

Factors affecting the computerization of small industrial enterprises

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ABSTRACT

Extensive research has been conducted on the computerization of the Small and Medium Enterprises (SMEs) and on the similarities, differences and specificities it presents compared with the computerization of the large enterprises. However the above research has mainly focused on the larger SMEs, while very little research work has been done on the computerization of the smaller SMEs, though they contribute significantly to the national product and to the total labour employment of most countries. This paper investigates the factors affecting the computerization of the Small Industrial Enterprises (SIEs), both the initial decision to introduce IS in the enterprise, and the subsequent decisions to extend the use of IS in the enterprise. For this purpose data from 427 SIEs were collected and processed, in order to determine statistically significant business and financial factors affecting the above computerization decisions. The results shed light on a variety of business and financial factors affecting the computerization of Small Industrial Enterprises.

1. INTRODUCTION

The Small and Medium Enterprises (SMEs) constitute in most countries the backbone of the economy and contribute significantly to

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the national product and the employment. According to the European Commission ([10]) "More than 99% of the 18 million European enterprises in the non-agricultural market are SMEs. They employ 66% of the workforce and generate 55% of the total turnover". The SMEs are very important not only in the less developed and developing countries, but also in the developed ones. For example in Germany the 99.6% of the enterprises are SMEs, generating 44.1% of the Gross National Product and 67.9% of jobs ([9]). Due to their flexibility the SMEs are an important source of innovation, and their importance is expected to increase in the "Digital Economy", because the rapidly emerging e-business technologies and capabilities are going to lower the entry barriers they often face today in order to enter new markets ([11]).

For these reasons extensive research has been conducted on the computerization of the SMEs ([1], [2], [4], [5], [6], [12], [19], [21], [25], [26], [27], [31], [32], [37]), which is considered as critical to their competitiveness and survival. The main directions of this research have been the investigation of the extent, the characteristics, the evolution, the motivators, the inhibitors, the organization, the level of success and the critical success factors of the computerization of SMEs. Much research has also been conducted in order to study the similarities, differences and specificities that the computerization of SMEs presents compared with the computerization of the large enterprises. An important finding from the above research, and at the same time a critical challenge for it, was the conclusion that there is generally a positive correlation between the size of an enterprise and the adoption of Information and Communication Technologies (ICTs). From all this research it has been clear that the SMEs generally use the ICTs, both the "traditional" and the modern internet-based ones, much less (quantitatively and qualitatively) than the large enterprises. Numerous activities and programmes have been implemented in the past, and many others are today in progress, organized by various regional, national and international authorities, aiming at increasing ICTs usage in the SMEs, both at the quantitative and the qualitative level ([11], [16]).

However the above mentioned research has mainly focused on the upper layer of the SMEs, namely on the larger ones. Very little research work has been done and very little is presently known about the computerization of the smaller SMEs, though in most countries they contribute significantly to the national product and the labour employment. According to the European Commission ([10]) 98.8% of the enterprises of the member states employ less than 50 employees, being classified as Micro or Small Enterprises. These enterprises are

very important for the economies of the member states, and generate 34.9% of the total turnover and 53% of the total employment.

The small enterprises are generally characterized by much lower adoption of ICTs than the other larger SMEs, as it is concluded in relevant reports and studies ([11], [26], [27], [32]). For example, as we can see in the table of Figure 1 (from [11]), the micro enterprises of the member states of the European Union (namely the enterprises with less than 10 employees) are characterized by much lower usage of Internet technologies than the small ones (with 10-49 employees). Also the small enterprises are characterized by much lower usage of Internet technologies than the medium ones.

	Number of employees			
	1	2-9	10-49	50-249
Have direct access to Internet	33%	49%	67%	86%
Distribute product information via Internet	14%	27%	42%	59%
Received orders via Internet	8%	10%	15%	20%
Receive payments via Internet	3%	3%	4%	7%
Make payments via Internet	4%	5%	8%	9%

Source: European Network for SMEs Research (ENSR) - Enterprise Survey 1999

Figure 1. Percentages of European SMEs using Internet technologies by size (number of employees)

For these reasons extensive research is required on the computerization of the small enterprises and its basic characteristics and specificities. All the above issues and perspectives, which have been investigated so far concerning the computerization of the SMEs viewed as a whole, should be now investigated specially for the small enterprises, due to their specificity and importance. In this research direction the present study attempts to contribute. Particularly, in this study we investigate the factors affecting the computerization of the Small Industrial Enterprises (SIEs), both the initial decision to introduce IS in the enterprise, and the subsequent decisions to extend the use of IS in the enterprise. For this purpose data from 427 SIEs were collected by means of a structured questionnaire, concerning their computerization and also their basic business and financial characteristics. In the following sections of this paper are presented the theoretical background, the research methodology, the results and their interpretation.

2. THEORETICAL BACKGROUND

There are many definitions of a Micro, Small and Medium enterprise, which have been developed and used by various public authorities, financial institutions, etc., for various purposes and contexts ([8], [9], [10]). Most of them are based on criteria concerning the number of employees or/and the annual turnover. Each of these definitions has been significantly influenced by the particular purpose and the particular context for which it was developed. For this reason there are big differences between these definitions, and their thresholds for classifying enterprises as micro, small or medium ones differ significantly: generally in the larger and more developed countries the thresholds are higher, while in the smaller and less developed countries they are much lower. For example in the USA as "Small" are classified the enterprises with less than 500 employees, and as "Medium" the ones with 501-1000 employees, while in most smaller and less developed countries an enterprise with 500 or 1000 employees is classified as a very large one.

The most widely utilized today definitions of a Micro, Small and Medium enterprise are the ones developed by the European Commission (Recommendation 96/280/EC) ([8]), which are based on criteria concerning the number of employees, the annual turnover and the balance sheet total. The basic thresholds of these definitions are shown below in Figure 2.

	Micro	Small	Medium
Number of employees	<10	10-49	50-249
Annual turnover (in million euro)	-	< euro 7m	< euro 40m
Balance sheet total (in million euro)	-	< euro 5m	< euro 27m

Figure 2. Definitions of a Micro, Small and Medium Enterprise according to European Commission Recommendation 96/280/EC

According to the above EC definition an enterprise is classified as a Micro Enterprise, if it is independent and satisfies only the above employees criterion, while an enterprise is classified as a Small or Medium Enterprise, if it is independent and satisfies the corresponding employees criterion and at least one of the two corresponding financial criteria.

The SMEs are generally characterized by significant differences from the large enterprises ([30], [33], [34]). They also encounter some

specific problems which are not encountered by the large enterprises. For these reasons an extensive body of research has been conducted in order to investigate this specificity and its impact on SMEs operation, computerization and performance. According to [30] this specificity has the following four main dimensions, which all affect significantly the ICTs usage, both at the quantitative and the qualitative level:

- The first dimension is the organizational specificity. SMEs are typically characterized by very simple and highly centralized organizational structures. They are also "resource poor" regarding human, financial and material resources. Because of their small size they have a much lower control over their environment (customers, suppliers, etc.) than the large enterprises, which creates to them higher environmental uncertainties.
- The second dimension is the decisional specificity. In the SMEs the decision time frame is much shorter term, and their decisions are of more reactive and less proactive orientation, compared with the large organizations. Also the decision process is more intuitive and judgemental, and the decision makers use much less formal decision making techniques, models and information.
- The third dimension is the psycho-sociological specificity. The managers of the SMEs are very often their owners as well, and play a very dominant role in terms of strategic decision making and of shaping the general psychological climate within the enterprise. Usually the owners-managers have a more individualistic ideology, compared with their counterparts in the large enterprises, and are much less willing to share information and delegate decision making and other important responsibilities.
- The fourth dimension is the information systems specificity. In most SMEs the information systems (IS) function is at the 'early' stages. Using the existing "IS Growth Stages Models" (e.g. [13], [24]), most SMEs are either at the "Initiation Stage" or at the early "Contagion Stage", and very few of them have progressed to the next and more mature stages. In SMEs the IS function usually is a part of another function of the enterprise, e.g. of the accounting function. In most cases it lacks the required hierarchical lever, power, personnel and expertise in order to plan, organize, support and control the usage of ICTs in the enterprise. Usually it does not progress to the higher hierarchical level and the increased

power of the "Control Stage". The evolution of IS to the more mature stages in the SMEs is positively affected by the positive attitude and the enthusiasm of the owner-manager for the ICTs, while it is negatively affected by resources insufficiency and the inadequate education, knowledge and expertise of the managers-owners in the ICTs ([5]). The applications portfolio of most SMEs includes mainly transactional applications (e.g. payroll, accounting, inventory control, etc.), aiming mainly at increasing the organizational efficiency, but with very small impact on the organizational effectiveness ([14]). Only a few cases have been reported in the literature of more advanced, innovative and strategic uses of ICTs ([17], [23]), aiming at the development of new products, services and markets using ICTs, at gaining significant competitive advantages, or at supporting environmental scanning in order to recognise threats and opportunities. The existing applications in SMEs are usually pre-programmed packages and the IS function has a relative low level of expertise in applications development.

The above multidimensional specificity of the SMEs has a negative impact on ICTs usage. Because of them mainly the SMEs generally use the ICTs, both the "traditional" and the modern Internet-based ones, much less (quantitatively and qualitatively) than the large enterprises. However in the last decade there is a relative increase of ICTs usage in the SMEs ([23]), which is mainly attributed to:

- The dramatic decrease of the cost of computers hardware.
- The numerous user-friendly and low cost pre-programmed software packages, which are offered in the markets of most countries.

Today the computerization of the SMEs is dominated by software packages, which very often is the only feasible solution ([15], [18], [20], [30], [36]), because SMEs usually do not have the specialized personnel to develop tailored applications internally, or the required funds to have tailored applications developed externally by software houses. This dominant software packages solution offers to the SMEs some important advantages in comparison with the tailored software solution:

- a) Lower acquisition, implementation and operation costs.
- b) Shorter implementation time.
- c) Lower implementation risk (because most of these software packages have been operational for long time in other similar enterprises as well).

However the software packages solution has some disadvantages as well:

- i) The user-SME often has to change radically its work procedures and adapt them to the package. Some of these adaptations may be usefull Business Process Reengineering (BPR), but some others may cause big problems.
- ii) The user-SME often becomes highly dependent on the vendor of the software package.

Extensive research has been conducted in order to investigate how SMEs practically implement the above solution, and whether there are some contexts or actions associated with higher implementation success levels ([3], [15], [18], [20], [36]). From this research it has been concluded that SMEs, in order to minimize the failure risk of such projects and maximize the level of success, should take the following actions: undertake initially a proper requirements specification, follow a rational vendor and package selection process based not merely on the price but also on the functionality, the adaptability and the ease of use of the package, require sufficient documentation and also training & support services from the vendor, etc.

Most of the research conducted on the computerization of the SMEs concerns mainly the ones of the services sector, and much less the industrial ones. However in most countries the industrial SMEs are very important for the national economy and have a critical role as basic partners and subcontractors of the large industries. They have some distinct differences from the service sector SMEs. Very important for their competitiveness are not only the "Office" oriented ICTs, but also the manufacturing ICTs, such as the Computer Numerically Controlled (CNC) Machines, the Computer Aided Design (CAD), the Computer Aided Manufacturing (CAM), etc. The industrial SMEs today are generally characterized by low usage of these advanced manufacturing ICTs ([6], [31]). However some increase in the adoption of these technologies is reported in the relevant literature, mainly by large industrial SMEs of developed countries ([31]).

Another important research issue, for which many studies have been conducted, is to measure the level of success of the computerization of the SMEs and to determine the organizational and technical factors affecting it. In [28] and [29] it was found that IS success is positively correlated with the proportion of applications run internally, the proportion of applications developed internally, the number of advanced decision support analytical applications (rather than pure transactional ones) and the hierarchical level of the IS function. In [18] it was found a positive correlation between IS success and the quality of vendor

involvement, the degree of user involvement and the prior experience in business computing, and also a negative correlation between IS success and use of consultants. In [22] it was found that IS success is positively correlated with the involvement of a systems analyst performing a formal requirements analysis, the degree of user involvement and the degree of interactivity of the systems. Also in [37] it was concluded that the most important factors for the success of the computerization of the SMEs are the level of support from the CEO, the degree of user involvement, the internal IS experience, the quantity and quality of vendor support, the efficiency of the consultants and the sufficiency of financial resources. In [35] it is concluded that the characteristics of the CEO of the SMEs, such as the attitude towards ICTs, the knowledge of ICTs and the innovativeness, affect critically the successful adoption of ICTs in the enterprise. In [12] the factors affecting positively the successful adoption of ICTs by the SMEs are grouped into two categories: internal factors, such as the general organizational culture the attitude towards ICTs, the expected benefits, the existing in-house IS experience, the level of support by management and the availability of financial resources, and external factors, such as the adoption of ICTs by competitors and trading partners, the organizational image and the degree of outside support by vendors and consultants.

Similar are the conclusions concerning the adoption and usage of the modern Internet-based ICTs by the SMEs ([11], [26], [27]). The SMEs, and particular the smaller ones, are generally characterized by much lower adoption and usage of these critical technologies than the large enterprises. Most SMEs use to some extent the WWW, in order to search for useful information, and the E-mail for business communication and document transfer, but hesitate to proceed to a more sophisticated exploitation of the Internet, such as receiving orders and payments from their customers or making purchases and payments via the Internet. Because of this low usage of the modern Internet-based ICTs the SMEs miss many business opportunities created by the rapidly growing Electronic Commerce and Digital Economy.

In most SMEs there is no IS strategy, therefore they miss many opportunities for more advanced, innovative and strategic uses of ICTs and for better planning of their relevant investments ([14], [19]). Only some large SMEs in developed countries (USA, Great Britain, etc.) have been reported to have some simple forms of IS planning, but without focusing on increasing the competitiveness and gaining advantages with the ICTs, and without using the most sophisticated IS strategy frameworks, methods and tools ([7]). In most SMEs their decisions for ICTs investments are influenced much more by their

main customers (e.g. in case they want to proceed to EDI with their suppliers) than by their own strategy (formal or not).

Most of above research on the computerization of SMEs has mainly focused on their upper layer, namely on the larger ones, mainly of developed countries (typically with 100-200 employees). Very little research work has been done and very little is presently known about the computerization of the small enterprises, particularly about less developed and developing countries, despite their economic and social importance. Therefore all the above mentioned issues and perspectives investigated so far concerning the computerization of the SMEs viewed as a whole, should be now investigated specially for the small enterprises in various national contexts, due to their specificity and importance, so that the main characteristics and specificities of their computerization can be determined and analysed.

3. METHODOLOGY

In order to investigate the factors affecting the computerization of the SIEs, as sample were used the SIEs of the Industrial Area of Magnesia, which is one of the oldest industrial areas of Greece (dating from the last years of the 19th century). The criterion used for characterizing an enterprise as small was to have less than 25 employees. We used a threshold lower than the one of the definitions of the European Commission (Recommendation 96/280/EC) ([8]), because we believe that it is more suitable for the smaller scale of the Greek economy in comparison with the average scale of the European Union economies.

A structured questionnaire was constructed, tested and sent to 612 SIEs (according to the above criterion) of the Industrial Area of Magnesia, in cooperation with the Organization for the Development of Magnesia. We tried to make this questionnaire as simple and short as possible, in order to have high response rate. The questionnaire included two categories of questions. The first category concerns basic business and financial characteristics of the enterprises (business and financial variables), which according to the literature might affect their computerization:

- Sector
- Year of establishment
- Legal Status
- Area of activity
- Number of employees
- Value of equipment

- Whether they had hired any new personnel in the last three years or not
- Whether they intended to hire any new personnel in the next two years or not
- Whether they had made any investments in the last three years or not, and in case of positive answer the total amount of investment in the last three years
- Whether they intended to make any investments in the next two years or not, and in case of positive answer the estimated total amount of investment in the next two years
- Trend of sales in the last three years (increasing, stable or decreasing)
- Trend of profits in the last three years (increasing, stable or decreasing)
- Trend of employment in the last three years (increasing, stable or decreasing)
- Expected trend of sales in the next two years (increasing, stable or decreasing)
- Expected trend of profits in the next two years (increasing, stable or decreasing)
- Expected trend of employment in the next two years (increasing, stable or decreasing)

The second category of questions concerned the computerization of the enterprises (computerization variables):

- Whether they used computers in the enterprise or not and in case of positive answer to the previous question: whether they used computers or not:
 - In the cash-desk unit
 - In the accountancy unit
 - In the administration unit
 - In the sales unit
 - In the production unit
 - In other units of the enterprise.

From the 612 SIEs, to which the questionnaire was sent, we finally received 427 completed questionnaires, having a good response rate of 69.8%. They were processed in two phases. In the first phase were calculated the statistics of each of the above business, financial and computerization variables separately, using univariate statistical analyses. In the second phase was examined the association between the comput-

erization variables on one hand, and the business and financial variables on the other, using multivariate statistical analyses. The main objective of these analyses was to determine which of the above business and financial characteristics have a statistically significant effect on the computerization characteristics. After each of the above two phases of processing, its results were discussed and interpreted by the authors in cooperation with the Organization for the Development of Magnesia.

4. RESULTS

4.1. *Computerization Characteristics*

As we can see in Figure 3, only 126 of the respondent enterprises (29.5%) answered that they were using computers to some extent for supporting some of their functions, while the remaining 301 (70.5%) answered that they were not using computers at all. The above low percentage of computer user enterprises among the SIEs is much lower than the corresponding percentages of the developed countries ([11], [32]). Therefore this very small enterprise size, probably in combination with the national and/or regional context, give rise to a specificity concerning ICTs adoption.

Use of Computers	Number	Percentage %
YES	126	29.50%
NO	301	70.50%

Figure 3: Users and Non-Users of Computers

In Figure 4 we can see that the function with the highest IT usage is the accountancy, as 63.6% of the above 126 computer users SIEs use IT for supporting the accountancy function, followed by the sales function (59.3%), the production function (45.8%), the administration function (43.2%), etc. These findings are in agreement with the findings of other studies that the accountancy function, and generally the financial functions, are the enterprise functions with the highest IT usage ([3], [6], [15], [32]).

Also for each of above 126 computer users SIEs was calculated the number of functions supported by IT, as a basic measure of the extent of IT usage in the enterprise, and its statistics are shown in Figure 4. As we can see from this Figure the average number of functions supported by IT is 2.64, however we can distinguish two

clearly distinct subgroups. The first of them, including 54.24% of the respondent SIEs having IT support either in only one function (33.90%) or in two functions (20.34%), are characterized by low IT usage. On the contrary the second subgroup, including 34.75% of the respondent SIEs having IT support in four or more functions (17.80% in four functions, 16.10% in five functions and 0.85% in more than five functions), are characterized by high IT usage.

Function	Percent (%)	Number of Functions supported by IT	Percent (%)
accountancy	63.60%	1	33.90%
sales	59.30%	2	20.34%
production	45.80%	3	11.01%
administration	43.20%	4	17.80%
cash-desk	39.00%	5	16.10%
others	13.60%	> 5	0.85%
Average = 2.64 functions			

Figure 4. Use of computers by function

4.2. Business and Financial Characteristics

As we can see in Figure 5 about half (45.4%) of the respondents belong to the sector of Transport Vehicles' industries, while 25.8% belong to the sector of Wood and Furniture industries and 20.8% to the Metal industries. As to their legal status, from the same Figure we can see that three quarters (75.2%) of them are sole proprietorships, namely personal enterprises with only one owner, which is the clearly dominant legal model. Also 18.9% are personal joint-stock societies with more than one owners, while only 4.5% have the more advanced legal status of anonymous society. Most of the respondents are old enterprises: one third (33.3%) have an age between 10 and 20 years, while about one third (32.1%) have an age between 20 and 30 years, and only 21.6% are less than 10 years old.

As we can see from the same Figure, most of them (77.5%) have a very small area of activity: 62.5% are active only within the Magnesia Prefecture and another 15% are active within the Magnesia Prefecture and its neighbouring Prefectures. Only 22.5% have a wider area of activity: 8.1% are active in many Prefectures of Greece, 10.1% are active in all Greece, while only 4.3% are active in all Greece and abroad. Their average number of employees is 4.21, and their average value of equipment is 37,302,821 GDR.

Sector		Legal Status		Age (in years)	
Food & Beverage	2.1%				
Wood & Furniture	25.8%	Sole Propr.	75.2%	< 10	21.6%
Metal	20.8%	Pers. Joint	18.9%	10-20	33.3%
Transport Vehicles	45.4%	Anonymous	4.5%	20-30	32.1%
Chemical Products	2.3%	Limited Liab	1.2%	30-40	9.8%
Building Materials	2.0%	Other	0.2%	> 40	3.2%
Other	1.6%				
Area of Activity		Investments in the last 3 years?		New employees in the last 3 years?	
Only Magnesia Pref.	62.5%	Yes	52.3%	Yes	5.8%
Magnesia Pref. + neighbouring Pref.	15%	No	47.7%	No	94.2%
Many Prefectures	8.1%	Investm. in next 2y?		In the next 2y?	
All Greece	10.1%	Yes	67.8%	Yes	12.4%
All Greece+abroad	4.3%	No	32.2%	No	87.6%
Average Number of employees			4.21		
Average value of equipment			37,302,821 GDR		
Trend of Sales in the last 3 years		Trend of Profits in the last 3 years		Trend of Employment in the last 3 years	
Increasing	36.8%	Increasing	28.3%	Increasing	24.9%
Stable	35.9%	Stable	39.9%	Stable	48.8%
Decreasing	27.3%	Decreasing	31.8%	Decreasing	26.3%
Exp. trend of Sales in the next 2 years		Expect. trend of Profits in the next 2 years		Expct. Trend of Employment in the next 2 years	
Increasing	13.2%	Increasing	12.1%	Increasing	11.7%
Stable	38.1%	Stable	38.9%	Stable	39.7%
Decreasing	48.6%	Decreasing	49.0%	Decreasing	48.6%

Figure 5. Business and Financial Characteristics

Concerning their investment behaviour, as we can see in Figure 5, 52.3% of the respondents have made some investments in the last three years, and 67.8% of them intend to make investments in the next two years. However only 5.8% of them have hired new employees in the last three years, and only 12.4% intend to hire new employees in the next two years.

More than two third of them (72.7%) experience an increase (36.8%) or stability (35.9%) in their sales during the last three years. Similar are the conclusions concerning profits and employment. However they are much less optimistic about the near future. For the next two years, about half of the respondents (48.6%) expect that their sales will decrease, 38.1% expect stability in their sales, while only 13.2% expect an increase in their sales. Similar are their expectations concerning profits and employment.

4.3. *Association between computerization and business and financial characteristics*

First we investigated the business and financial factors affecting the initial computerization decision to introduce IS in the enterprise. For this purpose X^2 Independence Tests were performed between:

- the first binary computerization variable, which measures whether an enterprise uses IS or not,
- and each of the above business and financial variables.

The continuous business and financial variables were properly discretized. For all these X^2 Independence Tests the usual 5% level of significance was used. The statistically significant dependences which were discovered from these tests are shown below in the second column of Figure 6 with the symbol (+) in the corresponding cells. From the results of these tests it is concluded that all the examined business and financial factors significantly affect the introduction of IS in the enterprise. These results, in combination with the corresponding Crosstabulations, are further analysed in the following.

First we can see that there is a statistically significant dependence of the introduction of IS upon the sector. The corresponding Cross-Tabulation shows that the percentage of computer user enterprises in some sectors (Food and Beverage, Chemical Products and Building Materials) is much higher than in some other sectors (Wood and Furniture, Metal, Transport Vehicles). Therefore the introduction of IS in the SIEs is affected by the sector, as the structure, the competition, the nature of the products/services and of their production processes, the problems, the general culture and other special charac-

teristics in some sectors favour the introduction of IT more than in other sectors. For this reason all national and international public authorities, ICTs vendors, consultants, universities, professional associations, etc. interested and involved in the computerization of the small enterprises should adopt less generic and more sectoral approaches and activities.

Business-Financial Characteristics	Introduction of Computerization	Extent of Computerization
Sector	+	+
Age	+	
Number of employees	+	
Value of equipment	+	
Legal Status	+	
Area of activity	+	+
Whether the enterprise has made investments in the last 3 years or not (binary variable)	+	+
Whether the enterprise intends to make investments in the next 2 years or not (binary variable)	+	
Whether the enterprise has hired new personnel in the last 3 years or not (binary variable)	+	+
Whether the enterprise intends to hire new personnel in the next 2 years or not (binary variable)	+	
Trend of sales in the last 3 years	+	
Trend of profits in the last 3 years	+	
Trend of employment in the last 3 years	+	
Expected trend of sales in the next 2 years	+	+
Expected trend of profits in the next 2 years	+	+
Expected trend of employment in the next 2 years	+	+

Figure 6. Association between Business and Financial Characteristics and Computerization

We can also remark that there is a statistically significant dependence of the introduction of IS upon the number of employees, the value of equipment and the area of activity, all being different perspectives and measures of the size of an enterprise. The corresponding Cross-Tabulation shows that the percentage of computer user enterprises among the SIEs with more employees, among the ones with higher value of equipment and among the ones with wider area of activity is much higher than it is among the SIEs with less employees, lower value of equipment and smaller area of activity respectively. Therefore, even among the SIEs, the introduction of IS is affected by the size, as the large size is generally characterized by bigger volumes of repetitive operational work, more information to process, more complexity, more coordination difficulties and more financial resources, all favouring the introduction of IS.

There is also a statistically significant dependence of the introduction of IS upon the age (meant as the number of years since the year of establishment). The corresponding Cross-Tabulation shows that the percentage of computer user enterprises among the older SIEs with age more than 30 years, and in particular among the ones with age more than 40 years, is much higher than it is among the more recently established ones. Therefore the introduction of IS in the SIEs is positively affected by longer business history, which is associated with longer collective experience and establishment in the market. Also there is a statistically significant dependence of the introduction of IS upon the legal status. The corresponding Cross-Tabulation shows that the percentage of computer user enterprises among the anonymous societies and the limited liability SIEs are much higher than the average in the present study, probably because they are characterized by larger size and higher organization and management. On the contrary the percentage of computer user enterprises is much lower among the sole proprietorships with only one owner.

Very interesting is the finding that there is a statistically significant dependence of the introduction of IS upon all the variables measuring various aspects of the general investment behaviour and the general attitude towards investment of the enterprise. The corresponding Cross-Tabulations show that the percentage of computer user enterprises is much higher among the ones which have made investments in the last 3 years, among the ones intending to make investments in the next 2 years, among the ones which have hired new personnel in the last 3 years and among the ones intending to hire new personnel in the next 2 years. Therefore the attitude towards the introduction of IS in the SIEs is affected by their investment behaviour and their general attitude towards investment.

Finally we can see that there is also a statistically significant dependence of the introduction of IS upon the trend of the enterprise sales, profits and employment in the last 3 years, and also upon their expectations as to the trend of their sales, profits and employment in the next 2 years. The corresponding Cross-Tabulation show that the percentage of computer user enterprises is higher among the SIEs with increasing trend of sales in the last 3 years than it is among the ones with stability of sales. Also among the SIEs with decreasing trend of sales in the last 3 years the percentage of computer user enterprises is higher than it is among the ones with stability of sales.

Similar are the conclusions from the corresponding Cross-Tabulation for the trend of profits and employment in the last 3 years, and also for the expected trend of sales, profits and employment for the next 2 years. Therefore the introduction of IS in the SIEs is positively affected by an increasing trend of their sales, profits and employment, as they are all associated with increased volumes of repetitive operational work, more requirements for information processing and also more available financial resources.

Next we investigated the business and financial factors affecting the subsequent decisions to extend the use of IS in the enterprise, and therefore the extent of computerization in the enterprise. For this purpose we used the data of the above 126 computer users and performed One-Way Analyses of Variance (ANOVAs) between:

- the number of functions supported by IT, used as the independent variable
- and each of the above business and financial variables, used as factor.

For all these ANOVAs the usual 5% level of significance was used. The business and financial factors found from the above ANOVAs to affect significantly the number of functions supported by IT are shown in the third column of Figure 6 with the symbol (+) in the corresponding cells.

From the results of these analyses it is concluded that, although many business and financial factors significantly affect the introduction of IS in the SIEs, in order to meet their basic information processing requirements, only a subset of them affect the extension of the use of IT in the enterprise, in order to meet their more advanced requirements with generally more sophisticated applications. In particular the extent of computerization of SIEs is affected by the sector, the area of activity, the investment behaviour in the last 3 years (whether the enterprise has made investments or not and whether it has hired new personnel), the trend of employment in the last 3 years and the

expected trend of sales, profits and employment in next 2 years. This difference from the initial computerization decisions is due to the fact that the decisions to extend computerization are generally more informed and are based on the experience gained from the initial computerization and the already existing IS.

5. CONCLUSIONS

In this study are investigated the factors affecting the computerization of the Small Industrial Enterprises (SIEs), both the initial decision to introduce IS in the enterprise, and the subsequent decisions to extend the use of IS in the enterprise. The results show that the initial computerization decision is affected by many business and financial factors such as the sector, the size, the age, the legal status, the area of activity, the general investment behaviour of the enterprise and its general attitude towards investment (both for assets and personnel), the trend of sales, profits and employment in the last 3 years and the expectations concerning the trend of sales, profits and employment in the next 2 years. However the subsequent decisions to extend the use of IS in the SIEs, being more informed and based on the experience gained from the initial computerization, and usually aiming at meeting more advanced requirements with generally more sophisticated applications, is affected by a only subset of the above factors. These factors are the sector, the area of activity, the investment behaviour in the last 3 years (whether the enterprise has made investments or not and whether it has hired new personnel), the trend of employment in the last 3 years and the expected trend of sales, profits and employment in next 2 years. The conclusions of this study may be useful to all national and international public authorities, ICTs vendors, consultants, universities, professional associations, etc. interested and involved in the computerization of the small enterprises.

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