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Differences in Characteristics of the ERP System Selection Process between Small or Medium and Large Organizations

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Abstract

In this paper we detail the results from an empirical study concerning differences in characteristics of the ERP system selection process between small or medium and large sized organizations. In particular we address the fields of software packages considered and chosen, the weights assigned to different selection criteria, the persons involved in this process, the methods employed and implementation characteristics such as costs and duration.

Introduction

An Enterprise Resource Planning (ERP) system is an organizational and management solution based on information technology towards challenges and problems in the business environment (Laudon and Laudon, 1998). The selection of the most appropriate solution is a semi-structured decision problem because only part of the problem can be handled by a definite or accepted procedure such as standard investment calculations and on the other hand the decision maker needs to judge and evaluate all relevant (and intangible) business impact aspects. There is no agreed-upon and formal procedure for this important task (Laudon and Laudon, 1998; Hecht, 1997), while nevertheless the corresponding decisions strongly influence long-term business success.

In recent years, most ERP system suppliers have increased their focus on small or medium sized organizations. There are some reasons for this trend including a saturation of the market as most large organizations have already implemented an ERP solution, increasing possibilities and need for the integration of systems between organizations and the availability of relatively inexpensive hardware (Gable and Stewart, 1999). Given this development, it seems necessary to understand the ways in which small or medium sized differ from large organizations and the resulting consequences for ERP system selection and implementation. In this paper differences in the requirements and in the selection process between these groups of organizations are explored. Frequently, references are made to factors proposed (Gable and Stewart, 1999) within a framework that identifies four main dimensions of the specificity of small to medium sized organizations: organizational, decisional, psychosociological and information systems.

Methodology

To investigate these research problems an empirical study was designed. The process undertaken included the design of a questionnaire that was validated in several pretests and the mailing together with separate, prepaid envelopes. In all cases the senior management of the IT-department was contacted. 813 Austrian small/medium and large size organizations have been addressed and 138 valid returns have been received between December 1998 and March 1999. This corresponds to a 17 percent return quota. The data was analyzed using a statistical package. A project group of graduate students participated in parts of this study.

Data Analysis

Mean values and standard deviations were calculated to study the distributions of the responses. Non parametric statistics, such as chi-square, were also calculated to test the independence of responses between small or medium sized and large organizations. When analyzing the strength of a relationship between two variables the Spearman rank correlation coefficient has been used instead of the Pearson correlation coefficient because this analysis has been conducted only with ordinal scaled variables. For comparison of two independent samples that were not normal distributed (tested using Kolmogorov-Smirnov), a Mann-Whitney U-test was employed.

Company Background

Of the 138 answers received, 22 (or 15.9 percent) belonged to small or medium sized organizations. The remaining majority (116 questionnaires or 84.1 percent) was classified as large enterprises (see Table 1). Classification was performed using data on number of employees and turnover following the European definition (Commission, 1996). A consequence arising from the different group sizes is that the precision of the estimates concerning the population characteristics of large organizations is likely to be more reliable compared to the case of smaller organizations, but the statistical tests employed account for the different sample sizes.

Table 1. Distribution of organization size

	Frequency	Percentage
Small or Medium Companies	22	15.9
Large Companies	116	84.1
Total	138	100.0

The organizations under consideration were for the most part from industry (70.0 percent of the small or medium and 54.1 percent of the large organizations), followed by retail (20.0 percent and 17.4 percent, respectively), service (10.0 percent and 17.4 percent) and public administration (11.0 percent of the large organizations and no small/medium sized) (see also Table 2).

Table 2. Distribution of branches of business

	Frequency	Percentage	Valid Percentage
Industries (Mining, Construction, Manufacturing)	73	52.9	56.6
Retail	23	16.7	17.8
Services	21	15.2	16.3
Public Administration	12	8.7	9.3
Missing	9	6.5	
Total	138	100.0	100.0

ERP Systems Considered and Chosen

Regarding ERP systems, 81.8 percent of the small or medium sized organizations had at this point already decided on a particular system, 4.5 percent were actively engaged in the selection process, 4.5 percent had chosen to implement an individual solution instead and 9.1 percent had not yet given any consideration to this point. This result is very similar to large organizations, of which 84.5 percent had completed the decision process, 5.2 percent undertook it during the study, 1.7 percent voted for the adoption of individual software and 8.6 percent had not given any thought to ERP systems. It can be assumed that the return quota among organizations without ERP initiatives has been below average and therefore a bias exists in the results given above. Especially the low number of smaller enterprises who returned the questionnaire might hint at a lower rate of ERP system adoption in this group.

The software suppliers and products considered for the decision process showed clearly the dominant position of SAP in the marketplace (see Table 3). Major contenders in Austria are (in this order) BaaN and Oracle, minor players are Navision, J.D. Edwards and Peoplesoft.

The strong presence of other, smaller suppliers hints at a need for more specialized and less complex systems. The situation regarding the solutions chosen is similar, although the advantage of SAP is more pronounced (see Table 4 and Figure 1). Again, smaller companies have captured quite a large market share with Oracle and BaaN being the only other contenders of larger size.

The analysis conducted showed that there is a significant influence of organizational size on the selected software package. SAP R/3 systems are selected more often by large organizations (chi-square test, significant at level of 0.05), while small or medium sized companies more often choose software supplied by BaaN (chi-square test, significant at the level of 0.01).

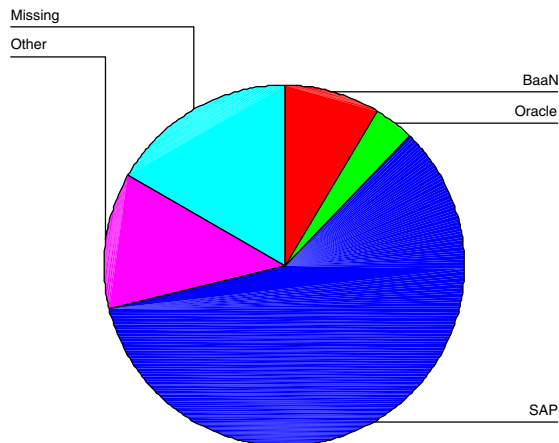
Table 3. Considered ERP solutions (120 valid answers)

	Considered (percentage)	Not considered (percentage)
BaaN	44.5	55.5
J.D. Edwards	9.2	90.8
Navision	16.0	84.0
Oracle	32.5	67.5
Peoplesoft.	5.0	95.0
SAP	87.5	12.5
XAL	6.7	93.3
Other ERP solutions	47.1	52.9

Table 4. Chosen ERP solutions (116 valid answers)

	Chosen (percentage)	Not chosen (percentage)
BaaN	11.2	88.8
J.D. Edwards		100.0
Navision	0.9	99.1
Oracle	13.8	86.2
Peoplesoft.		100.0
SAP	69.8	30.2
XAL		100.0
Other ERP solutions	23.3	76.7

Figure 1. Chosen ERP solutions



Selection Criteria

The following list of 29 inquired ERP selection criteria have been identified through application of the Delphi Method together with students, practitioners and researchers of our institute. The valid answers included the values: very important, important, rather unimportant and irrelevant. The distribution of these weights is given for each aspect (see Table 5). It can be seen that on the one hand some aspects are in the population generally given more importance (e.g. increased transparency and better information flow) than others (interestingly one example are customer and supplier needs hinting at a small adoption of supply-chain-management). On the other hand the Y2K problem for instance is a very important aspect for many companies but on the other hand not important for many other. These results show that the companies have weighted the inquired aspects very differently.

Table 5. Inquired selection criteria (all organizations, ordered by percentage of „Very important“)

	Very important (percentage)	Important (percentage)	Rather unimportant (percentage)	Irrelevant (percentage)
Increased Transparency and Better Information Flow	65.8	30.8	1.7	1.7
Well Tried Software System	60.3	36.2	2.6	0.9
Good Support	56.0	40.5	3.4	0.0
Y2K Problem	54.2	22.9	14.4	8.5
Adaptability and Flexibility of Software	52.6	41.4	5.2	0.9
Shorter Cycle Times	52.1	39.3	7.7	0.9
Process Improvement	48.7	41.9	8.5	0.9
Currency Conversion (i.e. Euro)	47.0	29.1	13.7	10.3
Increased Organizational Flexibility	46.2	39.3	11.1	3.4
Increased Customer Satisfaction	42.2	36.2	16.4	5.2
Internationality of Software	36.8	27.4	20.5	15.4
Other Strategic Considerations	36.2	35.3	22.4	6.0
Modular Architecture of Software	35.7	52.2	10.4	1.7
Higher Reliability	32.5	51.3	9.4	6.8
Market Position of Vendor	32.2	49.6	13.9	4.3
Implementation of Desired Business Processes	31.6	47.0	16.2	5.1
Short Implementation Time	31.0	52.6	12.1	4.3
Operating System Independency	28.4	37.1	28.4	6.0
Availability of Tools for Software-Adoption	27.7	45.5	21.4	5.4
Ergonomic Software	27.4	55.6	15.4	1.7
Availability of Special Solution for Branch of Business	26.3	28.1	30.7	14.9
Improvement of Organizational Structure	22.0	45.8	29.7	2.5
Guidelines from a Controlling Company	21.9	19.3	14.9	43.9
Improved Innovation Capabilities	19.3	38.6	33.3	8.8
Increased Know-How	12.0	36.8	40.2	11.1

Customer and Supplier Needs	11.2	19.0	27.6	42.2
Better Application of Management-Style	10.4	40.0	40.9	8.7
Improved E-Commerce Support	5.1	23.1	43.6	28.2
Improved Internet Services	4.3	34.2	38.5	23.1

Differences in the weights attributed to these criteria between small to medium sized and large organizations were also explored (see Table 6). It can be seen that several aspects dealing with flexibility (e.g. increased organizational flexibility, process improvement and improved innovation capabilities) have been rated as less important by smaller organizations, as these tend to be more flexible from the beginning and do not need to use an ERP solution for this goal. In addition, the adaptability and flexibility of the software is higher valued by smaller

organizations, as these advantages and maybe unique business processes need to be preserved. A short implementation time and therefore lower costs are also given more importance, as resources are a bigger issue. Internationality of the software and customer and supplier needs are given less importance, which is surprising from the aspect of recent trends towards supply-chain-management, integration with other organizations and world-wide e-commerce.

Table 6. Differences in decision making criteria (only criteria with strong relationship to organization size shown)

		Very important (percentage)	Important (percentage)	Rather unimportant (percentage)	Irrelevant (percentage)
Increased Customer Satisfaction	Small/medium companies	26.3	42.1	26.3	5.3
	Large companies	45.4	35.1	14.4	5.2
Process Improvement	Small/medium companies	31.6	47.4	21.1	0.0
	Large companies	52.0	40.8	6.1	1.0
Increased Organizational Flexibility	Small/medium companies	31.6	42.1	21.1	5.3
	Large companies	49.0	38.8	9.2	3.1
Improved Innovation Capabilities	Small/medium companies	11.8	29.4	52.9	5.9
	Large companies	20.6	40.2	29.9	9.3
Guidelines from a Controlling Company	Small/medium companies	10.5	21.1	10.5	57.9
	Large companies	24.2	18.9	15.8	41.1
Customer and Supplier Needs	Small/medium companies	5.3	10.5	26.3	57.9
	Large companies	12.4	20.6	27.6	39.2
Short Implementation Time	Small/medium companies	36.8	57.9	5.3	0.0
	Large companies	29.9	51.5	13.4	5.2
Adaptability and Flexibility of Software	Small/medium companies	68.4	26.3	5.3	0.0
	Large companies	49.5	44.3	5.2	1.0
Operating System Independency	Small/medium companies	15.8	26.3	52.6	5.3
	Large companies	30.9	39.2	23.7	6.2
Internationality of Software	Small/medium companies	31.6	10.5	26.3	31.6
	Large companies	37.8	30.6	19.4	12.2
Good Support	Small/medium companies	42.1	57.9	0.0	0.0
	Large companies	58.8	37.1	4.1	0.0
Market Position of Vendor	Small/medium companies	16.7	55.6	11.1	16.7
	Large companies	35.1	48.5	14.4	2.1

Team Structure

The process of selecting an ERP system needs also to be staffed correctly to ensure the inclusion of diverse stake-holders within the organization. As has been argued (Hammer and Champy, 1993; Davenport, 1993), the participation of the people affected by the system and knowing the business processes leads to better decisions and a higher rate of acceptance later on (Guha et al., 1997). Therefore the groups involved in the selection process have also been analyzed. Four different types for the structure of the selection group have been identified from more specific data gathered:

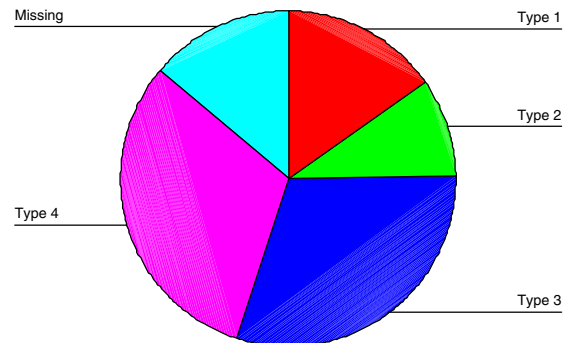
1. The decision is made by top-management with the inclusion of external consultants. The participation of groups from within the organization is minimal.
2. There is a centralized type of selection process in place, characterized by a strong focus on the IT- and organizational department with only small participation of other internal departments and no employment of consultants.
3. The decision is made participatively with the inclusion of several departments of the organization including those later on affected by the implementation of the system chosen.
4. Structures constituting a mixture of characteristics from the above and others.

The distribution of these types within the population can be seen from Table 7 and Figure 2. The high percentage for type 3 seems to indicate an adoption of a participative form of decision making, while a centralized decision within the IT- and organizational department is not very common. In small or medium sized organizations this centralized form is on the other hand in relation more often adopted, maybe because of either a resulting reduction in costs or a lack of know-how in other departments. Both a centralized structure per se and a certain shortage in human resources are factors attributed to the organizational specificity of smaller organizations (Gable and Stewart, 1999).

Table 7. Pattern of personnel participation

	Frequency	Valid Percentage
Type 1	21	17.6
Type 2	13	10.9
Type 3	42	35.3
Type 4	43	36.1
Missing	19	
Total	138	100.0

Figure 2. Pattern of personnel participation



The study of association between firm size and number of persons involved in the ERP selection process (see Table 8) showed that large companies engage more persons in the decision making process. This difference is statistically significant (Mann-Whitney U-test, significant at the level of 0.01). But some differences also emerge concerning single functions of various business departments. An interesting result is that in the case of large companies the decision is more often a top management decision compared to smaller companies (correlation coefficient of Spearman 0.249, significant at the level of 0.01). In the latter case top management is more often in charge of part of the decision making process (correlation coefficient of Spearman -0.211, significant at the level of 0.05) or is even taking an active role in the process (correlation coefficient of Spearman -0.252, significant at the level of 0.01) which corresponds to the psycho-sociological specificity of a dominant role of (owner-)managers in organizations of this size (Gable and Stewart, 1999).

Table 8. Statistics of involved persons

	Small/medium companies	Large companies	All companies
N valid	17.00	92.00	109.00
N missing	5.00	24.00	29.00
Mean	4.82	9.82	9.04
Median	5.00	7.00	6.00
Standard dev.	2.27	8.82	8.35
Variance	5.15	77.82	69.65
Minimum	1.00	3.00	1.00
Maximum	10.00	60.00	60.00

Information Gathering

The methods for gathering information as a basis for the decision to be made also differ between small or medium sized and large organizations. Eight different possible approaches were included in the questionnaire, of which the first group (small/medium) used in the mean 3.05 distinct ones, the second group 3.88 ones. This difference is statistically significant (Mann-Whitney U-test, significant at the level of 0.05). Beside this difference, there is also a trend to employ less expensive methods to be seen within the group of small or medium sized organizations: The analysis of a prototype, the buying of relevant studies and an examination by consultants were used extensively only by large organizations, while other approaches like presentations by the bidders or the mailing of a requirements catalogue in form of a questionnaire were used by all organizations (see Table 9).

Table 9. Information gathering activities employed (all companies, ordered by percentage of „Employed“)

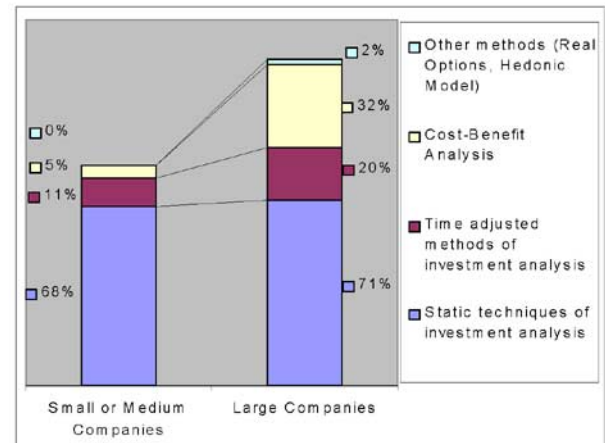
	Employed (percentage)	Not employed (percentage)
Working with Vendors	86.4	13.6
Presentations of Vendors	85.6	14.4
Analysis of Marketing Material	50.8	49.2
Use of Consultants	39.8	60.2
Design of a Questionnaire	38.1	61.9
Relevant Trainings	33.1	66.9
Analysis of a Prototype System	25.2	74.8
Analysis of Relevant Studies	10.2	89.8
Other Activities	5.9	94.1

Methods in Decision Process

The methods used in the decision process were also inquired (see Figure 3). Again, differences between organizations of different sizes show up, although the use of methods in this context overall is nearly equal in both groups as small to medium sized organizations used in 73.7 percent some sort of formal model and large ones in 78.0 percent. Organizations of small or medium size use for the most part only static investment methods, while large organizations also employ dynamic methods or utilization ranking analysis. The use of these methods correlates significantly with the size of the organization (chi-square test at significance 0.05). The decisional

specificity of less usage of formal models (Gable and Stewart, 1999) has therefore been validated partly, as a difference can be seen only in the rate of adoption of more complex models, not the rate of usage overall.

Figure 3. Methods applied in ERP selection process



Effort for Decision and Implementation

As the decision process also results in costs and takes time, it is important to plan this activity. Therefore some estimation of this effort to be expended seems necessary. In the mean, 46.6 percent of the organizations performed such an estimation with this percentage slightly higher for small or medium sized (55.6 against 44.9 percent), for which these (smaller) costs also seem to be more important in comparison to larger organizations. The methods employed showed no significant difference both in usage by small or medium compared to large organizations and in the correctness of the estimates. The effort actually expended was also inquired in the questionnaire but several organizations were not able or not willing to give a quantification (only 37 organizations were able to give costs, 104 were able to give the duration). For small or medium sized organizations, the decision process took in the mean 19.3 weeks and resulted in mean costs of 414,000 ATS (standard deviation of 8.8 and 317,000), while large organizations incurred expenses of 984,000 ATS (with standard deviation of 1,765,000) during the 26.8 weeks (with standard deviation of 27.9) duration.

The implementation of ERP systems is much more effort-intensive than the decision process. Some sort of estimation is therefore necessary to correctly plan for this effort that can pose severe problems for some organizations as examples (Scott, 1999) show. This importance seems to be recognized by the organizations questioned, as 96.5 percent tried to arrive at a quantification for the effort to be expended. The methods employed were not significantly different for the two groups of organizations. Again, the actual values for the cost incurred and the time elapsed were inquired (89

organizations were able to quantify the time necessary and only 45 the costs). For small or medium sized organizations, the implementation took in the mean 27.0 weeks and resulted in mean costs of 1,908,000 ATS (standard deviation of 24.7 and 1,411,000). The values for large organizations were 46.6 weeks (with standard deviation of 40.6) duration and costs of 15,000,000 ATS (with standard deviation of 19,235,000). The difference is statistically significant for the organizations that have implemented SAP (Mann-Whitney U-test, significant at level 0.05). The implementation seems to have higher variable costs increasing with size, as this difference is in relation bigger than for the decision process. There is a positive correlation of the effort expended with the number of modules implemented, although small or medium sized organizations have not chosen significantly more modules than large organizations.

Conclusions

In this paper, the differences between small to medium sized and large organizations concerning ERP system requirements and selection process were explored based on an empirical study. For example, a different approach to staffing the group performing the selection process was discovered, as a more centralized form of decision-making in the organizational or IT-department with fewer people involved is in place in smaller organizations. In addition, the decision in this group of smaller organizations is based on less complex models and less expensive methods of information gathering. The criteria for selection of a particular ERP system also showed different priorities, as increasing organizational flexibility, extra-organizational ties with customers and suppliers and internationality are less of an issue for smaller organizations compared to costs and adaptability of the software. All of these factors result in an above average adoption rate of the solution provided by BaaN. Both the selection process and the implementation of the solution chosen incur less time and expenses for smaller organizations. For these differences, the specificities of this group of organizations can give an explanation. Further research is needed to detail the differences in the implementation process and the actual usage of the selected package later on. These results can then be combined to form a coherent framework for the special attributes and needs of small to medium sized organizations concerning ERP solutions which will be of value to both these organizations and ERP system suppliers.

References

- Commission of the European Community „Empfehlung der Kommission vom 3. April 1996 betreffend die Definition der kleinen und mittleren Unternehmen,“ *Amtsblatt der Europäischen Gemeinschaften (L 107/4)*, 1996.
- Davenport, T.H. *Process Innovation: Reengineering Work through Information Technology*, Harvard Business School Press, Boston, Massachusetts, 1993.
- Gable, G., and Stewart, G. „SAP R/3 Implementation Issues for Small to Medium Enterprises,“ *Proceedings of the Fifth Americas Conference on Information Systems*, Milwaukee, Wisconsin, 1999.
- Guha, S., et al. „Business Process Change and Organizational Performance: Exploring an Antecedent Model,“ *Journal of Management Information Systems* (14:1), 1997, pp. 119-154.
- Hammer, M., and Champy, J. *Reengineering the Corporation*, Harper Collins Publisher, New York, 1993.
- Hecht, B. „Managing Resources - Choose the right ERP software,“ *Plugin Datamation*, 1997.
- Laudon; K.C., and Laudon, J.P. *Management Information Systems – New Approaches to Organization & Technology*, Prentice Hall, 5th Ed. London, 1998.
- Scott, J.E. „The FoxMeyer Drugs‘ Bankruptcy: Was it a Failure of ERP?,“ *Proceedings of the Fifth Americas Conference on Information Systems*, Milwaukee, Wisconsin, 1999.