University of Salford
A Greater Manchester
University

University of Essex
ESSEX
BUSINESS
SCHOOL
Centre for Entrepreneurship Research

The General
Jonas Žemaitis
Military Academy
of Lithuania

Ministry
of National Defence
Republic of Lithuania

World Institute for
Engineering and
Technology Education

RISEBA

Estonian
Business
School

NATO Energy
Security
Centre
of Excellence

ENTREPRENEURSHIP AND
SUSTAINABILITY CENTER

AVADA

Journal of Security and Sustainability Issues *www.lka.lt/index.php/lt/217049/*
2012, 2(1): 51–64

THE DEVELOPMENT OF COMPETITIVE ADVANTAGES OF LITHUANIAN BIOTECHNOLOGY COMPANIES VIA SUSTAINABLE INNOVATION STRATEGIES

Mindaugas Laužikas[1], Gintarė Baipšytė[2], Viktorija Butaitė[3]

Vilnius University International Business School
Saulėtekio av. 22, LT-10225 Vilnius, Lithuania
E-mails: [1]mindaugas.lauzikas@gmail.com, [2]gintaref@gmail.com, [3]vik.but@gmail.com

Received 18 January 2012 accepted 20 may 2012

Abstract. The aim of the present article is to investigate the role of sustainable innovation strategies on competitive advantages of Lithuanian biotechnology companies. The entire Lithuanian biotechnology market is targeted via the conduction of semi-structured qualitative interviews, consecutively carried out in 2011 and 2012. The methodological solution to introduce the time perspective in the research elucidates the importance of the sustainability in innovation processes as there could be the progress and the continuity in the implementation of innovation strategies observed among sample companies. There is the increasing number of discussions about innovations and the performance of organizations. The success of an innovative activity depends on the complex of human and financial resources, organizational, managerial, technical and other factors. Though competitive advantages cover a vast spectrum of aspects, they all are inter-related and dependent on a great number of factors and measures. The innovation strategy could help to reach target results and to provide a synergy effect. Main reasons for the creation and deployment of innovations should also be the increasing competition, rapidly evolving technology and changing consumers' expectations. Such factors as the human capital emerges as the key driver of high-tech industries because people involved in innovative activities are characterized by their competencies, motivation and willingness to act in different circumstances. It should not be forgotten the importance of the continuity of innovation processes and long-term strategic directions. The research question: are sustainable innovation strategies necessary for competitive advantages of Lithuanian biotechnology companies? Firstly, there is the concept and classification of innovations presented; it is continued by the revelation of main features of innovation management and success factors of the commercialization of innovations. These chapters are followed by the identification of companies' competitive advantages and the analysis of sustainable strategic human resource management. Finally, there are main characteristics of the biotechnology sector underlined and the research (2011 and 2012) results on a sustainable development of competitive advantages via the innovation strategy presented.

Keywords: sustainability, innovation strategies, biotechnology companies, competitive advantages.

Reference to this paper should be made as follows: Laužikas, M.; Baipšytė, G.; Butaitė, V. 2012. The development of competitive advantages of Lithuanian biotechnology companies via sustainable innovation strategies, *Journal of Security and Sustainability Issues* 2(1): 51–64.

JEL Classifications: D21, D04, D83, L1, L2, L65, M1, O3, Q55.

1. Introduction

In the broader sense the success of innovative activities depends on macro factors such as the country's cultural environment, market factors such as the consumers' satisfaction and micro factors such as the employees' tolerance of innovative activities that are carried out in companies, the diversity of innovations or the cooperation potential. Moreover, modern innovations are associated with businesses, government institutions, the innovation support mechanism as well as professional, social and managerial competencies of education organizations that consolidate and transform the individual knowledge into competitive

products.

To scrutinize the role of the innovative strategy on high-tech firms' competitive advantages there were Lithuanian biotechnology companies having a great potential in both global and Lithuanian markets selected. The research was consecutively conducted in 2011 and 2012 in order to find out how consistent and value-adding innovation strategies are.

The aim of the research (2011) was to examine the role of the innovation strategy on strengthening competitive advantages of Lithuanian biotechnology companies via the use of human resources. 9 Lithuanian biotechnology companies were contacted and innovation experts from 8 companies were successfully interviewed. Taking into consideration the limited size of the biotechnology market, the sample of 8 companies is more than representative and sufficient: there were nearly all the companies of the Lithuanian biotechnology market interviewed.

A semi-structured qualitative interview method was chosen due to the limited number of respondents and the focus on qualitative aspects of the issue. There was a personal interview type selected with the interview plan and the opportunity to ask additional questions not included in the plan. There were open questions phrased and both life and telephone interviews used**.** The research was conducted in the period from April to May 2011 by the team of researchers of the International Business School at Vilnius University (Laužikas, Treskauskienė and Keturakienė). Thanks to a good interaction between the interrogator and respondents an excellent communication during interviews was ensured. The choice of a semi-structured qualitative interviews method made it possible to control the situation, to smoothly manage the conversation and to explain respondents more precisely the question, if necessary. Similarly to the research of 2011, the study of 2012 aimed to examine the effects of innovations on biotechnology companies' sustainable competitive advantages. In order to determine whether innovations are responsible for strengthening competitive advantages, there were those Lithuanian biotechnology companies selected that successfully competed in both Lithuanian and global markets. To obtain the most accurate information it was intended to contact experts from eight biotechnology companies that were considered leaders in the market and were also interrogated in 2011. The sample of the research (2012) reads 5 companies, as one company refused to cooperate while other two were not reachable during the research period. On the other hand, such sample is sufficient, because the 2012 research was to support the previous year analysis while checking the progress and consistency in terms of the innovation performance. In addition, among respondents there were innovations-related experts from two largest companies (in terms of the headcount) interviewed. The study applied a semi-structured qualitative interview method with a logical sequence of questions; however, there was a possibility to ask questions spontaneously provided. The use of direct interviews and the collection of responses by e-mail were combined. The study was conducted in the period from April to May, 2012.

2. The concept and classifications of innovations

The word 'innovation' appeared in the fifteenth century deriving from the French word 'inovacyon' which means 'renewal' or 'providing a new form to an object'. Lithuanian language possesses the term 'novelty', but this word does not incorporate the innovation process, it is more the result of a process (Strazdas *et al.* 2008). To continue, efforts to find a single definition of innovations are vain as many authors and scholars it describes in different ways. It could be described as the creation process, the development and efficient use in various fields. Innovations can be understood as: changes in the position and characteristics of the object in order to improve the process of the research and development or management; activities to use inventions, improve technologies and the production process. The consideration of innovations more economic than technological is arguable, because technological inventions are not regarded as innovations without promoting the economic growth, increasing the productivity and competition.

The beginning and an integral part of innovations is a new knowledge, which can be generated only by using a human mind power and the creativity. The impetus to innovations is the dissatisfaction with the current situation and the perception that there is room for the improvement, the intellectual and creative potential and the desire to achieve better results (Jakubavičius *et al.* 2008). Schumpeter (1961) points out that the innovation leads to regional cyclical fluctuations. When the business starts to use new farming, manufacturing, business management ideas and

tools, there is an economic upturn. Thus, economic actors that apply innovations are the basis for the progress in the society because they do not only ensure the economic growth, but also encourage a scientific, technical, and, thereby, a social progress (Schumpeter 1961). The innovation is not only to increase the competitiveness, but also to be an effective part of the marketing. To continue, innovations are implemented at all stages of the production: the design, new technologies, the exploitation of resources, new products' characteristics. The society welcomes both the innovativeness of the product and the companies' openness to innovations as well as the desire to excel (Jakubavičius *et al*. 2003). According to Jakubavičius *et al.* (2003) innovations are developed and implemented by innovative companies. These principle innovation actors have some common features: making important changes, having regular information channels, driven by the decentralization and the teamwork, tolerating the risk, ignoring formalities as well as encouraging innovations. In general such companies seek for the increase in their competitiveness, growth, consumers' satisfaction, the quality of the product or service, the increase in the operational efficiency as well as the attraction and maintenance of the best human resources (Ramanauskienė 2010).

Ramanauskienė (2010) focuses on definitions of the innovation as a process in which the invention or the idea acquires an economic content; the innovation is a technical, manufacturing and commercial means to deliver new or improved manufacturing processes and equipments; the innovation is a social, technical, economic process which in the practical utilization of inventions and ideas brings best products in terms of their characteristics, a new technology and economic benefits.

Though many scholars define the innovation as the process by which the information, knowledge are realized in the development of new products or services, Milius (2011) relies on the Drucker's (2004) tradition, where the innovation can be described as a creative management tool helping to develop new products and services in order to maximize profits. The innovation classification consists of eight features, such as the content, the implementation level, the extent of implementation, degree of novelty, organizational features, the nature, the meaning and impact of the final outcome. Ramanauskienė's (2010) classification is based on the extent of innovations, the novelty and the intensity of innovative changes that express quantitative and qualitative characteristics and are important in assessing both the economic impact of innovations and the relevance of management solutions. Strazdas *et al.* (2008) also focus on Bright's (1968) researches where new ideas come from the old truth and it is not necessarily a new product or service; it may be the development of one or another aspect. Fields that are not considered as the adequate environment for innovations are usually full of new ideas and possibilities

To sum up, the innovation could be defined as the risk-oriented process in which the knowledge is converted into competitive products or services within the cultural environment. Some assess the technological side of innovations, others the economic side, but the majority conclude that the innovation promotes the growth of income, employment and, of course, encourages the competition in the market. A successful management of innovations requires not only the understanding of the concept, but also the investigation of the development process and features of innovations.

3. The commercialization of innovations and competitive advantages

Markets worldwide adopted a great number of different models of managing innovative activities. They reflect the creativity and innovativeness in practice. Jakubavičius *et al.* (2003) underline three well known management models of innovative activities. The foundation of the 'Risky Business' model (considered American) is composed of small and risky companies with activities related to the development and use of scientific ideas and their conversion to new technologies and products that later are transferred to large enterprises. Another innovative business model 'Scientific-research association' is the essence of the cooperation among corporations on the scientific basis. Corporations try to merge the knowledge and people and to develop both fundamental scientific ideas and the underlying technology. The developed technologies are transferred to participating organizations in order to adapt the technology and to get the final product. The efficiency is limited by the degree of a vertical integration among participants. This model is more suitable to the Japanese market. The third model is the 'International Inter-organizational Cooperation' model (considered European) being the intermediary

between the first and the second. Strategic alliances could be designed among large enterprises with common objectives, combined assets and opportunities.

Innovation management models differ from country to country, based on their time of occurrence, lifetime, the advancement level, their influence on the country's economy as well as the focus on the further innovation development. In addition, it is difficult to say whether they are carried out effectively or not: Europe is lagging, but both the U.S. and Japan (similarly to other innovation-driven economies) are advanced in innovations (GEM 2011).

The experimental development and various researches encourage the appearance of innovations and new technologies, creates a high added value which affects the country's economic growth. The commercialization of the research turns ideas into products that find new ways of solving problems as well as transform old or create new markets. The commercialization of the research is defined as the process of developing new ideas, converting the research into services or commercial products and introducing them into the market. It requires a large amount of resources, although there is a chance that a product or service will fail (Zemlickienė 2011).

Vijeikienė, Vijeikis (2000) emphasizes the importance of the preparation for the introduction of new products or services to the market. There are four crucial questions underlined as the guideline. *When?* The company preparing to introduce a new product or service to the market should choose a suitable moment. *Where?* The company should decide where a new product or service will be sold: in the local, regional, national or international market. Only few companies have courage and opportunities to introduce new products or services simultaneously in both national and international markets. Small businesses can only gradually absorb opportunities in attractive regions and cities, while large companies can penetrate cities, regions or national markets quicker. *What?* The company producing new products or services needs to identify its target customers and constantly focus on them. *How?* While launching new products or services the action plan is very important. The budget should be allocated to the marketing plan and other marketing procedures.

Success factors of commercializing innovations in general include financial capabilities, career plans and needs, the commercialization phase itself and a geographical location. Both internal and external factors determine the success of the commercialization of innovations. Jakubavičius *et al.* (2000) identify such internal and external factors affecting the success of the commercialization: political, legal, economic, technological, market, human resources, informational, organizational culture, resources. The application of innovations is valued on the basis of financial indicators and calculations, while the assessment criteria include numbers of patents and creations, products, trademarks, service options. The financial criteria include sales, profits or the increase in sales and profits due to a new service or product (Čiburienė and Povilaitis 2008).

In order to establish the criteria of executing and monitoring innovations companies must be clear about their goals. There should be targets and expected results, in terms of both the economic and social impact, set; the innovation performance should be monitored and necessary corrections done. Such methods as Six Sigma (a data-driven approach and methodology to eliminate defects in any process) or the Business Performance Index (covering the assessment criteria of the company's performance at different levels) should be applied. Notwithstanding the diversity of evaluation methodologies, managers should not rely on a single assessment system, as selected indicators should measure returns and the use of a great number of resources and should be in line with the management system overall.

Companies' competitive advantages and opportunities of strengthening them are closely related not only to the competition, but also to the innovation performance. Many Lithuanian companies face the increasing competitive pressure from both domestic and international competitors. In order to successfully compete it is important to identify factors that influence competitive advantages. Lithuanian companies' success can be ensured only by a continuous development and introduction of new products, the implementation of quality systems, managing segments-related factors, efficiently using resources, increasing the productivity, being responsible for the operational modernization as well as speeding up joint activities with foreign companies (Makštutis 2002).

Firms' innovations are related to the life cycle of a product, the company's position in the market and the development of the R&D strategy in the company. Within the development of technologies, the

aging of products is accelerating. Companies must constantly develop and commercialize innovative ideas, because consumers and clients are waiting for new products and services. Furthermore, the product development is beneficial due to the added value from the R&D and creative activities within the value chain. Although the development of new products might be profitable, Lithuanian enterprises are modestly investing in this field, as this process is complicated, expensive and risky.

Given a rapidly evolving globalization, the expansion of innovative businesses becomes more complicated, as flows of information are more intensive, innovative products and technologies have shorter life cycles, while consumers' needs are rapidly changing. The development of new products and services should be a well organized and continuous process, where the speed and flexibility are important prerequisites to a successful innovation.

4. Strategic human resource management

In spite of a large diversity of strategies (whether they are offensive, defensive or imitation) all strategies have two main objectives: the efficient use of resources (financial, technological, human and etc.) trying to specify the key activities and the adaptation to the external environment. During the innovation process a new knowledge is introduced in operations of enterprises seeking for economic gains. This process links the science, creativity and business. The innovation improves the competitiveness of both companies and the economy. Main participants in the innovation process are innovative companies due to their openness to innovations, the teamwork, the risk management and the reduction of formalities. To conclude, a strategic management is crucial for innovative businesses, as it consists of the use of resources and response to changes in the market.

In today's dynamic global markets to be successful and productive organizations need to re-evaluate priorities of using human resources; there is the need to integrate new strategies and ways to effectively use the most important assets of organizations. Employees are involved in creating, implementing, managing and controlling the organization's strategy. An effective management of human resources is via attracting and retaining highly skilled and well motivated human resources who help to develop products of a high quality, to reduce production costs as well as to strengthen organizations' competitive advantages. The knowledge becomes the key weapon in the competition, while the technological development and globalization encourage the use of human resource strategies. Many authors consider the human resource management as the use of human resources which allows the organization to achieve its strategic objectives focusing on the external and global environment, covering long-term perspectives and driven by the focus on generating new ideas and achieving results. M. A. Armstrong (2006) argues that the management of resources is a strategic, consistent and comprehensive approach towards the company's human resource management. Jewell (2002) identifies four principles of the human resource management: the need of investments in human resources, the importance of human resources in organizations' strategic plans, encouraging employees to voluntarily join the realization of company's objectives, a sustainable approach to strategic human resource management.

Huselid *et al*. (1997) define strategic human resource management as the most important in promoting the efficiency of the operational and business performance where employees (strategic resources) should be managed, according to the organization's strategy. Such authors as Martín-Alcázar, Romero Fernández and Sanchez-Gardey (2005) believe that strategic human resource management is influenced by the organizational, social and economic environment; thus, human resource management requires the integration among the practice, policy and strategy. Bamberger and Meshoulam (2000) argue that strategic human resource management is the link of strategic objectives with a human, social and intellectual capital.

Problems of strategic human resource management are tackled in different ways by applying such models as the Michigan Business School model, developed by Fombrun *et. al.*(1984) (the human resource management strategy is associated with the enterprise's strategy; the model is rational and quantitative), the Harvard/ 'Employees' involvement' model, considered as irrational, humanistic and qualitative (Beer *at al*. (1985) emphasize the importance of expected employees' results, the involvement of the human factor in the implementation of the business strategy and the focus on shareholders and environment-related impacts on the employees' behaviour, the attention to the communication, leadership, motivation and directing staff to achieve organizational goals in terms

of competitive advantages), Guest's (1987) model (while seeking strategic objectives the organization treats employees as it is economically more beneficial for the organization, and only top-level managers are strategic decisions makers), the Warwick model, initiated by Sparrow and Hiltrop (1994) (they emphasize the human resource management orientation to the process and situations, and the human resource management strategy depends on external factors or the relationship between human resource and the organization's strategy).

Although there is no consensus in the scientific literature on human resource strategies' components, it is possible to identify four key human resource management elements: human resource planning, remuneration and motivation, the assessment of the employees' performance, work environment, employees' education and qualifications (Išoraitė 2011). The human resource strategy is highly dependent on the organization type and its activities. Batt (2002) identifies three human resource management functions that contribute to the competitiveness of organizations: recruiting employees with certain skills and their training; particularities of work, promoting the employees' freedom of actions; the promotion related to results. The formation of human resource strategies should be without separating phases of the design and implementation. It is important to establish guidelines that can be used in the development of human resource management strategies. Human resource management should rely on long-term strategies including such aspects as the investment in the development of employees' skills and motivation. Moreover, the human resource strategy should be clearly linked to the overall corporate strategy and such strategies as the innovation and marketing, assessing company's human resources as crucial for competitive advantages. The human resource strategy includes the communication, motivation, leadership, forecasting of the human resources demand, the work environment evaluation, training of employees and other equally important aspects.

A rapid spread of information and communication technologies encourages many organizations to actively look for new ways, ideas, experimental and creative solutions and to improve existing products, processes, systems and technologies. It is hard to imagine a successful organization based on the intellectual potential if it does not treat its people as the most important resource. As it stated by Wang (2005), human resource management is particularly important in promoting technological innovations, organizational changes and entrepreneurship. It can contribute to high-quality technological innovations, in parallel to adding value to the technological and organizational strategies as well as combining such important aspects as the complexity of the human resources strategy, organizational effectiveness and competitive advantages.

It is important to combine the personnel, systemic and organizational approaches in order to encourage technological innovations and integrate human resources in the organization. These approaches connect human resource management functions in the improvement process of the organizations' performance: a sustainable strategic planning and the implementation of strategies at all structural levels help to achieve better results in innovation processes (Wang 2005). However, the investment in the scientific and technological education is a necessary condition to commercialize innovations via the use of human resources. To combine the innovation and human resource strategies it is important to involve human resources in innovation processes via the creation of the adequate climate and culture in favour of the creativity and innovations. In this way employees are encouraged to use modern technologies and tackle company's issues. To achieve such symbiosis, the organization often faces the necessity to employ high qualification specialists and managers.

Science-intensive branches that create a modern and sophisticated technology possess strategies, based on high-skilled professionals, managers, often recruiting from external markets. The issue of short-term objectives in the promotion system is often insufficiently tackled, as the effectiveness of different strategies is highly dependent on the system of priorities and employees' motivation. In addition, it is stated that the effectiveness of the knowledge management allows employees to generate knowledge in their particular fields as well as in organizational innovation processes. Thus, the relation between human resource management practices and organizational innovations is closely related to the effectiveness of the knowledge management (Tan and Nasurdin 2011).

5. Characteristics of the Lithuanian biotechnology sector

The biotechnology can be considered as one of the oldest human activities, but only in the second half of the twentieth century the modern era of the biotechnology began; scientists had discovered how to create micro-technologies by using molecules. Today biotechnology activities are widely applied and can be grouped into four categories: the application of the red-biotechnology for health; the white biotechnology for the industry and environmental protection; the green biotechnology applied in the agriculture; the blue biotechnology applied in the marine and aquatic processes (UAB 'Fermentas' 2012).

Innovation is a crucial element of the biotechnology sector. The European Federation of Biotechnology (2012) defines the biotechnology as an integrated application of natural and engineering sciences, when using organisms, cells, their parts or molecular analogs useful products and services are created. The biotechnology offers the potential to use technologies in many industrial sectors such as healthcare, pharmaceuticals, animal health, textile, chemicals, plastics, paper, fuel, food or feed production. The term 'Biotechnology' was developed from three Greek words 'bios' (life), 'techne' (art, craft) and 'logos' (science). The biotechnology industry is one of the Lithuania's key high-tech branches that could help Lithuanian companies to penetrate foreign markets. Thus, the need for innovations is obvious in the biotechnology sector.

Lithuanian biotechnology market is one of the largest in Central and Eastern Europe, because products do not have subsidiary products, so there are all conditions for effectively using the R&D in increasing the competitiveness of the Lithuanian economy. Although the Lithuanian biotechnology sector possesses a relatively modest number of companies, they employ highly qualified specialists and modern equipment that ensure the competitiveness of their products. Most of Lithuanian biotechnology companies represent the red biotechnology. This group also incorporates the company 'Thermo Fisher Scientific' (Fermentas), Vilnius branch, (which focuses on the molecular diagnostics) as well as the company 'Sicot Biotech' (which develops and manufactures recombinant biopharmaceuticals solutions using the advanced science and technology). The two companies are considered to be the largest in Europe by the number of employees. The Lithuanian biotechnology industry has been developing since 1990 and is considered as one of the most developed in Central and Eastern Europe. The sector employs 700 employees, including 160 employed in the R&D. The Lithuanian biotech sector is responsible for the world-class researches or inventions such as drugs against cancer. According to the Lithuanian Biotechnology Association (2012), sales of Lithuanian biotechnology products regularly increase on the annual basis, and more than 70 countries are the current export markets for Lithuanian biotechnology companies.

6. Innovations and competitive advatages of biotechnology companies

The first research in the series (2011) intended to examine how Lithuanian biotechnology companies positioned themselves in the market and how they defined their corporate strategies. All the interrogated companies stated that their corporate strategy is directly related to innovations. Some of them were developing new products; some were improving processes or introducing new management techniques. One of the interviewed experts stated that his/ her company was innovative, because they had acquired a modern equipment to produce one particular product, but the further innovation development was not expected. Thus, some companies perceived the concept of the innovation process in a very narrow perspective: the creation of only one or several products via using a new technology is not a continuous process, while the continuity and sustainability are necessary for the innovation strategy. Therefore, not all the companies working in innovative industries are innovative.

Within the ulterior semi-structured interviews (2012) it was tried to determine whether the innovation strengthened competitive advantages of Lithuanian biotechnology companies. All the interviewed experts agreed with the statement that innovations had improved their companies' position in the market. According to experts, innovations are mainly oriented to the development of a new product, the customer and the efficiency of companies' activities. In addition, innovations ensure the companies' uniqueness in the market, create their competitive advantages and raise the value of the company.

To ensure the company's success and effectiveness it is important to continuously develop and commer-

cialize innovations. Though the development of new products and services can be profitable, it is complicated, expensive and risky. According to experts of biotechnology companies, the result of the innovation performance often depends on the type of innovations itself.

Business experts agree with the statement that the growing market demand, profits, the increasing number of partners could all be the results of successful innovations, but there are occasions when the profit and the market stagnate, because innovations are too expensive and not always bring profits. Innovations require new resources and partners, and they lead to a more complex management of the organization. According to the interviewed experts, there is always a risk probability in implementing the innovation that innovations can not work and can not bring the desired expectation. Trying to identify the role of the market research in the innovation process three companies admitted conducting the market analysis, while one expert of those companies that carry out scientific and technological researches in the field of biopharmaceutical for other companies stated that his/her company did not directly focus on the market research, and concentrated on searching new customers with their particular innovation demands (as a result, their sales performance to other participants of the market is not relevant). According to other experts, the market research is conducted randomly, since an accurate market analysis is very expensive and time-consuming. The main tool is the observation of secondary sources, and the market research is in use only in the strategic decision making.

Innovation and marketing are the most important functions of businesses with the key objective to receive profits from their goods and services. To get the confidence and the acceptance of its products or services each company is forced to create and preserve its distinctive character, image and reputation. Only then companies' products and services can be noticeable. It is not surprising that the analyzed biotechnology companies have the marketing department established, the aim of which is to strengthen the companies' brand. However, experts have not mentioned another important aspect of the interaction between innovations and marketing, although it is closely related to the product creation stage, which is the assistance to the R&D department and a continuous cooperation with the Human Resource department. It should not be forgotten that to save time and resources a company does not always fulfil all stages of the development process of a new product or service. Even if the company fulfil all the steps perfectly, it still faces the risk probability (Vijeikienė and Vijeikis 2000). There are several types of risks, related to developing a new product or service that are listed by the interviewed experts.

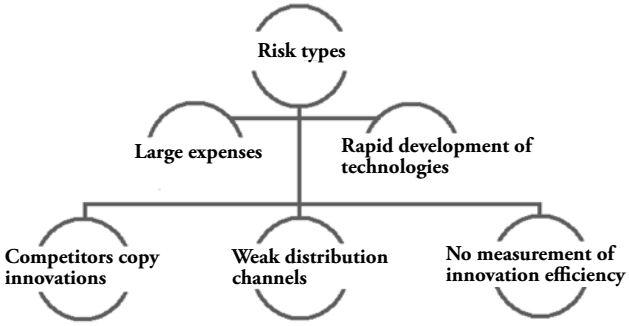

Fig. 1. Types of risks in developing new products or services

Source: prepared by authors, based on respondents' answers.

The interrogated biotechnology experts admitted that there was always a part of risk of innovations present. One expert measured the risk through the scale of investments required and expected financial benefits. Others believed that a reasonable risk should be an acceptable risk in order to have innovations as the development engine. Companies' competitive advantages depend on the expected value. Each division should contribute to the value creation. The competitive advantage is usually an advantage over competitors by any exceptional aspect of the company. To evaluate the entire biotechnology sector is difficult, because it is necessary to compare very different businesses and business models. It is also argued that the biotechnology investment market is risky and of a high return; it is a competitive and a high value-generating industry. According to some experts, the competition exists, but companies do not fight against competitors.

As the counterargument to the statement that there is no high competition, one expert argued that the pharmaceutical industry was under the influence of high barriers for new entrants, such as patents. New ideas were also endangered by the dumping or the disposal of a mass advertising. Another expert ad-

mitted that the competition is both high and low. A relatively large number of companies involved in the biotechnology industry point at a high competition, while a low competition is due to a small number of new emerging companies because of a substantial financial investment and knowledge. Only one expert argued that there was no competition in the Lithuanian biotechnology sector at all, because there is no a great number of companies or all of them operate in different segments.

7. Strategic human resource management in biotechnology companies

Innovations derive from innovative ideas that lie behind human resources and interactions among their knowledge and skills; thus, the lack of human resources could be destroying. All the respondents of the first year-interviews (2011) admitted that Lithuania had enough of biotechnology professionals, due to the national education and training policy and many years of experience in the development of the biotechnology sector. For larger companies (from 46 to 360 employees) a small percentage of the employees' turnover did not have a significant impact on the organizational performance. Meanwhile, small firms were more sensitive to the 'brain drain' of the qualified personnel. According to the expert of one of the largest Lithuanian biotechnology companies, the sustainability of biotechnology companies was endangered, as he/she expected a high vulnerability in terms of the 'brain drain' of young people interested in the field of the biotechnology, as they were planning their studies abroad. The expert regrets that the Lithuanian education system loses in the global competition and the biotechnology companies start losing in terms of the future employees, compared to foreign companies.

Another issue is related to management: it appears that the existence of human resource manager depends more on the size of a company, rather than on its innovation performance. Almost all the interviewed companies have managers and specialists, based on their field, involved in the innovation strategies making. It can be concluded that conservative traditions of a centralized management dominate among Lithuanian biotechnology companies. It should be marked that management of international business processes was enriched by a foreign experience and modern approaches.

Trying to identify whether employees are encouraged to generate innovative ideas, how these ideas are assessed and selected as well as how innovative employees are rewarded some interesting findings emerged. In general ideas were assessed and selected by managers and experts. Apart from two larger interrogated companies all firms encourage their employees to make innovative suggestions, but do not reward them financially because it is considered to be the employees' direct responsibility. It is difficult to measure the material value of the idea, to wit, it is difficult to determine a reward for it; however, the majority consider financial rewards as the most effective. The most of innovative firms encourage new ideas, but avoid of allocating funds for these activities. Non-financial reward techniques, public praises, trainings are more popular. The interviewed companies employ highly skilled employees, thus, seminars and trainings should be a part of the corporate strategy. The idea is to figure out how often employees have the possibility to attend trainings and seminars, as it is an important means of improving professional skills and promoting new ideas. One of the interrogated companies considers itself being innovative, but does not encourage employees to generate new ideas, does not encourage innovations and the creativity. Trying to find out how many innovative ideas have been successfully implemented in sample companies it was discovered that respondents do not have such information, which indicates that companies either do not measure such progress or have a very low percentage of commercialized innovative ideas. Analysis of the role of the teamwork in innovative activities and the way these teams are formed shows that many biotechnology companies invoke the teamwork. It appears that the top managers are often involved in innovation activities with other employees. Most teams are formed on a voluntary basis.

The responses received in 2012 point at the importance of strategic management and, in particular, human resource management, where involving all the stakeholders should be clearly identified as an innovation objective. Therefore, the present article should be continued with the identification of companies' innovation efforts and activities over the last three years.

Companies	Innovations	Innovation objectives
The company 'A2'	Continuously executing product, service and process innovations	Business growth
The company 'B2'	Modernization of the equipment	To stay at the edge in the field
The company 'C2'	Building a modern centre of the scientific and technological research	To have a number of laboratories to conduct the R&D in the field of biotechnologies
The company 'D2'	New manufacturing lines, products, management models	To lead in the quality and professionalism
The company 'E2'	Changes of the technological base	To be reliable and exceptionable in the quality

Fig. 2. Implementation of innovations and their objectives in Lithuanian biotechnology companies

Source: prepared by authors, based on respondents' answers.

According to experts' answers, all the companies have been continuously carrying out innovations, having their own objectives that serve as the guideline for the further performance and strategic management. The development and implementation of innovation strategies are one of the main conditions to be competitive in local and international markets. To develop the innovation strategy there should be an efficient strategic planning implemented, when there are long-term goals identified and expected ways to achieve those goals underlined. All the interviewed companies have their own innovation strategies. One of the companies uses STRAP (Strategic Planning Process) innovative business strategy, the aim of which is to constantly examine activities of the organization from both the present and future perspectives and to implement necessary changes in order to succeed in the future. Other companies have the innovation strategy to quickly introduce a new capacity into the operation and then to outsource the R&D. Given the expanding biopharmaceutical industry there is a growing need for the biotechnology research.

As it was previously tackled in the article, the financial support is crucial for innovative companies. Based on the interviews, carried out in 2011, larger sample companies appreciate Lithuanian Governmental actions in encouraging innovative activities. This can be explained by the fact that larger companies have the ease to absorb the financial support of the European Union, compared to smaller ones. All the companies-respondents (except one small company) have already used the European Union's support over the last 3 years. These funds were normally allocated to the research and development. Respondents identify strengthening their competitive advantages as the main driver of innovative activities. They believe that Lithuania possesses many educated people in the field of the biotechnology, and the importance of innovations is obvious for their companies; however, there should be a multifactor model designed, where all the interrelated factors would be presented in order to better understand the innovation process in high-tech industries and the way how innovation strategies could strengthen biotechnology companies' competitive advantages (see Fig. 2).

8. The role of financial resources

In 2012, experts assured the importance of the financial support one more time. Currently, Lithuania, like other Central and Eastern European countries, do not have properly equipped laboratories for biopharmaceutical drug developments that fully meet all international standards, to wit, they are not capable of preparing and producing medical products of the required quality for clinical trials. For this reason Lithuanian scientists do not have the access to the know-how acquired by the country's academic community, cannot use it for specific R&D projects and develop high value-added products. Building a biopharmaceuticals development laboratory is a very expensive, long-term investment process, thus, without the support of EU funds or other financial support means it would be difficult for the company to survive. Today, it is essential to develop the biotechnology sector where particularly high value-added products are developed, while the labour productivity is one of the largest.

All the interrogated experts declare using the financial support. For instance, one company gets 70 per cent funds from the EU, which is used for building a new modern centre (for the scientific and technological research) as well as for the investment in the infrastructure development for the research and development. Another sample company benefits

from the EU support in building an integrated molecular biology research centre. Another interrogated firm conducts three projects within the Lithuania's Strategy to efficiently use the EU Structural Funds (2007-2013) and the Economic Growth Actions Programme 'New Opportunities', driven by the purpose to increase sales in such foreign markets as Kazakhstan or CIS countries. To continue their peer has successfully implemented the project 'Development of the Industrial Biopharmaceutical Base' with the goal to expand the company's biopharmaceuticals manufacturing, suitable to the production of new products. All the companies mention the importance of the commercialization which they define as the application of a new product series production and the introduction of it to the market. It reminds that a successful introduction of a new product to the market needs answers to four questions.

9. The commercialization and measurement of innovations

It appeared that all the interrogated companies try to get answers to four questions while innovating. STRAP (Strategic Planning Process) provides the answer to the question 'When' to innovate for two respondents, others are influenced by the availability of the EU support and the possession of professionals who can perform well within the R&D. Interviewees sell their products and services mainly in international markets such as the EU and the U.S. They focus on both individual biopharmaceutical companies and large retail chains, and admit that the introduction of the marketing action plan is very important. In addition, all the investigated companies are engaged in the red biotechnology, thus, introduction of biopharmaceutical drugs to the market is a very long and complicated process which could take up to 10 years and need to adopt a sustainable strategy. Companies' competitive advantages depend on their created value. Each division contributes to the value creation, and activities of a company should be carried out in a system rather than individual parts. The biotechnology industry is growing rapidly, thus, a particular interest should be paid on products of a high added value such as pharmaceutical products. Hence, it is necessary to find out how companies measure the added value of innovations.

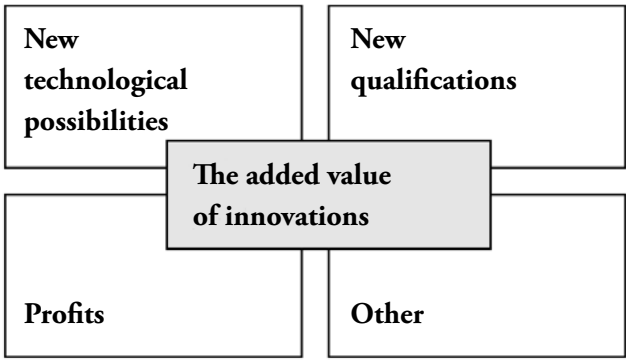

Fig. 3. The added value of innovations in Lithuanian biotechnology companies

Source: prepared by authors, based on respondents' answers.

Most experts measure the added value of innovations in profits, while one expert proposes the measurement method of the value added of innovations by the emergence of new technological opportunities and the creation of new qualifications (see Fig. 3). To sum up results of 2012 interviews it appears that Lithuanian biotechnology companies share a strong position in the international biotechnology research market segment, and their innovation strategies are driven by the need to encourage the innovation process by effectively managing human resources and applying adequate marketing actions. In order to strengthen their competitive advantages and maintain a strong position in international markets they use financial incentives of the EU and foreign investments. A strong and robust cooperation among the innovation and other business departments creates a higher added value to the biotechnology industry and the Lithuanian economy.

Experts of the year 2012, similarly to 2011 respondents, elucidate a holistic understanding of principles, factors and measures in strengthening competitive advantages of Lithuanian biotechnology companies. ***This helps to answer the research question whether sustainable innovation strategies are necessary for competitive advantages of Lithuanian biotechnology companies or not.*** To implement innovative ideas, to increase profit margins, to grow revenues and the market share, to expand to foreign markets and ensure both the employees' and consumers' satisfaction Lithuanian biotechnology companies need to focus not only on the EU financial support, but also on allocating their internal funds to innovations and the R&D. The innovation and human capital-intensive business strategy should help to strengthen all above

mentioned competitive advantages. As the counterweight to the 'brain drain' and legal constraints, companies should invest more in the creation of an adequate innovation environment, organizational structures and the development of a closer co-operation with educational, innovation, R&D and other strategically important organizations (see Fig. 4). All these important factors and implemented measures should be ingeniously tackled paying a sufficient attention to the monitoring system and measurements of the role of innovations on strengthening competitive advantages of Lithuanian biotechnology companies in the perspective of the continuity and consistency.

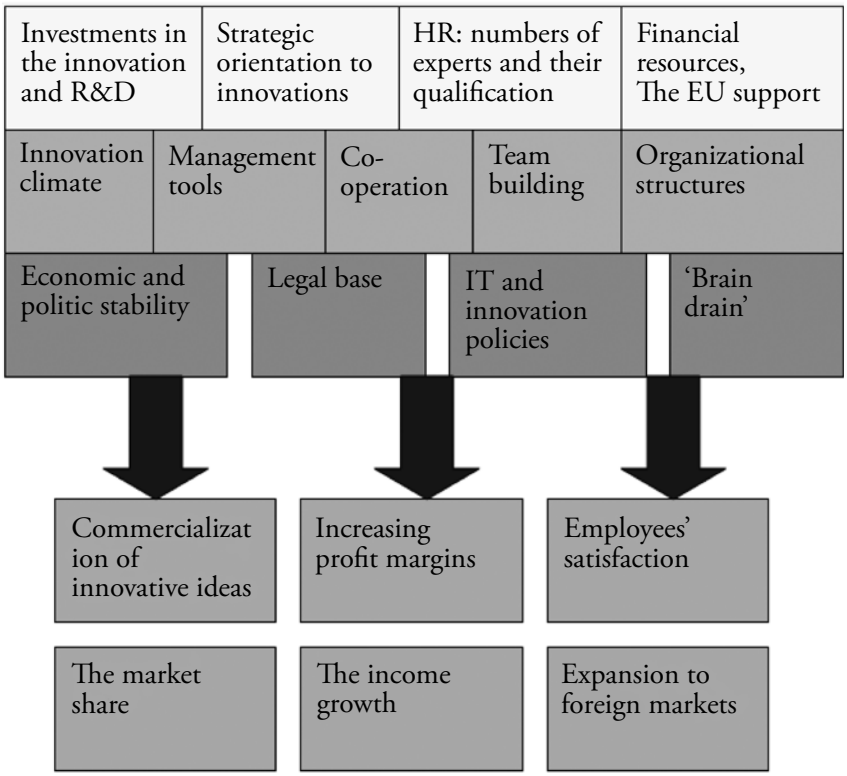

Fig. 4. Combination of the innovation and human resource strategies in Lithuanian biotechnology companies: factors and measures

Source: prepared by authors.

Conclusions

The development and realisation of innovation strategies should involve all the employees, shareholders and freelancers. They contribute not only with their professional knowledge and skills, but also with the moral support of innovations (or visa versa). Thus, the innovative company must not only be open to innovations, but also should motivate employees to support innovations and seek a sustainable improvement given the risk tolerance and the ability to manage it. Prior to the implementation of innovations, the firm chooses its strategy with its risk, potential risk management tools and the efficient use of resources. It should not be forgotten that the enterprise is a group of people developing products or services, driven by the purpose of selling them and receiving economic benefits.

To improve the productivity it is crucial to develop and implement an effective human resource strategy which shall consist of: the demand planning, motivation, evaluation systems and trainings. The creation of one particular or multiple products or services using a new technology and stopping improving them is not a continuous process and does not support sustainable innovations strategies. It can be argued that many innovative biotechnology companies that encourage new ideas are not innovative because not all of them have their innovation strategies. In addition, companies encouraging employees to generate new ideas do not reward their employees financially (often pay only for trainings); however, they believe that the financial reward system is efficient.

Innovation is a risky process in which the knowledge is converted into competitive products or services and promotes the income and employment growth. Firms' competitive advantages are related to both technical developments and process innovations that are based on the market knowledge and various initiatives. The innovation strategy is necessary for the company to develop and modernize products or services and to increase the competitiveness in international markets. The commercialization of innovations is the development and execution process of innovative ideas and researches, the conversion of these ideas and researches to commercial products or services and their introduction to the market. The speed and flexibility are important preconditions for the success of innovations in the rapidly evolving and competitive environment.

Though the development of new products and services can be profitable, the process is very complex and carries a significant risk. A successful innovation can increase profits and the market demand; however, the number of potential partners might also increase due to the lack of resources necessary for innovations. The interrogated biotechnology companies take a strong position in the international biotechnology research segment, and they tightly work with international companies. The demand in the Lithuanian biotechnology sector is limited, thus, it is important to promote the international development, attracting foreign investors.

Answering to the research question whether sustainable innovation strategies are necessary in creating competitive advantages of biotechnology companies the experts' answers indicate that a successful position in global markets calls for stronger efforts in marketing, strategic human resource management as well as the cooperation with a great variety of partners. There should be a set of actions further than using the financial support set while paying attention to the innovation climate, organizational structures and the commercialization process of innovative ideas as well as a clear monitoring system. Innovation processes should not be one-off investments in product, process or service innovations. To strengthen competitive advantages biotechnology companies should focus on the continuity and consistency.

References

Armstrong, M. A. 2006. *Handbook of Human Resources Management Practice*. Kogan Page, London.

Bamberger, P.; Meshoulam, I. 2000. *Human Resource Strategy: Formulation, Implementation, and Impact*. Sage: Thousand Oaks, CA.

Batt, R. 2002. Managing Customer Services: Human Resource Practices, Quit Rates, and Sales Growth, *Academy of Management Journal* 45(3): 587–597.

Beer, M.; Spector, B.; Lawrence, P.; Mills, D.; Walton, R. 1985. *Human Resources Management: a General Manager's Perspective.* Free Press, New York.

Čiburienė, J.; Povilaitis, M. 2008. Paslaugų inovacijų vertinimo diegimo kriterijai, *Ekonomika ir vadyba: aktualijos ir perspektyvos* 3(12): 243–250.

Drucker, P. F. 2004. *Valdymo iššūkiai XXI amžiuje.* Goldratt Baltic Network, Tallinn.

Fombrun, C. J.; Tichy, N. M.; Devanna, M. A. 1984. *Strategic Human Resource Management.* Wiley, New York.

Global Entrepreneurship Monitor Report. 2011. Availabe on the Internet: <http://www.gemconsortium.org/docs/2201/gem-2011-global-report.>

Guest, D. 1987. Human Resource Management and Industrial Relations, *Journal of Management Studies* 24(5): 503–521.

Huselid, M. A.; Jackson, S. E.; Schuler, R. S. 1997. Technical and Strategic Human Resource Management Effectiveness as Determinants of Firm Performance, *Academy of Management Journal* 40(199): 171–188.

Išoraitė, M. 2011. Žmogiškieji ištekliai – svarbiausias konkurencinio pranašumo šaltinis, strategiškai valdant organizaciją, *Socialinių mokslų studijos* 3(1): 31–58.

Jakubavičius, A.; Jucevičius, R.; Jucevičius, G.; Kriaučionienė, M.; Keršys, M. 2008. *Inovacijos versle: procesai, parama, tinklaveika.* Lietuvos inovacijų centras, Vilnius.

Jakubavičius, A.; Strazdas, R.; Gečas, K. 2003. *Inovacijos: procesai, valdymo modeliai, galimybės*. Lietuvos inovacijų centras, Vilnius, pp. 4–51.

Jakubavičius, A.; Melnikas, B.; Strazdas, R. 2000. *Inovacijų vadyba.* Vilniaus Gedimino technikos universitetas, Vilnius.

Jewell, B. R. 2002. *Integruotos verslo studijos.* The Baltic Press, Vilnius.

Makštutis, A. 2002. Globalizacjos veiksnių įtaka, optimizuojant įmonių veiklą Lietuvoje, *Organizacijų vadyba: sisteminiai tyrimai* 24: 89–89.

Martin-Alcazar, F.; Romero-Fernandez, P.; Sanchez-Gardey, G. 2005. *Human Resource Management.* Routledge, pp. 633–659.

Milius, P. B. 2011. *Technologinių parkų indėlis į Lietuvos ekonomiką.* VšĮ KTU regioninis mokslo parkas, Kaunas.

Ramanauskienė, J. 2010. *Inovacijų ir projektų vadyba.* Akademi-

ja, pp. 5–106.

Schumpeter, A. J. 1961. *The Theory of Economic Development: an Inquiry into Profits, Capital Credit, Interest, and the Business Cycle.* Oxford University Press, New York.

Sparrow, P.; Hiltrop, J. M. 1994. *European Human Resource Management in Transition*. Prentice-Hall, London.

Strazdas, R.; Chlivickas, E.; Jakubavičius, A.; Jančiauskas, B.; Maceika, A.; Staškevičius, J. A.; Toločka, E.; Zabielavičienė, I.; Žemaitis, E. 2008. *Inovacijų vadyba*. UAB 'Baltijos kopija. Vilnius, pp. 29–58.

Tan, C. L.; Nasurdin, A. M. 2011. Human Resource Management Practices and Organizational Innovation: Assessing the Mediating Role of Knowledge Management Effectiveness, *The Electronic Journal of Knowledge Management* 9(2): 155–167.

The European Federation of Biotechnology. 2012. Available on the Internet: <http://www.efb-central.org/>.

The Lithuanian Biotechnology Association. 2012. Available on the Internet <http://www.lbta.lt/>.

UAB "Fermentas". 2012. Available on the Internet: <http://www.fermentas.com/en/home>.

Vijeikienė, B.; Vijeikis, J. 2000. *Inovacijų vadyba: naujas produktas – nuo idėjos iki vartotojo*. Rosma,Vilnius, pp. 76–84.

Wang, Z. 2005. Organizational Effectiveness through Technology Innovation and HRM Strategies, *International Journal of Manpower* 26(6): 481–487.

Zemlickienė, V. 2011. *Mokslinių tyrimų komercializavimo metodai*. Vilniaus Gedimino technikos universitetas,Vilnius.