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A longitudinal comparison of the growth factors of Slovenian fast growing enterprises

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A LONGITUDINAL COMPARISON OF THE GROWTH FACTORS OF SLOVENIAN FAST GROWING ENTERPRISES

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ABSTRACT: *The article presents the main features of Slovenia's fastest growing companies and compares them with "gazelles" in the EU. The longitudinal survey presented connects with three other studies applying the same research method, namely studies employing the same questionnaire on growth factors that affect growing companies through to the criteria by which they were selected as growing businesses for the survey. The author notes that the growth factors which have an impact on Slovenian businesses and gazelles in the EU mostly do not show any significant differences, and that these differences also did not change significantly over a 15-year period. This hypothesis is verified by both statistical methods and the data mining method called machine learning from examples.*

1. INTRODUCTION

Micro, small and medium-sized enterprises constitute the "heart" of the Slovenian economy. Slovenia has over 117,000 micro enterprises with less than EUR 2 million in sales revenue (data for 2008), constituting almost 96% of all economic entities in the Republic of Slovenia. There are only 4,976 small, medium and large firms (or 3.8%), while just 774 large companies have more than 250 employees (AJPES, 2009). This means that Slovenia is a country where mainly micro and small enterprises operate.

Even in the current EU economy, micro-, small- and medium-sized enterprises represent 99.8% of all economic entities, employing 67.1% of the workforce; however, they generate 57.6% of total value added in the EU and, most importantly, represent the most dynamic part of the economy because in the past five years, according to the Commission, they have created over 80% of all new jobs (http://epp.eurostat.ec.europa.eu).

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In Slovenia and the EU, only some (about 5%) of companies grow at an above-average rate employ and generate the largest part of the growth of value added and national economic growth. Five thousand fast-growing, small companies in Slovenia (representing 4.5% of all businesses) in the five-year period from 2003 to the end of 2007 created 22,514 new jobs, i.e. 60% of all new jobs during this period; value added per employee increased almost three-fold while sales revenues rose by more than two and a half times. In five years these 5,000 companies and sole entrepreneurs generated nearly one-fifth of the increase in sales revenue in Slovenia (EUR 4.4 billion from the total amount of EUR 26.4 billion) or 23.4% of the total rise in net value added in the country (a EUR 1.2 billion increase from a total of EUR 5 billion) (Pšeničny, 2008).

The question remains: How do we in Slovenia stimulate the "propelling power", the "engine" of entrepreneurship – the fast-growing dynamic enterprises that are the only ones generating economic growth and added value (as recognised by David Birch, 1987)? How can we create the conditions and opportunities to ensure the prosperity of the most dynamic part of the economy?

Challenged by this issue, we launched a long-term research project into the prerequisite conditions and possibilities of developing dynamic entrepreneurship in Slovenia. The examination of fast-growing companies and growth factors in Slovenia has an almost 20-year tradition. The first survey was conducted by Jan Žižek in the early 1990s (Žižek & Liechtenstein, 1994) and the second by the author of this contribution (Pšeničny, 2003). Since 2002, growing companies in the context of the GEM research team in Slovenia have also been examined (Rebernik et al., 2008). Further, much research in recent years has been joined by the contribution of Rado Bajt (2008) who reviewed the impact of changes in growth factors over the previous five years.

2. RESEARCH GOALS

The underlying reasons for researching dynamic entrepreneurship in Slovenia are: (1) we believe that the Slovenian economy vitally depends on the successful growth of the most dynamic part of small enterprises which will manage to overcome the "growth pains"; (2) we wish to ascertain which external (environmental) and internal factors stimulate or impede the growth of dynamic enterprises in Slovenia; and (3) we hope to establish which factors are most relevant in identifying the potential of dynamic enterprises – the so-called *gazelles* – and their chances of success.

Moreover, with this research we also seek to contribute to: (4) improving knowledge of the factors of dynamic entrepreneurship and their effects on dynamic entrepreneurs; (5) more successful and efficient managing of the growth of dynamic enterprises; (6) developing a testing expert system to identify dynamic enterprises and their more successful and efficient administration and management; and (7) to shape governmental policy in relation to entrepreneurship, or influence the planning stage of the policy to promote entrepreneurship, in particular dynamic entrepreneurship, as a relevant creator of jobs and economic development.

3. DYNAMIC ENTREPRENEURSHIP, GROWTH FACTORS AND FORMATION OF THE RESEARCH HYPOTHESES

We have restricted our study of entrepreneurship to *dynamic entrepreneurship*. This has proven to have played an exceptional macro-economic role and the growth of the most dynamic enterprises contributes crucially to the growth of national economies, social prosperity, job creation, and to technological progress and development, as well as creating the highest added value.

Dynamic entrepreneurship is defined in great detail within the framework of the theory of growth (Penrose, 1995), by models and factors of growth divided into environmental and internal ones (the enterprise and entrepreneur), by the motivation for growth (and harvest), by strategies of growth as well as by management systems and development of the organisation of enterprise. In the long run, growth means profit – i.e. a harvest for the entrepreneur who has identified and seized a market opportunity and developed, on the basis of his clear vision and harvest expectation, a proactive strategy of growth and organisation throughout all organisational stages up to corporate entrepreneurship (Tajnikar, 2000). Dynamic enterprises are led by dynamic entrepreneurs who create change and have an effect on the environment, are innovative and successful in the long run (as can be measured by financial and non-financial indices), and whose business strategies are competitiveness, internationalisation and globalisation.

The examination of the determinants of growth of enterprises can be divided into three groups. The first group mainly concerns the study of the effects of the environment on growth of the company, the second examines in detail the internal environment of dynamic businesses, while the third deals with dynamic entrepreneurs and the entrepreneurial-managerial team. If we go back to the theory of growth, we see that Penrose set the foundations for this division of the factors of rapid growth which on one hand highlighted the external, environmental factors of growth (Penrose, 1995; 229) and where, on the other, within the internal factors of growth the emphasis is placed on the role of administrative organisation, which is critical for growth (*ibid.*, 15), and the role of the entrepreneur and entrepreneurial management (*ibid.*, 34-37, 44-47).

In previous studies (Pšeničny, 2002, 30-38), we found evidence that the growth of (dynamic) enterprises mostly depends on certain factors: (1) the business environment; (2) the entrepreneur and/or the entrepreneurial-managerial team and their capability; (3) the attitude of the entrepreneur and the enterprise to innovation, research and development activities, and introducing changes; (4) the strategy or model of growth and harvest; (5) the management system and business model; (6) the employees' and the management of human resources; and (7) the financing of growth. The factors of growth have external environmental (1) and internal components (2–7).

The similarities and differences in the interplay of these factors and individual principles of dynamic enterprises in Slovenia were scrutinised and compared with dynamic enterprises in the European Union (EU). In Slovenia, we already have dynamic enterprises

and dynamic entrepreneurs that can be categorised, according to the EU criteria, among the fastest growing dynamic enterprises in Europe. Some of them are listed among Europe's 500 gazelles.

Our thesis is that dynamic enterprises in Slovenia emerge and operate with the same characteristics but face different internal and external conditions that are relevant to the fast growth of enterprises in the EU. In order to accelerate enterprise growth and support dynamic entrepreneurship, we should at least provide conditions in the environment and within fast-growing enterprises similar to those which benefit dynamic enterprises in Europe. If we identify these differences, we can stimulate those activities that should lead to similar conditions for dynamic entrepreneurs in the near future such as those currently enjoyed by European dynamic enterprises. Therefore, our primary hypothesis is:

(H)   External and internal factors influencing the dynamic growth of Slovenian dynamic enterprises differ significantly from the factors affecting dynamic enterprises in Europe at the start of the 21st century.

To allow international comparability at more advanced stages we adopted factors and attributes affecting the growth and success of dynamic enterprises from European research (Roure et. al., 1999; Mei-Pochtler, 1999). The growth and success of dynamic enterprises were measured according to seven standard criteria: the DaBEG[1] index, the total revenue growth rate, the revenue profit growth rate, the capital profitability growth rate, the assets profitability growth rate, and the profit per employee growth rate.

On this basis, we reshaped the primary hypothesis (H), applied it as a basic working hypothesis (H1), and analysed it by developing several working hypotheses concerning the differences between individual factors of growth.

(H1)   The growth of dynamic enterprises in Slovenia depends on factors of dynamic entrepreneurship that are characteristically different from the factors in the EU.

The results of verifying this hypothesis (H1) also help verify the primary hypothesis (H) of our research.

The confirmation or rejection of hypothesis (H1) is, in fact, relevant to future planning of the business environment and the way entrepreneurs handle business activities; however, it does not provide an answer to a fundamental issue raised as part of the goals of this paper, i.e. how to recognise and identify a dynamic enterprise, or how to establish whether an enterprise has the potential for growth, on the basis of a minimum number

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[1] David Birch Employment Growth Index (Birch, 1987; 36-37), measuring the employment growth of the company:

$$DaBEG = \left(z_t - z_{t-5}\right) * \frac{z_t}{z_{t-5}}$$

where z stands for the absolute number of employees in a given year (t)

of attributes. Therefore, we took a further step in our research and tested the following hypothesis:

(H2) Some factors affecting the faster growth of dynamic enterprises are much more important than others and thus enable a forecast of the success and growth of dynamic enterprises.

Verification of this hypothesis is not only useful for entrepreneurs who lead dynamic enterprises and for investors, but also for the policymakers who can establish the conditions for the faster growth of dynamic enterprises.

4. RESEARCH MODEL AND METHODOLOGY

To verify the differences in growth factors between Slovenian and European dynamic enterprises, from the database of all enterprises in Slovenia we selected enterprises that met certain criteria and further checked them against the growth criteria specified above. The criteria that were applied to select the most dynamic enterprises are same as the criteria applied in the selection of European dynamic enterprises – *Europe's 500* (GrowthPlus, 2001; Europe's 500, 2008).
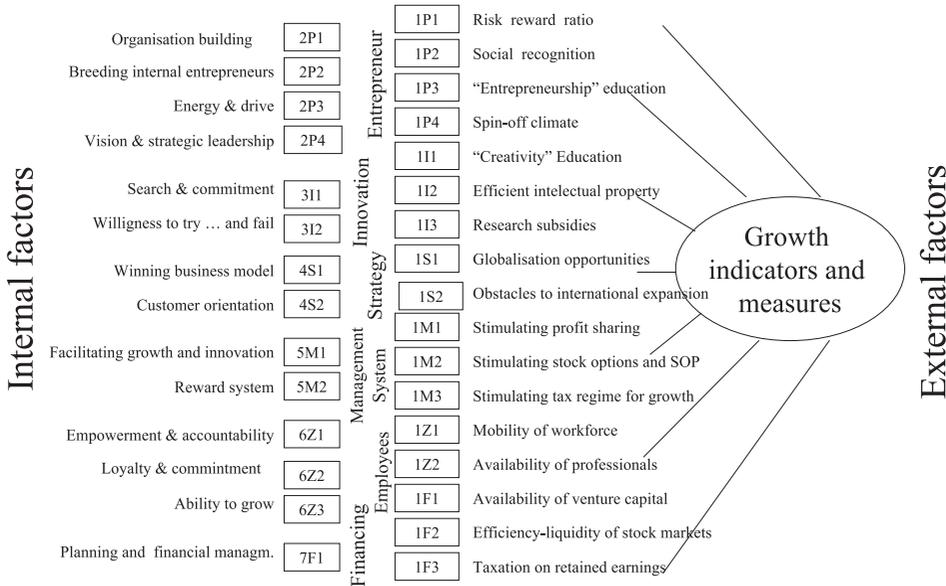
To examine both hypotheses, we employed: (1) original data sets of three fundamental studies (Žižek & Liechtenstein, 1994; Roure, 2001; Pšeničny, 2003); (2) the research model developed in the previous research (Žižek & Liechtenstein, 1994); and (3) the set of external-environmental and internal attributes identified as significant characteristics by researchers of European gazelles (Mei-Pochtler, 1999; 97-104). The basic data sets on the dynamic enterprise databases applied in our research are shown in Table 1. The six factors with 17 external-environmental attributes and 14 internal-environmental attributes are shown in Figure 1.

TABLE 1: *Basic data on the dynamic enterprise databases in the research*

	SI Dynamic entrepreneurs (1989-1993)	SI Dynamic entrepreneurs (1994-1999)	EU Dynamic entrepreneurs (1994-1999)
	Žižek 1994	*Pšeničny 2001*	*Roure and Pšeničny 2001*
Average age of enterprises	7,1	9	23
Average age of entrepreneurs	43	41	43
Average volume of total revenues in mEUR	2,2	6,4	53,1
Aver.growth of total revenues % in the appl. term	105	386	318
Average no. of employees in the last year	26	98	754
Av.Total Rev.per employee in 000 EUR, last year	84,6	65,3	70,4
Aver. Employment growth in % in the appl. term	64,6	172	302
Sample size	150	175	93

Sources: Žižek and Liechtenstein (1994), Pšeničny (2003), Roure (2001)

FIGURE 1: *Factors and attributes of the fast growth of dynamic enterprises in the EU*

Internal factors				External factors
Organisation building	2P1		1P1	Risk reward ratio
Breeding internal entrepreneurs	2P2	Entrepreneur	1P2	Social recognition
Energy & drive	2P3		1P3	"Entrepreneurship" education
Vision & strategic leadership	2P4		1P4	Spin-off climate
Search & commitment	3I1	Innovation	1I1	"Creativity" Education
Willigness to try … and fail	3I2		1I2	Efficient intelectual property
Winning business model	4S1	Strategy	1I3	Research subsidies
Customer orientation	4S2		1S1	Globalisation opportunities
Facilitating growth and innovation	5M1	Management System	1S2	Obstacles to international expansion
Reward system	5M2		1M1	Stimulating profit sharing
Empowerment & accountability	6Z1	Employees	1M2	Stimulating stock options and SOP
Loyalty & commintment	6Z2		1M3	Stimulating tax regime for growth
Ability to grow	6Z3		1Z1	Mobility of workforce
Planning and financial managm.	7F1	Financing	1Z2	Availability of professionals
			1F1	Availability of venture capital
			1F2	Efficiency-liquidity of stock markets
			1F3	Taxation on retained earnings

Growth indicators and measures

Source: Adapted from Mei-Pochtler, 1999.

To compile the descriptive data, opinions and points of view by entrepreneurs, we applied a questionnaire developed for research on dynamic enterprises in Central and Eastern Europe in 1993 (Žižek & Liechtenstein, 1994) and in the first research completed on European dynamic enterprises in 1995 (EFER, 1996). As this questionnaire did not cover certain questions and attributes, we amended the underlying questionnaire on the basis of test results obtained from a sample of 94 dynamic enterprises in 1999 by adding 14 questions that enabled us to analyse the entrepreneur's motivation, business and harvest strategy, attitude to hiring consultants, and some others. However, the basic 87 questions were kept.

We approached verification of our hypothesis *(H)* by noting differences in the factors affecting dynamic enterprises in Slovenia and the EU. We approached verification of the additional hypothesis related to the differences in the responses by studying dynamic entrepreneurs in these three research projects, and by an alternative method to establish causal (cause-effect) connections between the attributes of the enterprises; i.e., one of the contemporary artificial intelligence methods. For statistical analysis, we applied the t-test and the χ2 test to establish differences in separate samples, while for the analysis of cause-effect relations we applied a data mining method called machine learning from examples, also known as inductive machine learning (Mitchell, 1997). The particular form used in our case was the induction of decision trees (Quinlan, 1986; Witten & Frank, 2005).

The analysis of data by machine learning is a field of computer science dealing with the extraction of implicit, previously unknown and potentially useful information from databases (Witten & Frank, 2005). The key procedure of this methodology is machine learning which includes the automatic induction of decision trees, classification rules, regression models and other types of models from data. The models derived with these techniques represent generalisations of the input data (or cases) and can be used for the classification, prediction and explanation of explored phenomena.

The best explored and most frequently used machine learning approach is learning from examples, also referred to as inductive machine learning. In this approach, examples of problem situations are submitted to a learning system (a computer program) which induces a general description of the underlying concepts useful for problem solving. The resulting concept descriptions can take the form of decision trees or if-then rules. Learning examples can often be very naturally described with attributes and classes. Attributes represent features of objects from the considered domain, while class defines how an example with given attribute values is treated or classified. A decision tree corresponds to a set of if-then rules relating attributes with classes and can be used for classification and predictions in the problem domain. Similar to this approach is a "what-if" analysis which has already been applied in predicting business development (Makridakis, 1990; Stevenson, 1998). Machine learning has been used to analyse enterprise growth factors (Filipič & Pšeničny, 2003) and is becoming increasingly useful for business forecasting (in CRM, Competitive Intelligence and Knowledge Management) (Zanasi et al., 2007). In our study, we used the Weka machine learning software (Witten & Frank, 2005) that allows using various methods of machine learning on the same data.

We varied the procedure of decision tree induction by changing the parameters so as to obtain several models for each particular decision problem: these models give a differentially detailed insight into the concrete problem and also differ according to the accuracy of classification. The transparency and interpretability of these models are features that generate a new level of quality compared with the results of statistical processing, which are normally a standard approach when studying the growth of enterprises (such as in Solymossy, 1998; Wiklund, 1998).

Our analysis by means of decision trees comprised the 134 most dynamic enterprises in Slovenia in 2002 and 21 test dynamic companies in 2007. Out of 320 descriptive and numerical data items on dynamic enterprises in our database, a subset of data was selected for the analysis. We excluded the attributes not containing information potentially relevant to the prediction of enterprise growth, such as the company name, contact information, instructions on filling in the questionnaire etc. As a result, 158 data items were selected. However, some of these items were actually questions with more than one possible answer. To obtain clearer results in the data mining stage, these company attributes were transformed into multiple attributes with binary values.

5. THE FEATURES OF DYNAMIC ENTERPRISES IN SLOVENIA AND DIFFERENCES BETWEEN SLOVENIAN AND EU GAZELLES

In this section we briefly present the results of the statistical analysis of differences between Slovenian and EU gazelles and the importance of factors influencing fast growth among Slovenian gazelles in given years.

We established that Slovenian dynamic enterprises have not changed considerably in the preceding 15 years (internal – environmental factors of growth); on the other hand, business, financial and tax environments have changed, as has the attitude of the environment towards entrepreneurs with more critical remarks being elicited from the dynamic entrepreneurs involved in our research in 2002 and 2008 than in 1994; however, they remained less critical than their European counterparts.

When measuring the impact of individual features of dynamic enterprises on our growth criteria, we established that the DaBEG index of Slovenian dynamic enterprises in the past strongly depended on favourable governmental regulations, the level of remuneration for a dynamic entrepreneur, the age of the enterprise's equipment, the knowledge of the habits and behaviour of consumers, and the quality of the entrepreneurial team.

The growth of total revenues in dynamic enterprises depended on the company's activity (the highest being in building and construction), favourable governmental regulations and administration, an orientation to foreign (non-European) markets, the source of suppliers (suppliers from Central and Eastern Europe), and planning of future investments.

The growth of profits from total revenue generated by dynamic enterprises was the highest in the branch of engineering, and depends on the entrepreneur's opinion on the level of corporate profit tax: the profit can grow from year to year if the entrepreneur considers the tax rates reasonable. Likewise, the profit increased if the entrepreneur had been receiving the highest compensation for their current work, if the competition in their branch was not strong, and if members of the managerial team contributed to the financing of growth.

Higher total capital profitability growth rates are found in enterprises in which the owner would set up an equivalent enterprise once again if they had the opportunity, the owner pays himself relatively low remuneration for their current work, the owner's employees are sufficiently qualified for their work, and where the primary source of start-up capital (not the founding capital) was their own capital.

The total assets profitability growth is affected by problems in transportation and communications, social recognition or recognition by the environment, the origin of the enterprise (if founded by the entrepreneur), the business activity, the remuneration to the management, and the expectation of the harvest; whereby the growth of profitability is

adversely affected by high remuneration to the management, a neutral attitude to workers' participation in the management, and by the entrepreneur himself if he founded the enterprise merely to implement his idea and provide for his existence.

We also found that the responses of Slovenian and European dynamic entrepreneurs differ characteristically in questions concerning a stimulating innovative environment and the transfer of R&D achievements to dynamic enterprises, as well as in the expansion strategies to international markets, the tax bonus for the co-ownership of employees and their participation in the profits, and all factors of the financial environment (accessibility of venture capital, the efficiency of financial markets, and taxation on retained profits and re-investments). For other environmental factors, we found either no considerable difference or no difference at all.

In spite of this, we can assume that the differences in the environmental impact on the growth of enterprises in Slovenia and Europe are important, which supports our hypothesis regarding the differences existing in the business, financial and fiscal environments of dynamic enterprises between Slovenia and the EU.

For the internal growth factors, we found several characteristic differences, mainly in the entrepreneur's attitude to building up a solid organisation. Dynamic enterprises in Slovenia are in their early developmental stages and most of them have not entered the professionalisation stage. However, due to the large differences in the enterprise histories of Slovenian and European gazelles this is quite unlikely to point to typical differences in the entrepreneurs as the other three features of the EU gazelles (the attitude to internal entrepreneurship, leadership, and a clear vision) are equally present in Slovenian dynamic enterprises. The hypothesis on differences emerging with this factor cannot be confirmed or rejected on the basis of these tests.

Significant differences between Slovenian and European dynamic entrepreneurs and enterprises were found in the attitude to innovation and in business strategies. In most answers to these two factors the answers differ greatly, leading us to conclude that the hypotheses on differences in these two factors can be confirmed.

In questions related to the management system, there were bigger differences with respect to the features of the management system that point to an "organisation that promotes growth and innovation", and fewer differences in the entrepreneur's attitude to the remuneration of employees and the management. The hypothesis on differences in this factor cannot be fully rejected or confirmed.

The situation is similar regarding the difference in relation to the European dynamic entrepreneurs in the attitude to employees. In particular, differences are seen in the responses to questions on the loyalty and commitment of employees to the dynamic enterprise, while with questions related to work conditions, promotion, and possibilities of participation in a growing enterprise we find more similarities than differences. Our hypothesis on different effects of this factor can be rejected, with some reservation.

The greatest differences were found in the respondents' opinions on financing the growing business; however, due to the different size and corporate life of these enterprises (and thus different phases in the corporate development and different phases of financing the enterprise), we cannot cogently confirm the hypothesis on differences between EU and Slovenian dynamic enterprises regarding financing and financial management.

Looking at the overall results of our statistical analysis, we may conclude that there are significant differences between Europe and Slovenia in factors affecting growth, primarily in: (1) the business environment; (2) the business strategies; (3) the attitude to innovation; and (4) financing growth. On the other hand, there are no important differences in the attitude of dynamic enterprises to: (1) the employees in dynamic enterprises and (2) entrepreneurs themselves. However, on the basis of our analysis we cannot assess the differences in the scope of management which is, in fact, not developed yet in Slovenian dynamic enterprises.

We verified the differences with the machine learning method.

6. FINDING DIFFERENCES BETWEEN SLOVENIAN AND EUROPEAN GAZELLES WITH INDUCTIVE MACHINE LEARNING

When developing decision trees by means of using the inductive machine learning method on examples, we find that based on the examples of the 134 most dynamic enterprises we can extract a number of rules by predicting numerically and non-numerically expressed attributes of dynamic enterprises and their growth; these rules can help us define the conditions for the fastest growth of dynamic enterprises. Our predictions will be much more accurate in the future if we "screen" the attributes of dynamic enterprises by using a questionnaire developed on the basis of our own knowledge of the attributes resulting from this research and incorporate it in a study of a still bigger number of successful dynamic enterprises from several countries.

To illustrate the applicability of machine learning from examples, we present a decision tree for predicting the DaBEG index and planning the attitude of entrepreneurs to shareholders' options in gazelles. The first case is explained in full detail; in the second case only the fundamental information based on the decision trees is given.

Example 1: Predicting the DaBEG index

The calculation of the DaBEG index is shown in the footnote on page 4, with the classes for the DaBEG index taking the following ranges:
• Class 1: DaBEG > 1000 (10.4% of the enterprises in the database);
• Class 2: $200 < DaBEG \leq 1000$ (11.2%);
• Class 3: $100 < DaBEG \leq 200$ (23.9%); and
• Class 4: $DaBEG \leq 100$ (54.5%).

The classification accuracy is still acceptable when higher than the share of the majority class. An example of such a decision tree to predict the DaBEG index is shown in Figure 2. The inner nodes are labelled with the attributes and the end nodes (leaves) with classes. Paths from the top node (root) to the end nodes (leaves) correspond to if-then rules. The classification accuracy of the decision tree on the 134 training data is 72.4% and on the test data it is 46.3% (transversal testing of the model obtained).

FIGURE 2: *The decision tree to predict the DaBEG index*
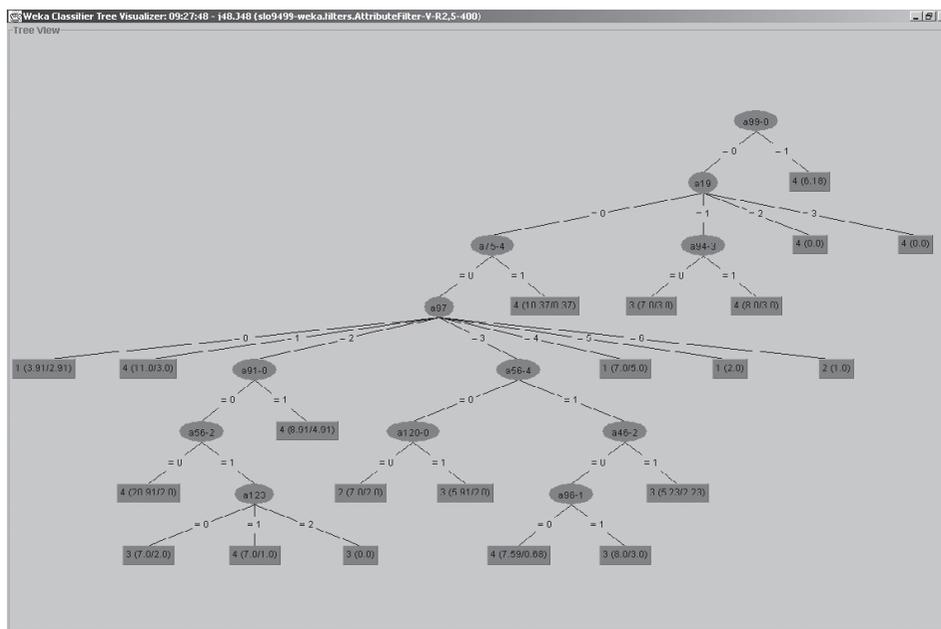
Source: Pšeničny (2003)

This decision tree allows us to derive several rules to predict the DaBEG index; however, we only list the rules to predict the highest class or value of the DaBEG index above 1000 (such as in Birch's "gazelles").

Class 1
IF (A99-0 = 0) & (A19 = 0) & (A75-4= 0) & (A97 = 0) OR
(A99-0 = 0) & (A19 = 0) & (A75-4= 0) & (A97 = 1) OR
(A99-0 = 0) & (A19 = 0) & (A75-4= 0) & (A97 = 4) OR
(A99-0 = 0) & (A19 = 0) & (A75-4= 0) & (A97 = 5) THEN DaBEG > 1000

Here A99-0, A19 etc. denote the attributes extracted from the questionnaire. This formal representation tells us how to predict the highest values of the DaBEG index (DaBEG>1000). Written in natural language, such values of the DaBEG index can be found in dynamic enterprises that are:

(1) limited liability companies believing that the business environment could motivate them for higher growth, having efficient cash management, and which do not plan new investments or to create new jobs;
(2) limited liability companies believing that the business environment could motivate them for higher growth, having efficient cash management, and planning new investments but not creating new jobs;
(3) limited liability companies believing that the business environment could motivate them for higher growth, having efficient cash management, and planning new investments and 50 to 99 new jobs in the coming five years; and
(4) limited liability companies believing that the business environment could motivate them for higher growth, having efficient cash management, and planning new investments and 100 to 199 new jobs in the coming five years.

Example 2: Predicting the employees' stock option plans

The factors underlying the fast growth of European dynamic enterprises also involve the inclusion of employees as co-owners of a dynamic enterprise. We also checked this attribute in the gazelles in our database. Possible replies (SOP) to the question, "What do you think about the possibility of the workers becoming shareholders in your company?" were:
– SOP = 0: no, on no account (22.4% of the enterprises in the database)
– SOP = 1: it makes no difference to me (4.5%)
– SOP = 2: maybe it could work, but I won't commit myself to it (29.1%)
– SOP = 3: maybe it could work; I plan to undertake it (13.4%)
– SOP = 4: they are shareholders already; I am satisfied (19.4%)
– SOP = 5: they are shareholders already; I am not satisfied (3.7%)

The *decision tree* to predict the dynamic entrepreneur's attitude to the employees' stock option plans is shown in Figure 3. It achieves a classification accuracy of 66.1% on the training data and 45.1% on the test data.

FIGURE 3: *Decision tree to predict employees' stock option plans*
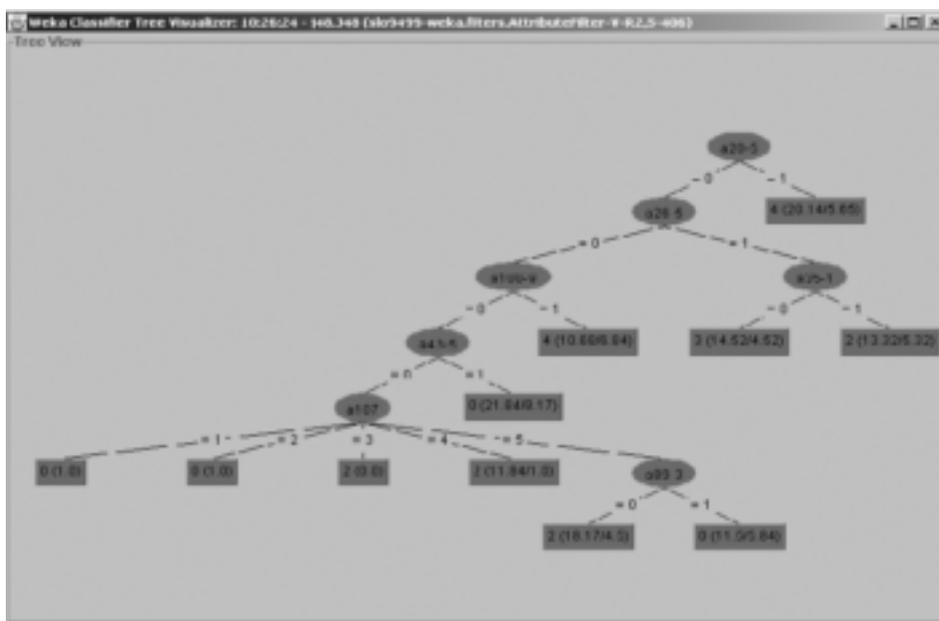
Source: Pšeničny (2003)

This decision tree can, in the same way as the tree shown in Figure 2, be interpreted as follows:
(1) Employees will not (SOP=0: "on no account") be included in the shareholding structure of dynamic enterprises where:
    1.1 Employees have not become owners yet, and the entrepreneur has a two-year college degree, the prevailing strategy for growth is not globalisation, and in enterprises where payment collection is causing the greatest difficulties;
    1.2 Employees have not become owners yet, and the entrepreneur has a two-year college degree, the prevailing strategy for growth is not globalisation, and in enterprises that have not stated the greatest difficulty in payment collection, but in tough competition with state-owned enterprises.
(2) Employees will not (SOP=2: "maybe it could work, but I won't commit myself to it") be included in the shareholding structure in those dynamic enterprises in which the employees have not yet become owners, the entrepreneur completed a four-year college or university education, the prevailing strategy for growth is not globalisation, their greatest difficulty is other than payment collection, the main (5 on the 1 to 5 scale) reason for growth is the customer satisfaction approach of the employees, and their main competitors are those other than state-owned enterprises.
(3) Employees will most probably (SOP=3: "maybe it could work, I plan to undertake it") be included in the shareholding structure in dynamic enterprises in which the employees have not yet become owners, and are led by an entrepreneur with a college or university education, and who did not start up the enterprise due to their dissatisfaction with a previous business.

(4) In enterprises where employees are shareholders already and the entrepreneurs are satisfied with this (SOP=4: "they are shareholders already, I am satisfied"), employees will be invited to become shareholders in enterprises that are led by entrepreneurs with a higher education, and who apply the strategy of growth with globalisation or introducing new products into new markets.

With more than 70 of such decision trees and on the basis of the data in the dynamic enterprise database described with 158 financial and non-financial attributes, we found that dynamic enterprises in Slovenia have the following characteristics and factors for the growth of dynamic enterprises in Europe:

(1) The growth of dynamic enterprises in Slovenia depends on the *external environment attributes of the enterprise:* of the 17 environmental factors that stimulate or hinder growth in dynamic enterprises in Europe, only two in our decision trees remained without any descriptive attribute. These are "social recognition by the environment" and "the protection of intellectual property". We may therefore conclude that the external environment affects the growth of Slovenian enterprises similarly to those in Europe.

(2) The growth of dynamic enterprises in Slovenia depends on the entrepreneur or the entrepreneurial-management team; however, we did not record the most important attributes from the EU among the factors of growth in Slovenia. The fundamental attribute, *the vision and strategic management,* is the only factor stimulating the growth of dynamic entrepreneurs from the set of European attributes we obtained in our decision trees to predict the growth of dynamic enterprises in Slovenia. Other factors (building-up the organisation, internal entrepreneurship, leadership) did not occur in our results.

(3) The growth of dynamic enterprises in Slovenia depends on an *innovation-friendly* attitude and implementation of the change, like in Europe; however, in the decision trees no attribute appeared that points to the readiness of Slovenian entrepreneurs to assume higher growth-related risk, which is a major characteristic of the European gazelles.

(4) The growth of dynamic enterprises in Slovenia depends on the selection and implementation of the *business strategy (the strategy of growth), similarly as in Europe.* The results obtained by means of the decision trees reveal that the strategy of international expansion and a strict customer-centred orientation were the most important features in Slovenian dynamic enterprises as well as in their European counterparts.

(5) The growth of dynamic enterprises in Slovenia depends on features of the *management system.* The attributes of the European gazelles were identified in our results as well, although more specifically the Slovenian dynamic entrepreneurs are more neutral than the European entrepreneurs regarding the relevance of corporate organisation which is innovation-friendly and they do not find the employee remunerating system as important as their European counterparts.

(6) The growth of dynamic enterprises in Slovenia depends on *employees'* working conditions, such as promotion and responsibility, the loyalty and commitment of employees to the enterprise, the possibility of participation in the growing concern and the personal growth of the employees, which was similar to dynamic enterprises in the EU.

(7) The growth of dynamic enterprises in Slovenia also depends on *financing the growth* or the development of financial planning and management in a dynamic enterprise. However, considering the responses from dynamic entrepreneurs in both Europe and Slovenia we may conclude that there are differences in financial management and planning in dynamic enterprises.

7. LONGITUDINAL COMPARISON OF GROWTH FACTORS IN SLOVENIAN DYNAMIC COMPANIES

Our longitudinal research of growth factors in Slovenian gazelles (fast-growing companies) was enriched in 2008 by comparing the differences in the answers in the research by both Pšeničny (2003) and Bajt (2008). Using a statistical χ^2 test, we estimated the differences in answers between the two research works and tried to ascertain if the growth factors had changed in the last five years. In our recent survey, 21 owners and entrepreneurs of 74 fast-growing companies participated. The questionnaire used was the same as those used in 1994 and 2002.

In 2002, all gazelles (74) employed 2,589 people (with an average of 35) and, in 2007, altogether 5,252 people (with an average of 71), which means that in the entire period they employed 2,663 people in total (with an average of 36). The annual average number of newly employed at Slovenian gazelles is 14.2, which is the same as in Pšeničny's research (hundreds of Slovenian gazelles created 7,150 new jobs between 1998 and 2002).

In Table 2, the number of all answers according to influential factors is presented as well as the number and share of the same and different answers. In total, 10% have statistically significant different answers but we can see differences in factors referring to financing (25% different answers), innovativeness (15.79%), business strategy (14.29%), management system (10%), external environment (9.09%), then entrepreneur (5.88%) and employees (4.35% differences).

TABLE 2: *Comparison of answers of Pšeničny and Bajt according to growth rate factors*

	External environment for companies	Entrepreneur	Innovativeness	Business strategy	Management system	Employees	Financing	Total
Answers	66	17	19	28	10	23	8	171
Same	60	16	16	24	9	22	6	153
	90.91%	94.12%	84.21%	85.71%	90.00%	95.65%	75.00%	89.47%
Different	6	1	3	4	1	1	2	18
	9.09%	5.88%	15.79%	14.29%	10.00%	4.35%	25.00%	10.53%

Source: Bajt, R. (2008): Growth factors in Slovenian Dynamic Companies

With the growth factors describing the external environment of the company, we checked 66 answers, 90.91% of which were the same as in 2002; the rest differ from each other. This factor includes characteristics like: the relationship between the risk and award which can be gained by an entrepreneur; what is education and support for entrepreneurship like; the social climate for exclusion; is there any creativeness in the education system; what is protection of intellectual property like; is there any support and co-operation in research and development; are there any barriers to international expansion; what is the climate for internationalisation; what are tax supports in the current income statement; share options and plans for interests; is there enough personnel available; what is the mobility of personnel; is the risk capital accessible; are financial markets effective; and what is the taxation of deferred income tax assets and reinvestment.

8. CONCLUSIONS

If Slovenia is to become a prosperous country and transform into a more developed European economy and even overtake some of the most developed EU countries in a decade or two (as some years ago Aleš Vahčič "called for" in the Slovenian Economic Periodical (1995; 295–312), we need to follow the example of the entrepreneurially most developed and active countries (Glas, 2000). Knowing that some countries are more entrepreneurial than others (Reynolds et al., 2001; Bosma et al., 2008), the most advanced and expressly entrepreneurially friendly countries that favour the emergence and growth of enterprises seem to be best suited as our model of development.

Our analysis confirms that the growth of enterprises in Slovenia is affected by more or less the same growth factors as in the EU, bearing in mind that as regards some features, mainly related to the business and financial environment, along with some internal-environmental factors, our gazelles are not yet comparable with their European counterparts.

By applying the method of machine learning to the case of Slovenian dynamic enterprises as an alternative and complementary method of growth factor analysis, we find that:
(1) some attributes are more relevant to the success of dynamic enterprises than other attributes; and
(2) such attributes are quite few in number, which facilitates the identification of successful dynamic enterprises with growth potential.

Our research shows that the growth factors found in the research of European dynamic enterprises can be "trusted" and relied upon: we have identified the vast majority of these factors as key growth factors in Slovenian gazelles as well. Further research on dynamic entrepreneurship should focus, according to our findings and experience, on the most relevant growth factors and features that have proven successful in research into European, and now Slovenian, dynamic enterprises. Likewise, social efforts should be directed at setting up the identified conditions for the fast growth of enterprises, whereas

on the enterprise level the attributes common to the most successful gazelles in Slovenia and the EU should be highlighted.

The growth of Slovenian gazelles in the last five years is highly correlated with almost nine of the ten environmental factors influencing the growth and success of European gazelles, such as those seen in 2002. In contrast, some important factors (e.g. stimulating the innovation and internationalisation policy, growth of a supportive taxation system, availability of different financial resources) are still impeding the faster growth of firms. A strong entrepreneurial vision and a strategic management approach are the most significant characteristics of dynamic entrepreneurs in both Slovenia and Europe. Sustainable growth depends on a permanent innovative and research-implementing orientation of dynamic enterprises, while the lack of risk taking among Slovenian gazelles could be a significant barrier to further sustainable growth. Internationalisation and globalisation, both inexorably customer-oriented, are significant characteristics of the growth strategy of gazelles. Some indicators of winning business models of European gazelles (e.g. the importance of logistics, organisation and awarding employees) are less important for Slovenian gazelles, while the loyalty and commitment of employees and their ability for personal growth are not significantly different. Some major differences between Slovenia and Europe were found in the financial environment (e.g. taxation on stock option plans and retained earnings) but also for financial planning and cash management.

On the other hand, we checked the differences in answers between the 2002 and 2007 studies. Answers were grouped to describe several growth factors and the most numerous differences were found in the "financing" group (25% different answers), whereas answers in the "employee" group remained practically unchanged with different answers only about newly created jobs. It seems as if the financial sector is adapting quickly to the new conditions by offering new products and services. It is worrying that the answers in the group of factors of "innovativeness" had only changed by 16%, mostly about the growth strategy in the future, the main advantages, and the reason for success. Innovation in Slovenian dynamic companies is very poor and only a small share (3/21) of companies owns a patent or a license. Responses regarding the "business strategy" only differ in 14% of cases. This is quite understandable since Slovenia joined the EU relatively recently (2004).

As the machine learning model was built in 2002, we also tested its accuracy. We used the 2002 database as a learning dataset and the 2007 database as a test dataset. The best results were found in the class RDCP (profit growth in total income) where prediction was more than 85% accurate; however, in some other cases we found less than 30% accuracy.

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