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Abstract

We conducted an executive level survey in the 500 largest companies in Finland. In general, the adaptation of leading edge technology in Finland is high. We analyzed systematic support tools that were used for strategic decisions. Two hundred seventy five executives described their used of strategy support. The most used tool types were: SWOT-analysis, spreadsheet applications, Balanced Scorecard, risk analysis, and analysis of financial statements or investments. On average, the companies used 5 tools in their strategy process, and only 0.5 were traditional OR tools. Size of the company and industry class had impact on tool usage. Only one-third of the companies used traditional OR tools. OR tools were used mainly in large companies for certain functions and certain industries. In strategy level, ability to form a functional strategic advantage for a company is the strongest feature of traditional OR methods. Softer OR methods were not used. Highly competitive strategy support market is flocked by various other disciplines. Penetration to the market would mean clearer evaluations measures of OR tools and better overall understanding of the market and the needs of the executives.

Keywords: Practice of OR, survey, strategic management, strategy tools.

Modern knowledge based global competition has created a necessity for purposeful strategy processes to provide growth and competitive advantages for the companies (see for example, Foster 2002). At the same time, the number of academic articles on support methods to aid strategic decision making has been increasing (Keefer et al. 2004; Bell and Anderson 2002; Eom et al. 1998) and the advances in the information technology have opened up new possibilities for the companies to use these methods.

OR/MS has penetrated the strategic level decision support market. In 1998, Eom et al. predicted, that the main function and the future of the decision support methods would be in the strategy level. Their article surveyed method descriptions in OR journals through 1988-1994 and concluded that over 28 percent of the tools described in the articles dealt with strategic support, when in the preceding period (Eom and Lee 1990) it was less than 13 percent. According to Clark and Scott (1995) 78.5 percent of OR/MS professionals in the United Kingdom have been involved directly at the strategic level.

Overall, substantial growth in the field of OR strategy tools has taken place after the beginning of the 90's. Method development with a strategic incline has gained acceptance. Bell and Anderson (2002) have studied OR methods offering competitive advantages, soft operations research methods (Mingers and Rosenhead 2004) have achieved a strong foothold in structuring strategic problems, decision analysis offers broad strategic possibilities (for example Keeney 1996; Kirkwood 1996), and mixing and matching methods has become an accepted practice in aiding complicated decisions (Munro and Mingers 2002).

There has also been research on strategy level decision making and the roles of OR models in it (Morecroft 1992). However, it is not clear to what extent the strategy level OR methods have gained acceptance among the executives as most of the application surveys have aimed at collecting information from OR professionals (for some, see Chen and Wei 2002; Abdel-Malek et al. 1999; Jeffrey and Seaton 1995; Kivijärvi et al. 1995). The article by Clark and Scott (1999) specifically reports strategic level OR/MS usage and provides a useful understanding of diverse uses for OR/MS tools throughout the strategy process. Still, only OR professionals were surveyed and an executive point of view is missing.

There has been some earlier reports of managers not using OR/MS decision aid in important decisions (for example, Nutt 2002; Corner et al. 2001; Kasanen et al. 2000). Furthermore, the discipline of strategy does not draw attention to the use of tools in the strategy process. Main strategy literature offers very few guidelines on what methods to use, and generally the portrayed methods are offered by strategy consulting companies and not OR/MS professionals. Thus, the importance of the OR/MS methods for the company executives in significant decisions can be questioned.

Furthermore, the existing support tools for the strategy process are diverse and are offered by many different disciplines. The advances in the information technology have significantly accelerated the development in this area. In addition to the study of strategy itself and OR/MS, systematic methods that claim to support strategic decisions can be found under the names of the following disciplines: artificial intelligence, systems science, marketing, accounting, industrial engineering, systems thinking, decision support systems, expert systems, knowledge management,

information systems, management, business intelligence, executive information systems, online analytical processing, and enterprise systems. Some of these disciplines could be classified under the field of OR/MS, and some of them have common roots, but some of them do not have interdisciplinary communication.

Hence, the providers of the strategy tools form an indistinct field of scattered disciplines. There is plenty of research and literature on the strategic level decision support, but it remains disintegrated and ambiguous. Competition between the disciplines makes unified efforts to improve solutions rare and comparing the methods of different disciplines difficult. As a result, the entire market of strategic decision support may seem confusing and time-consuming to the executives.

In summary, for managing today's demanding strategic issues, there exist plenty of support tools. Yet, it is not clear how information age corporate executives take advantage of these tools. Therefore, we have conducted a survey that presents an executive view of the systematical tools used to support strategic issues. In addition to constructing an overview, we have concentrated on tools offered by the OR/MS field. The aim of our research is to provide an executive view of the strengths and weaknesses of the currently used OR methods. Strategic tools are an important growth area for our field, and executive opinions should be taken into account. With our paper we aim at showing path for future development.

Our research is based on a survey conducted in the 500 largest companies in Finland (*Talouselämä* 2002). Why are we interested in companies in Finland? According to the Global Competitiveness Report 2003-2004 (*World Economic Forum* 2004) Finland is the most competitive country in the world. The top of the list consists of the US and Nordic countries. Annually, for the report, over a hundred global economies are ranked based on their macroeconomic environment, the quality of public institutions, and technology. Finland's steady climb over the last ten years has been founded on technology use by its citizens, businesses and government. Technology sophistication, company-level technology absorption, and university/industry research collaboration are Finland's weapons in the global competition. Hence, leading edge technological possibilities and knowledge for advanced strategy process support should exist in the 500 largest corporations in Finland.

Research Goals and Methodology

The main goal of our paper is to depict a general executive view of the support tools for major decisions. To achieve this, our research had three objectives:

The first objective of our research was to find out, from the executives, what systematic decision support tools were in use in the strategic decision making processes in the 500 largest companies in Finland.

A systematic decision support tool refers to a decision aid that is methodologically used for specific purposes in the strategy process. A tool can be quantitative or qualitative. It can be used in a manual or computerized manner. It can be based on traditional OR methods or some systematic methods from another discipline. Moreover, a support tool can be based on one or several methods. In this paper, the terms systematic decision support tool, decision support tool, support tool and tool are interchangeable.

In our survey, we did not study methods that were not deliberately carried out in a methodological way, i.e. heuristic evaluation, discussion, intuition, dialogue, faith, and other non-procedural practices.

We divided systematic decision support tools into two categories: *traditional OR tools* and their complement, *non-OR tools*. Traditional OR tools refer to methods and tools that are introduced in most introductory level management science textbooks (such as, Anderson et al. 2000). In our survey, most of the traditional OR tools were applications in the fields of optimization, simulation and statistics. Non-OR tools included all other systematic tools such as SWOT-analysis (strengths, weaknesses, opportunities and threats), Balanced Scorecard, brain storming, and quality techniques, as well as financial and other spreadsheet calculations.

Our second objective was to study where, and to what extent, these systematic decision support tools were used according to the executives. The different purposes for tools were classified according to strategic hierarchy levels (Stahl and Grigsby 1992, p. 104): Corporate strategy/business unit strategy and functional strategy such as marketing, finance, human resources etc. Furthermore, different corporate/business unit uses were classified into elements of Kotler's (1997, p. 80) strategy process (Figure 1). This enabled us to analyze where in the strategy process the reported tools were used and, particularly, where not.

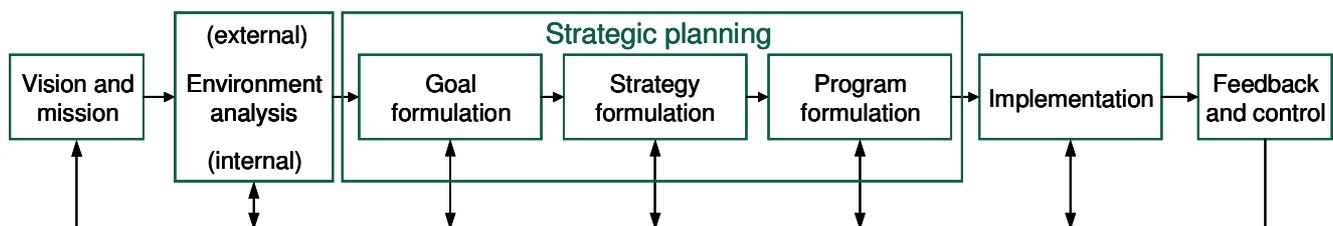


Figure 1: The elements of strategy process modified from Kotler (1997, p. 80). The sequence of the elements can vary in the process, as it is possible to return for re-evaluation at any point.

It is necessary to note that the concept *strategic* is often unclear. Defining a strategic level problem may be subjective or dependent on the company strategy framework. In addition, the word strategic may also limit perspective. Mintzberg et al. (1976), Hickson et al. (1986) and Nutt (2002a) define strategic decision as a choice that has considerable importance to the organization as a result of the required resources and the scope of the expected impact. In order to allow personal judgment and avoid confusion in our survey, we asked what systematic decision support tools were used to aid major decision making i.e. we substituted the word strategic with the word major.

Our third objective was to study why the executives used support tools, or why they did not use them. Thus, we gathered information not only on the roles of the tools but also on the benefits and disadvantages that the executives had experienced.

Our research is based on a data collected from 275 executives of the 500 largest companies in Finland. Our explorative and data-analytic study combines both

qualitative and quantitative methods. The data varies from numerical answers to phone conversations, and consists mostly of open written descriptions provided by the executives and collected in our survey. To provide a general executive view of the support tools for the strategy process, the answers of the executives are depicted, interpretive classifications are performed, and dependencies and frequencies are reported. Our research group discussed and analyzed the data. The classifications emerged and evolved from these discussions. Statistical tests were used as guidelines to help analysis, and were not interpreted strictly as the respondent's do not represent a statistical sample. Inferences from our study to other groups than the 500 largest companies in Finland should be made with caution and understanding of the special elements in the Finnish economy.

Respondents

The survey took place between March and September, 2003. A short questionnaire with five questions was sent out to the executives involved in strategic management. Hence, our research has an executive perspective, even though the object of the study is 500 largest companies in Finland.

Finland is a sparsely populated middle-sized country of 338 000 square kilometres in Northern Europe with a population of only 5.2 million people and a female president. Finland has a highly industrialized, largely free-market economy, with per capita output roughly that of the UK, France or Germany. Its key economic sector is manufacturing - principally wood, metals, engineering, telecommunications, and electronics. GDP was €112 billion (\$134 billion) in 2002, and of that, exports equal almost one-third. In 1990s, electronics rose to prominence and high technology now represents a major source of export revenues. Increasing integration in Europe is expected to dominate the economic picture over the next years. (*The World Factbook 2003*)

The industry class categorization with numbers of companies in each class, for the 500 largest companies, illustrates the economic atmosphere in Finland (Figure 2). *Wholesale trade* is the largest industry measured (61), followed by *metal* (56) and *retail trade* (40). The smallest categories are *textiles/clothing* (4) and *furniture* (4).

The same categorization can also be formed with the average annual revenues in each industry class (annual revenues 2001). The highest average revenues were in *forest* €3.8 billion (\$4.5 billion), *wholesale trade/daily goods* €1.7 billion (\$2.0 billion), *electronics* €1.2 billion (\$1.4 billion) and *finance and investment* €1.1 billion (\$1.3 billion) and *insurance* €1.0 billion (\$1.2 billion). On the other hand, the smallest average revenues were in *business services*, *furniture*, *motor vehicle sales*, and *textiles/clothing*, all of them had under €200.0 million (\$240.0 million) average revenue.

The average revenue of Finland's 500 largest companies in 2001 was €524.5 million (\$622 million). The largest Finnish corporation has the same revenue as the 40th company on the list of the largest U.S. corporations (FORTUNE 5 HUNDRED Largest U.S. corporations 2002). Only twenty corporations in Finland have annual revenue that could have placed them on the U.S. 500 largest corporations list. The 500th largest company in Finland has a revenue of €55.8 million (\$66 million). In general, the companies on the Finnish list are smaller and there is more variation in

size. Altogether, 264 (53 percent) of the 500 largest companies in Finland responded. A paper copy or a Web-form of our questionnaire was filled out by 171 companies. In some companies, more than one executive answered independently to the questionnaire making the actual number of the returned questionnaires 182. In addition, 93 companies answered by another medium than the questionnaire i.e. they sent a free form e-mail or phoned their response.

The average revenue is highest among the companies that responded by returning the questionnaire. On average, the revenue is higher in the companies with free form response than in the companies that did not respond at all (Table 1). Small companies did not reply to our questionnaire as often as large companies. One possible explanation may be that support tools are not so widely known by the executives in the smaller companies.

	Response Category			All
	Questionnaire	Free Form	Non-respondents	
No. of companies	171	93	236	500
Percentage	34.2	18.6	47.2	100
Revenue 2001, average (M€)	640.0	549.4	431.1	524.5

Table 1: Average revenues and the number of the 500 largest companies in different response categories. Average revenue is highest in the companies that responded by answering the five questions in the questionnaire.

In general, the questionnaire responses and free form answers, together, correspond to the distribution of Finland's 500 largest companies in different industry categories (Figure 2.) Greatest number of responses within an industry came from *metal* sector, as we received 33 responses representing 58.9 percent within the industry and 12.5 percent of all the responses. The following industries had response rates within their industries that exceeded 70 percent: *oil trade* (86 percent), *business services* (85 percent), *insurance* (73 percent), *telecommunications* (71 percent) and *energy* (71 percent). The most underrepresented classes were *textiles/clothing* and *furniture*. The response rate may reflect the use of strategy support tools in the corresponding industry class.

Out of the 182 respondents that returned the questionnaire, 16 were chief executive officers, 17 executive vice presidents, 92 executive officers, 53 managers, 3 specialists and 3 did not provide this information. In short, approximately 70 percent of the respondents were executives. The two most common fields of education, for the 182 respondents, were business administration (109) and engineering (52). Only 20 respondents had education in other fields, and 10 questionnaires lacked this information. Almost every respondent had an academic degree, some even two. The respondents had graduated between the years 1960 and 2002.

The 93 respondents, who answered in free form, informed us that they were not able to fill in a structured questionnaire. Mostly, the reason they gave for this, was lack of time (28.1 percent of the free form respondents). Some of the executives came from global enterprises or their subsidiaries where decision making was spread over several divisions, and this made the questionnaire not suitable for them. Another reason for not being able to answer the questions was that support tools were used only partially or they were tailored to a specific situation. Also, ongoing changes in the

organization, for instance mergers, reorganizations, and restructuring of the strategy process, were reasons for informing us of their situation in free form.

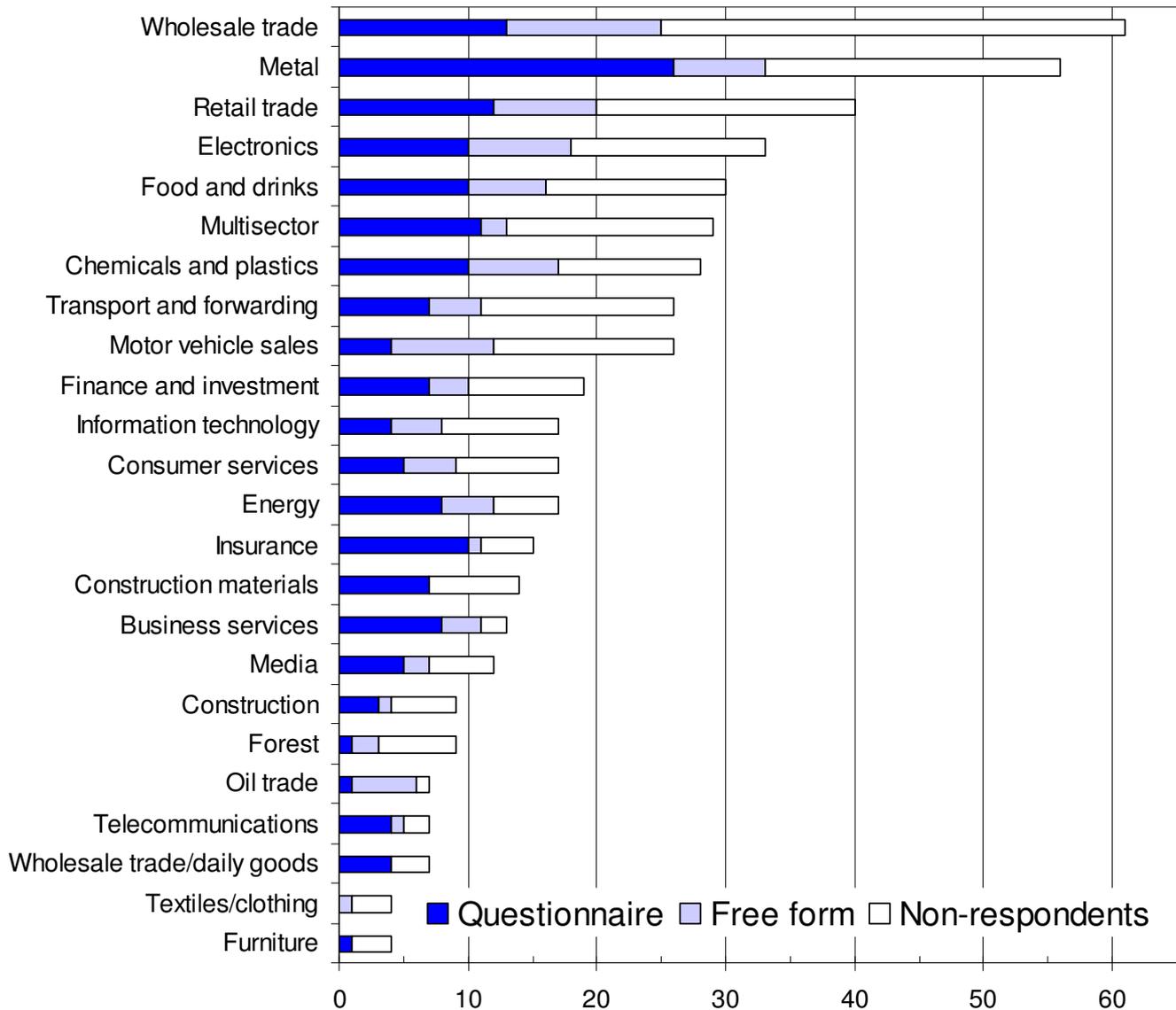


Figure 2: The 500 largest companies in Finland categorized by industry (*Talouselämä* 2002). Black bar indicates the number of companies which responded by questionnaire, gray bar refers to free form answers, and white bar illustrates the number of non-responding companies.

Executives' Perception of Support Tools

Support Tools

To find out what tools the respondents acknowledged, they were asked to list the support tools used to aid major decision making in their company. We also asked to list the functions of these tools. To clarify our aim, we gave an array of examples of systematic decision support tools (Balanced Scorecard, forms based on spreadsheet programs, brain storming, SWOT-analysis, transport optimization

models, Six Sigma, product line simulation programs, scenario planning, risk analysis, life cycle analysis, data mining, House of Quality), and a few suggestions of possible purposes for them.

Thirteen percent (33/264) of the companies informed us that they did not use any kind of tools for strategic issues. These included for instance companies whose company culture did not support or prohibited the use of tools.

From our questionnaire responses (182 respondents), we collected 865 tools and 1033 purposes for the tools altogether. The respondents listed a multitude of names for tools, of which we were able to classify 93.3 percent into 17 categories (Table 2). The frequency of the types refers to the number of times a tool of the corresponding type was mentioned in the answers. The categories are not disjoint and in some cases a tool may appear in two categories.

Support tool category	Frequency
SWOT-analysis	136
Spreadsheet applications	120
Balanced Scorecard	104
Risk analysis	66
Analysis of the financial statements or investments	63
Quality methods	51
Scenario analysis	46
Environment analysis	40
Brain storming	37
Statistical analysis	33
Life cycle analysis	25
Optimization	23
Project management	20
Simulation	20
Value chain analysis	10
Human resource management	7
Activity based management	7
Number of tools classified (93.3 percent)	808

Table 2: Types of strategy support tools used by the 500 largest companies in Finland. The categories are presented in the order of frequencies. The first three (SWOT-analysis, spreadsheet applications and Balanced Scorecard) are noticeably most common.

SWOT-analysis and *Balanced Scorecard* have established themselves as the most frequently used tools for the strategy process. According to our survey, *SWOT-analysis* is clearly the most common tool: it is mentioned 136 times, and *Balanced Scorecard* is reported 104 times. However, *spreadsheet applications* is the second most common tool type category, but their function is somewhat different from the other tools, as they are often used as supplements for other tools or for data storage and calculations.

According to the company executives, on average, 4.8 different tools (traditional OR tools and non-OR tools) were used for strategic support in a company. The support tools were most commonly used in the *construction* sector, where an average company used 7.0 tools for their strategic issues. *Energy* sector was the second

highest user of tools with the average number of tools being 5.6. All the industry classes reported use of more than four support tools on average. In general, this shows an active role of systematic support tools for major decisions.

However, only 9.7 percent (84/865) of all the reported tools were traditional OR tools. The frequency of traditional OR tools was calculated by summing up the frequencies of *optimization*, *simulation* and *statistical analysis* categories and then adding separately analyzed individual tools. There were no newer OR tools (for example soft OR tools) reported that would have fallen into the non-OR tools category. The low number of traditional OR tools is quite understandable, as the tools were not originally developed for strategic purposes, but rather for operational tasks.

Industries have specific needs, and it seems that traditional OR tools fit particular purposes of certain industries. Average use of OR tools was 0.3 per company. OR tools were used the most in the *energy*, *forest*, and *insurance* sectors. All of these industries used more than one OR tool on average per company. Industries that did not use OR tools at all were: *motor vehicle sales*, *furniture*, *information technology*, *oil trade*, and *media*. Less than one-third (54/171) of the companies used traditional OR tools to support their major decisions.

Our analysis also reveals that larger companies use OR tools more often than smaller companies within the largest 500 companies in Finland. Out of the total of 84 OR tools, 39 were reported by 56 respondents in the largest 100 companies, which shows an average of 0.7 per respondent, whereas the average in the whole sample was only 0.5. This could also reflect the superior resource possibilities of larger companies.

The executives were asked to connect the names of the tools, they were using, to a list of methods behind them. Only a few executives were able to do this. In general, the methods behind the tools are not known to the executives.

Functions of Support Tools

The respondents clarified where the tools were used by giving 1033 purposes for the tools altogether. Our goal was to categorize these purposes to find out specific strategic decisions, problems and needs that support tools were used for.

The purposes for the tools were of two types, either they were specific to different functional parts of the company or had to do with the corporate or business unit strategy process itself (Table 3). Furthermore, these two types of strategic activities were classified correspondingly into different functions of the organization or different elements of Kotler's strategy process (Figure 1).

In addition, OR and non-OR tools were separated and number of applications in each category calculated (Table 3). Almost 70 percent of the non-OR tools belonged to the corporate or business unit strategy type, and conversely, over 70 percent of the OR-tools belonged to the functional strategy type. This is indicative of the separate purposes of the OR and non-OR tools in the strategy process.

Under the first type, corporate and business unit strategy, the largest subclass was *strategic planning*, which had the largest difference between OR and non-OR tools in this type: only 2.2 percent of the reported OR tools were used for this purpose, while

22.0 percent of the non-OR tools belonged to this category. OR tools were strongest in *analysis*, but it is quite clear from our classification that they were used less when softer or more human processes were involved.

Under the second type, functional strategy, the subclass where OR tools were used the most was *planning of production, logistics and purchasing* with 32 OR tools. This was the strongest segment for OR-tools with 34.8 percent of OR tools being used in this class. However, it should be noted that OR-tools only represent 41 percent ($32/(32+46)$) of all the tools used in this class, hence even this class was not dominated by OR-tools.

STRATEGIC ACTIVITIES	Use of			
	OR tools		Non-OR tools	
	number	percent	number	percent
CORPORATE AND BUSINESS UNIT STRATEGY	26	28.3	618	65.7
Vision	7	7.6	112	11.9
Innovation and development	0	0.0	33	3.5
Investment decisions	7	7.6	79	8.4
Environment analysis	14	15.2	126	13.4
Internal	4	4.4	55	5.9
External	5	5.4	52	5.5
Risk management	5	5.4	19	2.0
Strategic planning (goal, strategy and program formulation)	2	2.2	207	22.0
Strategy implementation	1	1.1	66	7.0
Feedback and control	2	2.2	107	11.4
Monitoring the strategy	2	2.2	69	7.3
Financial control	0	0.0	38	4.0
FUNCTIONAL STRATEGY	66	71.7	323	34.3
Planning of production, logistics and purchasing	32	34.8	46	4.9
Finance	12	13.0	67	7.1
Planning of sales and marketing	12	13.0	23	2.4
Functional management	5	5.4	92	9.8
Quality and process development	2	2.2	33	3.5
Research and development	2	2.2	27	2.9
Project management	1	1.1	26	2.8
Human resource management	0	0.0	9	1.0
Total	92	100.0	941	100.0

Table 3: The purposes of decision support tools divided into corporate/business unit strategy process (Figure 1) and into functional strategy tasks. In addition, purposes are divided into traditional OR tools and non-OR tools. The traditional OR tools are mainly used for planning of production, logistics, and purchasing, whereas the strategy process is supported by using other systematic tools.

Motive for the Use of Support Tools

The respondents were asked to choose general roles for all the support tools used for major decisions. There were ten given alternatives (Table 4), and in addition the respondents could specify other uses. On average, the respondents chose 5 roles.

Support tool roles	Frequency	Percentage
Clarify company strategy	134	74
Ease information collection and analysis	127	70
Aid budgeting and financial planning	127	70
Assist in communicating company strategy at all levels of operation	98	54
Help monitor and comprehend the environment	93	51
Generate dialogue	82	45
Encourage new ideas and creative visions	72	40
Strengthen commitment to the organization	71	39
Facilitate human resource and organization management	44	24
Support marketing efforts	43	24
Other role (clarified by the respondent)	24	13
Number of respondents	182	100

Table 4: Ten alternatives for different general roles of support tools were given to the executives. Frequencies of the answers and the respective percentages show that at least 70 percent of the respondents thought the support tools clarified company strategy, eased information collection and analysis, and aided budgeting and financial planning. From 182 respondents only 11 did not choose any roles.

In line with our findings before, the executives think that the support tools work in many different roles. The five most common roles, which were selected by over 50 percent of the respondents, tell us about the most common uses for support tools. Two of the roles for the tools are to support realizing the chosen strategy, two are to ease exploitation of information, and one is to aid financial planning. These are all high priority aspects for the companies in today's global competitive knowledge based society.

Advantages of Support Tools

It is important to note that strategic support tools were not used as often in softer roles, i.e. functions involving creativity, marketing, and human aspects (Table 4). This also became clear when 462 different benefits for the tools, that the respondents (182) reported, were classified into Kotler's elements of the strategy process (Table 5). We were able to classify 89.8 percent of these benefits. The categories are not disjoint and in some cases a benefit may appear in several categories.

Element name in Kotler's strategy process	Percentage of all reported benefits
Business mission	0.2
External environment analysis	10.4
Internal environment analysis	8.7
Goal formulation	1.7
Strategy formulation	5.0
Program formulation	15.9
Implementation	23.4
Feedback and control	34.7
Total	100.0

Table 5: All reported benefits of the support tools were classified into the elements of Kotler's strategy process (Figure 1). Most of the benefits (74.0 percent of the total) were classified in feedback and control, implementation, or program formulation.

The classification of the benefits in the strategy process (Table 5) revealed the same tendencies as our classifications of purposes (Table 3) and roles (Table 4). Over one-third of all benefits were classified as feedback and control. Most of the executive's short expressions, where they praised communication as a benefit of tools, were classified into this category. Almost one-fourth of all benefits were classified in strategy implementation and one-fifth in environment analysis (external and internal combined). All this strengthens our impression that the tools mostly support executives in a concrete and number based decision making.

However, classifying the benefits in the strategy process does not give us the full picture of the benefits. It is important to note most often mentioned expressions in executives' lists of advantages. Often the executives commended enhanced systematic procedures in companies' strategic management, implementation and communication. Also, executives reported increased credibility in their decision making through improved accuracy and clarity as well as higher efficiency for the company. The use of the tools had committed different levels in the company to the objectives in form of common language and collective thinking. The tools offered benchmarking and evaluation techniques for the management, both inside and outside the company. In addition, the tools had helped executives to sharpen focus on the strategy and to concentrate on key issues. In general, many executives stressed that the quality of their work had improved along with the use of tools.

In addition to the above mentioned softer benefits there were also financial ones. Over 17 percent of the respondents emphasized benefits measurable in money. The tools offered help in analyzing masses of quantitative data quickly and easily. At corporate and business unit strategy level, significant benefits had been gained in managing business and investment risks, and in searching for a competitive advantage. At functional strategy level, the most often quoted benefits were optimized costs and increased productivity. Financial benefits were expected from a successful tool. However, the executives reported that the benefits were not often immediate nor easily expressed in monetary terms.

Although the support tools were rarely used in company's business mission and vision formulation and hardly any benefits were reported there either, the tools were still considered important part of developing executives' strategic thinking. Many executives mentioned better balance between strategic and operative issues. Almost 5 percent of the respondents revealed spontaneously that the support tools had an essential or even a vital role in the companies' activities and that they could not do without the tools. In addition, 8.8 percent of respondents expressed that they had not experienced any problems with support tools. In general, the executives had a genuinely curious and positive attitude towards the tools.

Disadvantages of Support Tools

The executives described a total of 222 disadvantages of support tools. These disadvantages could also be dangers, barriers, and problems. We were able to classify 89.6 percent (199/222) of the problems into three chronological phases describing the familiarity with the tool (Table 6). The frequency of the disadvantage notes the number of times a separate disadvantage was mentioned. The categories are not disjoint and in some cases a disadvantage may appear in several categories.

Disadvantages					
Search of tools		Implementation of tools		Usage of tools	
• knowledge of tools is inadequate or inaccurate	6	• tools are complicated and heavy	22	• modeling uncertainty does not meet the needs	9
• need for an outside consultant	4	• underestimation of workload, resources and gathering the data needed	29	• building, updating and maintenance are a burden	6
• market for tools are not buyer friendly (comparison is hard, unclear integration, oversupply, customization needs are not met, tools are too focused)	16	• lack of skills, learning demanding	15	• deciding and using parameters are difficult	7
• total price	3	• weakness of commitment throughout the organizations and change resistance	8	• form goes over substance	14
• prejudices e.g. fear of stiffness, technical thinking and lack of creativity	7	• unlearning the old procedures	5	• interpretation of the results is difficult	10
		• new vocabulary is not easy to understand	3	• results do not lead to continuous or fast actions	7
		• communication	6	• narrows and limits thinking	4
		• tools do not suit the company culture	3	• blind belief in tools	8
				• theory and practice do not meet	7
Total sum 199	36		91		72

Table 6: The dangers, problems, disadvantages, and barriers divided into three chronological phases describing the familiarity with the tool: search, implementation, and use. The figures after each disadvantage indicate the frequency it was mentioned. Most of the disadvantages the executives experienced were in the implementation phase.

Over 45 percent of the classified disadvantages were in the implementation phase (18.1 percent in search phase and 36.2 percent in usage phase). A few respondents noted complications when changing over from one tool to another, but there were no other disadvantages that had to do with retiring a tool. Many of the disadvantages or problems exposed attitudes and beliefs towards the tools. The disadvantages pile up to the phases where the decision to acquire the tool has already been made. Realistic information of needs, suitability and advantages of different tools should be more readily available to reduce this problem.

Some of the disadvantages were benefits for others. The praised systematic procedures that were adopted with the tools were seen as increased bureaucracy by other executives. Other pairs like this were: gains in communication/problems in communication, clarified accuracy/lack of accuracy, financial benefits/additional costs, and increases in efficiency/decreases in efficiency. In short, companies and executives have diverse needs that tools should take into account.

Discussion

In our study, we aimed to shed light into the field of systematic strategy tools, from the executive point of view. The executives of the 500 largest companies in Finland used 5 tools, on average, in their strategy process. Larger companies were more aware of the support tools. In general, the executives had positive experiences and a bright attitude towards the tools. They wanted to know more about the strategy support that the tools could offer them in today's demanding business environment.

From OR/MS point of view, we discovered that each company in our study used on average only 0.5 traditional OR tools and actually, this use was limited to only one-

third of the companies. OR tools seemed to suit certain functions and certain industries better. Also, the larger companies used OR methods more often. Overall, the use of traditional OR methods in the strategy process was not common and the methods behind the tools were unknown to the executives.

As expected from the studies of executive decision making (for example Nutt 2002), our results differ from those of Clark and Scott (1999) by failing to detect significant levels of OR/MS involvement across the spectrum of strategic tasks. This could be a result of the fact that the subjects of Clarks' and Scott's survey were OR professionals, whereas our subjects were individuals involved in the actual strategic decision making. In general, the surveys conducted among the OR professionals report much higher uses of OR tools in the strategic field. It appears that the executives of the companies do not consider OR tools as suitable for strategic issues as the OR professionals themselves.

Yet, it should be pointed out that in certain sectors traditional OR tools are in active strategic use. Peter Bell (1999) seems to have grasped the essence of OR applications by suggesting the term strategic OR. Indeed, it seems like the use of OR tools can serve as a competitive advantage in certain sectors like *energy*, *forest* or *insurance*. These fields have high revenues, can typically generate numerical data, and have critical operative functions that can be streamlined with the help of OR tools to provide strategic advantage. This is where the traditional OR tools have their opportunity in providing successful strategic support.

But as the business environment becomes increasingly unpredictable and intangible assets get more important, new kinds of tools are needed. Unfortunately, the list of non-traditional OR/MS tools provided by the executives did not have any softer OR methods. Despite the advances in the academic community with methods geared more towards strategic problems (i.e. less clear problems, better communication, group work, flexibility, longer perspectives, creativity) the executives do not mention OR applications that are developed for these situations. This type of tools are relatively new to OR, and the existing tools, provided mainly by the strategy consultants, have already been well established. Hence, the competition is strong.

In the field of strategy tools, different tools from different disciplines compete for their position in the strategy process. SWOT-analysis, spreadsheet applications and Balanced Scorecard applications were the most often reported strategy tool groups. The three most often mentioned traditional OR tool groups (statistical methods, optimization and simulation) were all used less than brainstorming. In today's strategy literature there exist no research that would compare these methods in a sensible way. It would be very important to clarify the functions of different strategy tools and provide accurate information about them to the executives.

Choosing the right tool for the right purpose is essential, and this is where the OR professionals can help. The executives do not know the different methods and for them it is quite impossible to compare the array of methods that are offered by different disciplines. Hence, OR professionals should have an understanding of the entire strategy field and they should be able to compare, understand and explain specific uses for different tools.

Currently, OR/MS methods make up one minority group of acronyms in a large number of tools and techniques that are offered for strategic decision making. The OR professionals should more clearly see their specific possibilities in this vast field and team up with suitable disciplines in order to provide better service to the executives. Active use of *multimethodology* and *multiadvocacy* (Rosenhead and Mingers 2001) seems to be a sensible way to continue in addition to strategic, functional OR (Bell 1999).

Furthermore, evaluation methods of OR tools should be enhanced in order to provide better information about the tools to the executives prior to their use. There has been plenty of articles on validation and evaluation (for example, Oral and Kettani 1993, Borenstein 1998, and Finlay and Wilson 1997), but in practice very few new methods and tools are properly evaluated. This is natural, as evaluation is difficult, but yet, our discipline does not offer a standard evaluation procedure either. Development of these metrics would help us to be more critical and to focus better our research resources.

In the current competitive flat and flexible organizations the support tools are important part of everyday work environment. Although development in the information technology has made it possible to use very sophisticated methods, the executives stress the importance of simple, transparent, clear, and understandable tools that could be trusted. They look for flexible tools that could be suited to their specific needs. Furthermore, they stress the importance of being able to measure gained achievements and contributions of tools. To them, at its best a strategy tool is easy to use, creates new perspectives and choices, cuts risks, and eases communication. Tool developers should take into account the needs of the executives.

Today, tools in the strategy process are used for clarifying company strategy, easing information collection and analysis, aiding budgeting and financial planning. These, no doubt, will be important application areas also in the future. In the future, the advances in the information technology will also bring us new opportunities in developing more qualitative and softer functions. There is a clear void of tools in the softer parts of the strategy process and a possible opportunity for softer OR tools.

The main function and the future of the decision support methods can very well be in the strategy level. The biggest impacts in the companies can be made in that level, also the strongest need for tools is there. The time is working for our advantage in two ways: first, the economies get more and more unified and the companies larger; second, the advances in the information technology enable faster computing and new technological solutions to deal with more qualitative data. The challenges, we are now facing, can be overcome by focusing our efforts on our strength areas and on the needs of the companies.

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