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**eCollaboration:**

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## **Investment in Business Software and Perceived Utility: An Empirical Study**

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### **Abstract**

Authors have identified many different reasons why companies invest into IT and there has been much discussion of how IT can generate value. This paper adds to the discussion of IT value generation by investigating investments in business software for the support of business processes in Swiss SMEs. In an empirical survey on the future IT investment for process support, 917 questionnaires were collected and analysed. In a first step, using exploratory factor analysis, two factors representing different sets of business software modules were identified: (1) basic modules and (2) specialized modules. In a second step, using cluster analysis, we identified four typical characteristic company profiles regarding investments in business software: (1) the IT convinced, (2) the IT differentiators, (3) the IT sceptics, and (4) the IT pragmatists. To further explore and profile the clusters, we ran several bivariate analyses with selected questions from the questionnaire. This study has both theoretical and managerial relevance as it helps to understand firm attitudes towards investments and business software.

**Keywords:** Empirical Study, SME, Switzerland, business processes, innovation

# 1 Introduction

The theme of the 21st Bled Conference is “Overcoming Boundaries Through Multi-Channel Interaction”. Despite significant progress in software development, organizations still face a number of significant challenges when connecting disparate business systems and services. Traditionally, the challenge of electronic business networking has been addressed through the deployment of electronic data exchange (EDI). Despite recognition of the challenges associated with connecting disparate systems and services, business software does not normally provide a standard tool suite for the easy facilitation of electronic exchange processes. Thus, the problem of overcoming “boundaries” still remains.

The present study was stimulated by an interest in the behaviour of small and medium-sized enterprises (SMEs) regarding investment in ERP modules (software for enterprise resource planning) with a special emphasis on electronic data exchange. The aim of this research is to investigate typical attitudes and behavioural patterns of firms planning ERP-related investments. The main objectives of the present study were:

- Compare investment in business software modules and the perceived utility of the investment
- Identify company clusters based on their way of achieving competitive advantage in the market and
- Analyse these company clusters regarding their attitude towards business software.

In order to address these objectives, a survey was conducted and primary data was gathered and analysed.

The paper is structured as follows: We begin with a brief review of the literature to provide background and context to the study. An explanation of the intentions of the study and an overview of the theoretical framework used to guide the research are given. We then present the study research design including the method of investigation and the characterisation of the sample. The key analytical findings of the exploratory factor analysis and the cluster analysis are presented and discussed. The final section contains a summary of the conclusions drawn from our analysis of findings.

## 2 Literature Review and Objectives of the Study

This research addresses three different areas of literature: (1) ERP systems and their business value, (2) ERP systems for business collaboration (or, more specifically, electronic data exchange (EDI)), and (3) small and medium-sized enterprises (SMEs).

### 2.1 Literature Review

The focus of our study is on Enterprise Resource Planning systems, i.e., the class of information systems which supports primary and secondary processes in a company. A recent analysis of industry case studies showed that software systems can help companies to effectively support their core processes and thus help sustain competitive advantage [Schubert 2007].

## Literature Review and Objectives of the Study

There has been ample discussion in the literature whether or not ERP systems merit the usually substantial money investments [McFarlan 1984; Peppard and Ward 2004; Rettig 2007]. McFarlan [1984] developed a typology of companies classifying their use of information technology in turnaround, strategic, factory, and support. It seemed interesting to see if the Swiss SME study would show similar patterns. Peppard and Ward [2004] developed an IS capability model in which they examine how organizations can continuously derive and leverage value through IT. Rettig [2007] claims that enterprise software has become too complex to be effective. Her MIT Sloan Management article was vividly discussed after its publication showing that scholars differ on the question of how and to what extent companies can derive value from business software.

Although the business value of ERP implementations has been extensively debated in trade periodicals in the form of qualitative discussion or detailed case studies, there is little large-sample statistical evidence on whether the benefits of ERP implementation outweigh the costs and risks” [Hitt et al. 2002, p. 72].

The question of how much value IT has in companies is often not easy to answer. There are frequently two diametrically opposed opinions. One faction believes, following Porter and Millar’s theories of more than 20 years ago [Porter and Millar 1985; Porter 2001], that IT has a particular potential in the achievement of competitive advantage. The other faction takes the view that the diffusion process of IT is now so advanced that it has already become a so-called “Commodity” or “Utility” (therefore a basic commodity available to all) [Carr 2003], suggesting it has lost its effectiveness as a strategic instrument of differentiation.

The second topic area, *business collaboration*, is not only about the exchange of electronic documents but it goes further looking at the support of transactions and business processes between companies. ERP systems are usually the core systems which need to be connected through (standardised technical and business) interfaces. The term “business collaboration” is not clearly defined in the literature. In the field of information system the term usually refers to the IT support of business processes spanning company locations or different companies [Wölfle 2007]. It is connected to a broad set of similar terms such as inter-organizational systems [Klein 1996; Alt and Fleisch 2000], electronic data interchange (EDI), B2B-Integration [Linthicum 2001], business networking [Österle et al. 2001] or networkability [Wigand et al. 1997].

Electronic Data Interchange (EDI), and with it the streamlining of the purchasing process, has been a research topic for almost 20 years. There have been many studies on the effects of the electronic support in business processes which were published in leading journals [e.g., Iacovou et al. 1995; Lim and Palvia 2001; Dai and Kauffman 2002; Lee et al. 2004; Beck et al. 2005].

The sector of *small and medium-sized enterprises* is a significant sector for most developed Western economies [Beaver and Prince 2004; Meckel et al. 2004]. The adoption and use of business software by SMEs has been the subject of a considerable body of literature in the last years. In an extensive literature review, Parker and Castleman [2007] identified more than 120 journal articles published between 2003 and 2006. The 2003 Observatory of European SMEs states that the “vast majority of enterprises in Europe (99.8%) are SMEs”, and SMEs are crucial for continuing strong economic performance in Europe [European Commission

2003]. The importance of the SME sector is evidenced by the fact that in most developed countries it constitutes more than 90% of the total business establishments, making research in this area pertinent.

## 2.2 Research Steps

We started our analysis of the survey data with a comparison between the *business areas* that are *already supported* by ERP modules and the *planned investments* in these areas. We then attempted to identify factors from the business areas using an exploratory factor analysis (EFA) and identified two. In the next step, we performed a cluster analysis on the basis of the *ability of the companies to achieve competitive advantages* with the *two factors* from the EFA and additional profiling variables such as *company size* and development of *turnover*. We tried to further describe the clusters by searching for typical *industry sectors* and the scope of applied *EDI*. Finally, the clusters were analysed against some general statements regarding IT support for business processes.

## 2.3 Research Framework

Using themes derived from the literature on ERP systems and business processes we developed a theoretical framework which we worked from to develop the study questionnaire and the underlying research questions (see **Figure 1**).

Porter's discussion of the value chain is still one of the most useful and often cited classification approaches in literature [Porter 1985]. Following Porter, the business processes which characterise the underlying business model in such a way that they constitute a *competitive advantage* naturally tend to be *primary processes*. These are processes that contribute directly to the fulfilment of customer needs. A company also needs to manage *secondary processes* in order to maintain its operations. These supporting activities do not always contribute to the value generation of the company but are needed to run the company.

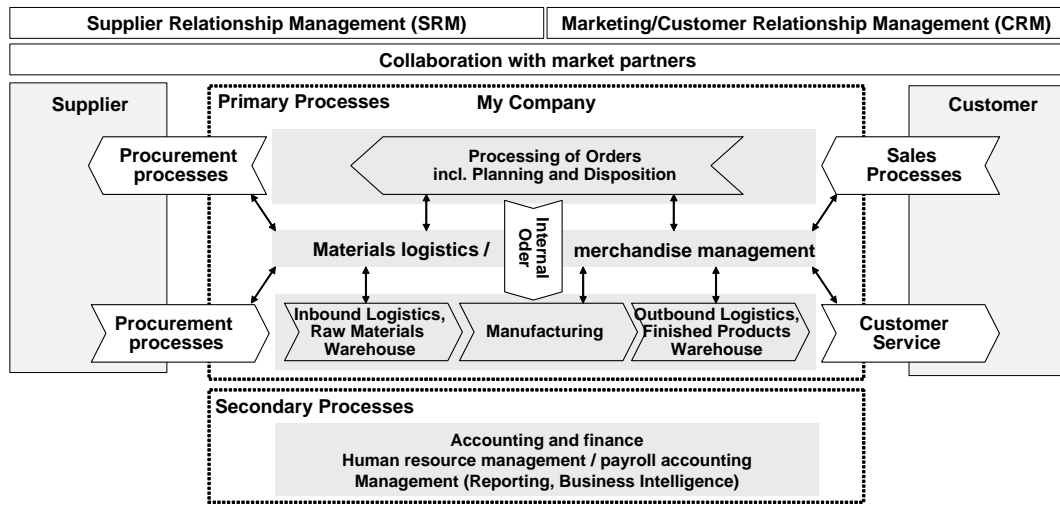
In the "Netreport 2006" study on SMEs, companies indicated that they primarily used ERP systems for *supporting activities* [Schubert et al. 2006]. The most intensive use is found in the classical areas of Accounting and Finance (94.9%), followed by Human Resource Management (80.5%) and Management (77.7%). These findings are consistent with the results of the "Netreport '5" [Dettling et al. 2004], in which the modules Accounting and Finance and Human Resource Management and Controlling were used most intensively.

## 2.4 Taxonomy

The taxonomy which was developed for the current study incorporates elements of the eXperience taxonomy to business software. This taxonomy has been validated and used for more than 10 years [Schubert and Wölflé 2007]. The classification can be used to examine business relations between players in the value chain. The resulting process model shows a specific company in the centre of the figure (dotted line). The primary processes start with the customer contact (sales process), followed by internal processes such as order processing and procurement and terminate with an eventual customer service.

## Literature Review and Objectives of the Study

The taxonomy was used to develop the questionnaire. The process areas correspond to measurable items (questions) in the questionnaire. For the purpose of orientation and reference, we will display the numbers of the questions from the questionnaire in the following paragraphs (in brackets).



**Figure 1:** Taxonomy of Processes

The framework shows the processes which we examined in our study and their specific location in the internal value chain of the company. The first three processes – Accounting and finance (Q01), Human resource management / payroll accounting (Q02), and Management (Reporting, Business Intelligence) (Q03) – are secondary processes which are necessary to maintain the business.

The process “Sales Processes (Q08)” is the contact point to the customer where orders are taken. Today, orders are typically received through multiple channels (such as telephone, fax, Web shop, e-mail). In the following process “Processing of orders (Q07)” the orders are planned. If the products cannot be delivered from stock, activities in this phase either result in the initiation of an external procurement process and/or an internal production order. There are various types of ways that companies plan and process their orders (e.g., built-to-stock, built-to-order). This is why business software modules supporting order processing often need to be specialized for specific industries. For a detailed description on different kinds of order management see Ruile [2006].

Materials logistics / merchandise management (Q06) is a core process which has interfaces to sales processes, order processing, procurement, logistics, manufacturing, as well as customer service. The description of the products and the underlying bill of material play a role in all primary business processes and thus act as a point of integration between the other processes.

Procurement and procurement processes (Q04) are initiated if goods (merchandise) or raw materials/components need to be bought from third parties. Once all the necessary goods/material are available, the production process is initiated. Although included in the overall study, the processes of logistics and manufacturing were excluded from the analysis in this paper. In some cases, the process does not end with the delivery of goods/services to the customer but extends into Customer Service (Q10) in case of questions, maintenance, and further customer requirements.

The processes of Supplier Relationship Management (SRM) (Q05) and Marketing/Customer Relationship Management (CRM) (Q09) are both located on the strategic level. They reflect the support of the firm's relationships to both sides of the value chain. Collaboration with market partners (Q11) is a cross-company supply chain function which facilitates electronic information exchange between the parties.

The process areas are supported by specialised business software modules. For these modules, we aimed to investigate the degree of integration. There are two dimensions of integration which have been explored in previous studies: *scope* and *reach* [Keen 1991; Weil and Broadbent 1998]. In our study, *scope* corresponds to the level of data integration within and across boundaries whereas *reach* refers to the regional factor (within home country or across borders).

### *Scope*

We asked the respondents to classify the levels of integration into the following groups:

- Cross-company data exchange
- Cross-area data exchange
- Only within one process area
- No exchange at all

We used 'Return on Investment (ROI)' as key figure for the assessment of benefits from IT use. In order to keep the questionnaire simple, we did not further elaborate on the method used for ROI calculation. We assume that the respondents used the most common meaning from the literal interpretation of the words: the comparison between the cost of the investment and the financial return.

### *Reach*

One of our focus topics in the study was electronic data exchange (EDI). We investigated the intensity and the reach of EDI. For each of the three partners "customers", "suppliers", and "business partners", respondents were asked to indicate EDI (1) within Switzerland (regional), (2) within Europe or (3) worldwide.

The last part of the questionnaire included questions related to the general assessment of IT-supported business processes in the companies. The question regarding the application of new technologies in the area of business software was recently debated in the scientific community. With her article "The Trouble with Enterprise Software" Cynthia Rettig [2007] stimulated a lively discussion in the blogosphere on the effectiveness of ERP systems. Essentially, Rettig argues that ERP systems are too complex and implementation cost is too high to ever produce a fair ROI. She suggests the implementation of Service-Oriented Architectures as a possible way out of the dilemma. In our study, we wanted to find out if SOA and related changes in technology are an issue for SMEs. For a detailed explanation of SOA we refer to [Liebhart 2007].

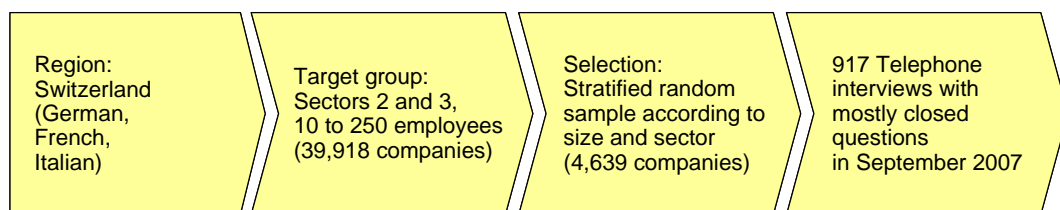
We asked the respondents to indicate their level of agreement with the following statements:

## Research Design

- We need to design our business processes more flexible and more customer-specific in the future (Q4101)
- Our business processes have been optimized and are not going to change much in the future (Q4103)
- We are willing to apply new technologies (e.g., SOA) if they help us to better support our business processes (Q4107)
- We were able to achieve competitive advantages with the use of IT (Q4109)

### 3 Research Design

This study presents an analysis of companies with 10 to 250 employees in business sectors two (industry) and three (services). It covers a universal set of 38,099 companies. The Federal Office of Statistics drew a stratified random sample of 4,393 companies from this universal set, based on sector and company size (Figure 2). We used computer-aided telephone interviews (CATI) for the collection of the data. The basis of the survey was a standardised questionnaire in German and French with predominantly closed questions. The questionnaire was developed in cooperation with business partners and trialled several times in pre-test interviews. It was aimed at members of senior management in small and medium-sized Swiss companies and other organisations.



**Figure 2:** Research Steps

In total, 917 companies participated in the survey. This corresponds to a return rate of 19.8%. Declaration of company size and business sector were mandatory. All 917 questionnaires were suitable for further analysis. A comparison of the distribution of those companies which answered with the universal set shows that the companies with 50 to 100 employees are under-represented as compared to the Swiss universe. The distribution of sectors, however, shows a good correspondence with the universal set.

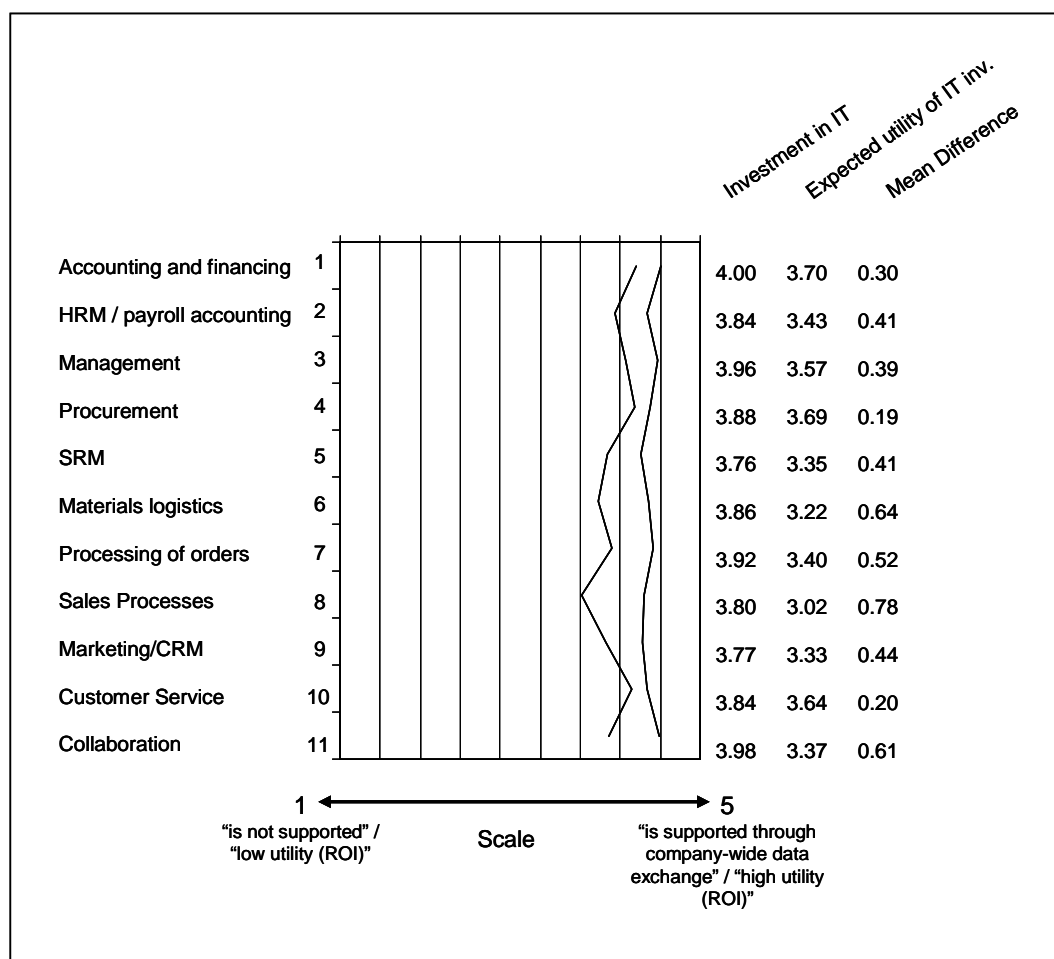
Nearly all respondents are members of senior management. Fifty-five percent of the questionnaires were answered by CIOs, 23% by CEOs, and 19% by other executives in commercial and technical areas. Only 3% of the respondents have other functions in the company. The distribution of companies according to their size shows a balanced picture. The company size was measured in “number of employees” (full-time equivalent). Thirty-eight percent of the companies have between 10 and 49 employees, 29% between 50 and 99 and 33% between 100 and 250 employees.

Companies from business sectors 2 (industry) and 3 (service) are represented in the control sample; almost all business fields. The largest proportion is taken up by *Manufacturing and industry* (16%), followed by *Trade and repair of durable goods* (15%) as well as *Public Administration* (8%).

## 4 Data Analysis

### 4.1 Investment in Process Support and Perceived Utility

In a first step, companies were interviewed about their past investments into business software for different process areas. Given a prior investment, they were asked to indicate the electronic integration which had been achieved with the use of business software in the respective area. As can be seen from Figure 3 (right line) “Accounting and finance” is the functional area where the highest degree of electronic integration is reached. This is easy to explain since most SMEs use electronic interfaces for the exchange of data with their banks or with government agencies (e.g., DATEV standard interface or ELSTER method for the electronic submission of tax declarations). Other areas which score high on integration are “Management”, “Processing of orders”, and “Collaboration”, the latter being specialized on the exchange of data over company borders.



**Figure 3:** Comparison investment in IT and expected utility of IT investment

In general, the high degree of data exchange is remarkable. All average values are higher than “3” which means that the majority of Swiss SMEs which use these eleven business software modules make use of cross-area data exchange. There is a possible explanation for this. If companies use an integrated business software system (e.g., Abacus, SAP, or Sage Sesam) the cross-area integration comes with the implementation of the system. Questions of data exchange only arise if companies use specialised software products for different areas. So we can

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surmise that most companies use integrated software packages. These results are in accordance with a Swiss specialized study on this topic which reported that the use of integrated software packages was relatively high in SMEs [Dettling et al. 2004, p. 46]. Accounting and finance (55.8%), human resource management (46.4%) and sales processes (39.1%) were the top three integrated ERP modules in the year 2005.

Interestingly, the values for the expected utility of investments in business software modules are lower (left line) than the prior investments (right line). As for the investments, the figures reflect an even estimate of the future return on investment into the different areas. It is interesting to notice that the highest return is expected from “Accounting and finance” (3.70), a mere supporting function which does not directly contribute to the firm’s value generation. Nevertheless, this high value reflects the importance which SMEs attach to a smooth and fully functional accounting and finance system. “Procurement” (3.69) has the second highest score underlining the continuing trend towards an increased electronic support of the buying process which is also true for the large companies in Switzerland. In a recent study of the top 200 companies, almost 80% of the respondents stated that information technology makes an important contribution to successfully carrying out the procurement function [Tanner et al. 2008]. The third highest ROI is expected from the area of “customer service” (3.64).

## 4.2 Exploratory Factor Analysis (EFA)

Exploratory factor analysis (EFA) is a class of procedures used for data reduction and summarization [Malhotra and Birks 2007]. In the present study, we asked firms to evaluate their intended IT-related investments in business processes on a series of items (i.e., questions) using a 5-point scale ranging from “1 = is not supported / low utility” to “5 = long-range exchange / high utility”. Eleven items were subjected to an exploratory factor analysis (principal components analysis with Varimax rotation); a minimum eigenvalue of 1 was selected as the criterion for inclusion [Kim and Mueller 1978]. The result was a two-factor solution that accounted for 59% of variation.

The first factor includes the remaining modules which have functionality beyond the basic running of a company (primary processes in our framework). They are either buying-oriented (procurement, SRM, material management), selling-oriented (sales processes, CRM, order processing), or service-oriented (customer service). Accordingly, we named this factor *Specialized Modules*.

The second factor contains “accounting and finance”, “human resource management/ payroll accounting” and “Management (reporting, business intelligence)”. These are usually the first ERP modules which a company needs to run its business. These modules support basic functions (secondary processes according to our research framework) such as bookkeeping, salary management and the provision of basic figures for company management. We therefore named this factor: *Basic Modules*.

These two underlying factors – *Specialized Modules* and *Basic Modules* – explain the correlations among the items loading onto the respective factor. A measure of sampling adequacy value of 0.91 indicated that the correlation matrix was “marvellous” [Kaiser 1974]. With Cronbach alphas of well above 0.70 [Nunnally

1978], the scales representing the two factors are stable and internally consistent in the sample (see Table 1). As mentioned above, the data collection process yielded a sample of 917 usable records. After excluding firms (334) with missing or dubious responses, a final sample of 583 firms remained for analyses.

The factor “*Specialized Modules*” is measured with eight and the factor “*Basic Modules*” with three items, respectively. As can be gleaned from Table 2, the three items loading onto the second factor represent basic business functions. In contrast, factor one summarizes specialised business functions that may not necessarily exist in all firms.

**Table 1:** Factor Analysis Results

	Cronbach’s $\alpha$ / Eigenvalue/ Factor loading (from EFA*)
<i>Factor 1: Specialized Modules</i>	$\alpha = 0.81$ Eigenvalue = 5.30
Q05: Supplier Relationship Management (SRM)	0.82
Q04: Procurement and procurement processes	0.73
Q06: Materials logistics / merchandise management	0.69
Q10: Customer Service	0.69
Q08: Sales Processes	0.66
Q09: Marketing/Customer Relationship Management (CRM)	0.66
Q11: Collaboration with market partners	0.60
Q07: Processing of orders	0.58
<i>Factor 2: Basic Modules</i>	$\alpha = 0.87$ Eigenvalue = 1.17
Q01: Accounting and finance	0.87
Q02: Human resource management / payroll accounting	0.85
Q03: Management (Reporting, Business Intelligence)	0.69

\*EFA = exploratory factor analysis

### 4.3 Cluster Analysis

In order to identify groups of firms, a hierarchical cluster analysis followed by a k-means analysis was performed. Each firm’s relative standing on each of the two factors (*Specialized Modules* and *Basic Modules*) was estimated by computing factor scores, which were then used as input variables for clustering. The more strongly the values (i.e., factor scores) are situated in the negative range, the more

## Data Analysis

firms rate the respective factor below the cluster average, while positive values indicate a rating above the cluster average. In addition, firm-related variables (e.g., number of employees) as well as questions on activities geared towards gaining a competitive advantage (see Appendix for scale items) were used to profile the clusters. Analysis of variance followed by a Scheffé test [1953] was performed to examine inter-group differences on the profiling variables. Distances between the clusters were calculated with the Euclidean distance measure and aggregation of clusters was performed with Ward's procedure. To reflect the true structure of the data set, the elbow criterion was used to decide on the number of clusters. Thresholds existed at four and six clusters, respectively. To decide on the most appropriate solution, an additional multiple discriminant analysis for both solutions was performed. The hit rate (or proportion of firms correctly classified) was highest for the four-cluster solution according to the confusion matrices (see Table 2).

**Table 2:** Characterization of the firm clusters

	Cluster 1 n=231	Cluster 2 n=165	Cluster 3 n=108	Cluster 4 n=79
<i>Identifying Firm Clusters</i>				
Factor 1: <i>Specialized Modules</i>	0.4678	0.6754	-1.0705	-1.3310
Factor 2: <i>Basic Modules</i>	0.6763	-0.8402	-0.9538	1.0457
<i>Profiling Firm Clusters</i>				
Mean number of full-time employees	84 <sup>a*</sup>	89 <sup>a, b</sup>	66 <sup>c</sup>	82 <sup>a, c, d</sup>
Activities to gain competitive advantage	3.00 <sup>a</sup>	2.92 <sup>a, b</sup>	2.77 <sup>b, c</sup>	2.69 <sup>c, d</sup>
Sales (development over last 3 years)**	3.95 <sup>a</sup>	4.01 <sup>a, b</sup>	3.71 <sup>c</sup>	3.82 <sup>a, b, d</sup>
<i>Current assessment regarding business processes</i>				
Need to be more flexible and more customer-specific	3.18 <sup>a</sup>	3.21 <sup>a, b</sup>	2.83 <sup>c</sup>	2.85 <sup>c, d</sup>
Have been optimized and are not going to change much	2.37 <sup>a</sup>	2.47 <sup>a, b</sup>	2.73 <sup>b, c</sup>	2.42 <sup>b, d</sup>
Need to apply new technologies	3.30 <sup>a</sup>	3.17 <sup>a, b</sup>	2.78 <sup>c</sup>	3.13 <sup>a, b, d</sup>
Competitive advantages with IT could be gained	3.13 <sup>a</sup>	2.99 <sup>a, b</sup>	2.69 <sup>c</sup>	2.57 <sup>c, d</sup>

Mean; within a row, means with the *same* superscript are not significantly ( $p < .05$ ) different from each other (according to LSD test); \*\* 5=increase > 6% per annum, 4=increase > 2%-6% per annum, 3=stable (+/- 2%), 2=decrease > 2%-6% per annum, 1=decrease > 6% per annum

Four clusters emerged from the analysis. They were named after their attitude towards investment and are described in the following paragraphs.

- Cluster 1: The IT convinced
- Cluster 2: The IT differentiators
- Cluster 3: The IT sceptics
- Cluster 4: The IT pragmatists

**Segment 1** is the largest of the four clusters and represents firms that can be described as ***IT convinced***. Companies in this cluster score positively on both factors (*specialized modules* and *basic modules*) and are most likely to engage in activities that will give them a competitive advantage in the marketplace.

They see a need to design more flexible business processes that are more customer-specific. Of all clusters, this group sees the greatest need to apply new technologies (such as SOA) within their IT landscape. They are also the ones most certain to have gained competitive advantages with IT. This is in accordance with Hitt et al. [2002, p. 93] who found that “ERP adopters are consistently higher in performance across a wide variety of measures than nonadopters”.

The firms in **segment 2** are striving for ***differentiation through IT***. They have the highest score of all segments for the factor *specialized modules* which would suggest that they consider IT investments as a means to differentiate themselves from their competitors. Indeed, similar to segment 1, these firms engage in activities to gain a competitive advantage. However, these firms are less likely to invest in IT supporting basic business functions. A possible explanation for this is that they have invested substantially in basic software modules in the past and are thus “saturated” in this area. Firms in this cluster have the highest average number of employees and report the highest growth in sales of all segments.

The companies in cluster two are most sensitive regarding the need to make business processes flexible and more customer-specific.

Differentiation through IT is vividly discussed in the literature. In a recent article on business process excellence through business software, “differentiating factors” were identified which led to improvements/optimizations of primary processes [Schubert 2007]. Similar to our business processes, examples were efficient *order commissioning* or optimised *sales-driven production*. These findings contradict Carr’s [2003] statement that “IT does not matter” and support his later statement that it only makes sense to be innovative with IT “if it is extremely difficult for the competitor to copy this innovation” [Kisseloff 2006].

The ***IT sceptic*** firms in **segment 3** are the second smallest group, containing firms with the lowest average number of employees. One of their defining characteristics is that they score low on both factors, having the smallest score of all segments on the factor *basic modules*, suggesting that these firms do not see much value in investing in IT at all. It is perhaps not surprising, that firms in this cluster report flat to low growth in sales.

Typically, the sceptics believe that their business processes have already been optimized and they are not going to change much in the future.

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Finally, **segment 4**, the smallest of the four clusters, represents firms that appear to agree that investing in *basic modules* makes good business sense, whilst investing in *specialized modules* does not. This finding is consistent with the fact that firms in this cluster are the least likely to engage in activities aimed at gaining a competitive advantage. Therefore, firms in this group can be described as ***IT pragmatists***. They do not show any specific attitude towards the flexibility of their business processes or the need to change. It is worth mentioning that they are the ones which gained least competitive advantages with IT in their self-assessment.

The answers given by companies in cluster 2 and 4 are significantly different in *all questions* regarding future requirements towards business processes. This indicates that the different standpoints of *IT differentiators* and *IT pragmatists* have a statistical significance and are thus the most important result of this part of the study. While the differentiators value the use of IT and identify business opportunities from it, the IT pragmatists are on the other side of the spectrum as where they use IT to run their business but not to improve it or to gain competitive advantage from it.

### 4.4 Distribution of Industry Sectors in the Clusters

In a next step, we wanted to learn more about the clusters and their characteristics. Table 3 shows the distribution of industries in the four clusters. It is surprising to see that the distribution of industries in the clusters is quite even. There are only some gentle indications of “typical” industries. Cluster 2, the *IT differentiators*, for example, shows an above average number of companies from the manufacturing industry. The retail industry, on the other hand, is well represented in the group of the “*IT convinced*”. Among the “*IT sceptics*” we see a disproportionate number of construction companies. The smallest cluster, the “*IT pragmatists*”, finally contains many companies of the non-profit sectors: public administration, education and health as well as social services.

**Table 3:** Distribution of industries in the clusters (Swiss NOGA code)

Cluster No.:	1	2	3	4
(D) Manufacturing, industry	38	48	19	11
(E) Power, water utility	18	8	7	6
(F) Construction company	13	10	11	4
(G) Retail, repair of durable goods	50	32	16	10
(H) Hotels and restaurants	14	8	3	4
(I) Transport and telecommunications	21	6	7	3
(J) Banking and insurance	18	14	3	0
(K) Company-related services	25	13	9	10
(L) Public administration	7	7	4	7
(M) Education	6	8	14	11
(N) Health and social services	11	7	8	9
(O) Other services for third parties	10	4	7	4
<b>Total:</b>	<b>231</b>	<b>165</b>	<b>108</b>	<b>79</b>

## 4.5 Focus Topic: Electronic Data Interchange

Electronic data interchange is at a very high rate in Swiss SMEs. Table 4 and Table 5 show cross tabs between the clusters and the responses regarding EDI use with customers and suppliers. Around 94% of the companies in cluster 1 and 2, the *IT convinced* and the *IT differentiators*, use electronic document exchange with their customers and their suppliers. Cluster 3 and 4, the *IT sceptics* and the *IT pragmatists*, are at around 90% which is still remarkably high.

**Table 4:** EDI with customers

Cluster No.:		1	2	3	4
	EDI no	15 (6%)	12 (5%)	21 (9%)	13 (6%)
	EDI yes	216 (94%)	153 (95%)	87 (91%)	66 (92%)
	Domestic only	130 (56%)	90 (39%)	62 (27%)	51 (22%)
	Europe	52 (23%)	30 (13%)	11 (5%)	8 (3%)
	World-wide	34 (15%)	33 (14%)	14 (6%)	7 (3%)
Total		231	165	108	79

**Table 5:** EDI with suppliers

Cluster No.:		1	2	3	4
	EDI no	17 (7%)	11 (5%)	26 (11%)	19 (8%)
	EDI yes	214 (93%)	154 (95%)	82 (89%)	60 (92%)
	Domestic only	112 (48%)	76 (33%)	51 (22%)	38 (16%)
	Europe	68 (29%)	53 (23%)	20 (9%)	16 (7%)
	World-wide	34 (15%)	25 (11%)	11 (5%)	6 (3%)
Total		231	165	108	79

## 5 Conclusions and Summary

The business software modules which we examined with the exploratory factor analysis showed two distinctive factors representing different sets of business software modules: *specialized modules* and *basic modules*. These modules incidentally correspond with the *primary* and *secondary* processes from our research framework. Interestingly, Porter's distinction of company processes is also a valid means to differentiate attitudes towards IT investment in Swiss SMEs. In order to investigate the attitude of the respondents towards investment in business software modules, we performed a cluster analysis based on their ability to achieve competitive advantages. We found four different types of companies: (1) The IT convinced, (2) The IT differentiators, (3) The IT sceptics, and (4) The IT pragmatists. Our identified patterns are similar to earlier studies by McFarlan [1984] who identified a similar typology of companies: (1) turnaround, (2) strategic, (3) factory, and (4) support.

## Conclusions and Summary

The clusters demonstrate statistically significant differences regarding their attitude towards *specialized modules* and *basic modules*. Also, they can be profiled according to their *firm size* and the development of their *turnover*.

We examined the clusters in detail looking for typical industry sectors. We found some tendencies but could not identify a clear relationship between industries and clusters. The use of EDI was not a differentiating factor since all groups show a surprisingly high use of over 90%.

In the final „self-assessment regarding IT use for business processes“, we asked the companies to respond to pre-defined statements. Here, we found clear differences in the responses. The more IT-welcoming clusters 1 and 2 agreed with the statements more strongly that their “processes need to be more flexible and more customer-specific” and that “competitive advantages with IT could be gained”. Additionally, the IT convinced were the strongest confirmers of “we need to apply new technologies”. The IT sceptics on the other hand believe that “our processes have been optimized and are not going to change much”. Not surprisingly, cluster 4, the IT pragmatists, were the ones who reported “least competitive advantage achieved with IT”.

In future research, we intend to further link our research with previous literature on IT investment and value generation [e.g., McFarlan 1984; Keen 1991; Peppard and Ward 2004; Weill and Broadbent 1998]. For example, the data of our study could be used to draw analogies to the model of IS capability [Peppard and Ward 2004].

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## **Appendix**

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### **Items included in cluster profiles**

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#### **Activities regarding competitive advantage / Cronbach $\alpha = 0.75$**

We contrast with our competitors because we are amongst the cheapest in the market

We contrast with our competitors because of the uniqueness of our products

We can persist in the market because we focus onto the specific needs of market segments.

The quality of our products is key to gaining competitive advantages.

The quality of our added services is key to gaining competitive advantages.

Having a cross-company coordination of processing of orders is a deciding factor for maintaining a competitive edge.

Our customers view us as an innovative company that tends to be the first to introduce new products into the market.

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