs usually refer to structured and repetitive activities, and regarding the use of IT have to be covered by transaction processing systems (TPS), management information systems (MIS), or both kinds of systems. Typical examples of simple needs (and corresponding IS functions):

- levels of inventory on hand;
- schedule of orders to be delivered to the customers;
- this week's or month's income, etc.

Sophisticated needs arise in less structured, usually non-repetitive (though exceptions may happen in turbulent and dynamic environments) activities. The regular, bottom-line TPS and MIS applications put more emphasis on routine operations and have a limited response potential to satisfy this kind of information needs. Special kinds of information systems – decision support systems (DSS), management support systems (MSS), executive support systems (ESS) and others have been developed to respond to ill-structured problems and sophisticated information needs. Examples of situations with information needs that could be regarded as sophisticated:

- setting the best price for a new product or service;
- discovering a new market segment;
- setting up a plan to deal with upcoming problems, etc.

This division of information needs into simple and sophisticated is not necessarily always evident in real activities. Rather, in a generic managerial mindset we will find a variety of diverse information needs, where sophisticated (or some kinds of) information is complemented by simpler kinds, striving for a more or less complete picture of the business unit, its activities and environment. This picture does not stay stable over time, so the manager or the organization is constantly involved in a cognitive process.

The difference between various information needs is more expressed in the ability of IS and IT to support these needs by different architectures and sets of tools. As mentioned before, simple needs are addressed by

traditional applications with emphasis on transaction processing, simple monitoring and reporting functions, whereas sophisticated needs arise from specific situations and decisions to solve them, and are addressed with different, accordingly more sophisticated and assorted tools and techniques. Existing research on the use of decision support techniques in small businesses and organizations shows that readiness of an organization to use methods based on IT and management science/operations research (Alpar, Reeves 1990) depends upon such factors as the number of functional areas covered by IT applications, software development sources, organization age, years of IT use, and IT expenses. Another study (Cragg, Zinatelli 1995) has looked into factors that inhibit IT and IS evolution in small firms and found among the most important the lack of internal expertise, high cost of external sources of support, inadequate attention of top management to IT issues.

2. Decision support as a vital component of management support

The nature of decision support by IT means and methods is by now quite well researched; on the other hand, this field is subject to changes as well, and various authors have discussed the changes. Thus, in decision support field several diverging directions may be noted; namely, group activity support, intelligent decision support, spreadsheet modeling, knowledge discovery in databases and others (Sprague, Watson 1996; Angehrn 1993; Adriaans, Zantinge 1996) These directions, varying in their approaches and

tools they apply, do conform to the generic definitions of DSS (Sprague 1980; Eom, Lee 1990) as
- computer-based systems,
- that help decision makers,
- confront ill-structured problems,
- through direct interaction with,
- data and analysis models.

There is not so much research done in Lithuania on computerized decision support in business management (Brazaitis 1996; Simanauskas, Skyrius 1996), so an empirical study would provide insights at the existing usage and demand for decision support principles and methods, also at the possible directions for developments in this area. The aim of this work is to use the empirical data gathered in a survey among enterprises and organizations in Lithuania over the years 1997–1999, and to attempt to define factors that influence the use of decision support technologies.

3. Method and its goals

The survey was conducted among the community of IT personnel in small and medium enterprises and organizations in Lithuania and is based on responses to a questionnaire from 41 company and organization, both private and public. The term "Small and medium enterprises" was applied according to the definition in the Lithuanian business laws , which sets the size of a small organization as up to 50 employees, though there is no definition of a medium organization. Prior to the survey in Lithuania, similar questionnaire has been

presented in the fall of 1995 to a number of small and medium businesses in the vicinity of Chicago, USA. Due to the small number of responses (ten), the statistic significance of the results of this survey is rather low. Nevertheless, some comparisons and conclusions can be made, especially considering the spoken responses in interviews which reflected the managers' personal opinions on IT tools and techniques regarding decision support.

The survey concentrated on few key areas. First, the type and size of organization was defined by pointing out activities, number of employees, years in operation. Second area has been the general state of IT in the organization, including technical systems in use, number of workstations, LANs, external connections and information sources, principal applications and systems, IS development and management policies. Third area has been assigned to problems and situations with more sophisticated information needs and potential for decision support, including vital or critical applications, problem areas with specific decisions, information sources, processing modes, decision techniques and methods. Finally, the fourth area dealt with the respondents' personal attitudes towards IT tools and techniques for decision support, including level of involvement, ease of use and flexibility (for software tools), ending with personal opinion on their usefulness.

4. Obtained results

The surveyed organizations perform various activities, and their distribution by activities is presented in table 1.

Table 1. *Distribution of surveyed organizations by activities*

Type	Number
Production	4
Wholesale/retail	9
Banking and finance	5
Transportation	3
Services	14
Construction	1
Government agency	5
Total:	**41**

The most numerous groups are services (insurance, IT, advertising agencies etc.) and wholesale and retail trade. Both types of activities require agility and flexibility due to the dynamic environments and needs to respond, and undere these conditions the number of unstructured management decisions increases.

The distribution of organizations by their size and years in business is presented in the tables 2 and 3.

Table 2. *Distribution of organizations by their size*

No. of employees	No. of cases
1–20	14
21–40	8
41–60	7
61–80	–
81–100	4
Over 100	8

Table 3. *Distribution of organizations by years in business*

Years in business	No. of cases
1–2	7
3–4	11
5–6	13
7–8	2
9–10	1
Over 10	7

Regarding the number of employees, the overall picture among surveyed organizations is somewhat distorted due to the presence of state (government) organizations, where the number of employees is normally over 100. In small and medium businesses the number of employees falls mostly between 20–100, with the mean being 61.9. For this size of organizations we can expect simple structures and fewer layers of management, which leads to more centralized and less complicated decision making process. Decision making is very much a cognitive process in the head of the leader (Borch, Hartvigsen 1991).

Similar comments can be given to the data on organization age. State and government organizations have existed way before economy reforms and fall into the group of organizations having the age of 10 years and over. The business companies predominantly have the age of 3–6 years, the mean being 4.51. This age distribution suggests modest experience in their activities, usually loose corporate culture due to lack of tradition, absence of long term ties – in other words, less corporate knowledge and management know-how, and these circumstances put additional strain to decision making.

Among hardware platforms, as expected, the dominating share goes to IBM PC-type of computers, with several separate cases of usage of Apple Mackintoshes, Unix workstations, other platforms (IBM AS/400) or some combinations of the above cases (table 4).

Table 4. *Distribution of hardware platforms among surveyed organizations*

IT platform	No. of cases
IBM PC	31
Apple Mackintosh	2
Unix	3
Other	2
Mixed	9

The number of installed workstations varies between 2 and 221, and itself as such is not much indicative, although its relation to the organization size (number of employe es), expressed as number of workstations per employee, is more indicative regarding the penetration of IT. This relation varies between 0.04 and 1.13, with the mean equal to 0.47.

Absolute majority of respondents (36 out of 41, or 88%) have installed LANs to facilitate communications and resource sharing. As well, a majority of respondents (33 out of 41, or 80%) use external technology resources (remote computers, directories, databases).

Table 5 shows the use of installed applications, rated by their occurrence. As it may be expected, the applications that support everyday operations and activities and belong to operational and tactical level are the most widespread: financial accounting, order entry and tracking, personnel information, sales management, inventory. Applications that support organization strategy and other higher management issues – strategic planning, marketing, pricing, activity planning, management accounting – have about 2–3 times lesser occurrence, and this relation can be indicative towards IS development priorities

aimed at the quick-effect operations support. The survey did not contain any questions on IS development and implementation schedules, but an assumption was made that in most cases, applications of operations and tactical levels are developed and implemented in the first place, creating an IS foundation on which subsequent developments are based. The interviews supported this assumption.

Table 5. *Distribution of installed applications*

Application	*Occurrence*	*Occurrence as critical*
Financial accounting	36	19
Personnel	26	4
Order entry	21	5
Order tracking	21	6
Sales management	18	7
Inventory	17	6
Management accounting	14	3
Activity planning	12	4
Pricing	12	3
Marketing	11	5
Strategic planning	8	4
Other (graphic design, electronic data interchange, invoicing, assignment tracking etc.)	14	17

Column 3 of the table 5 contains distribution of the applications that are considered critical by the respondents. Obviously, the term "critical" was understood by the respondents as pertaining both to operations and strategic functions. Though no further inquiries on critical applications were made, the structure of this distribution suggests a rather high level of dependence of activities upon IT functions.

The data on resources for development of current and planned applications are presented in the table 6.

Table 6. *Distribution of resources for IS development*

Development resources	*Current applications*	*Planned applications*
Own development team	7	12
Outside development (consultants)	4	4
Ready-made software packages	7	5
Mixed	20	19
Did not specify	1	1

The dominance of mixed development is obvious as the development process stretches over time and assorted applications. The total reliance on outside developers is not too popular, as well as the installation of universal off-the-shelf packages.

The management of IT issues is performed by some kind of administrative body in charge of IT (e.g., IT group), with the exception of several cases where no managing body had been reported. The data on IS management types are presented in the table 7.

Table 7. *Distribution of IT management types*

IT management type	No. of cases
IT group	16
IT manager (person)	9
Outsourced (performed by external agency)	9
Information center	4
None	4

Respondents were also asked to indicate problem areas in their activities requiring special decisions and decision techniques, including IT tools and techniques. The results are presented in the table 8. It must be noted that this list includes a wider set of problem areas than just the areas covered by IT applications.

Table 8. *Distribution of indicated problem areas*

Problem area	No. of cases
Activity planning	21
Budgeting	16
New technologies	16
New products and services	15
Sales discounts	13
Marketing strategy	12
Supply management	10
Pricing	9
Other	5

Among the problem areas stated as "other", the cases were: financial accounting, logistics routing, transportation mode/carrier selection, personnel training and expertise, and legal act preparation.

To our opinion, interesting results could be produced by detailed comparison of the lists of critical applications and problem areas. This comparison could give us the idea about which activities, being relatively more important and at the same time problematic, could allow the application of advanced decision techniques, including IT tools, to yield more substantial results. The presence of the activities in both lists is presented in the table 9 below, and rated by the number of cases of occurring together in a single questionnaire.

Table 9. *Comparison of critical applications and problem areas*

Activity	Number of cases in :		Number of cases of mentioning together in a single questionnaire
	Critical applications	Problem areas	
Inventory	6	10	3
Pricing	3	9	2
Activity planning	4	21	2
Sales management	7	13	2
Marketing	5	12	2
Financial acccounting	19	1	–
Personnel	4	1	–

This comparison is still quite superficial and might partially be biased by different attitudes of the respondents to the meanings of "critical application" and "problem area". As well, a few assumptions were made while processing the data for table 10 – it was assumed that the following pairs of activity names can be treated as roughly meaning the same:

- inventory/supplies;
- activity management/activity planning;
- marketing/marketing strategy;
- sales management/sales discounts;
- personnel management/personnel training and expertise.

Various information sources are used in developing decisions for encountered problems (table 10).

Table 10. *Usage of information sources for decision development*

Information sources	Number of cases	
	In the USA (out of 10)	In Lithuania (out of 41)
Own resources	9	28
Personal contacts	4	27
External computerized sources	1	18
Mass media	1	17
Consultants	5	13
Other	1	6

The "other" sources are attributed to:

- in the American case – professional associations,
- in the Lithuanian case – parent organizations (2 cases), partners, legal documents, experienced specialists in the field, and own employees.

Typically, own information inside organization or inside decision maker's activity range prevails, together with information obtained through personal contacts; the former – due to its familiarity and reliability, the latter – due to the content factor described in various sources as "richness" (Saunders and Jones 1990, Browne 1993). Not much reliance is assigned to such professional market resources as consultants – just 13 cases out of 41, especially when compared to the results of the same survey in USA, where a half of the respondents indicated use of consultants as a decision information source. Though the use of external information resources available through IT, such as public and commercial databases, is not too intensive, the spreading influence of Internet and the presence of professional information sources through the Web format should increase the intensity of use of computerized external information sources.

Respondents were asked to indicate what processing modes they apply to the source information for decision development. The results are given in the table 11.

Table 11. *Use of procesing modes for decision information*

Processing mode	No. of cases
Browsing	• 34
"What–if" analysis	25
Sorting and grouping	20
Graphing	14
Pattern tracking	10
Mathematical analysis	7

Table 12. *Use of decision approaches*

Decision approaches	No. of cases
Heuristic	22
Formal	7
Both	12

Two types of decision approaches – heuristic and formal – were identified. Responses on their use are provided in the table 12.

The inclusion of formal methods into decision development is not too widespread, as shown by table 13.

Table 13. *Use of formal methods*

Method	No. of cases
Spreadsheets	26
Statistics	13
Forecasting	10
Linear methods	4
Decision trees	3
Other	1

Table 14. *Preparation of decision information*

Information prepared by:	No. of cases
Decision maker	7
Assistant	3
Both	30
Did not specify	1

Under "other" methods one respondent has indicated creation and maintenance of a specific manager's database.

It should be admitted that some inconsistency of the data in table 13 exists if we consider that some (or, more precisely, all named) formal methods can be performed with the help of spreadsheet functions. This inconsistency can be attributed to the fact that the use of spreadsheets is far more popular for other uses (eg., financial planning), than just implementation of formal methods. For the same reasons there is an inconsistency between tables 11 and 13. Responses of table 11 show just 7 cases of mathematical analysis, and at the same time table 13 shows almost 30 cases of using mathematic methods (statistics, forecasting, linear methods). This inconsistency can again be attributed to different meanings assigned to the terms "mathematic analysis" or "mathematic metods" – some respondents apparently treated them in a more narrow way than others.

The information for decision making can be prepared by the decision maker him/herself, an assistant coping with information collection and processing, or by both ways, as shown in the table 14.

It is evident that the mix of both cases prevails. The reasons for this might be in the first place lack of decision maker's time and relatively low IT expertise to deal correctly with decision information processing. Low reliance on assistants alone might be introduced, as some interviews have shown, by the decision maker's need to supervise the development of decision information. If we add here the variety of information sources and the often iteractive nature of decision process, that would explain the prevalence of the cases of mixed efforts of both the decision maker and the assistant.

The questions on the ease of use of software tools for decision support provided several insights into how easily users interact with these tools (table 15).

Table 15. *Ease of use and flexibility of software tools for decision making*

Feature	Number of responses		
	Yes	*No*	*Don't know*
Easy to convey information for processing	29	6	6
Easy to activate	28	9	4
Friendly and consistent interface	28	5	8
Easy to tailor results to the required format	25	9	7
Ability to combine information from different sources	24	7	10
Ability to apply different tools on the same problem	24	7	10
Ability to apply same tools to the different problems	19	12	10

The results indicate that, clearly, the attitudes of the users of decision support software towards its ease of use are much more positive than not. It is obvious if we take into account that the most popular software tools for decision making are spreadsheets with their universal tools and generic functions. Spreadsheet experience is usually one of the first experiences in the assorted courses of IT training for business students or professionals. These results also imply that software tools to users are problem-specific, as is shown by the data in the last line of the table 15 "Ability to apply same tools to the different problems" – ease of use of this feature raised the most pessimistic responses.

The concluding question of the questionnaire on the general usefulness of IT-based tools and techniques in business decision making has drawn responses reflected in the table 16.

Table 16. *Opinions on general usefulness of IT-based tools and techniques in business decision making*

Opinion	No. of cases
Highly useful	16
Useful in many cases	22
Useful in a few cases	2
Not useful at all	–
No opinion	
Confusing	1

These responses support the overall positive attitude towards use of IT tools in business decision making and could serve as an encouragement for IT professionals to direct their efforts to further development of practices and methods to support business decisions and creative business thinking.

5. Discussion and conclusions

Despite some mixed responses towards actual use, IT tools have become practically an

everyplace necessity to conduct business activities, just like fax machines or meeting rooms. The reliance upon IT and users' confidence in its performance have been proved by numerous studies, and results obtained by this survey add evidence to it. Though this confidence relates more to base-level activities, the intent to use IT tools and techniques to satisfy more sophisticated information needs is evident as well. It is easy for the users to define problem areas and specific decisions, and the next step is to address certain problems with appropriate set or sequence of tools. In developing a decision, users often perfom iterative buildup of decision support points towards a sufficient set to make a decision. Assorted IT tools and techniques provide aid to produce these points, at the same time enhancing decision maker's creativity and problem solving skills by providing more complete insight into the problem and its environment. As the face-to-face interviews have shown both in USA and Lithuania, all important decisions involve combination of heuristic ("gut feeling") and formal approaches to decision making. Apart from providing support to formal decision aspects, IT tools and techniques have a potential to support heuristic approaches as well.

The survey has also shown that in an environment of installed base-level IS it is easier to use IT decision support tools for a number of reasons mostly regarding users' acceptance of IT as a commonplace business technology. An important feature of IT functionality is the access to multiple information sources which, when coupled to analytical tools, support the development of knowledge about the organization, its environment and evolution. Though some parts of this knowledge are kept inside the information system, it may be not incorrect to suggest that most of it resides in the users as experience, expertise, better understanding and management skills.

This survey can be considered as an initial research attempt into characteristics of IT use for decision support in small and medium enterprises in Lithuania. Currently more research is being conducted, and a few generalizations regarding the further directions can be made. One of the next important steps for both researchers and practitioners could be to define more precisely critical points in user-IT interaction and its parts which support problem solving and creative thinking, and to point out possible ways to exploit much larger part of IT potential in business decision making.

From the author's point of view, possible directions for further detail research in the area of IT use for decision support in SMEs might be: gaining more insight into the use of types of software tools for decision support; addressing of information needs with different levels of sophistication; rating of utilized information sources and software tools; finding out what IT tools and their features enhance creative thinking.

Acknowledgement

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INFORMACINĖS TECHNOLOGIJOS IR SPRENDIMŲ PARAMA LIETUVOS MAŽOSE IR VIDUTINĖSE BENDROVĖSE

Santrauka

Pereinamuoju laikotarpiu daugelis naujai atsiradusių verslininkų ir verslų, o ypač mažos ir vidutinės bendrovės, susiduria su įvairiomis veiklos problemomis iki pat galimybės išlikti. Tai lemia įvairūs išorės ir vidaus veiklos veiksniai. Veiklai valdyti šiomis sąlygomis reikia lankstumo ir paslankumo. Tuo tikslu naudojami įvairūs valdymo ištekliai, metodai ir priemonės, tarp kurių viena iš labiausiai paplitusių ir svarbių laikytinos informacinės technologijos (IT).

Šiame straipsnyje apibendrinti atliktos Lietuvos ir JAV mažose ir vidutinėse bendrovėse ir organizacijose apklausos rezultatai, o tai leido detaliau pažvelgti į informacinių technologijų (IT) naudojimo problemas, ypač kreipiant dėmesį į pagalbą sprendžiant problemines situacijas ir priimant sprendimus nestandartinėmis situacijomis. Šis apibendrinimas leidžia geriau suvokti, kas lemia sprendimų paramos technologijų naudojimą valdant mažas ir vidutines bendroves. Straipsnyje apžvelgiami įvairūs IT naudojimo aspektai – įdiegti valdymo uždaviniai, veiklos problemos, naudojamos sprendimams informacijos šaltiniai, apdorojimo metodai, formalių ir euristinių metodų santykis, sprendimų programinės įrangos patogaus naudojimo savybės. Be to, straipsnyje pateikiamos galimos tolesnės šios krypties tyrimo gairės.