ANALYSIS OF SMES EVOLUTION IN FRANCE

Ioana CEAUSU[1], Régis BOURBONNAIS[2], Cezar SCARLAT[3]

This paper presents the preliminary results of the study of the evolution of the SMEs in the information technology industry in France. This study was started during a research visit at the University Dauphine Paris, France, as a test model for a study involving SMEs from the information technology at national level in Romania. The analysis of the evolution develops around three indicators: size (number of employees), performance (turnover) and the age of each enterprise. Within this article the theoretical context for this research will be presented, as well as the methodology, the preliminary analysis and the conclusions.

Keywords: SMEs, evolution, information technology industry, growth

1. Introduction

During the last years, the expression "growth crisis" has been assimilated to the global financial crisis, which fundamentally challenged the business environment at all levels. However, enterprises have been encountering growth problems regardless of the type of economic, financial or business environment they ran their business in. The small and medium enterprises (SMEs) are more affected by such growth problems, especially because of their traditional restraints (Van Tonder & Ehlers, 2011; Lester & Trans, 2008; Pasanen, 2006; Rutherford et al., 2003). This is why the theme of the growth problems within the evolution of small and medium was approached. This paper will analyze a model test sample of SMEs from France, with the objective to identify, in function of three indicators, the behavior of SMEs throughout their development: the size (number of employees), performance (turnover) and age of the SMEs.

2. Context of Research

In order to comprehend the phenomena of growth problems of SMEs, it is necessary to understand the manner of development of SMEs. In order to achieve this, the model of the organizational life cycle (Fig. 1) offers a well fitted mainframe for the development of SMEs (Rutherford, 2001; Dodge & Robbins,

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[1] PhD Candidate, University POLITEHNICA of Bucharest, Romania; e-mail: ioana.ceausu@gmail.com
[2] Directeur Master Logistique, Management et Economie des réseaux, Université de Paris-Dauphine, Paris, France
[3] Prof. dr. ing., University POLITEHNICA of Bucharest, Romania

1992; Quinn & Cameron, 1983). Although there have been many variations of this model suggested over the past decades, the generally accepted model comprises four or five stages, named using a biological metaphor that suggests the life cycle of an organic being: birth, growth, maturity, expansion (optional in some models) and decline (or death) (Dodge & Robbins, 1992).
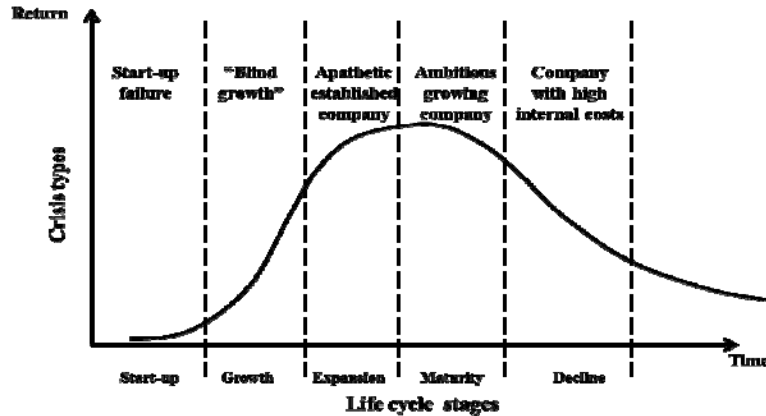

Fig. 1. Growth problems within the organizational life cycle (own contribution)

Scott (1971) noticed that throughout the development of an enterprise there are certain regularities and patterns, which permit to be grouped into different stages, which maintain a consistency in the development of most enterprises. Each of these stages proves a unique set of characteristics, structures, challenges and activities, which do not correspond to the set of the previous stage or to that of the next stage (Quinn & Cameron, 1983). During the evolution of an enterprise through the organizational life cycle, different challenges and crisis may arise, which the entrepreneur must, in the best case scenario, predict and prevent and, in worst case scenario, manage and offer support to the organization to surpass the problems in the most efficient and cost effective manner as possible, as well as with the less risk to its survival. Following the research, each stage of the organizational life cycle was matched a type of crises (Fig. 1).

Growth in the context of SMEs is usually encountered in contexts which discuss size and performance of the enterprise (Pasanen, 2006; Delmar et al., 2003; Davidsson & Wiklund, 2000). In the organizational management literature, the types of growth of SMEs most often are described by the types of strategies the entrepreneurs deploy in order to support the development of their business (Perry, 1986/1987; Burns, 1990; Thomson, 2001; etc.). However, basically, one can distinct among two fundamental types of growth: organic and anorganic growth. The organic growth is the type of growth which results from a series of incremental steps of evolution in the development of the enterprise, whereas the

anorganic growth is the result of disruptive evolution, generated from strategic decisions such as acquisition of new business, strategic alliances or joint venture. In the case of SMEs the recommended growth type is the organic one, especially because it is rare that a small and medium enterprise has enough resources to deploy a complicated strategy as an acquisition and still be able to safeguard the survival of the company.

The concept of crisis, as accepted for the scope of this paper, is defined as a process (Ropega, 2011), that is in most cases caused by an internal trigger and is almost never inevitable (Probst & Raisch, 2005), which deeply affects the performance of an enterprise, over consecutive time periods, while resulting in difficulties in continuing operations as usual within the company (Coombs, 2012; Pretorious, 2009; Chowdhury & Lang, 1993; Weitzel & Jonsson, 1991). In order to demarcate the concept of organizational growth crisis within the concept family of "organizational crisis", it will be included to the above definition of organizational crisis the characteristic that an organizational growth crisis will unequivocally attack the development of the enterprise (meaning size and performance), and in some extreme cases even its survival. As shown in Fig. 1, each stage of the organizational life cycle may be attributed a type of organizational growth crisis scenario. However, the scope of this paper is not to describe each scenario.

As the most basic theoretical landmarks have been exposed, in the next chapters the research methodology and the overall results will be presented, followed by limitations of the research and future research directions.

3. Methodology

Within this research the main focus is on the SMEs within the information technology industry from France. The SMEs definition used in this paper is the one agreed by the European Commission (Table 1; simplified definition). Although the name states SMEs, micro-enterprises are also taken into consideration, due to the fact that they encounter for a large part of the SMEs sector in the national economies. The reason for choosing this sector of economy for the research is the fact that it accounts for between 55% and 95% of GDP in most European countries and it constitutes one of the primary income sources to the state budget (through taxes, VAT, etc.).

Table 1

Definition of SMEs according to the European Commission

Type of Enterprise	Employee Number	Turnover
Medium	< 250	≤ 50 Mil. Euro
Small	< 50	≤ 10 Mil. Euro
Micro	< 10	≤ 2 Mil. Euro

In order to choose only SMEs within one industry activity, the classification of activities from the national economy (NACE) has been used. This classification is unique at European level, as it respects the European Commission Regulations nr. 29/2001. Accordingly, for the purpose of this research the Section J, "Information and Communication", has been chosen, with its Division 62, "Service activities within information technology", with its corresponding classes (6201, 6202, 6203, 6209).

In this paper a model test sample is analyzed, which has been constituted at the University Paris – Dauphine, France, with the purpose to asses and perfect the research methodology. This model test sample comprises 192 micro, SMEs from France, with an activity included in the division 62 of the classification of activities of the national economy. The database created with these 192 SMEs contains information such as: SIREN code[4], incorporation date, number of employees (2009 - 2012), turnover (2009 - 2012). For creating the database the Excel program from the Microsoft Office 2010 suite has been used.

Table 2

Initial data for the analysis of the evolution of the enterprises from a given industry

Enterprise i i = 1, 2, …, N	Incorporation Date of the Enterprise	Age[5] of Enterprise i	Size of Enterprise i	Performance of Enterprise i
	T_i	X_i	Y_i	Z_i
	[Day.Month.Year]	[Months]	[No. employees]	[Turnover € / Year]
Enterprise 1	T_1	X_1	Y_1	Z_1
Enterprise 2	T_2	X_2	Y_2	Z_2
…..	…	…	…	…
Enterprise i	T_i	X_i	Y_i	Z_i
….	…	…	…	…
Enterprise N	T_N	X_N	Y_N	Z_N

The model tested on the model test sample with enterprises from France starts out from the total number of SMEs from a given industry in a given country.

N = total number of enterprises; Enterprise i, where i = 1, 2, 3… N (1)

The information known in the data base consists from (Table 2):
- T_i – the incorporation moment of every enterprise i, respectively the age X_i of each enterprise i at the research moment (this age is computed as the difference between the calendar date at the analysis

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[4] SIREN = company registration number
[5] Computed with equation (2); if the analysis date T_a is known [day, month, year], then X_i is expressed in months. Obviously, X_i is a natural number; for an enterprise *j* incorporated in the same month with the analysis, then $X_j = 0$.

moment T_a and the calendar date of the incorporation of the enterprise T_i):

$$X_i = T_a - T_i \quad i = 1, ..., N \tag{2}$$

Obviously the measuring unit of the enterprise age is a temporal one (year, quarter, month, etc.);

- Y_i – size of the enterprise i at the research moment; this is evaluated with regards to the number of employees of the enterprise at the analysis moment T_a;
- Z_i – performance of the enterprise i at the research moment T_a; this is evaluated with regards to the turnover of the enterprise i at the analysis moment T_a.

Taking into consideration the limited types of data from the database, the issue of identifying the performance differences versus the size differences among different enterprises in a given industry arises. This issue will be addressed in this article, in the following section. The evolution of the enterprises within each test sample database will be presented, compared and analyzed, in order to better understand the similarities and differences among the evolution of the enterprises from the information technology industry in the two countries.

To be able to thoroughly address this issue, each sample will be analyzed according to the following methodology:

Firstly, the distribution of the number of employees Y in relation to the age X of the enterprise will be represented graphically, as a discrete function. This graphic representation will provide a snapshot of the industry at the moment of research T_a, with regards to the number of employees.

$$Y = f(X) \tag{3}$$

Let the following function be

$$y = \varphi(x) \tag{4}$$

A continuous function which approximates the discrete function Y:

$$y \approx Y \tag{5}$$

In the first approximation, if a linear variation of this function is taken into consideration:

$$y = \alpha x + A \tag{6}$$

Then the slope (α) is a measure of the growth velocity of the size of the enterprise. The interpretation of A suggests that the enterprise starts with an initial number of employees (not an impossible situation). This is why, the parameter A cannot be negative ($A \geq 0$).

Secondly, the distribution of the turnover Z in relation to the age X of the enterprise is represented graphically, as a discrete function. This graphic representation will provide a snapshot of the industry at the moment of research T_a, with regards to the turnover of each enterprise.

$$Z = g(X) \tag{7}$$

Let the following function be
$$z = \psi(x) \tag{8}$$
A continuous function which approximates the discrete function Y:
$$z \approx Z \tag{9}$$
In the first approximation, if a linear variation of this function is taken into consideration:
$$z = \beta x + B \tag{10}$$
Then the slope (β) is a measure of the growth velocity of the performance of the enterprise. Generally speaking, the parameter B is null; otherwise the enterprise should start from a turnover different to zero (B = 0).

In order to address the issue stated earlier, the slopes of the two linear continuous functions should be compared and analyzed, as this way a comparison between the growth velocity of the size and the growth velocity of the performance of enterprises can be achieved. However, this is a theoretical exercise, as in practice, due to reasons of measuring unit (Y – number of employees, Z – turnover – currency - Euro), the two cannot be compared. So, only at theoretical level, if α β, then it means that that number of employees grows faster than the turnover of the business. This may indicate a low productivity or yield of the employees, or even a series of bad management decisions (especially in the human resources sphere). If α β, it means, in opposition to the previous case, that the turnover has a higher growing rate than the growing rate of the number of employees. The observation that may be made here refers to the high efficiency of the employees, in relation to the turnover of the enterprise. The third possible relation, $\alpha = \beta$, the perfect equality, is even in theory very improbable. However, there may be cases of approximate equality, ($\alpha \approx \beta$), which could be translated through an almost organic growth of the enterprise, with a productivity rate that may lead to a sustainable development of the enterprise.

3. Analysis of the evolution of SMEs from the information technology industry in France

According to the methodology proposed in the last section, in this section the case of France will be presented, followed by the case of Romania. In the final part of this section, the two cases will be compared and analyzed.

For France the total number of enterprises (N_F') in the model test sample, for which this analysis is made, is:
$$N_F' = 192 \tag{11}$$
The indicators used for this analysis are:
- X_F - the age of the enterprises in the model test sample, measured in months;
- Y_F – the number of employees of these enterprises;
- Z_F – the turnover of these enterprises.

The data base contains all this data for the enterprises for the year of research T_{aF} 2012. In order to better understand how this database looks, Table 3 is presented below.

Table 3

Initial data[6] for the analysis of the evolution of the enterprises from NACE division 62 from France, 2012

Enterprise	Incorporation Date of the Enterprise	Age of Enterprise	Size of Enterprise	Performance of Enterprise
	T	X	Y	Z
	[Day.Month.Year]	[Months]	[No. employees]	[Turnover € / Year]
DECLARANET	04.11.2010	25	18	4,958,694.00€
MEDIANE	01.10.2008	50	3	4,604,240.00€
CXP	25.06.1991	258	36	3,816,108.00€
AIXIAL-PHARMA	12.05.2009	43	36	4,568,739.00€
MUTUA SI	13.02.2009	46	19	2,416,198.00€

In the Fig. 2, the linear continuous function y_F (x) (Equation 4), which approximates the discrete function $Y_F(x)$ is graphically represented. As we can notice, in the graphic, the equation has the following expression:

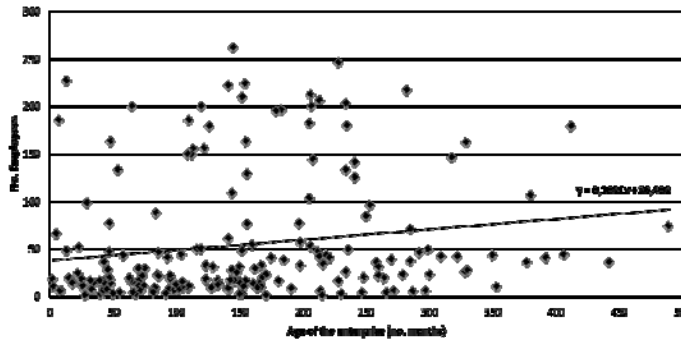$$y_F = 0.1091x + 38.409 \tag{12}$$

Fig. 2. The distribution of the number of employees in relation to the age of SMEs from the NACE division 62 in France, 2012 – representation of the linear continuous trend line

From this, we can infer that the slope is

$$\alpha_F = 0.1091 \tag{13}$$

And the parameter is

$$A_F = 38.409 \tag{14}$$

If we observe the linear continuous trend line in Fig. 3, we notice a positive slope, which may mean, that throughout their development the SMEs in France do experience growth. However, as said before, in an established industry, such a growth is usually stable, and in this particular case very conservative.

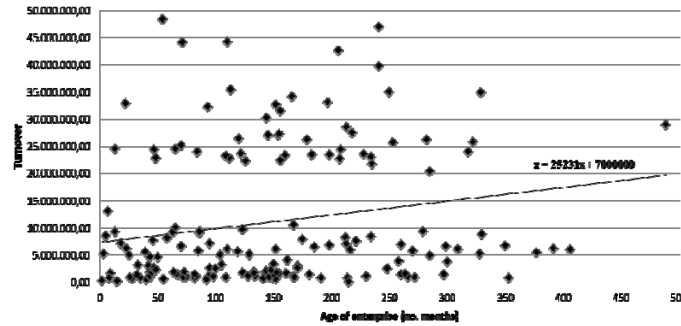[6] The data presented in Table 4 is an example from the model test sample data base.

Fig. 3. The distribution of the turnover in relation to the age of SMEs from the NACE division 62
in France, 2012 – representation of the linear continuous trend line

The linear continuous function $z_F(x)$, represented in Fig. 3, which approximates the discrete function $Z_F(x)$ has the following expression:

$$z_F(x) = 25,231x + 7,000,000 \qquad (15)$$

From this we can infer, that the slope is

$$\beta_F = 25,231 \qquad (16)$$

And the parameter B is

$$B_F = 7,000,000 \qquad (17)$$

Knowing the growth velocities of the two indicators, number of employees and turnover, it is interesting to compare them in order to analyze the SMEs' development evolution with respect to productivity. However, in the present form the two cannot be compared due to different measuring units and order of magnitude. In order to compare them, a normalization of the values must be done, by relativizing the values of the indicators function of the maximum values they may have. So, for every Y_{Fi} and Z_{Fi} the following operation will be completed:

$$\mathbf{Y_{Fi}}/\mathbf{Y_{FT}} \qquad (18)$$

$$\mathbf{Z_{Fi}}/\mathbf{Z_{FT}} \qquad (19)$$

Following these operations, the two indicators receive normalized values, without any measuring unit and with values between 0 and 1. As a result the trend lines of the two indicators can, under this form, be represented in the same graph (Fig. 4):

The two slopes, graphically represented this way, maintain proportionally the evolution tendency and allow comparison.

The new functions present the following new expressions:

$$Y_F = 0.0004x + 0.1536 \qquad (20)$$
$$Z_F = 0.0006x + 0.1366 \qquad (21)$$

And so the new slopes are:

$$\alpha = 0.0004 \qquad (22)$$
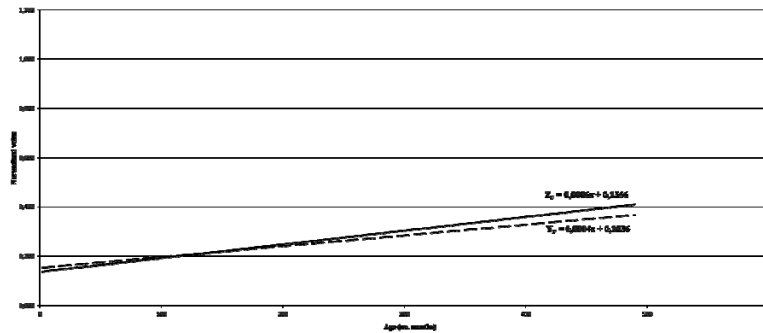$$\beta = 0.0006 \qquad (23)$$

Fig. 4. Comparison between the growth velocities of the two indicators (no. employees and turnover) for France (normalized values)

It can be observed that $\alpha < \beta$, which indicates a high productivity of the information technology in France, the turnover having a higher growth velocity as the number of employees. However, if the graph is analyzed, it can be noticed that initially the number of employees tendency line lies above the turnover one, which suggests that productivity grows along with age. Moreover, it can be observed that there is an intersection point of the two trend lines with the following coordinates: A(85, 0.1876)   (24)

As   X = 85   (25)

It can be deduced that this intersection is made in the 85th month of the life of the enterprise. Also, the ordinate of this point (0.1876 on the Oy axes) is known, fact which makes it possible to identify the exact number of employees and turnover at which the enterprise becomes productive, by "derelativizing" the values. The following values (Y_{Fprod}[7]; Z_{Fprod}[7]) are obtained:

$$Y_{Fprod} = 47 \text{ employees} \qquad (26)$$
$$Z_{Fprod} = 938.000 \text{ €} \qquad (27)$$

6. Conclusions

This article studies the evolution of SMEs from the information technology industry, NACE division 62, from France. The indicators used to analyze the evolution of enterprises from France are the size, the performance and age of the enterprises. After analyzing the linear continuous trend lines of the distribution of the number of employees, respectively of the turnover in relation to the age of the enterprise, it may be concluded that France presents a mature industry with long living SMEs, the average age being of 12 years. With respect to the number of employees, the SMEs tend to grow in size throughout their development, with a quite high employee number average of 54 employees. The average turnover is 11 M. Euros. Also, after comparing the growth velocities of the two indicators, the exact point at which enterprises in France become

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[7] Values at which enterprises become productive (prod)

productive may be identified: during 85th month at approximately 47 employees and a turnover of 938.000 €.

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