

## **PERFORMANCE EVALUATION INDICATORS OF UNIVERSITY SPIN – OFF COMPANIES**

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**Abstract:** Article deals with the performance of university spin-off companies. First step of this contribution is to evaluate the theoretical results of given problems and specifications of spin-off companies. The work evaluates and compares different and existing methodologies used in the scientific literature with the characteristics of used factors. On the basis of processed methodologies there have been create the list of factors needed for evaluation of innovative potential of university spin-off companies. It was processes by comparative method. The result is a proposal of concept evaluation of recommended methodology

### **1 Introduction**

Universities in particular countries or regions often represent high level of support the local development of culture and science and research. All information that is situated on the academic, universities are trying to push into the consciousness by different ways. It is producing high-quality and educated workforce, or support by various projects. The increasingly important is however begins the commercialization of research results through the establishment of spin - off companies [1].

The main incentives leading to the creation of spin-off companies is:

- Relatively easy to enter the market.
- Probable profitability of the project.
- The possibility of obtaining a patent.
- Intellectual wealth.

Academic spin-offs companies are companies founded by an academic inventor aiming to exploit technological knowledge that originated within a University to develop products or services. These companies contribute to technology transfer in two stages: as first, they transfer technology from their parent organization to themselves and, secondly, they transfer the technology to customers.

The main task of university spin-off companies is to use technological expertise acquired by research and development activities of universities and their subsequent commercialization. Each technology transfer takes place from the parent company to spin-off and subsequently to customers. The contribution of university

spin-off companies and their business is not just marketing, but also the linkage between university activities and practice. This link has at present a great social value because it offers many advantages for all parties involved such activities.

Interconnection to universities may have other benefits as well at the same time for spin-off and industrial start-up businesses in the form of access to new knowledge, human capital, training and other resources. Literature also focuses on the links between scientists in their breadth and diversity.

Spin-off and industrial start-up businesses may be linked to universities in many forms such as research projects, contract research for universities and outside the universities, sending employees to training for university, student internships in companies or maintaining informal relationships [1], [14].

#### ***Key success factors of spin-off companies***

Generally, there are two key factors that are common to the success of spin-off companies focused on profit:

- employees with relevant experience,
- maintain management structure that is independent from the mother organization.

The most common business model for spin-off companies is: the subsidiary company is not just a property of a parent company, but pays to the parent company dividends based on its profitability. Whereas it is necessary to generate revenues through new business activities or investments, reduce taxable business income,

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maintain the exemption or restrict legal obligations, companies are increasingly returning to the creation of profit-oriented subsidiaries. Many spin-off companies started with venture capital or with finance provide by investment/business angels (individual investors who provide the initial capital of the company in order to start operations) [14].

## 2 Analysed methods

The aim of this article is to identify and propose, on the basis of literature review, a model of evaluation of the spin-off companies' performance. The need for evaluation of university spin-off companies is based on the efficiency of the linkage between university environments with practice. Assessment provides feedback in terms of use and commercialization of knowledge and skills by providing scientific-academic environment into practice.

### *Methodology of Maximilian Goethner and Uwe Cantner*

The methodology is based on analysis of large number of university spin-off companies and non-university innovative start-up businesses. In this work, the authors deal with the issue of performance of university spin-off, compared to non-university ISTART-up companies, with factors that affect their performance and the fact whether the differences in performance are evident. The assessment is based on data which authors of works collected from 128 university spin-off and 128 non-university innovative start-up companies in Germany. [11]

The assessment includes 6 dependent and 11 independent parameters:

- 6 dependent parameters: increase in demand, increase in unemployment, business rescue, rating, patent and its application in practice and the probability of patenting.
- 11 independent parameters: previous experience of the founders of management, innovation, initial capital, degree of development of a new product or service, number of company founders, the objectives of growth and development, Indicator target market, market growth, market competition, PhD. team, natural sciences team.

Each of indicators is more precisely specified and has precisely defined values of individual parameters for realization the individual assessment.

### *Methodology of Manheim Foundation Panel*

This methodology models the probability of "survival" new companies in the field of industries that require a high degree of expertise. Factors that this model monitors and studies include: year founded of company, industry focus, ownership that a company holds in another company, the number of founders in company,

credit rating, buildings and land property belonging to the company and the highest level of education achieved in society. On the base of this model there was also developed company's growth model, which relies on the characteristics and factors mentioned above [8].

This model uses three categories of variables.

The first of these represents characteristics of founding team:

1. Academic entrepreneur (AE) - current employee of University,
2. Research AE - if at least one of the academic entrepreneurs involved in university research during his time at university.
3. No-research AE - at least one academic entrepreneur who did not act in university research.
4. % of academic titles in team
5. The size of team

The second category is characteristics of company and external environment at the time of its formation.

1. Science - at least one of the academic entrepreneurs worked in the field of engineering.
2. Engineering / Mechanical engineering - at least one of academic entrepreneurs operated in the area of engineering.
3. Patent of company.
4. Research and development (cont.) internally and regularly on a continuous basis.
5. Research and development (OCC) internally, but only on an occasional basis.
6. Employees in the time of company formation.
7. Credit rating: Characterizes access to the borrowed capital.
8. Limited liability: fullness of law conditions relating to the legal form of company.

The third category is characteristics that relate to the environment. It deals with relationships with universities:

1. Interface with universities.
2. Branch of industry
3. Cohort: Represents annual categorical variables that characterize the year of company formation.

### *The method of assessment Research Centre of Science and Technology TEKPOL*

This method comes from the work of authors Yelda ERDEN and Alp Eren YURTSEVEN who approached to each of the factors individually, whereby they scored each factor by comparative method of all 12 evaluated university spin-off companies. This methodology includes also informative but very interesting information about these companies, e.g.: barriers preventing or slowing down the innovation process, reasons which led the founders to establish spin-off, the motivation that leads them to cooperate with other

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actors on the market, etc. The main evaluative factors of this work consists of following 11 factors [10]: Year of establishment, number of founders, number of employees, sector in which company operates on the market, factor of researched and development activities, product innovation, process innovation factor, cost of innovation, cooperation factor - it describes profile of actors with whom a university spin-off companies cooperate, place where the company is setting up, product and sale factor.

***The evaluation methodology of supporting programs of innovative companies***

The evaluation method is based on the work of Džupka Peter and William Vajda, who dealt with the supportive programs of innovative start-up companies and spin-off and they researched the difference of their innovation performance. Comparison and evaluation of company focused on Slovak spin-off and start-up businesses, whereas, according to the authors of work this issue has not yet been applied to the Slovak innovative company. The companies were interviewed online by an e-mail form. The database included small and young companies. The database of these companies was obtained from the start-up centre of the Technical University in Kosice. The authors addressed more than 100 innovative companies. 26 completely filled forms were returned to authors. From this group, 16 were identified as start-up companies and 10 spin-off companies. Following indicators were used as a tool for analysis the results:

1. Employment represents the number of full-time employees.
2. Research and development - funds invested in R & D.
3. Region - place of establishment of a new company.
4. Patents - number of patents requested by the founder and the inventor eventually just as the applicant.
5. Age - number of years of new company
6. Sales - the total value of sales within the last three financial years
7. Profit - within a three marketing years
8. Industries - a market area in which company operates [12].

***The methodology of evaluation based on the work of María Beraza-Garmendia and Arturo Rodríguez-Castellanos***

The methodology of evaluation is based on the work of María Beraza-Garmendia and Arturo Rodríguez-Castellanos who primarily dealt with the issue of efficiency the supporting programs of university spin-off companies. Their work is based on the results of European universities but mainly from universities in England and Spain. Due to the differences of individual supported programs for the creation of spin-off businesses

at universities, it is needed to characterize the by using different identifiers and identify the determinants of their performance. The research was conducted on the base of online questionnaire, which was sent to more than 250 universities in Europe, with the presentation of research and invitation on the participants of this reconnaissance by answering various questions.

Information-gathering process ran from November 2005 to end of February 2006. Commission received responses from 67 universities, 25 universities of which belonged to the UK and 42 were European universities (except Spain). The level of participation in the survey was 20.36%. In the case of Spain reconnaissance was conducted separately. Online questionnaires were sent out virtually to all universities that deals with the technologic transfer. The level of participation represented 58% in Spain. Only about half of universities answered on almost all questions. Questions were classified into several categories, which were evaluated as separate indicators [13]:

1. Age of spin-off.
2. The size of the team in the spin-off.
3. Liabilities of university are indicative links of university to promotion of entrepreneurial culture
4. Selectivity is certain prudence in the selection and evaluation of results of studies dealing with the product launch.
5. Creativity of university in search of creativity and prospecting business ideas.
6. The degree of efficiency is an indicator that is based on the results of the number of based spin-off companies and the percentage of surviving on the market for at least three years.
7. Involvement in the management of spin-off is an indicator that assesses the degree of cooperation and active involvement of universities in spin-off companies [13].

**3 Comparative analyses of indicators**

On the base of all mentioned methodologies of individual authors there is possibility to search the relation between individual evaluations. Each of the methodologies represent sum of factors and indicators that have their common characteristic or characteristics adapted by the author. Each of the authors deals with a slightly different theme. That is the reason why the evaluation criteria differ on the base of its exact focus on their work. Selection of individual factors is also connected to the period of its elaboration because newer works are partially influenced by previous studies in which the authors express a view on these issues. By collecting all the evaluative factors in solving methodology it is possible to summarize all the indicators mentioned in the individual works.

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All of above mentioned indicators solved in the individual work is necessary to categorize into three main groups:

**The first group** is characteristics of founding team where we can find more the same or similar characteristics used by authors in their works. The importance can be attributed to emphasized characteristics. According to this table, important factors are: research AE - it represents the

importance of having in founding's team at least one member who was participated in university research and the number of members with the academic degree. These factors along with other factors represents: experience in the individual sector and experience with start-up / spin-off, the importance attributed to acquired skills of founders the issue in the past.

Table 1: Characteristics of founding team

Charakteristics of founding team	Goethner and Cantner (2010)	Goethner and Cantner (2011)	Garmendia and Castellanos	Czarnitzki, Rammer and Toole	Džupka and Vajda	Erden and Yurtseven
AE				X		
Research AE	X			X		
Non-research AE				X		
The number of team members with an academic title	X			X		
Team size				X		X
Entrepreneurial personality		X				
Wages		X				
Founding team		X				
Experience in a sector	X	X				
Previous experience with management	X					
Previous experience with research	X					
Experience with start-up/spin-off	X	X				

**The second major group** of allocation all the criteria mentioned in the described work is characteristic of the new, already existed company. In this group we can see an intensive occurrence of various factors mentioned by said authors. The most commonly used criteria included in this group are values representing the growth in employment, investment in research and development, number of patents and rating granted by independent reputable rating agency. Other evaluative criteria

which are referred to several authors are values representing the amount of capital, increase of sales, number of years on the market, but also factors dealing with the issue of a new product in company, its novelty and also region and target market to which the company wants to penetrate.

Table 2: Characteristics of new company + external environment

Charakteristics of new company + external environment	Goethner and Cantner (2010)	Goethner and Cantner (2011)	Garmendia and Castellanos	Czarnitzki, Rammer and Toole	Džupka and Vajda	Erden and Yurtseven
Science				X		
Engineering				X		
Other sector				X		
Company	X	X		X	X	

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patents						
Research and development	X	X		X	X	X
Employment	X	X	X	X	X	X
Rating	X	X	X	X		
Limitation of liability				X		
Region, target market	X				X	X
Number of years on the market			X		X	X
Sales	X				X	
Profit					X	
Sector		X		X	X	X
New product	X	X				X
Capital	X	X				
Salvage business	X					
Competitiveness on the market	X					
Process innovation						X
Product-sale						X

*The third group* of factors represent relations and cooperation with universities. In this group, most of individual criteria is not repeated, but they have some connection. For some authors, this category is difficult to evaluate, some other authors do not solve the principle and intensity of company cooperation with universities. The tables below show the evaluative factors of individual methodologies that represent relationship between university and company from different perspectives. Interconnection with university is one of the factors mentioned in two different methodologies and represents training of staff and students but also interconnection in

research activities. Despite the low intensity of occurrence and solution of these factors it is necessary to attribute them an important role within the frame of well operating spin-off company. After the establishment of company and consequently without next cooperation, the company can show good results in terms of profits, increase in employment or create perfect product for the market. But without active participation and sharing of university on its operation, company do not sufficiently exploit its potential wherewith the University spin-off companies dispose.

Table 3: Relations with universities and cooperation

Relations with universities, cooperation	Goethner and Cantner (2010)	Goethner and Cantner (2011)	Garmendia and Castellanos	Czarnitzki, Rammer and Toole	Džupka and Vajda	Erden and Yurtseven
Links with universities				X		X
Involvement in the management of spin-off			X			
Cohort				X		
University liabilities (supporting of business activities)			X			
Creativity			X			
Cooperation with other firms						X

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**Conclusions**

Reasons of process performance measurement do not have to be same for each organization. Through that, some reasons have common features and one of them is implementation of quality standards. Results that were found by measurement of processes performance:

- analyse problem that happened and deals with obtaining of information. On the base of obtained information it is possible to eliminate concrete problem and manage individual processes effectively without unnecessary losses,
- help identify key business processes and their inadequacies. (It is more efficient to ignore the process that is not significant for company, but it is

- important to deals with key processes that have a significant impact on earnings, turnover, etc. and eliminate processes which are irrelevant and unprofitable. ),
- provide a real background papers of problem (Business management intuitively anticipate that something is not all right but only results of measurement allow them to compare the actual situation with the plan.),
- are available for identifying relationships between inputs and outputs as well as for analysis of total results and their assignment fractional.

*Table 4: Recommended factors for evaluating method of the innovation potential*

Factor	Characteristic
Research AE	At least one member worked in university research
The number of team members with an academic title	% of members with the academic degree
Entrepreneurial personality	Indicators of entrepreneurial personality describes the characteristic features of the founder personality and the conditions of their use in favor of business
Team size	Number of employees in the company
Experience in a sector	The variable indicating the experience of one or more members in a sector of new business
Experience with start-up/spin-off	Previous experience with start-up, or spin-off companies at the time of setting up a business
Company patents	Number of patent application form
Research and development	Company activity in the field of research and development
Rating	Value rating from an independent agency
Sales	The total amount of company sales
Capital	Amount of capital input
Employment	Number of employees in first financial year
Competitiveness on the market	Level of competition operating on the market
Region, target market	Target group, the market, the company plans to enter
Number of years on the market	The number of years of company from entering the market
Sector	Industry in which the company operate
University liabilities	Support of business activities
Link with university	Relations in time of establishment
Innovation	Product innovation of new company

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