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M. Matejun - Barriers to development of high-technology small and medium-sized enterprises * no. 1824

BARRIERS TO DEVELOPMENT OF HIGH-TECHNOLOGY SMALL AND MEDIUM-SIZED ENTERPRISES

Marek Matejun

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INTRODUCTION

The issue of functioning of SMEs has been essential in recent years as far as considerations in the field of economic sciences, including management sciences, are concerned. Experience of countries with developed market economy plays vital role and in Polish sector, interest in SMEs is mainly caused by the effects of system and structural transformation of the 80s and 90s.

Small and medium-sized enterprises are seen as a group of entities which is internally diverse, particularly susceptible to the influence of external factors and determined by multidimensional and cooperational relations. **High-technology SMEs** (HTSMEs) are a special subgroup. They essentially influence enhancing competitiveness of economy in international arena, they are a main source of innovative and technical progress and they positively influence other economic and social trends. They can be defined as entities functioning on a lesser scale in fields and branches which take into account achievements of contemporary science and technology. They are highly innovative and enterprise companies, organizations enhancing knowledge, which function where economy and science meet, commercializing solutions based on scientific research in the market.

The question of **development and increase of SMEs**, particularly high-technology SMEs, is an essential area of interest in companies belonging to the SME sector. The development of SMEs is seen as a complex, multidimensional process of changes taking place in time. In literature, various approaches to this issue are presented. For the sake of this work, it is assumed that the process of complementary qualitative and quantitative changes assessed positively from the point of view of assigned long-term aims of an enterprise, is regarded as a company development.

Development barriers and inhibitors of various types, which hinder or make introduction of positive changes impossible, are a significant part of development processes. They evoke certain effects for the functioning of enterprises, influencing development gap increase and impeding development processes. Taking into account the above considerations, multidimensional analysis of barriers to development of high-technology SMEs, assessment of their influence on development processes of these entities and suggestions of actions limiting barriers to development of high-technology SMEs, have been set as **the aim of this work**.

On the basis of preliminary literature studies and the results of secondary research[1], the following **research hypotheses** have been marked out in support of the above aim:

[1] The research conducted by M. Martin in 2002 was mainly used, see: Martin M., Relacje pomiędzy podstawowymi charakterystykami małych firm technologicznych a głównymi barierami ich rozwoju, „Zeszyty Naukowe Politechniki Łódzkiej", nr 42/2006.

H1: The main development aim of the researched entities is to introduce numerous product and organizational innovations, which proves the characteristics of high-technology enterprises as organizations with high flexibility of action, creative, enterprise and very active in the market.
H2: Basic barriers to development of the researched high-technology SMEs include market, legal, financial barriers and those resulting from the country policy, in larger companies problems increase related to sufficient qualifications of workers and difficulties in gaining qualified people.
H3: The researched companies use forms of supporting development offered by various institutions supporting SMEs to a small extent, mainly due to high costs of this cooperation and information shortages on offer and directions of this support.

Empirical research[2] conducted in the form of **case study method** in two high-technology SMEs was devoted to realization of the aim of this work and verification of research hypotheses put forward. The case study method was chosen as it is considered that the role of management sciences is mainly to provide organizations with suggestions of solving management problems, meant to be applied and case studies showing examples of good and bad management as well as best solutions (the so called best practices) should be main method and main task of management sciences[3].

The enterprises were chosen by means of **target method**. Two entities were chosen: MakoLab S.A. and LTC Sp. z o.o. Both enterprises are located in the Lodz province and function in IT area, which allows comparability of results. On the other hand, the companies differ in size and operate in different target markets, which allows to draw certain conclusions regarding varied development strategies and directions chosen by enterprises.

Empirical material was collected in enterprises by **interview method**. Interviews were conducted with two managers working on development and implementation of high-tech information technologies. **Questionnaire interview technique** was used as research method and extensive interview questionnaire was a research tool, which conistsed of 23 tabular questions with possibile answers from 0 to 5 and the possibility to add the respondents' own opinions and remarks. Interviews were conducted on: 19 September 2008 (MakoLab S.A.) and 03 October 2008 (LTC Sp. z o.o.)

The manager from IT department (business systems) of MakoLab S.A. taking part in the research is a mid-level manager in the enterprise. In organizational hierarchy, he is directly subordinate to president of the company. He is young (31years old) graduate of the Institute of Technical Physics, Computer Science and Applied Mathematics at Technical University of Lodz, his specialty being Artificial Intelligence. He has been working in MakoLab S.A. since the year 2003. He manages the work of 19 people divided into 4 teams:

– programists team (10 people),

[2] Empirical research was conducted within postdoctoral grant at the Institute of Organization and Management of the Technical Univerity of Lodz entitled: „The forms of supporting development in phase models of lifecycle of SMEs" for the years 2007 – 2008.
[3] Sudoł S., Nauki o zarządzaniu. Węzłowe problemy i kontrowersje, TNOiK, Toruń 2007, p. 71.

- technical support and client service team (4 people)
- testers team (2 people),
- business consultants team (3 people).

The manager of IT team (Development Manager) in LTC Sp. z o.o.is also a mid-level manager in the company. Similarly, he is a young (31 years old) graduate of the Institute of Technical Physics, Computer Science and Applied Mathematics at Technical University of Lodz, his specialty being computer networks. He has been working in LTC Sp. z o.o. since the year 2001, managing the work of 12 people, among whom dynamic task assignment teams are created.

The work has been divided into eight chapters and consists of two main parts – theoretical and empirical one. Theoretical part, which consists of first five chapters, presents literature studies presenting works of Polish and foreign authors as regards considerations on the nature of a company development and barriers to this process. In empirical part, comprising chapters from 6 to 8, own research conducted on the topic has been analyzed.

Chapter one is devoted to characteristics of high-technology SMEs. Varied qualitative and quantitative criteria enabling distinction of SMEs from the whole group of economic entities are presented. After that, attention is paid to specific features and conditionings of functining of high-technology SMEs, which are a specific subgroup of the SME sector. **Chapter two** discusses the concept and conditionings for development of contemporary organizations. In this part, emphasis was put on increase factors of high-tech companies and possibilities to use them in the process of limiting development gap are also presented.

Chapter three presents the taxonomy of barriers to development of high-technology SMEs. Division of barriers according to the time they have occurred in the course of functioning of enterprises and other criteria useful in the process of classifying activity are presented here. Presentation of the most important barriers to development in generic scheme is also essential and it becomes a suggestion of a model of barriers to development of high-technology SMEs. The considerations are completed with summary, multidimensional taxonomy of limitations to development of SMEs, taking into account all the above mentioned criteria. **Chapter four** is devoted to the analysis of occurrence of barriers to development in lifecycle of high-technology SMEs. Types and meanings of phase models of lifecycle of organizations are presented here as well as chosen concepts, in more detail. In the last part of the chapter, attempt is made at identification of the most serious barriers occurring in successive phases of development of high-technology SMEs.

Chapter five discusses actions limiting barriers to development of high-technology SMEs. It presents general assumptions for enterprise support system, characterizes chosen institutions supporting development of SMEs and discusses the most important external forms of supporting development of high-technology SMEs. **Chapter six** initiates the empirical part of the work. It presents the characteristics of the researched enterprises - MakoLab S.A. and LTC Sp. z o.o. Basic data and the subject matter of the activity of companies are presented, their history and development are discussed and basic high-tech products offered by the enterprises are presented.

Chapter seven is the first part of analysis of empirical research. It presents development priorities and external barriers of the researched enterprises. In this part, identification and assessment of barriers to entry for new entities and external barriers to development of the researched companies, on the basis of the managers' opinions, is also made. **Chapter eight** is the analysis of internal barriers and actions limiting negative influence of development inhibitors. On the basis of the results of the research, a synthesis of conducted empirical considerations regarding barriers to development is made and the results of comparative studies with the works of other authors are presented. The analysis and assessment of the influence of actions limiting negative influence of barriers to development of the researched enterprises close the work.

Taking into account the number of the test, possibilities to generalize presented results of the research can be limited. However, presented considerations and conclusions can be useful for students of economic faculties, managers making decisions concerning development in high-technology enterprises and also for institutions supporting development of SMEs.

Marek Matejun

1. THE CHARACTERISTICS OF SMALL AND MEDIUM-SIZED ENTERPRISES OF ADVANCED TECHNOLOGIES

1.1. The quantitative and qualitative criteria to distinguish small and medium sized enterprises

The small and medium sized companies constitute a dominant part of the participants of the contemporary market economy as far as the number is concerned. In the Polish conditions, the increase of their importance was connected with the changes of the economy and of the system at the end of 20th century which led to the liberalization of the economic activities and to the rebirth of the private property. As the effect in the years 1989-1993 the phase of "**the explosion of enterprises"** leading to more than 2 millions of small and medium sized companies took place[4].

Currently the companies of SME sector function in the conditions of the economic integration in the framework of the European Union, the progressing processes of globalization and the increased dynamics of the commercial exchanges. The small and medium-sized companies play significant economic and social functions in the market economy. To the basic **economic effects** of their functioning one can include the positive stimulation of the technological progress and innovations, the positive impact on the level and structure of the employment, the stabilization of the market and the significant influence on certain macro economic factors such as the level of gross domestic product, the structure of export and import and the size of the investments. The activities of the companies of SME sector can be also characterized by[5]:

- relatively smaller ecological threats (the ecological effect),
- the creation of decentralized networks which do not require special infrastructure conditions in order to function (the effect of regional decentralization),
- the engagement of resources, which but for the presence of such companies, would have been left unused (the effect of the mobilization of capitals),
- the beneficial influence on the economy during the system of transition (the transformation effect).

In **the social context** the functioning of small and medium sized companies lead to the creation of the positive image of the entrepreneurs and to promoting the

[4] Lachiewicz S. (eds.), Małe firmy w regionie łódzkim, Wydawnictwo Politechniki Łódzkiej, Łódź 2003, p. 50.

[5] Safin K. (eds.), Zarządzanie małym i średnim przedsiębiorstwem, Wydawnictwo AE we Wrocławiu, Wrocław 2008, p. 55-61.

entrepreneurial attitudes. These companies become the creators of the middle class and they help to eliminate the disproportions in the regional development. As the effect the small and medium sized companies have a key position in the socio-economic policy of many countries and their development is considered as one of the elements of the economic growth and as the illustration of sound market competition[6].

One of the basic problems which refer to the functioning of the sector of SMEs and to the management of small and medium sized companies is the need to define unambiguously the category of these companies and to separate them from different participants of the economy exchange. In order to do so, different quantitative and/or qualitative criteria are used which constitute the basis to categorize the subjects according to the size. Some of these characteristics are presented in Table 1.

Table 1. Quantitative and/or qualitative criteria to distinguish small and medium sized companies.

Quantitative criteria	Qualitative criteria
– number of the staff, – size of turnover/income – value of assets and liabilities of the company, – values of the durable resources, – number of clients, – usage of the energy or production – size of production and/or services – share of the sale market, – range of activities, – amount of capital involved, – participation of external capital, – size of the participation of different companies/ capital independence, – size of the materials flows – level of the financial effect.	– social structure of the company marked by the personality of the owner, – financial independence of the company, – special character of the finance economy of the company, – lack of the access to the sources of financing offered by the capital market, – independence of the decisions, – unity of property and management, – simplified organizational structures, – indirect business contacts, – specific system of choosing and motivating staff – flexibility of acting, – innovations and creativity, – operating on a local scale, – wide range of responsibilities of the managers staff.

Source: Own preparation on the basis of: Matejun M., Rola outsourcingu w zakresie rachunkowości i doradztwa podatkowego w rozwoju małych i średnich przedsiębiorstw, the doctoral thesis, Katedra Zarządzania, Politechnika Łódzka 2006, p. 14.

The unambiguous separation of the category of small and medium sized companies by means of a certain combination of the criteria is feasible from the technical and substantial point of view. In the economy and law practice there are a lot of definitions which are used for different aims (e.g. tax reasons, connected with the public aid, political or even market- connected with the offer for SME sector).

[6] Nogalski B., Karpacz J., Wójcik-Karpacz A., Funkcjonowanie i rozwój małych i średnich przedsiębiorstw, Wydawnictwo AJG, Bydgoszcz 2004, p. 5.

In the Polish conditions the definition which is based on the qualitative properties included in the act on the freedom of economy activities has the leading role. According to the provisions of the articles 104, 105 and 106 of the above mentioned act, the three categories of entrepreneurs included in the sector of SMEs are defined as: microenterpreneurs, small and medium size entrepreneurs[7]. This characteristics is in line with the acquis communataire and is based on the way of reasoning which was adapted in it[8] and in the art. 110, par. 1, as far as the applications of public aid are concerned, it directly refers to the provisions of the acquis.

Currently the basic definition of the small and medium sized companies derive from the provisions of the acquis and is based on the provisions presented in annex nr 1 to the Regulation of the European Commission (EC) nr 364/2004 from 25th February 2004 amending the Regulation nr 70 from 12th January 2001. The basic elements of the provisions are presented in Table 2.

Table 2. Criteria to distinguish small and medium sized companies in European Union

Criteria	Micro company	Small company	Medium company
Average yearly employment	0 – 9 staff members	10 - 49 staff members	50 – 249 staff members
and			
Annual turnover	Does not exceed 2 mln Euro	Does not exceed 7 mln Euro	Does not exceed 40 mln Euro
or			
Total annual balance	Does not exceed 2 mln Euro	Does not exceed 5 mln Euro	Does not exceed 27 mln Euro

Source: Own preparation on the basis of : Definicja małych i średnich przedsiębiorstw, Załącznik nr 1 do Rozporządzenia Komisji Wspólnot Europejskich NR 364/2004 z dnia 25 lutego 2004 r.

The important point of the above mentioned characteristic is the separation of the independent companies, partner companies and bind companies. This category is based on the quantitative assessment of the capital and property binds of the company. In order to define the company's belonging to the sector of SMEs the suitable data connected with the level of employment and the financial size of the dependent companies need to be taken into consideration. In case of partner companies and bound as to the level of employment and the financial data of a given company, one must add to its own data the percentage of people employed and the financial data of the capital partners. This percentage reflects the possessed proportional share in capital or in votes (depending which one is bigger).

As the effect the companies with tiny scope of activities and which are in complex property relations are excluded from the category of SMEs. It is possible to award the public help only to the companies which do not have a resource base in the form of capital partners.

[7] Ustawa z dnia 2 lipca 2004r. o swobodzie działalności gospodarczej, Dz. U. 2004, Nr 173, poz. 1807 z późn. zmianami.

[8] Bieniek-Koronkiewicz E., Sieńczyło-Chlabicz J., Działalność gospodarcza i przedsiębiorca na gruncie ustawy prawo działalności gospodarczej „Przegląd Prawa Handlowego", nr 04/2000, p. 17.

An important exception to this rule is the possibility to qualify as a company an independent company, even if its threshold value of 25% of the capital or votes was attained or exceeded by such investors as[9]:

- public investment corporations, capital joint stock company with high risk, individuals or groups of people who regularly run investment activities with high risks, who invest their own capital into the companies which are not present on the market (business angels), on condition that the whole sum of investment of these investors into business angels does not exceed 1 250 000 euros,
- universities or non-profit research centers,
- institutional investors together with regional development funds,
- local governments whose the budgets do not exceed 10 millions euros and with the number of inhabitants below 5 000[10].

This approach seems to be especially beneficial for the highly innovative companies, which use the advanced technologies, use the capital and substantial support of numerous institutions from the business environment, including the investment institutions with high risk (venture capital). Thanks to it, these companies entering capital relations do not have to lose the status of the company from the SME sector and can try to obtain public aid from different sources.

The different approaches to the categorization of the companies according to the criteria of size lead to the usage of new definitions depending on the aim of their usage. For **the needs of the public statistics** the only determinant is the size of employment. Generally the following categories are introduced: companies with 0-9, 10-49, 50-249, 250-999 and over 1000 employed, without taking into consideration the income criteria, the balance sum or the capital independence of the company.

The notion of the company functioning in a smaller range is also present in the provisions of the tax or balance law. The example here can be the definition of a small taxpayer as stated in the act on tax on goods and services[11]. The accountancy act also foresees the possibility to prepare financial reports in a simplified forms by smaller units, distinguished on the fulfillment of two from three quantitative criteria which refer to the employment, the sum of the balance of assets and the net income from the sale of products, goods and the financial operations[12].

Next to formalized classifications introduced in the frameworks of law regulations a lot of authors and researchers use their own systematic of the companies of SME sector **adjusted to the aim, range and specificity of research.** The example can be the classification proposed by L. Berliński who distinguishes the companies which are very small, average, and the above average ones[13] or the systematics of the stationary phone operators examined by R. Kozłowski in which the division is made into the companies which are very small, small, medium and

[9] art. 3 ust. 2 Definicji małych i średnich przedsiębiorstw, Załącznik nr 1 do Rozporządzenia…, op. cit.
[10] Each of the listed investors can posses not more than 50 % of shares in the company, on condition that these investors are not bound in terms of capital.
[11] art. 2 pkt. 25 ustawy z dnia 11 marca 2004r. o podatku od towarów i usług, Dz. U. 2004, Nr 54, poz. 535.
[12] art. 50 ust. 2 ustawy z dnia 29 września 1994r. o rachunkowości, Dz. U. 1994, Nr 121, poz. 591.
[13] Berliński L., Zarządzanie strategiczne małym przedsiębiorstwem, Wydawnictwo OPO, Bydgoszcz 2002, p. 12.

big taking into consideration the employment criteria[14]. The big companies present on the market use their own criteria to distinguish the companies from SME sector in order to present the offer aimed at a special target group. Such activities result on one side from the perception of the big companies of the specific needs of small and medium sized companies but on the other hand show the interest of the financial potential of the smaller financial companies[15].

The discussions on the variety of definitions of small and medium sized companies show that the SME sector seems to be heterogeneous, difficult to define, whose character is determined by the methodology of the systematization. P. Dominiak pays attention to the fact that the sector of SMEs **is highly differentiated internally,** which makes it difficult to do the scientific comparisons as well as the generalization of certain tendencies observed in a certain group of companies[16].

In the group of small and medium sized companies there are companies with different sizes, which influence their qualitative characteristic. The important differences are also as far as the sectors and branches of operations are concerned, the technical solutions used and in different properties which cause significant differences among small and medium sized companies.

The aims accepted by the companies of SME sector, the possibilities of development and the contacts with the environment are also important factors that differentiate the companies. This division is often connected with the person of the entrepreneur and it reflects their personal features which exert the influence on the personalization of the management in these companies[17].

1.2. The small and medium sized technological companies as a sub group of the enterprises of SME sector

The special category of the companies which exert substantial influence on the economic prosperity of Poland and the European Union are **the small and medium sized companies of advanced technologies.** The small and medium sized technological companies started to come into existence at the turn of 60s and 70s in the USA and in the 70s of 20th century in the Western Europe.

They are defined as developing, producing and selling goods and services which take into consideration the output of the contemporary science and technique. Being the companies highly innovative and entrepreneurial they do the conversion of the

[14] Kozłowski R., Przeobrażenia struktur organizacyjnych przedsiębiorstw zaawansowanych technologii (na przykładzie operatorów telefonii stacjonarnej), Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2006, p. 80.

[15] Matejun M., Rola sektora MSP w rozwoju dużych organizacji gospodarczych, [in:] Lachiewicz S., Staniec I., Sytuacja ekonomiczna organizacyjna i kadrowa dużych organizacji gospodarczych w aglomeracji łódzkiej, Politechnika Łódzka, Łódź 2007, p. 89.

[16] Dominiak P., Sektor MSP we współczesnej gospodarce, PWN, Warszawa 2005, p. 21.

[17] Stawasz E., Pojęcie i źródła finansowania MSP, [in:] Bilski J., Stawasz E. (eds.), Bariery w korzystaniu z usług bankowych w finansowaniu działalności małych i średnich przedsiębiorstw, Wydawnictwo UŁ, Łódź 2006, p. 14.

science into the new techniques, starting at the same time its market commercialization[18].

The notion of technology, advanced (high) technology and the company of the advanced technology is not presented in the literature in the unambiguous way. Different authors try to define these notions taking into consideration different criteria and measures.

The notion of technology can be defined as the physical combined with the intellectual or knowledge processes by which materials in some form are transformed into outputs used by another organization or subsystem within the same organization[19]. This definition includes the components of skills, equipment and knowledge mentioned by most scholars of technology. However, it is also mentioned explicitly that this is also made of raw materials and a transformation process. It is also important to mention in this definition that outputs might be used within the same organization. Finally, this definition is noteworthy because of its emphasis on processes rather than on static knowledge, skills and equipment. By equating technology with the process, the authors take into consideration the importance of changes over time and sequence[20]. According to a different definition technology "refers to a body of knowledge about the means by which we work on the world, our arts and our methods". Essentially, it is knowledge about the cause and effect relations of our actions. Technology is knowledge that can be studied, codified and taught to others"[21].

In the literature one calls for the rejection of the classical approach to technologies or at least the modification of it as far as highly advanced technologies are concerned (HT). **The notion "advanced technology"** is used to characterize different aspects of the new technologies such as computers and informatics, microelectronics, teleinformatics, optic fibers, satellite communication, lasers, automatics or robotics. This notion can refer both to the products including these technologies and to the processes which enable the production of modern products and services. In this way one can define the branches in which the technology changes very quickly and refer to high qualifications required from the staff members[22].

M. Zeleny states that highly advanced technology changes the nature of the tasks and their efficiency, the links between them and the nature of the physical flows, energy, information and its usage results in the need to modify the organization, introduce new tasks, new styles of management, new cultures, which means the implementation of the new ways to run the business[23].

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[18] Matusiak K., Stawasz E., Przedsiębiorczość i transfer technologii; polska perspektywa -,Katedra Ekonomii Uniwersytetu Łódzkiego, Łódź-Żyrardów 1998, p. 54.

[19] Hilin C.L., Roznowski M., Organizational Technologies: Effects on Organizations' Characteristics and Individuals' Responses, [in:] Cummins L.L., Staw B.M. (eds.), Research in Organizational Behavior, Vol. 7, Greenwich, Conn, JAI Press 1985, p. 47.

[20] Weick K.E., Making Sense of the Organization, Blackwell Publishing, 2001, p. 149.

[21] Berniker E., Understanding Technical Systems, Paper presented at Symposium on Management Training Programs: Implications of New Technologies, Geneva, Switzerland, Nov. 1987, p. 10.

[22] Hatch M.J., Teoria organizacji, PWN, Warszawa 2002, p. 140.

[23] Zeleny M., High Technology Management, [in:] Noori H., Radford R.E. (eds.), Readings and Cases in the Management of the New Technology: An Operations Perspective, Prentice-Hall, Englewood Cliffs, 1990, p. 17-20.

As the effect this kind of technology does not require the management of the efficiency of work understood as the desire to improve the productivity but it transfers the managers into the so called catalyst of changes, whose aim is to activate and support the introduced improvements and self management which is based on the dispersed hierarchy and the usage of the organizational and managerial skills[24].

K. Weick states that the new technologies, contrary to the previous ones, differ taking into account three kinds of event[25]:

- **stochastic**, which means that the processes take place in an unpredictable way as the results of interactions with a gigantic number of factors. As the result it is difficult to steer such technologies, and they can lead to incomprehensive and repeatable breakdowns which happen at random,
- **permanent,** which means that human labor is transferred to machines. The new technologies do run parallel in the users' minds and in the real world and the coordination among them happens not permanently but from time to time. It can result in numerous unpredictable interactions and inexplicable consequences.
- **abstract,** which means that the human labour is to great extent switched to machines. New technologies do not run simultaneously in the users' minds and in the real world and the coordination between them does not happen permanently but periodically which can lead to the existance of numerous unpredictable interactions and inexplicable conseguences.

The broad understanding of the categories of high technologies lead to the difficulties in defining clearly the companies which are technologically advanced. In the literature one can observe different categories of such companies which take into consideration e.g.:

- the specific local requirements and the infrastructure of the companies which operate in the sector of advanced technologies. The example can be the research of J. F. Williams[26] and A. Herring, J. Son and C. Daw[27], in which the authors concentrated on the analysis of the differences between the companies of advanced technologies in comparison to the whole industrial immovables,
- the division into the companies which are technologically advanced and the companies which operate in the field of leading technologies. J. Debenham, A. Tewson and S. Chinnocks[28] include in the first group the companies which concentrate their activities on the commercial usages of the scientific achievements to create the unique market offer. The companies which operate in the field of the leading technologies, are the companies which break the existing technological barriers in the field of research and testing new products and the processes also in the pre production phase.

[24] Kozłowski R., Przeobrażenia struktur organizacyjnych…, op. cit., p. 41.
[25] Weick K.E., Technology as Equivoque: Sensemaking in New Technologies, [in:] Goodman P.S., Sproull L.S. (eds.), Technology and Organizations, Jossey-Bass, San Francisco 1990, p. 1-44.
[26] see: Williams J.F., A Review of Science Parks and High Technology Developments, Drivers Jonas, London 1982.
[27] see: Herring A., Son J., Daw C., Propoerty and Technology – The Needs of Modern Industry, HSD, London 1982
[28] see: Debenham J., Tewson A., Chinnocks S., High Tech Myths and Realities – A Review of Developments for Knowledge Based Industries, Information Services Department, London 1983.

- the kinds of industrial activities of the companies which are considered to be technologically advanced. The example here can be the systematics of C. Brook's[29], in which four categories of activities were distinguished: the research and development in the field of high technologies, the production of technologically advanced systems and equipments and the activities connected with the implementation and usage of the high technology,
- the defined characteristics and the measuring instruments connected with the field of activity according to a given classification, the expenditure on the sphere of R & D or the size of the qualified specialists or engineers.

As the effect of these various attitudes, there is no unambiguous approach to the classification of the companies of advanced technologies. Poland, following the examples of the different countries, while including the branches to the HT industries use the methodology of OECD. In this approach three methods of the classification of the companies of advanced technologies are used: the domain method, the product method and the horizontal method. As the high technologies are also defined there are the branches or the products which in comparison to different companies and products have a higher shares in the research and development (R&D) in the final value. The indicator of the intensity of expenditure on R&D is estimated both in the reference to the whole branches or the fields of industry (the domain approach- sectoral approach), and to the certain products or the groups of products (the product approach)[30].

In the domain approach four types of industries are distinguished: of high technique, of middle-high technique, middle-low technique and low technique. The industries in which the expenditure on research and development are within the limits of 8-15 % of income are included in HT group. The classification of the branches of industry included in the group of high technologies are presented in Table 3.

[29] see: Brook C., The Rapidly Changing Field of High Technology Development and Science Parks, Oxford Polytechnic, 1983.

[30] Wojnicka W., Klimczak P., Wojnicka M., Dąbkowski J. (eds.), Perspektywy rozwoju małych i średnich przedsiębiorstw wysokich technologii w Polsce do 2020 roku, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2006, p. 7.

Table 3. The industries included in the group of high technique according to the methodology of OECD

Polish classification of activities	The description of the industry	The expenditure on R+D [%]		
		1990	1999	Average 1990-1999
35.30	The production of air planes and space ships	14,98	10,3	13,3
30	The production of office devices and computers	11,46	7,2	9,2
32	The production of equipment and radio, television and communication apparatus	10,47	7,4	8,0
24.4	The production of pharmaceuticals, medical chemicals and the products of plant origins	8,03	10,5	10,5
33	The production of medical instruments, precise and optic instruments, clocks and watches.	5,1	9,7	7,7

Source: Hatzichronoglou T., Revision of the High-Technology Sector and Product Classification, OECD, Paris 1996, p. 17; Science, Technology and Industry Scoreboard 2005, OECD, www.oecd.org.

In the product approach one determines the technological intensity of the certain groups of products and not the whole branches or concrete companies. According to this approach one can include in the products of high technologies[31] the following categories:

- the means of car transport (excluding trailers and semitrailers),
- the pharmaceutical products,
- the products of electronic and teletechnical industry (excluding telecommunication),
- TV sets,
- telecommunication devices,
- devises to the automatic regulations and steering,
- tools, instruments, medical and veterinary apparatus,
- means of air transport,
- machines, organizational and technological devises of office activities,
- measurement apparatus and laboratory devises,
- instruments and optic goods and the ones which are of optic and mechanical type,
- robots and industrial manipulators,
- optic fibre cables.

The domain and product definitions are based on the qualitative approach which is the level of expenditure for the research and development activities in comparison to the value of the production sold. As the effect of their usage the enumerative lists of industries or products regarded as highly technological are

[31] Piekarec T., Rot P., Wojnicka E., Sektor przedsiębiorstw wysokiej techniki w Polsce, Polska Regionów nr 26, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2001.

created. The new approach to the following problem is the adoption of the so called horizontal definition.

This approach based on **the horizontal definition** embraces the wide range of technologies perceived from the perspective of science. The example here can be biotechnology which is characterized from one side by the high share of expenditure for R&D and whose commercial usages are found in the whole range of industrial and service sectors from the traditional food industry to technologically advanced production of the drugs. The information technologies, communication technologies, space technologies or the materials engineering are included in the sector of high technologies according to the horizontal classification[32].

The evaluation of the services from the point of view of the technological advancement can be the supplement for the above mentioned characteristics. The services constitute the biggest part of the national income in the developed countries. In the European Union the evaluation of the countries as far as the innovations are concerned include the factors which refer to highly technological services (e.g. the level of employment in the highly technological services). Such services are considered as high-tech: communications and telecommunications, software and informatics, research and development services. As the effect the classification of the services based on the knowledge embracing 14 categories of classification of EKD were created in which three with the highest intensity of R&D are defined as high-tech services. Post, telecommunication, informatics and science can be included in this category[33].

Analyzing the issue of the domains, products or the enterprises of the HT sphere one should pay attention to the **influence of the time factor** to define the notion of the advanced technologies. The example can be here the textile industry which in the 19th century was an important carrier of the technological progress but nowadays it represents a low degree of the technological advancement[34]. As the effect, the sector of advanced technologies is characterized by dynamic and changing characteristics. Its specificity in comparison with the traditional industries results from the fact that the domains which are technologically advanced function at the point of contact of science and industry basing on the usage of the results and the outcomes of the scientific research in the economy practice[35]. The companies of advanced technologies are characterized by supra average innovations and the expenditure in the sphere of R&D.

[32] Wojnicka W., Klimczak P., Wojnicka M., Dąbrowski J. (eds), Perspektywy rozwoju małych …, op. cit. p. 13.
[33] Ibidem, p. 16
[34] Martin M., Charakterystyka pojęcia wysokich technologii – ujęcie retrospektywne, „Zeszyty Naukowe PŁ", nr 42/2006, p. 81.
[35] Stankiewicz B., Sektor wysokich technologii w Polsce – nadzieje a rzeczywistość, [in:] Lachiewicz S., Zakrzewska-Bielawska A. (eds.), Zarządzanie przedsiębiorstwem w warunkach rozwoju wysokich technologii, Wydawnictwo Politechniki Łódzkiej, Łódź 2008, p. 13.

1.3. The specific conditions of the functioning of small and medium sized technological enterprises

As the result of the above mentioned deliberations, as **small/ medium company of advanced technologies** can be described the company which is innovative, acting within the branches of industry or services which are considered as highly technological, taking at the same time into consideration the qualitative and quantitative features proper for the companies operating on a smaller scale. In the literature different descriptive characteristics of the small and medium technological companies are presented.

The example can be the separation by R. Rothwell of the categories of **small companies based on the new technologies[36].** They operate in the sectors of advanced technologies and high risk services such as: biotechnology, energetic technologies, advanced materials, informatics and information technologies or electronics. They are characterized by the realization of their own research and development activities and also a high level participation of the researchers and engineers employed. They are open for contacts with environment, including higher education institutions, research institutions and different companies[37] creating e.g. network relations or relations based on the principles of clustering.

A. Rizzoni classifies the companies **according to the innovative behavior,** where in the group of the most innovative companies where a sub class of small companies based on technology and small companies based on new technology is distinguished[38]. The first ones operate in the quickly growing sectors with changing and diverse demand and big technological requirements , where the following branches can be treated as examples: the branch of scientific research, telecommunications and industrial automatics. The small companies based on new technology are in comparison to the previous ones filled with science and they enter into bigger interactions with scientific and research institutions. The following industries can be quoted as the examples here: semi conductors industry, pharmaceutical industry, advanced materials industry and biotechnological industry[39].

As the effect the small and medium companies of advanced technologies are the enterprising companies whose owners concentrate on the development of their undertakings in order to transform them into bigger companies or even corporations in the future. They are perceived as quickly developing companies which are connected with the big or dynamically growing market which enables them to develop quickly. These are the companies connected in the majority of cases with the new market, which requires the company to grow since the growth seems to be the only possibility to "survive" on this market. They are set up by dynamic and enterprising people who prefer risky undertakings. Their companies are

[36] See: Oakey R., Rotwell R., Cooper S., The Management of Innovation in High-Technology Small Firms, Pinter Publishers Limited, London 1988, p. 8-9

[37] Stawasz E., Innowacje a mała firma, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 1999, p. 98.

[38] See: Rizzoni A., Technological Innovation and Small Firms: A Taxonomy, „International Small Business Journal", vol 9/1991.

[39] Stawasz E., Innowacje a mała …. op. cit., p. 103-104.

characterized by a bigger involvement of the capital, they are connected with a high risk and they use more complicated methods of production[40].

The characteristics of small and medium sized technological companies is largely based on the qualitative features of the companies of SME sector putting the emphasize on such features as: high flexibility of activities, creativity and possibility to use innovations very quickly, which can be verified by the market needs, entrepreneurship and the market activity. The important feature is also the ability to enter into different corporational relations, also with the companies that operate at the edge of science and technique. What is more, the competitive advantage of high-technology SMEs can be built on using the privileged conditions to obtain financial sources or promotional, technological and educational help from the sources launched especially to support the local economy and the small business.

It seems, however, that taking into consideration the specificity of operation on dynamics and developing markets the small and medium sized technological companies should not by characterized by the features typical for the companies of SME sector such as the regionalism of operations, simplified methods of management and the intuition of management. During globalization, advancing internationalization of the economic activities and the progress in the field communication technology high-technology SMEs cannot limit the range of operation only to the local and regional markets. Small and medium sized companies, although they have potentially bigger possibilities to succeed on local markets , which because of its size is easier to penetrate, they should use the innovations and the flexibility of functioning in order to extend the market range of operations.

If small and medium sized companies of advanced technologies want to exist and develop in the turbulent surroundings they need to free the possibilities of creative and flexible activities, in order to create the conditions to compete for the customer value. They need to become dynamics organizations, agile, intelligent, market oriented. In order to evaluate towards such characteristics they need to be concentrated on knowledge, intellect and follow the vision. They also need to go out of the existing borders, keep on improving their skills and introduce the innovations[41]. While becoming **the learning organizations** they will be able to extend their possibilities to create their own future[42].

As the effect these companies are perceived as the companies "of the third wave"- the young companies, both as regards the age of their creation and the age of the staff, with flat organizational structure, in which the forms of cooperation are dominant , the knowledge and the personal skills can be developed and the free transfer of information among people and the small personnel groups. The strong market competition and tremendous environment make them introduce the innovations without cease, which means that they invest in the development research, trainings, education and personal development of the staff members. Their

[40] Compare: Piasecki B. (eds.), Ekonomika i zarządzanie małą firmą, PWN, Warszawa-Łódź 2001, p. 75-76.
[41] Compare: Penc. J., Przedsiębiorstwo w burzliwym otoczeniu, Część 1., Oficyna Wydawnicza OPO, Bydgoszcz 2002, p. 27.
[42] Senge P., Piąta dyscyplina, Dom Wydawniczy ABC, Warszawa 1998, p. 26.

main property constitutes the knowledge of the staff, which diminishes the need for financial capital and also material resources[43].

It is possible that their characteristic should evaluate towards the characteristics of the "born global" companies and the International New Ventures, according to the theory originated by B. M. Oviatt and P. P. McDougall[44]. They are often defined as the companies which operate in the sector of the newest technologies and they are searching from the very beginning the sources of competition advantage as far as the resources and the scale of sales in the different countries are concerned[45]. To the basic trends that influence the shaping of such companies one can include [46]:

- the increase of the pace of the technological changes, especially in the sectors which are " knowledge- receptive",
- more and more mobile structure of the resources such as the knowledge or the information,
- new communication technologies, which ensures the fruitful management of foreign operations,
- tendencies to create international and global networks,
- bigger demand for the highly specific products, the bigger importance of market niche.

High-technology SMEs should also limit the operation on the base of intuition, basing on the analysis of the market trends, done also in the international scale. The big meaning in the process of management have also the contemporary methods and tools which are connected with the relations with different companies (eg. CRM, SCM), the problematic to improve the quality (e.g. ISO system, TQM philosophy), as well as based on the information technologies (e.g. class systems ERP).

[43] Toffler A., Toffler H., Budowa nowej cywilizacji, Wydawnictwo Zysk I s-ka, Poznań 1996, p. 54-58.
[44] Compare. Oviatt B.M., McDougall P.P., Toward a Theory of International New Ventures, "Journal of International Business Studies", 25/1994.
[45] Popczyk W., Przedsiębiorczość globalna a wzrost firmy, [in:] Lachiewicz S., Zakrzewska-Bielawska A. (eds.), Teoria i praktyka zarządzania rozwojem organizacji, Wydawnictwo Politechniki Łódzkiej, Łódź 2008, p. 39.
[46] Knight G.A., Cavusgil S.T., The Born Global Firm: A Challenge to traditional Internationalization Theory, „Advances in International Marketing", 8/1996, p.11-26.

2. THE NOTION OF THE DEVELOPMENT OF THE ORGANIZATION AND ITS CONDITIONS

2.1. The development of the organization as ongoing process of changes

The widely understood development of the small and medium sized companies is the condition for them to participate actively in the market activities and as the result they stimulate the economic and social development of the country. Taking into consideration the specific conditioning of their functioning, these companies are included into the category of innovative, enterprising and growing companies. One can say that their activities should be **oriented on the permanent growth.**

The development of the company is one of the most complex processes in its functioning. In the general approach it is defined as **the process of ongoing changes**[47]**.** T. Pszczółkowski pays attention to the fact that during the development certain entities join into more complicated systems, in the entity of "the superior importance", which is characterized by new properties and new correctness which have never been encountered[48]. Cz. Sikorski defines the development of the company as the increase of the efficiency of functioning as well as keeping the so far efficiency in the changing conditions. This development is done thanks to the changes in certain elements of the organizational system and the forms of the realization of the individual functions of management[49].

Although a lot of attention is attached to the development of the organization and to the wide analysis of this phenomenon, the literature lacks the discussions as to the essence, the specifics and the conditioning for further changes. Many authors treat the development of the organization as the **quantitative phenomena**, presenting or completing them with a separate category of growth, representing the changes with qualitative character[50].

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[47] Machaczka J., Zarządzanie rozwojem organizacji, PWN, Warszawa-Kraków 1998, p. 14.

[48] Pszczołowski T., Mała encyklopedia prakseologii i teorii organizacji, Wydawnictwo Ossolineum, Wrocław 1978, p. 212.

[49] Kaczmarek B., Sikorski Cz., Podstawy zarządzania. Zachowania organizacyjne, Absolwent, Łódź 1995, p. 225.

[50] Such understanding of the cathegory of development is pointed out by e.g. Machaczka J., Zarządzanie rozwojem organizacji…, op. cit., p. 14, Masłyk-Musiał E., Zarządzanie zmianami w firmie, Centrum Informacji Menedżera, Warszawa 1996, p. 36, Stabryła A., Zarządzanie rozwojem firmy, Akademia Ekonomiczna w Krakowie, Kraków 1996, p. 9, Pierścionek Z., Strategie rozwoju firmy, Wydawnictwo Naukowe PWN, Warszawa 1996, p. 11, Wasilczuk J., Wzrost małych i średnich przedsiębiorstw. Aspekty teoretyczne i badania empiryczne, Politechnika Gdańska, Gdańsk 2005, p. 11.

In the prakseology theory the development is understood as the complementary existence of the quantitive changes (the development of the organization) together with the qualitative changes[51]. The similar notion of the development of organization is defined by J. Penc stating that it is the direct system of qualitative and quantitative changes (structural, technological, cultural etc) showing a permanent tendency, favorable to survive, stability and the development of a given company[52]. These approaches reflects the economical practices, because the qualitative and the quantitative changes in the majority of cases take place simultaneously and they complement one another. The example can be the qualitative increase of the production or the employment, which requires in the majority of cases the implementation of changes in the organizational spheres or the entering into new markets[53]. From the other side the qualitative changes can be the base and the impulse to increase the size of the organization. The qualitative changes which are too dynamic without the adjustment of the system of management and the qualitative coordination can lead to the organizational hypertrophy.

In Table 4 there the examples of qualitative and quantitative changes leading to the development of the company are shown.

Table 4. The examples of qualitative and quantitative changes leading to the development of the company

Qualitative changes (the indicator of the company's growth)	**Quantitative changes (the indicators of quantitative changes in the company)**
– size of the turnover/ income of the company, – size of profits, – level of costs, – number of the staff members, – size of the added production, – sum of balance, – size of initial capital, – growth of the market share of a given company- on a global, regional and local scale	– level of the technological advancement of the products and the level of diversity, – level of the complexity of the organizational structure and the forms of management, – level of complexity of the decisive problems within the organization, – level of profesionalization of the managers, – abilities to use the proper strategy, – good opinion on the market and in the society.
The development of the company	

Source: Own preparation on the basis of: Kortan J. (eds.), Podstawy ekonomiki i zarządzania przedsiębiorstwem, C.H. Beck, Warszawa 1997, p. 151-152, Bolesta-Kukułka K., Jak patrzeć na świat organizacji, Wydawnictwo Naukowe PWN, Warszawa 1993, p. 185-186

This Table puts the order into the distinction made by D. Hahn between the growth of the company understood in a narrow and a wide manner. As the growth of the company in the narrow (strict) meaning one took only the measurable, qualitative change in the long period of time, which can be calculated on the basis of

[51] Pszczołowski T., Mała encyklopedia prakseologii, …, op. cit., p. 211
[52] Penc J., Leksykon biznesu, Agencja Wydawnicza Placet, Warszawa 1997, p. 381.
[53] Lachiewicz S. (eds.), Małe firmy …, op. cit., p. 94.

the statistical data. The growth of the size of the company in the broad meaning is the whole process of transformation in the longer term, which embrace both the increase of the qualitative value and the quantitative changes. The growth in the wide understating is treated by Hahn as the **development of the organization**[54]**.** A similar distinction is quoted by J. Różański who enumerates multiple growth which happens while the qualitative factors are unchangeable and the mutative growth, which is identified with the development of the company[55].

Another important factor of the development of the company seems to be the positive evaluation of the changes or the phases of development done from the point of view of the set aims. In prakseology it was taken for granted that if a company in the latter phase is aware a positive evaluation, then the development can be joint with the progress of that organization[56]. A. Stabryła also points at the usefulness of changes stating that the development means the existence of changes which are assessed positively from the point of view of the aim to which they refer[57]. In the theory of management one pays attention to the fact that the phases of the process of development can also have a regressive character if they are negatively assessed. They can also lead to stagnation, which is the phase of development characterized by the lack of any changes[58].

As the effect the phase of development is perceived as a multi dimension process of changes which take place in the organization. It seems that one can also talk about it when the qualitative changes take place in the company and they are accompanied by the shrinking of the organization[59]. The example can be the purchase of the modern technology supported by the improvement of production which leads to the increase of efficiency connected with the decrease of employment in the company. In this case there are both the qualitative changes (the increase of efficiency, the increase of the value and the quantity of the durables) and the qualitative changes (the reorganization of the management production). As these aims are positively assessed from the point of view of the main (strategical) aims of the company, they definitively lead to the development, although certain inconsistencies exist e.g. of social character.

In the literature the attention is often paid to the lack of stabilization, the lack of harmony and the existence of diversified phases, not always in line with the theoretical models and the lack of planning for changes[60]. In the definitions of the

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[54] Hahn D., Wachstumspolitik industriellen Unternehmen [in:] Betriebswirtschaftliche Forschung und Praxis, 11/1970, [after:] Kortan J. (eds.), Podstawy ekonomiki i zarządzania przedsiębiorstwem, C.H. Beck, Warszawa 1997, p. 153.

[55] Różański J., Inwestycje rzeczowe w procesach rozwojowych przedsiębiorstw, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 1998, p. 22.

[56] Pszczołowski T., Mała encyklopedia prakseologii …, op. cit., p. 212.

[57] A. Stabryła uderstands under the notion of the progess only the qualitative changes, see. Stabryła A., Zarządzanie rozwojem firmy …, op. cit., p. 9.

[58] Białasiewicz M. (eds.), Rozwój przedsiębiorstw. Modele, czynniki, strategie, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2002, p. 13.

[59] Różański J., Inwestycje rzeczowe w procesach …, op. cit., p. 21.

[60] por. Machaczka J., Zarządzanie rozwojem organizacji, …, op. cit., p. 10.

development the relative stability of the changes and the long term character of this process are underlined[61].

Taking into consideration all the divagations which were described above, for the needs of this book it was taken for granted that by the development of the company one must understand the process of the complementary qualitative changes and quantitative changes, assessed from the point of view of the set aims. The model of the development of the company which takes this way of understanding into consideration is shown in Figure 1.

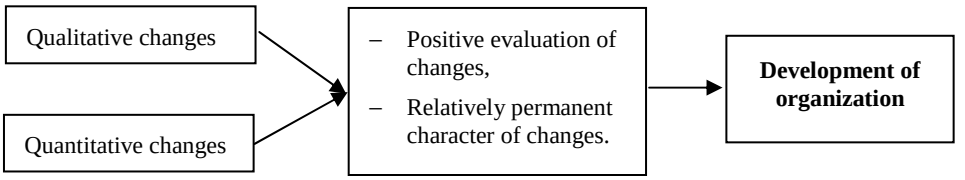

Figure 1. The general model of the development of the company
Source: Own preparation.

The criteria of a positive evaluation of the undergoing changes seems to be a big problem. It's difficult to state unanimously from which (whose) point of view the changes should be assessed as positive. The example can be the development decisions taken by the board which is not given acceptance by the executive organs or the owners of the company. It seems that analyzing the changes which are taking place, one should take into consideration the assessment of the external clients, including first of all the financial organizations supporting the company in terms of capital, customers and public opinion. The positive evaluation made by the external institutions is especially important in case of using the aid funds (often of the public aid kind), when it's one of the conditions of awarding such help to the company. Another dimension can be also the evaluation of the development of the company from the point of view of public institutions, including the organs of the public administration. In this case one can accept the interest in such factors of development as the size of the employment (influencing the smaller unemployment) or the height of income (influencing the height of public tributes).

As the effect the development of the company is perceived as **the phenomena with a subjective character** which can be differently assessed and perceived by the different groups of interested parties. The groups of stakeholders interpreting and assessing the development processes of the company are shown in Figure 2.

[61] Biczyński S., Miedziński B. (eds.), Słownik ekonomiki i organizacji przedsiębiorstwa, PWE, Warszawa 1991, p. 150; Smid W, Leksykon menedżera, Wydawnictwo Profesjonalnej Szkoły Biznesu, Kraków 2000, p. 317.

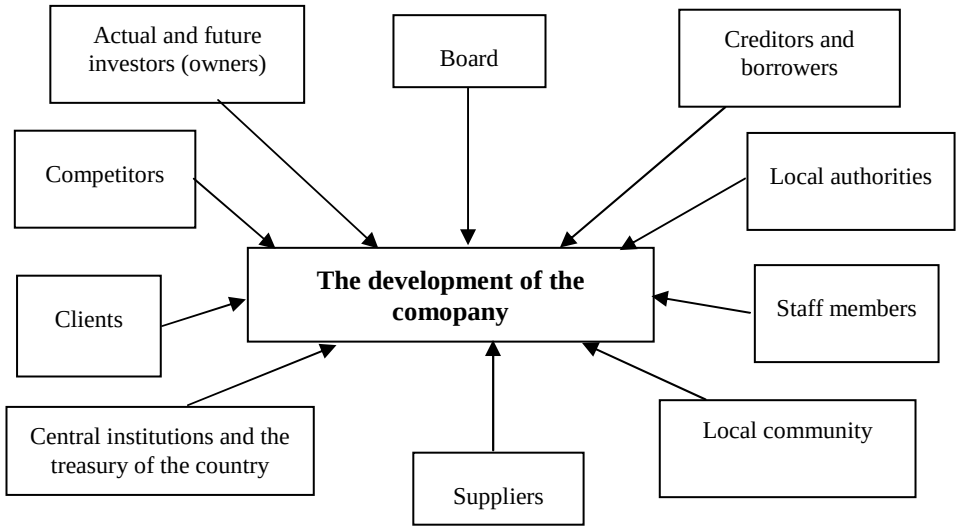

Figure 2. The chosen groups of the stakeholders influencing and assessing the development processes of the company
Source: own preparation

There are also the problems with the choice of criteria and the factors of evaluation since not all the factors seem to be equally important form the point of view of the evaluation of development. K. Bolesta-Kukułka enumerates as the most trustworthy the factors which refer to the **market position and the financial position of the company.** The companies which systematically improve both of these factors can be considered as developing in the proper way and assuring them good basis for the survival in the future[62]. J. Kortan pays attention to the fact that **the size of the turnover is** a very useful factor as it enables to calculate a percentage share of a company in a given market and its comparison in the following periods allows to check whether a given company develops quicker than the competitors[63]. Analyzing the issues of the growth and the development of the company, in the literature it is often underlined that the usage of one of the measurers is not sufficient in this case and does not give proper interpretation of results. That is why it is always advisable to combine a few factors to measure the development of the company.

The organization can choose different ways (directions) of development. One can differentiate as the components of this process the internal growth (endogenic) and the external growth (egsogenic)[64] and the simultaneous external and internal one. The first means the growth of the company from inside, mainly by means of new materials investments (new machines, tools, new objects) and the organizational initiatives (new organizational cells, plants, branches). The external growth means the joining (fusions), entering the co operational relations with different companies or the creation of the forms of concentration (holdings).

[62] Bolesta-Kukułka K., How to look at…, op. cit., p. 186.
[63] Kortan J. (eds.), Podstawy ekonomiki i zarządzania,…, op. cit., p. 151.
[64] Ibidem, p. 154.

The external growth is considered to be a quicker and less expensive form of the development of the company, it is connected with obtaining the rights to use the already existing talents and potentials. This solution does not create the market of new production capacities, does not increase the market of demand and does not create new posts. On the other hand the direction of the internal growth is considered to be less risky then the external development since it is easier to foresee the results of operation in the sector and it is easier to synchronize the new branch with the ones already functioning in the company[65]. The simultaneous external and internal growth can be realized as the result of the restructurization of the company[66].

2.2. The factors of the development of small and medium sized enterprises of advanced technologies

Apart from the problematic of defining the development and its qualitative and quantitative measures, in the literature a lot of space is reserved also to the **factors of the development.** They can be defined as the elements which influence in a given way the development processes in the organization. Analyzing the specific features of the small and medium sized companies of advanced technologies it is vital to remember that it is a very delicate group of companies which is easily influenced by different conditions of growth. It is visible in the big changeability of the development of this sector and the lack of stable qualitative changes[67]. That is why in the literature different sets of determiners which influence the development of the small and medium sized companies are presented and which in case of the beneficial influence fulfill the role of the stimulators of growth, in some case can limit or make difficult the functioning of the factories from SME sector, becoming the barriers for them and making their activities difficult.

That is why two groups of the developing factors are enumerated with the opposite character: the stimulators and the barriers of growth. To the stimulators one can include all the processes or the activities which facilitate the development of the company. The barriers (obstacles, inhibitors) can be defined as the factors, the processes or the activities which make the functioning of the company and the realization of aims impossible. Among the factors of the development of small and medium sized companies one enumerates two general groups of elements: internal determinants, connected with the owner and the potential of the organization and the external determinants resulting from the environment of the company.

In the group of different determinants the stimulators of growth can be defined as the positive factors, where the negative determinants of change can be treated as obstacles. Some of these factors, referring especially to small and medium sized companies of the advanced technologies are shown in Table 5.

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[65] Romanowska M. (eds.), Leksykon zarządzania, Difin, Warszawa 2004, p. 497.

[66] Nogalski B., Macinkiewicz H., Zarządzanie antykryzysowe przedsiębiorstwem, Wydawnictwo Difin, Warszawa 2004, p. 37.

[67] Andrzejczak T., Lachiewicz S., Zdrajkowska H., Dynamika rozwoju sektora małych i średnich firm w województwie łódzkim w latach 1994 – 1997, „Zeszyty Naukowe Politechniki Łódzkiej" nr 799/1998, Łódź 1998, p. 63.

Table 5. Some of the external and internal factors of the development of small and medium sized companies of the sector of advanced technologies.

Internal factors of the development of HTSMEs	External factors of the development of HTSMEs
Connected with the owner – enterprising features, such as: engagement, determination and persistence, strong need of achievements, initiative and responsibility, orientation on occasions, looking for feedback, internal placement of control, taking calculated risk, tolerating uncertainty, honesty and trustworthy, ability to accept the failures, creativity and innovations, having a vision of the company, self confidence and optimism, the need of autonomy, independence, ability to build a team. – Sociologically determined: age, sex, family and environment traditions, period of childhood, kind and course of education **Connected with the company** – Competencies and the abilities of staff members, – Ability to implement the technological progress, – size of the capital, – production abilities, – knowledge of the character of the market on which the company operates, – high quality of the products/services offered, – cooperation connections, – ability to act flexibly, – high level of profitability of sales, – other factors.	**Connected with the environment** – lawful conditions which refer to setting up and managing the economy activities, – the pace of the national development, – the regulations of the finance and tax system, – the height of payments for Social Insurance Institution, – the conditions of the access to the external funding, – solutions connected with patent law and protection of intellectual property, – level of the market competition, – processes of shaping of the demand and supply, – customs policy, – quickness and the solutions in the field of technological progress, – solutions in the transfer of technologies, – conditions of the government's policy toward small and medium sized companies, – socio-political culture of the entrepreneurship: the approach in which the entrepreneurship is awarded, it is considered as the factor which is capable of changing the culture of a given time, realizing the fact that the society derives the advantages from the development of the entrepreneurship but also the entrepreneurship form the society, – other external factors.

Source: Own preparation on the basis of: Śliwa J., Szanse rozwoju małych i średnich przedsiębiorstw, „Wynagrodzenia", dodatek miesięczny nr 1, 01/2000, p. 1; Matejun M., Rola outsourcingu w zakresie rachunkowości i doradztwa podatkowego w rozwoju małych i średnich przedsiębiorstw,, the doctoral thesis, Katedra Zarządzania, Politechnika Łódzka 2006, p.37 .

In case of the beneficial influence on the development of the company the factors enumerated in Table 5 will be defined as the stimulators of the growth (e.g. the high knowledge and experience of the owner, proper cooperation relations of the company, simplified access to the external financing). However, if these factors make difficult or slow down the development processes they will be included into the barriers of the development (e.g. the lack of engagement and the determination of the owner, insufficient amount of the initial capital, big taxes). One must pay attention to the fact that in the theoretical models the clear division into the positive and negative factors can be difficult. Certain factors can for some of the companies be the opportunities for development and for others can be an important barrier for

the development being the inhibitors of growth. The example can be the existence of changeable and complicated rules of law which for many offices can be an obstacle for the development limiting the flexibility of activities and causing the engagement of the resources to monitor the law environment and the supplies activities. On the other hand the same law conditions can be an important stimulator for the development of the service companies such as the law offices, accounting offices and notary's offices, causing a bigger interest in the professional law services.

Similarly, the impact of the technical progress on the development of the companies can also be treated as ambiguous. For many companies of SME sector quick technical and technological changes can be perceived as an important barrier of the development, connected with the necessity to adjust to the dynamic of progress. On the other hand, small and medium sized companies of advanced technologies can perceive big possibilities in them generating demand for their products and services. It seems that considering the factors of development as barriers or stimulators also has to some extent a **subjective character,** which depends on the specifics of a given company.

2.3. The usage of the factors of development to limit the development gap of the enterprise

J. Machaczka pays attention to the fact that the process of development of the company can be interpreted as the elimination of the so called development gap or as the improvement of the place which the company has in the environment[68]. He takes for granted following the ideas of I. Ackoff that the strategical behavior of the organization in the general approach is defined by creating forces, the so called potential of activities and the potential of influence and their difference leads to the creation of the so called development gap, which can be explained by means of the following formula (1):

$$DG = |P_a - P_i|, \quad (1)$$

where: DG– development gap, P_a – potention of activities, P_i – potention of influence

The potention of activities embraces first of all the passive forces, such as the culture of the organization, the managerial skills or the resources possessed. Such factors which exert influence on the choice of the behaviors of the company are parts of the potential of influence. One can enumerate here the efficiency aspirations and the culture factors, the structure of power and the features of the strategic leadership.

The notion of the development gap can also be understood as the difference between the possibilities possessed by the company (the potential) and the real achievements[69]. In this context one can differentiate its two basic kinds: the operational gap and the strategical gap[70]. The appearance of the operational gap

[68] Machaczka J., Zarządzanie rozwojem organizacji, …, op. cit., p. 14.
[69] Ibidem, p. 15.
[70] Kreikebaum H., Strategiczne planowanie w przedsiębiorstwie, PWN, Warszawa 1996, p. 51.

results first of all from the insufficient usage by the company of its resources. It is advisable to dispose of it by such activities as: the harmonization, the rationalization, the intensification of activities.

The strategical gap is connected with the broader notion of the limits of the development of the company. These limits are from one side limited, from the other side they are constantly expanded e.g. due to the scientific and technological progress or the discoveries of new possibilities. In this case the elimination means the innovative and creative actions which entitles novelties and uniqueness. Since the elimination of the operational gap enables to succeed and to achieve profitability in the short term, whereas the usage of the results in the long term aspect requires the actions in the field of the strategical gap, its elimination can be associated with the development of the company. In the economic activity the separation of the operational activities from the strategic ones can cause certain problems.

The development gap exists when the company, regardless of its degree of the organization, is always below its optimal efficiency of operation[71]. As the consequence, the elimination of the development gap can consist of:

- searching and eliminating all the barriers for the development processes,
- identification and the usage of all kinds of the stimulators of the development of the company.

The influence of the actions to eliminative the barriers and the usage of the stimulators of development of the development gap of the organization are shown in Figure 3.

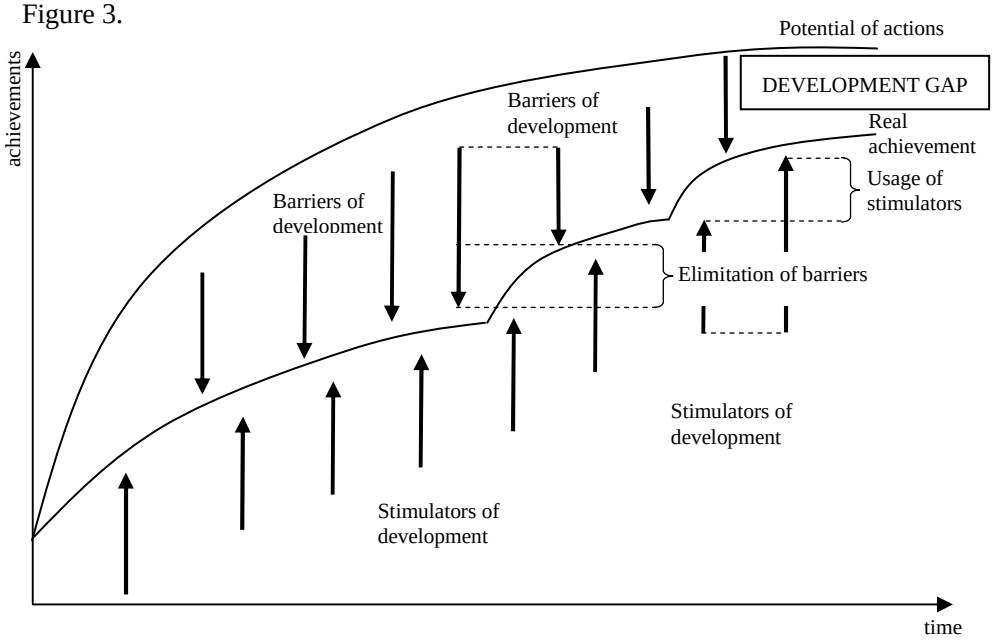

Figure 3. The elimination and the usage of the stimulators of the development in the process of the elimination of the development gap in the organization

Source: Own preparation on the basis of: Machaczka J., Zarządzanie rozwojem organizacji …, op. cit., p. 16.

[71] see. Fabiańska K., Rokita J., Planowanie rozwoju przedsiębiorstwa, PWE, Warszawa 1986, p.106.

It seems then that the development of the company can be modeled by using different stimulators and the restriction and getting rid of the barriers, which appear during this process.

The development is one of the most desirable situations in the commercial business. The attention is often drawn to the fact that the final aim of the company which gathers profits is the maximalization of the long term profit and the development of the company. Both directions of actions have a complementary character. Although the development of the company depends on many factors, in the companies the profit often constitutes the basic source of the financing of the development.

On the other hand the development is one of the conditions to achieve the profit by the company[72]. The attention should be paid to the fact that the growth of the size of the company does not always lead to the proper increase of the value of the company and that it can become a factor which makes it difficult in the long run e.g. to resale the activity. It happens so due to the fact that the level of risk and the scale of resources that the new owner will have to engage in the introduction of the necessary changes and the investment processes is much higher[73].

Analyzing the conditions of the development of the small companies, especially in the financial aspect one can differentiate two groups. To the first group one can include the companies which are self limited because of the character and the aim of the functioning e.g. the traditional crafts, small carriers, local services. The feature of this group is the existential connection of the owner and the company. From the point of view of the investment these companies require a certain level of spending to achieve the planned aims

The feature of the second group is the expansiveness although in the first stage it is difficult to tell them apart from the companies of the first group. Their increase is connected with the development of the process and product and the entrepreneurship of the owner decides who takes the risks of decisions and who expects a certain compensation from that[74].

The small companies of advanced technologies can be surely included in the second group of the companies. That is why in the process of their development the identification, analysis and the proper reactions for the stimuli and barriers that arise is really vital. In the latter part of this book the author concentrated on the divagations on the barriers for the development of the small and medium sized companies of advanced technologies.

The author did an attempt to prepare a multi dimensional systematics together with the analysis which of the inhibitators are especially detriment in the phases of the life cycle of the companies from SME sector.

[72] Duraj J., Podstawy ekonomiki przedsiębiorstwa, PWE, Warszawa 2000, p. 55-56.
[73] Szablewski A.T., Czy konsolidacja energetyki nie zaszkodzi rynkowi?, „Nowe Życie Gospodarcze", nr 7/2001, p. 6.
[74] Stępkowski S., Sieci przedsiębiorstw, „Ekonomika i Organizacja Przedsiębiorstwa", nr 5/1996, p. 11.

3. TAXONOMY OF BARRIERS TO DEVELOPMENT OF HIGH-TECHNOLOGY SMES

3.1. The division of barriers with regard to the time they have occurred in the course of functioning of enterprises

High-technology SMEs encounter **various barriers** in the process of their development. On the one hand, barriers to development of enterprises are usually the result of market competition, which consists in realizing often contradictory aims of competitors. On the other hand, they are a consequence of imperfect political, legal, social or economic systems. Mistakes made by an enterpreneur during development process or a company restrictions (resource, process and other) are also their essential sources. The barriers contribute to limited freedom of activity, hinder development processes and ultimately, they can lead to a crisis and fall of a company. However, they force economic entities to take enterprise and innovative actions, lead to improvement in the quality of products and services and prompt the company to take corrective and developmental actions. In positive meaning, they can stimulate larger development efforts of enterprises.

The problem of barriers to development of SMEs has been the subject of many research projects conducted by scientific centers and institutions related to the SME sector in recent years. In literature, there are not any expanded typologies of barriers to development of enterprises, though, which makes analysis of these occurences difficult and causes interpretation difficulties. The taxonomy aims at introducing theoretical order and enabling analyses and comparisons within vertical research.

Distinguishing barriers to development of SMEs from barriers to devlopment characteristic to high-technology SMEs is also vital. As the latter ones constitute a subgroup of the SME sector, some of the barriers will certainly be similar in the case of both categories of enterprises. On the other hand, in the case of HTSMEs, certain factors can occur more frequently and can influence their development differently than in the case of the whole SME sector. Barriers characteristic to technology-based SMEs seem to be related most of all to technology transfer, innovativeness, initiative and creativity of action, particular legal conditions (including those related to patent law), challenges being the result of internalization of activity or access to information. Therefore, barriers to development of high-technology SMEs can be treated as a subgroup of barriers to development of those SMEs which are characterized by slightly different quality features and which influence the functioning and development of enterprises in a different way.

One of the most basic criteria for distinguishing barriers to functioning of SMEs (including high-technology SMEs) is classification **with regard to the time they**

have occurred in the course of functioning of enterprises. According to this division, barriers to entry, barriers related to current activitiy, development barriers and barriers to exit can be distinguished. Factors which influence a company dynamics in a different time and way, e.g. at the beginning of business activity, when a company moves from one phase of development to another or at the end of activity, are the basis for their recognition[75].

Barriers to entry appear at the start of the company activity and are related mostly to problems connected with the company existance in the market. They include:

- vague regulations concerning taking up business activity,
- administrative barriers, including corruption and incompetence of public officials,
- general slump in a branch or a given market,
- insufficient funds necessary to enter a given branch, high investment costs,
- difficulty in access to technologies and limitations related to patent laws[76].

Competitive barriers, created deliberately by market participants in order to discourage new competitors, are also a significant group of barriers to entry. By developing and strengthening competitive advantage, entities already existing in the market hinder or even block the possibility of entering the market by new enterprises[77].

Development barriers and barriers related to current functioning concern enterprises which has already existed in the market. They are distinguished as a result of isolation of operational, tactic and strategic activities. As a company development is a long-term process and is connected with strategic changes, hidnrances impeding strategic processes can be defined as development barriers. On the other hand, factors hindering short-term activity should be included in the group of barriers related to current functioning. The examples of both types of barriers in the functioning of technology-based SMEs have been presented in Table 6.

Table 6. Examples of development barriers and barriers related to current functioning of high-technology SMEs

Barriers of current functioning of high-technology SMEs	Development barriers of high-technology SMEs
time relation	
short-term ◄——————————► long-term	
– illness of a key worker, – failure of a machine or device, – delay in supply caused by the supplier, – control by revenue office.	– high staff fluctuation, – hindrances in technology transfer, – high market competition, – high fiscal charges.

Source: Own preparation.

[75] compare: Bławat F. (eds)., Przetrwanie i rozwój małych i średnich przedsiębiorstw, Scientific Publishin Group, Gdańsk 2004, p. 61.

[76] compare: Garofoli G., New Firm Formation and Local Development: the Italian Experience, Pavia 1992 [after:] Bławat F. (eds)., Przetrwanie i rozwój małych i średnich przedsiębiorstw, Scientific Publishin Group, Gdańsk 2004, p. 62.

[77] Wachowiak P. (eds.), Funkcjonowanie przedsiębiorstwa w gospodarce rynkowej, Stowarzyszenie Księgowych w Polsce, Warszawa 2006, p. 63.

As unequivocal interpretation of influenece of the changes on time-related functioning of enterprises is difficult, differentiation between development barriers and barriers in current functioning, though it is theoretically justified, is less important practically and is disregarded by some authors[78].

Barriers to exit are related to a company leaving the market. They concern mostly costs of all types, related to closing market activity. Basically, they can be further divided into barriers related to finishing certain venture (e.g. investment), leaving a branch or a particular type of business activity or a particular market or finally, barriers connected with finishing activity.

3.2. Other criteria for division of barriers to development of SMEs

In literature, barriers to development of enterprises are often distinguished with regard to the **criterion of direction in which they occur**. It leads to distinguishing external and internal barriers. External barriers result from an enterprise environment and are mostly related to its low potential, high complexity and uncertainty of business environment. Internal barriers are identified as faults of an enterprise itself[79]. Referring to terminology applied in strategic analysis, external barriers can be identified with threats to an enterprise, whereas internal obstacles occur when weak points of an economic entity are identified. Internal barriers include barriers connected with an enterpreneur or shortages in the scope of resources and processes existing within a company.

As the criterion of direction of existance of barriers is substantially justified by the concept of a company environment, a subcriterion can be applied in relation to external barriers, dividing them further into general ones (resulting from conditions of general environment, remote to a company) and competitive external barriers (justified by changes and actions taken within a company direct environment). Uncertain political situation of the country is an example of external barrier, whereas strong market competition in a given area is the example of external competitive barier.

The **criterion of level of barriers** is a supplement of the criterion of the place of their occurring. The three levels of influence of environment on the functioning of SMEs (macro, mezo and micro level) are the starting point for this taxonomy.[80] The macro level comprises macroeconomic environment. Depending on the aim of analyses, it can be considered on international (global) level, including the European Union level, or in local dimension. The consequences of global warming and climate changes are examples of enterprises' activities on a global level. Complex regulations or unfavourable customs sulutions can be included in barriers on international level.

The concept created by L.C. Leonidou and S.T. Cavusgil has proven vital for the analysis of barriers to development, taking into account the level criterion and the

[78] see e.g. Bławat F. (eds)., Przetrwanie i rozwój małych…, op. cit., p. 61-62.

[79] Matejun M., Wewnętrzne bariery rozwoju firm sektora MSP, [in:] Lachiewicz S. (eds.), Zarządzanie rozwojem organizacji, tom II, Wydawnictwo Politechniki Łódzkiej, Łódź 2007, p.122-123

[80] compare: Dominiak P., Wasilczuk J., Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa w obliczu internacjonalizacji integracji gospodarek europejskich, Scientific Publishin Group, Gdańsk 2005, p.18-19.

direction criterion. They have isolated four types of barriers of internalizing activities of SMEs: internal national barriers, internal foreign barriers, external national barriers and external foreign barriers[81].

Internal national barriers are obstacles resulting from the inside of a company and they refer to national environment. They include:

- lack of staff dealing with export marketing or foreign regulations,
- negative perception of risk related to selling,
- managers aiming at developing activities in national markets, particularly in the case of high potential of these markets.

Internal foreign barriers are hindrances resulting mostly from limited marketing possibilities of SMEs, which is noticed in target foreign markets. Difficulties in contacts with foreign clients or high costs of transport are problems. External national barriers result from national environment of SMEs but they are controlled by an enterprise, e.g. complex documentation related to international transactions. Insufficient government support necessary for overcoming internalization barriers is also pointed at. The last group, external foreign barriers are hindrances resulting from the outside of a company and are noticed in international markets, e.g. tariff or non-tariff limitations.

Analyzing further barriers to development of SMEs according to the criterion of their level, conditionings inside the sector (e.g. within the SME sector or high-technology SMEs) as well as the ones related to branch (e.g. threats existing within IT branch) should be taken into consideration in mezo level. Factors appearing in partial markets (regional and local ones) are also essential. Lack of homogeneous government policy towards a particular branch or weak representation of economic government are some examples. On the other hand, the micro level includes the inside of an enterprise. Barriers appearing on this level can be, therefore, identified with internal barriers to development.

Division of barriers to development from the point of view of the **size of enterprises** is a development and particularization of systematizing barriers of SMEs according to the level ctiterion. In this case, types of entities classified according to their size, which face certain barriers, are point of reference. Therefore, we can distinguish barriers to development specific to micro enterprises, small and medium-sized enterprises and, finally, large economic entities[82].

In the case of the smallest enterprises, resource shortages, concerning e.g. too low funds or limited number of workers, can be the biggest problems. Complex regulations or administrative barriers are also obstacles. On the other hand, larger companies can face problems being the consequence of disruption in information flow of the company or maladjustment of organizational structure to an enterprise strategy. The largest entities can struggle with excessive number of employees or insufficient flexibility of action.

[81] Cavusgil S.T., Differences among Exporting Firms Based on their Degree of Internalisation, „Journal of Business Research", nr 12 (2), 1984.

[82] as SMEs enter into numerous interactions with large economic entities, barriers to development of large companies can indirectly influence the functioning and development of smaller enterprises.

The next division of barriers to development of SMEs is the **criterion of barrier activity**. Within this typology, active and passive hindrances can be singled out. The former are the result of actions taken by other entities and institutions, directed or aimed directly at an enterprise, which faces particular barriers to development in the aftermath. **Active barriers** are also some unfavourable factors being the reaction of certain enterprises, units or social groups to actions of an entity. Bearing this in mind, active barriers include e.g. certain actions taken by competitive companies in order to strengthen their positions in the market and limiting possobilities for development of other entities at the same time. The barriers can be also the result of failure in meeting deadlines of supply or low quality of realized orders by suppliers. In internal context, active barriers can include strikes or other deliberate unfavourable actions taken by the staff of an enterprise and limiting possibilities for development. Complex regulations or restrictive fiscal requirements are also a kind of barriers as non-fulfillment of duties within them can result in particular financial sanctions.

On the other hand, **passive barriers** concern certain occurrences enterprises come cross in the course of their functioning and development, which are not connected with any retailatory actions. These barriers can change their properties in the course of time but lack of immediate reaction to actions of a particular economic entity is its characteristic feature. Therefore, they are passive towards actions taken by an enterprise. They include unstable political situation in the country, bad weather conditions, decreasing purchasing power of the society or worsening economic situation in the market.

In analyses of barriers from the **point of view of their appearance**, natural barriers, which are not the consequence of human activity and artificial ones, which are the result of obstructing, emerge. Natural barriers include various types of hindrances connected with lay of the land, geographical position or climatic conditionings and changes. Artificial barriers are created by other participants of market game, social groups or units. In broad context, they are the result of functioning of economic or legal systems.

The analysis of barriers according to the **efficiency criterion** is the next way of dividing them. In this case, they include barriers that an enterprise can overcome or the ones that cannot be surmounted. The former group comprises various kinds of hindrances related to the activity of market competitors, low workers' qualifications or difficulties in finding agents and distibutors for their products.

The group of barriers unable to surmount is disputable. An enterprise should aim at development based on strong points and market chances. In this aspect, an economic entity should use enterprise, flexibility and innovativeness in order to take advantage of arising opportunities, reducing the influence of negative factors at the same time. As a result, managers in enterprises should possess knowledge, experience and ideas set on levelling barriers to development and determining directions of actions based on positive development stimuli.

However, this approach can be difficult in the case of SMEs. Firstly, attention is often paid to intuitiveness and lack of proffessional training of managers, which can affect hardships in taking creative and efficient actions. Secondly, due to limited company resources, SMEs are less able to act in alternative way.

It seems, therefore, that part of barriers of SMEs, incuding high-technology SMEs, can be perceived by managers and owners as impossible to surmount. They include serious health deterioration of the owner, complex regulations and instability of law system or insufficiency of administration of justice. It seems, though, that seeing barriers as able or unable to be surmounted is in most cases subjective, dependent on competencies of managers as well as on the possibility to use chances and strong points of an economic entity.

Analyzing barriers according to the efficiency criterion can be particularly essential from the point of view of a company development and, above all, it can be justified in the context of motivation. It is emphasized that the existance of barriers impossible to surmount can evoke frustration[83], lower motivation to act and can lead very quickly to organization crisis in the aftermath.

Barriers to development of an organization can be also analyzed from the **point of view of their durability**. According to this criterion, long-term barriers (relatively permanent) and short-term ones (temporary) can be distinguished. Long-term barriers include hindrances resulting from too high tax liabilities, mistakes regarding a company location or social problems related e.g. to low prestige of an enterpreneur or workers' reluctance to take up a job in the SME sector. On the other hand, short-term barriers concern problems with access to capital (although in the case of some enterprises this barrier can be relatively permanent), problems with company equipment or breaks in the supply of energy, gas, etc to a company. Attention should be paid to the fact that division of barriers according to this criterion is dependent on the situation of a particular economic entity and the analysis of these barriers require conducting vertical research.

A. Skowronek-Mielczarek includes in the barriers to development in the short run: lack of processing powers, insufficient number of managerial staff and qualified workers, high costs of financing activity, lack of working capital, exchange rates, costs of research and development. Long-term limitations concern, in turn: difficulties in maintaining continuity of management, export limitations, high costs of financing development, limited demand in the market, lack of long-term sources of financing, domestic regulations (including tax regulations) and European Union regulations as well as difficulties in accessing new markets[84].

3.3. Barriers to development of SMEs in a generic scheme

Systematizing barriers according to the **criterion of their type** is an important division, complementary to the ones presented above. Six groups of limitations can be distinguished, systematized according to similar substantial features resulting from occurrences taking place in internal and external environment of an organization, which can negatively influence a company development. In literature, a lot of generic schemes of barriers to activities and development of enterprises can be found. In Polish conditions, research on these occurrences was started mostly at the time of

[83] Pszczołowski T., Mała encyklopedia prakseologii…, op. cit., p. 196.

[84] Skowronek-Mielczarek A., Małe i średnie przedsiębiorstwa. Źródła finansowania, Wydawnictwo C.H.Beck, Warszawa 2003, p. 12.

economic and political transformation which happened after the year 1989. B. Piasecki was one of the forerunners who, along with his team, identified limitations such as: market and financial barriers, the ones related to the goverment policy, offices, production, workforce, infrastructure or management[85].

This research was later continued by teams preparing statements about the condition of the SME sector in Poland within the Polish Agency for Enterprise Development[86] and conducted by a number of scientific centers in the whole country,e.g. research conducted by research teams under the supervision of K.B. Matusiak and E. Stawasz[87], S. Lachiewicz[88], N. Daszkiewicz, J. Wasilczuk, F. Bławat and others[89] as well as the team of B. Nogalski and J. Rybicki[90] or K. Safin in recent time[91].

As the consequence of this research, certain groups of barriers to activity and development of SMEs in a generic scheme emerge. They include: market, social, financial, political and economic, legal, corruption barriers, the ones related to access to public procurement market, technical and technological hindrances, information and educational barriers, the ones related to infrastructure or resulting from natural environment and also international barriers. The above groups of limitations are mainly the consequence of the conditions of competitive environment and macro environment of SMEs. Therefore, they are mostly external barriers.

The second group of limitations in a generic scheme includes weaknesses of management, competencies, knowledge and qualifications, psychological ones, production limitations, the ones related to the size of activity and also innovativeness barriers. The origin of these factors is found mostly in internal environment of an enterprise, therefore, they affect the appearance of internal barriers to development in a greater degree.

Market barriers include first of all problems connected with market demand limitation e.g. as a result of decrease in purchasing power, problems concerning competition or hardships connected with finding new outlets. **Barriers concerning staff** include unwillingness to take up a job in the SME sector, which makes it difficult for smaller enterprises to gain qualified workers. Employees' low tendency to commute or high staff fluctuation in an enterprise are important obstacles.

Limitations in development of SMEs can be also caused by some unfavourable **social occurrences**, which include e.g. difficulties in acceptance of social stratification, social sense of disrespect towards people working in private companies

[85] Piasecki B., Rogut A., Smallbone D., Mocne i słabe strony małych i średnich przedsiębiorstw produkcyjnych w Polsce w 1995 roku. Raport z badań, maszynopis, Łódź 1996, p. 60.

[86] see e.g. Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce w latach 1998-1999, Polska Fundacja Promocji i Rozwoju Małych i Średnich Przedsiębiorstw, Warszawa 2000, p. 238.

[87] see: Matusiak K., Stawasz E., Przedsiębiorczość i transfer…, op. cit.8.

[88] see: Lachiewicz S. (eds.), Małe firmy w regionie…, op. cit.

[89] zob. Bławat F. (eds)., Przetrwanie i rozwój małych i średnich przedsiębiorstw, Scientific Publishing Group, Gdańsk 2004.

[90] see: Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw na rynkach Unii Europejskiej, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007; Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007.

[91] see: Safin K. (eds.), Zarządzanie małym i średnim przedsiębiorstwem, Wydawnictwo AE we Wrocławiu, Wrocław 2008.

or insufficient enterprise culture. **Financial limitations** constitue a group of barriers essentially affecting the development of high-technology SMEs. In this case, problems with access to the capital from commercial sector as well as from public sources, low standard of services rendered by financial institutions or long date of maturity required by clients, are some dangers. A Skowronek-Mielczarek pays attention to certain barriers restricting access of SMEs to external sources of financing that are often caused by internal weaknesses of these entities. They are:[92]

- low level of accumulative abilities of small enterprises, which does not guarantee return of invested capital,
- high costs of functioning influencing low level of profitability, which is not conducive to accumulation of funds,
- difficulties in assesing objectively economic and financial situation of these enterprises, which is often the necessary condition for gaining external capital,
- high costs of obtaining funds and high security required,
- complex and time-consuming procedures concerning gaining capital,
- limitations connected with organizational and legal form of activities and the form of accounting.

Barriers resulting from the country **policy** and general **economic conditions** are the next group of limitations. They include dangers such as too general guidelines of political strategies and programs, delaying executive actions and also not taking a firm position on continuing policy towards SMEs. **Legal barriers** constitute a broad and internally complex category of barriers to development of SMEs. General dangers in this group include the amount of tax and social insurance liabilities or insufficiency of administration of justice. Problems concerning corruption or **crime danger** belong to a particular group, that can be partly included in legal barriers, though it is isolated by some researchers[93]. Barriers related to accessing SMEs **in public procurement market** also belong to legal limitations, although it is a specific group of barriers. They include administration difficulties behind the access to public procurements, which require high qualifications, guarantees or disregard technical specifications.

Technical and technological barriers are the next group of limitations, which include difficult access to external technological thought, fast technological progress in branch and in the world and high costs of investment in the sphere of technology. **Information and educational** barriers can be also a threat to SMEs. They include e.g. too little information about support programs for SMEs or lack of broad and easily accessible system of enterpreneurs' training. Barriers **related to** road, energy, telecommunications and water **infrastructure** are also problems. **Natural environment** barriers are the next group. They include changeable weather conditions, restrictive regulations concerning environmental protection or high costs of ecologic solutions. **International barriers,** including limitations connected with internationalization of enterprises, are the last group of external barriers. Selected external barriers to development of SMEs, including high-technology SMEs, in a generic scheme, are presented in Table 7.

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[92] Skowronek-Mielczarek A., Małe i średnie…, op. cit., p. 10.

[93] see: e.g. Martin M., Staniec I., Główne bariery rozwoju małych firm technologicznych, [in:] Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007, p. 110.

Table 7. Selected external barriers to development of SMEs, including high-technology SMEs, in a generic scheme

Type	Example of barriers
Market barriers	– reducing demand, – decline in purchasing power of the society/economic entities, – aggressive actions of competition, – liberalization of trade exchange with foreign countries. – difficulties in finding outlets, – broad import of substitutes, – difficulties in finding market partners,
Personnel barriers	– reluctance to take up a job in the SME sector, – low mobility of workers, – high fluctuation of the staff, – low qualifications of workers, – low qualifications of managerial staff,
Social barriers	– low social prestige of an enterpreneur, – difficulties in accepting social stratification, – feeling of disrespect of workers in private companies, being oriented towards maximizing profit, – insufficient enterprise culture, – negative defining of small enterpreneur as a „swindler" or even a „cheat"", – emigration of valuable workers and specialists,
Financial barriers	– problems in accessing capital from commercial sector, – difficulties in accessing capital from public sources, – high costs of obtaining capital, – difficulties in gaining new investors, – complicated conditions of rendering financial services, – necessity to have high guarantees, – low quality of rendering financial services, – too small number of financial institutions, – long dates to maturity,
Political and economic barriers	– too general guidelines of programs and political strategies, – lack of coherent policy towards SMEs, – delay of executive actions, – information shortages, – no clear position regarding continuation of fiscal policy, – small influence on forming economic law, – low activity of institutions supporting enterprise, – indifferent or negative attitude of local authorities,
Legal barriers	– amount of tax and social insurance liabilities, – changeability of regulations, – high costs of adapting to changing regulations, – difficulties in interpreting regulations, – system of control of offices, – low quality of officials' work, – insufficiency of administration of justice, – lack of effective protection of trademarks, – difficulties in gaining patent protection,
Crime-related barriers	– corruption, – dishonesty of business contractors, – dishonest actions of competition, – danger of vandalism and crime, – black and grey economy,

Type	Example of barriers
Barriers related to access to public procurement market	– legal and administrative hardships connected with access to public procurement market, – requiring high qualifications and certificates, – requiring credit guarantees, – difficulties in finding co-executors, – discriminating technical specifications, – little information on public procurements, – excessive value of ordes,
Technical and technological barriers	– difficult access to external technological thought, – high costs of gaining external solutions from research and development section, – very fast technical progress in branch, – sustaining technological delay in branch, – high requirements in the field of technological safety, – high costs of machines, equipment and know-how, – low adaptativeness of scientific research to economy, – complex and expensive procedures of gaining quality certificates,
Information and educational barriers	– little information about support programs for SMEs, – training programs inadequate for small business, – little effective system of accumulating economic information, – difficult access to economic infromation, – difficulties in cooperation with scientific institutions, – difficulties in access to the Internet,
Barriers related to infrastructure	– bad road condition, no highways, – shortages in other transport and communications infrastructure, – rising costs of transport, – problems with water economy and waste disposal, – shortages within telecommunications infrastructure, – bad condition of energy infrastructure, – small number of institutions from small business environment, – low level of business-related services,
Natural environment barriers	– changeable weather conditions, – difficulties in predicting weather conditions, – difficult access to natural resources, – too restrictive regulations regarding environmental protection, – high costs of solutions within natural environment,
International barriers	– process of integration with the European Union, – restrictive norms of the European Union, – complex regulations of international law, – customs conditions, – cultural diversification, – problems included in other types of barriers, which are related to international environment.

Source: Own preparation on the basis of: Matejun M., Analiza zewnętrznych prawno-podatkowych barier rozwoju firm sektora MSP, „Zeszyty Naukowe Politechniki Łódzkiej", nr 43/ 2007, p. 109; Matejun M., Bariery rozwoju małych i średnich przedsiębiorstw (na podstawie badań w aglomeracji łódzkiej), [in:] Piech K., Kulikowski M. (eds.), Przedsiębiorczość: szansą na sukces rządu, gospodarki, przedsiębiorstw, społeczeństwa, Instytut Wiedzy, Warszawa 2003, p. 236-239, Matusiak K., Stawasz E., Przedsiębiorczość i transfer…, op. cit., p. 81-85; Bojewska B., Małe i średnie przedsiębiorstwa jako podmiot sprawczy przedsiębiorczości regionalnej, [in:] Strużycki M. (eds.), Małe i średnie przedsiębiorstwa w gospodarce regionu, PWE, Warszawa 2004, p. 117-119; Łuczka T., Bariery rozwoju małych i średnich przedsiębiorstw w Polsce, [in:] Łuczka T. (eds.), Małe i średnie przedsiębiorstwa. Szkice o współczesnej przedsiębiorczości, Wydawnictwo Politechniki Poznańskiej, Poznań 2007, p. 32-34; Stawasz E., Innowacje a mała…, op. cit., p. 210-214; Woźniak M., Instrumenty wspierania małych i średnich przedsiębiorstw na rynku zamówień publicznych, [in:] Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa. Szanse i zagrożenia rozwoju, CeDeWu sp. z o.o., Warszawa 2007, p.144-145; Żuber R., Zarządzanie rozwojem przedsiębiorstwa, teoria i praktyka, Difin, Warszawa 2008, p. 25-26.

Management barriers, qualification, psychological or production weaknesses and the ones related to the size of activity as well as innovation barriers are another big group of barriers the source of which is **inside the enterprise**. **Management barriers** include mistakes in development strategy, personal problems or organizational structure weaknesses. The group of **qualification, knowledge and competence weaknesses** include insufficient managerial and working skills, difficulties in identifying chances that appear in the market and low tendency to learn. **Psychological barriers** include fear of taking risks and family resistance as far as ventures undertaken by a company are considered.

Production barriers are the next group of internal limitations, which include insufficient production powers, obsolete machinery or lack of individual technical and technological solutions. **Dangers related to size of activity** include among the others insufficient office space, lack of parking places or remote location, far from main routes. Barriers related to implementing innovation are the last identified generic category. They include low engagement of workers in innovative activity, lack of individual development of R&D sphere or no support for intra-enterprise. Selected internal barriers to development of SMEs, including high-technology SMEs in a generic scheme are presented in Table 8.

Table 8. Selected internal barriers to development of SMEs, including high-technology SMEs, in a generic scheme.

Type	Examples of barriers
Management barriers	– mistakes in development strategy, – mistakes in operational management, – personal problems of a company owner, – weaknesses of organizational structures, – unpredictable increase in costs of activity, – weaknesses related to flow of information in an enterprise, – ignorance of contemporary management methods,
Competence, knowledge and qualification weaknesses	– insufficient managerial skills, – insufficient workers' qualifications, – not identifying chances appearing in environment, – difficulties in recognizing and assesing marlet conditions, – low tendency to learn, – no support for development of intelectual capital of an enterprise,
Psychological barriers	– fear of taking risk, – family resistance, – workers' resistance, – excessive optimism, – lack of motivation of an enterpreneur for a company,
Production barriers	– obsolete machinery and old tehcnologies, – insufficient production powers, – supply hardships, – problems with technology transfer, – difficulties in keeping pace with technological progress, – lack of individual, mature technical and technological solutions,

Type	Examples of barriers
Barriers related to the size of activity	– too low capital engaged in a venture, – limitations related to legal form, – limitations related to the form of accoutancy, – too little amount of resources, – insufficient office space, – improper location of a company, – necessity to do costly rennovations, – lack of parking places, – long distance from main routes,
Barriers to innovation	– limited innovative potential of an enterprise (including limited human resources), – low level of innovative awareness, – a „monopoly" position of an enterpreneur regarding innovations in their enterprise, – low level of workers' engagement in innovative activity, – lack of individual development of R&D sphere, – no support for intra-enterprise , – low expenses on innovative activity.

Source: Own preparation on the basis of: Matejun M., Wewnętrzne bariery rozwoju firm sektora MSP, [in] Lachiewicz S. (eds.), Zarządzanie rozwojem organizacji, tom II, Wydawnictwo Politechniki Łódzkiej, Łódź 2007, p. 123-124, Matejun M., Bariery rozwoju małych i średnich przedsiębiorstw (na podstawie badań w aglomeracji łódzkiej), [in:] Piech K., Kulikowski M. (eds.), Przedsiębiorczość: szansą na sukces rządu, gospodarki, przedsiębiorstw, społeczeństwa, Instytut Wiedzy, Warszawa 2003, 239-240. Stawasz E., Innowacje a mała…, op. cit., p. 210-214, Przychocka I., Małe i średnie przedsiębiorstwa w Polsce, wybrane problemy, Wydawnictwo „Comanim:, Warszawa 2002, p. 15-19; Nogalski B., Szpitter A., Karpacz J., Stymulatory i bariery aktywności innowacyjnej małych przedsiębiorstw w ujęciu regionalnym, [in:] Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw na rynkach Unii Europejskiej, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007, p. 210-211.

Attention should be paid to the fact that internal barriers are often strongly determined by the nature of a particular enterprise. Therefore, it is difficult to present a universal set of limitations having their sources inside an economic entity. Nevertheless, barriers to development of SMEs, including high-technology SMEs presented in this chapter, are an attempt at model depiction of certain dangers for positive developmental changes of these enterprises.

3.4. The multidimensional taxonomy of barriers to development of SMEs

As a result of criteria for division of barriers to development of SMEs and high-technology SMEs presented above, the multidimensional taxonomy can be created. It is presented in Table 9.

Table 9. The multidimensional taxonomy of barriers to development of SMEs

Division criterion	Category of barriers	Subcategory	Examples of barriers
Time of occuring in the course of activity	entrance barriers		administration barriers.
	barriers related to current activity		illness of a key worker.
	barriers to development		difficulties in technology transfer.
	exit barriers	bariers to exit from investment	incurred costs of investment expenses.
		bariers to exit from branch	costs of purchased machines, equipment and materials.
		bariers to exit from the market	incurred expenses on investments.
		bariers related to finishing activity	costs of material not used.
Direction of occuring	external barriers	general barriers	political instability.
		competitive barriers	high market competition.
	internal barriers		low information flow in the company.
Level	macro-level barriers	global barriers	unfavourable climatic changes.
		international barriers	unfavourable customs solutions.
		national barriers	lack of developed highway network.
	mezo-level barriers	sector barriers	administration obstacles.
		branch barriers	rapid technical progress in branch.
		regional barriers	low affluence and low purchasing power of clients in the region
		local barriers	lack of support of local authorities.
	micro-level barriers		low competencies of managerial staff.
Subjective criterion according to size	micro-enterprises barriers		complex legal rules.
	small-sized companies barriers		limited production powers.
	medium-sized companies barriers		no information flow in a company.
	large enterprises barriers		excessive employment.
Activity	active barriers		personnel strike.
	passive barriers		decline in purchasing power of the society.

Division criterion	Category of barriers	Subcategory	Examples of barriers
Way barriers are created	natural barriers		unfavourable lay of the land under investment.
	artificial barriers		administration hardships.
Efficiency criterion	barriers possibile to surmount		low qualifications of workers.
	barriers impossible to surmount		very serious health deterioration of the owner.
Durability	long-term barriers (relatively permanent)		workers' reluctance to take up a job in the SME sector.
	short-term barriers (temporary)		break in energy supply to a company.
Type	market barriers, HR barriers, social barriers, financial barriers, political and economic barriers, legal barriers, barriers related to crime, barriers related to access to public procurement market, technical and technological barriers, information and education barriers , barriers related to infrastructure, natural environment barriers, international barriers, management weakneses, competence, knowledge and qualification barriers, psychological barriers, production weaknesses, barriers related to size of activity, innovation barriers		

Source: Own preparation.

We should take into consideration that individual barriers to development of SMEs can be classified according to all criteria presented in Table 9. In this way, a multidimensional characteristics of obstacles arising in the process of development of high-technology small and medium-sized enterprises can be done.

4. BARRIERS TO DEVELOPMENT OF LIFE CYCLE OF HIGH-TECHNOLOGY SMES

4.1. Types and meanings of phase models of a enterprise life cycle

Amongst theoretical models explaining the occurrence and meaning of barriers to development of enterprises, **phase concepts of a company life cycle** are essential ones. Their basic assumptions consist in quantitative and qualitative changes occuring in the process of development of enterprises. These models point at the necessity to adapt to the situation of a company, the situation that changes along with a company development and also focus on problems (including barriers and limitations) which occur at individual stages of an enterprise development.[94].

Phase models of life cycle are used in management sciences among the others for describing the life cyle of a technology, life cycle of sphere of activity[95], life cycle of a product, sector or industry. However, the life cycle concept is also used for analyzing the development of an organization, which is an important theoretical trend. J. Machaczka defines life cycle of an enterprise as the consequence of its successive forms of development, which show certain quantitative and qualitative differences, stimulated by various internal and external forces[96]. S. Hanks, in turn, pays attention to the fact that it is a unique configuration of variables, dependent on context and structure of an organization[97].

The concept of life and development cycle of enterprises derives from the tendency to compare organizations to living organisms, which are born, grow, develop, get old and become less agile and die eventually. In this context, life cycle models of enterprises describe a chain of changes taking place from birth (or even pre-founding stage) until death of an organization, putting emphasis at the same time on variability and relative impermanence of economic entities[98].

Organizations are, no doubt, historic occurrences and time is an important parameter of their functioning. Life cycles of economic entities are varied. There are organizations that have existed for thousand of years (e.g. the Roman Catholic

[94] Wasilczuk J., Wzrost małych i średnich…, op. cit., p. 52.
[95] see e.g. Strategor, Zarządzanie firmą, PWE, Warszawa 1999, p. 150.
[96] Machaczka J., Zarządzanie rozwojem organizacji…, op. cit., p. 44.
[97] Hanks S., Watson C., Jansen E., Changler G., Thightening the Life-Cycle Construct: A Taxonomic Study of Growth Stage Configurations, High-Technology Organizations, Entrepreneurship Theory and Practice, Winter 1993, p. 5.
[98] Koźmiński A.K., Jemielniak D., Zarządzanie od podstaw, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2008, p. 449.

Church), others disappear soon after they are founded. Observations of some general, different from each other phases,[99] which developing enterprises go through, are the starting point for the creation of phase models of a company life cycle.

In economic and management literature, there are many concepts and models of life cycles of enterprises. Their stages are classifed and characterized by authors in various ways. Most of them derive from the classical model of development cycle of social systems according to the S-curve, in which J.H. Jackson and C.P. Morgan distinguished three basic phases: beginning and development, stability and dynamic balance and change or fall and dissolution[100]. In accordance with that, in the majority of models of an organization life cycle, the following general phases of development are distinguished[101]:

- **the phase of birth and fight for survival**, which relates to a company founding and aiming at its sustaining in the market,
- **the phase of youth and dynamic development**, in which rise in the efficiency of functioning of an organization takes place, the scope of market activity widens, all segements of an enterprise potential develop and other positive consequences in the scope of the company activity are observed,
- **the phase of maturity and stability of a company**, which is characterized by stability of organizational solutions, workers' specialization and significant stability of employment. It is often the time of having to involve bigger capital resources as well as modern technological and organizatonal solutions,
- **the phase of slump and changes or fall of an enterprise**, which is related to various options in the scope of further functioning of a company.

Following R.W. Griffin[102], three paths of development of a situation, which are presented in Figure 4 (p. 49) can be distinguished. Path 1 **(increasing)** occurs when pro-development changes, ensuring further expansion and enhancing the possibilities of a company activity, were implemented at a proper time. Path 2 **(steady)** is typical of companies maintaining the previous level of sales and profit but, at the same time, it can show passive adaptation to changes and requirements of the environment. As there are no pro-development actions, danger of economic slump can occur. Path 3 **(decreasing)** presents the option of break down and decline in the efficiency of a company functioning, leading to its fall and liquidation at the time when no radical saving actions are taken[103].

However, relating most of the models of a company life cycle to the SMEs category could give misleading conclusions as, in this case, most of SMEs could be at first stage of development or prepare for the beginning of the second stage. Small enterprises are characterized by lower durability of functioning than large

[99] Kaczmarek B., Organizacje – polityka, władza, struktury, Międzynarodowa Szkoła Menedżerów, Warszawa 2001, p. 127.
[100] Jackson J.H., Morgan Cp.P., Organization Theory. A Macro Perspective for Management, Prentice Hall, 1982 [after:] Machaczka J., Zarządzanie rozwojem organizacji, Wydawnictwo Naukowe PWN, Warszawa – Kraków 1998, p. 43.
[101] Lachiewicz S., Firkowski M., Zdrajkowska H., Cykl życia małego przedsiębiorstwa, [in:] Lewandowski J. (eds.), Zarządzanie organizacjami gospodarczymi w warunkach globalizacji, Wydawnictwo „Elipsa", Łódź 2000, p. 157-159.
[102] Griffin R.W., Podstawy zarządzania organizacjami, Wydawnictwo Naukowe PWN, Warszawa 2001, p. 731.
[103] Lachiewicz S., Firkowski M., Zdrajkowska H., Cykl życia małego… ,op. cit., p. 160.

enterprises and slightly different rules of development. Many small companies are characterized by shortened life cycle and different type of phases in relation to generally established models[104]. Therefore, in literature, various suggestions of model depiction of a cycle of development of SMEs appear. The suggestions include the model of development of SMEs created by V. Lewis and N. Churchil (1983), model by M. Scott and R. Bruce (1987), or shortened S-curve model, adapted to the specificity of SMEs (2000). PAEI model of Adizes, in which development is depicted as change of dominant functions (1979), can also be related to small enterprises to a great extent. In Polish conditions, attempts are also made at model grasping of a life cycle of SMEs[105].

Complex and mutidimensional issue of functioning of SMEs causes, however, that, as A. Chodyński states, there are no credible models of development of small enterprises, which take into account all the essential development factors[106]. Additionally, in literature, there are no life cycle models relating to the group of high-technology SMEs. It is useful to think about to what extent general assumptions concerning functioning of enterprises and particularly SMEs can be used for describing the development of HTSMEs as they are entities set on permanent development and functioning in a complex and turbulent market environment.

Some analogies regarding development of SMEs can be also made when analyzing the evolution and resolution model by L.E. Greiner (1972). Essential considerations on problems arising in individual phases of development are presented in Dodge's and Robins's model (1993). The authors identify three groups of barriers: marketing, managerial and financial barriers, claiming that wrong solutions applied during overcoming them can lead to slowdown or stop of an enteprise development. However, thier research concerns mainly internal problems and do not comprise the influence of external limitations on development processes of enterprises. Problems appearing in individual phases of life cycle are also emphasized in D. Felsenstein's and D. Swartz's model (1993).

The usefulness of phase models of life cycle is often criticized. The lack of unequivocal, objective criteria allowing to ascribe an enterprise to a particular development phase is an important reason. As a result, it is difficult to point at a defined stage of development in which an enterpise is. Other critical remarks as to phase models are[107]:

- difficulties in determining arbitrary time intervals for individual development phases as the time of lasting of successive stages is often individual matter of an enterprise, dependent on resources at its disposal as well as external market and economic situation,
- discrepancies relating to certain features influencing the qualification of an entity for a particular development phase, e.g. a company analysed with respect to its structure is in a higher phase whereas applied management style shows lower stage of development,

[104] Lachiewicz S. (eds.), Małe firmy w regionie…, op. cit., p. 103.
[105] see e.g. Marciniak E. (eds.), Etapy rozwoju małej i średniej firmy, A Vista Group sp. z o.o., Warszawa 2006, p. 27-33.
[106] Chodyński A., Zarządzanie rozwojem firmy. Strategia jakości ekologicznej, Wyższa Szkoła Zarządzania i Marketingu, Sosnowiec 2002, p. 34.
[107] Wasilczuk J., Wzrost małych i średnich…, op. cit., p. 69-70.

- difficulties in grasping causative actions of development, i.e. determinants, which cause enterprises to develop,
- not grasping thoroughly external factors influencing the development of described enterprises,
- in Polish conditions – the dominance in the SME sector of new companies, established at the beginning of the 90s in the 20th century, which have not gone through all or not even most of development stages.

Despite critical remarks, phase models are at an important position in management sciences. The analysis of barriers to development occuring at individual stages of life as well as defining barriers making it difficult to move from one stage of development to the next phase, is one of the goals of their applying.

4.2. Selected phase models of life cycle of SMEs

Referring development regularities described in phase models of life cycle of an organization to specificity of functioning of small enterprises, attention is paid to the fact that, in this case, **limitation of life cycle phases** and reducing the time between the first and the fourth phase occurs. Depicting development phases of SMEs according to the shortened S-curve is an expression of this approach. In the case of most of small enterprises, after brith and initial growth phase, market verification of an enterprise usually takes place, as a result of which further development trend, stabilization of a company development or the phase of slump and fall ensue. The above regularity explains short period of functioning of small enterprises and large scale of their liquidation in the first years of their activities. Figure 4 presents life cycle of a small enterprise according to the S-curve.

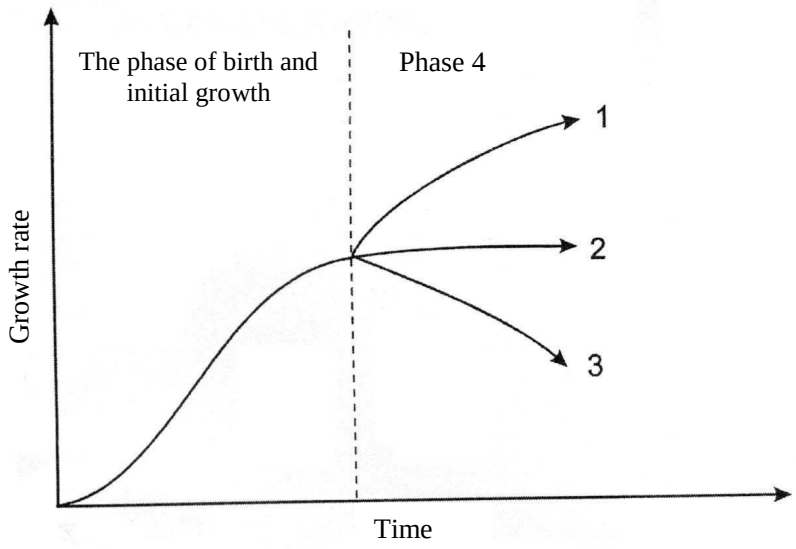

Figure 4. The life cycle of a small enterprise according to the shortened S-curve
Source: Lachiewicz S., Firkowski M., Zdrajkowska H., Cykl życia małego…, op. cit., p. 164.

N. Churchil and V. Lewis stated **in their model**[108] that the development process proceeds differently in small and medium-sized enterprises than in large corporations. They distinguished five stages of development characteristic to smaller companies, in which eight factors determine success or failure. The first four are rather static and **concern an enterprise itself**. They include:

- financial resources (monetary, cash reserves, possibility to get loans),
- personnel resources (the number and qualifications of employees, particularly at the management and staff level),
- system resources (a company information system, management system including planning and control system),
- business resources (market share, supplier relations – factors determining a company position in the market).

Other factors **are related to features of an enterpreneur** and comprise categories such as:

- motivation (owner's goals for himself or herself and for the business),
- operational abilities (ability to perform tasks from the field of marketing, innovation, production or management on one's own),
- managing capabilities (willingness to delegate powers and responsibility, ability to manage the activities of others),
- strategic capabilities (long-term thinking, analysing good and bad points of the enterprise, opportunities and dangers arising in the environment).

These factors have influence on an enterprise going through five stages: existence, survival, success (there are two possibilities here: success and not involving or success and growth), expansion and maturity. Particular actions of economic units are characteristic to each of the phases and each stage brings about different conditions of functioning[109]. In every development stage, a company faces new problems and challenges, the role of individual factors related to enterprise and management changes as well. The owner's capability to perform tasks individually decreases with the company development, at the same time, the meaning of strategic planning, workers' qualifications and the enterpreneur's ability to delegate tasks, powers and responisibilites increases.[110] The change of the role of individual factors taking place together with the company development is presented in Figure 5.

[108] Churchil N., Lewis V., The Five Stages of Small Business Growth, „Harvard Business Review", May-June 1983, p. 38.
[109] Janiuk I., Strategiczne dostosowanie polskich małych i średnich przedsiębiorstw do konkurencji europejskiej, Difin, Warszawa 2004, p. 115.
[110] Machaczka J., Zarządzanie rozwojem organizacji…, op. cit., p. 83.

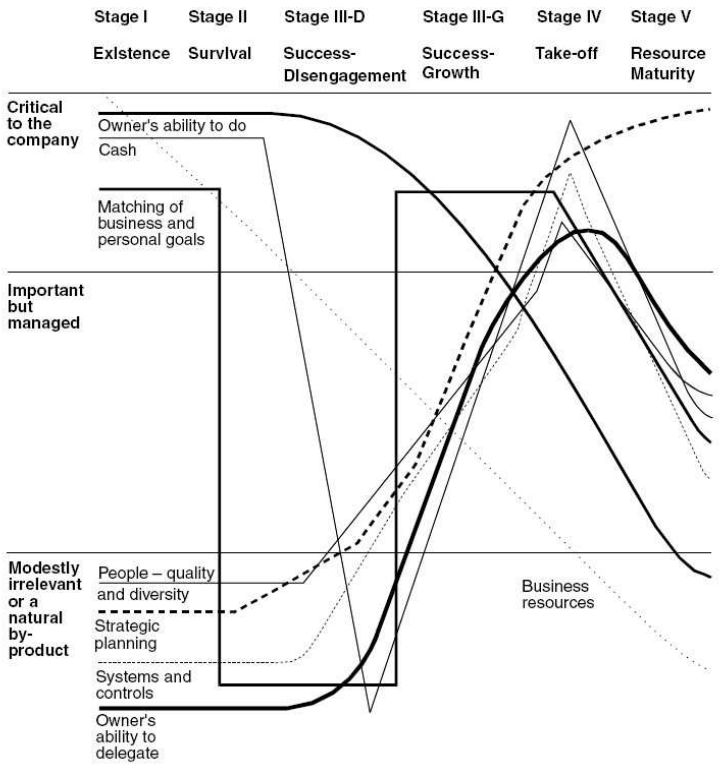

Figure 5. Change of the role of individual factors in life cycle stages according to the model by N.C. Churchill and V.L. Lewis.
Source: Churchil N., Lewis V., The Five Stages…, op. cit., p. 42

The problem of analysis of factors vital for individual development phases of a small enterprise is also considered in **M. Scott's and R. Bruce's model** [111]. Five stages of development of a small company are distinguished here, in which the owner-manager as well as variable source and financial situation of the company are of great importance. They are: the phase of existence, survival, growth, expansion and maturity.

In PAEI model of I. Adizes[112], attention is paid to functions and factors of an organization, which dominate in the course of an enterprise development to a greater or lesser extent. According to that, a company actions can be directed to:

– production(P), i.e. supplying the market with particular products or services,
– administration (A), i.e. creating formal order within structures and processes,
– enterprise (E), i.e. creating changes and introducing innovations,
– integration (I), i.e. striving for cooperation of participants of an organization.

[111] Scott M., Bruce R., Five Stages of Growth in Small Business, „Long Range Planing", Vol 20, No 3 1987, p. 47 [after] Lachiewicz S. (eds.), Małe firmy w regionie…, op. cit., p. 107.
[112] Adizes I., Corporate Lifecycles. How and Why Corporations Grow and What to Do About It, Prentice-Hall, Englewood Cliffs 1988 [after:] Machaczka J., Zarządzanie rozwojem organizacji…, op. cit., p. 70.

It follows from the model that the enterprise factor dominates before the creation of an enterprise and short after its arising. Soon later, focus is on product or service as it is the recepient and market that finally decide about the success of every venture. In the phase of growth, emphasis is put on production effects, enterprise and management and social factors are not that visible yet. Further stages constitute a danger for an enterprise of entering the decline phase. Bureaucracised management system starts to dominate, enterprise is neglected, which leads to limitation of the rest of factors, their disappearance and fall of the enterprise in the aftermath[113].

In **L. Greiner's phase model**[114] growth is presented as the processes of evolution and revolution taking place alternatively, where „evolution" relates to stages characterized by gradual and harmonious growth and „revolution" regards periods characterized by shocks and dynamic confusion. Each evolutionary phase creates crisis that is characterirstic to it, in which managerial structure and style, motivation and control system differs from actual needs so much that a radical change is essential[115]. The author of this model distinguishes the following phases of a company growth: growth through creativity, direction, delegation, coordination and collaboration. Each of them ends with a crisis: crisis of leadership, autonomy, control and red tape. It is assumed that after the growth phase called collaboration, another crisis will also occur, which has not been defined in this model. In literature it is sometimes defined as „crisis of information"[116], although it is difficult to determine its nature unequivocally.

An interesting concept of life cycle and the analysis of barriers arising in individual phases is depicted in **D. Felsenstein's and D. Swartz's model**[117]. They distinguish prelaunch stage as the first stage of life cycle, in which enterpreneurs define „what the company should be in the future" or create a general concept of a company operations. The need for capital is small in this phase. The amount of resources is needed which enables the enterpreneur to make sure that his or her concept stands a chance of market success. In the next, start-up stage, an enterpreneur moves to realization stage. At this time, need for capital increases and an enterprise often faces financial barriers. In the third, operating stage, a company starts permanent operations. New problems arise, mostly financial ones as increase in expenses becomes necessary. Moreover, the multitask role of the enterpreneur ends and he or she needs to be replaced by specialists. In the last phase, expansion stage, the company growth requires increasing expenditure in all areas. The range of products and services develops, which requires additional capital expenditure, infrastructure extension, new specializations and there is a greater need for information[118]. Table 10 presents the comparison of models of a company growth according to various authors.

[113] Machaczka J., Zarządzanie rozwojem organizacji…, op. cit., p. 71.
[114] Greiner L., Evolution and Revolution as Organizations Grow, „Harvard Business Review", July-August 1990.
[115] Machaczka J., Podstawy zarządzania, Wydawnictwo AE w Krakowie, Kraków 2005, p. 121.
[116] Nogalski B., Macinkiewicz H., Zarządzanie antykryzysowe przedsiębiorstwem, op. cit., p. 42.
[117] Felsenstein D., Swartz D., Constraints to Small Business Development Across the Life Cycle; Some Evidence from Peripheral Areas in Israel, Hebrew University of Jerusalem, 1993.
[118] Bławat F. (eds)., Przetrwanie i rozwój…, op. cit., p. 62.

Table 10. Models of growth of SMEs according to various authors

N. Churchil, V. Lewis – The model of SMEs growth					
Existence	**Survival**	**Success – „no involvement"**	**Succes – „growth"**	**Take-off**	**Maturity**
- registration of a company, - gaining clients, - simple structure, - personal supervision.	- reaching point of balance, - financial liquidity.	- stability of growth, - delegating responsibility.	- risk of growth, - increasing capital, - planning, - budgeting.	- financing growth, - control, - extension of planning and control system	- consolidation, - emphasis on financial indexes, - integration and collaboration
L. Adizes – Growth as change of dominant functions – selected stages					
Legalization stage (paEi)	**Initial stage (Paei)**	**Rapid growth stage (PaEi)**	**Youth stage (pAEi)**	**Optimalizatio n stage (PAEi)**	**Maturity stage (PAeI)**
- strong enterprenaul actions.	- emphasis on production, - time pressure, - no tradition, - little planning.	- rapid expansion, - personal leadership, - fast, often intuitive decisions.	- increasing role of planning and coordination, - increasing role of administration, - stabilization.	- emphasis on efficiency - balanced role of administration and enterprise.	- paternalism, - less concern about production, - formalized relations.
M. Scott, R. Bruce – Changes in individual stages of a company growth					
Problems	**Phase 1 existence**	**Phase 2 survival**	**Phase 3 growth**	**Phase 4 expansion**	**Phase 5 maturity**
Key issues	Gaining clients, profitable production	Profit and expenditure	Greater importance of managing, ensuring resources	Greater importance of finances, keeping control	Control of expenditure, productivity, market niche in the case of decline of branch
Role of management	Direct supervision	Planned supervision	Delegation, coordination	Decentralization	Decentralization
Managerial style	Enterprising, individual	Enterprising, administrative	Enterprising, coordinating	Proffessional, administrative	Supervisor
Organizationa l structure	No formal structure	Simple strukture	Functional, centralized	Functional, decentralized	Decentralized in case of products
Main financing sources	Owner, friends and relatives, leasing	Owner, suppliers, banks	Banks, new partners, stopped income	Stopped income, new partners, long-term credits	Stopped income, long-term credits
Financial situation	Negative	Negative, reaching profitability threshold	Positive, reinvestment	Positive with small dividend	Creating cash, high dividend
Sources of main investments	Machines and equipment	Working capital	Working capital, extension of machinery	New plants	Keeping machinery and market position

L.E. Greiner – Growth as evolution and revolution				
Cretivity phase	**Direction phase**	**Control phase**	**Coordination phase**	**Collaboration phase**
the direction of the company development by means of involvement of the owner is looked for, the number of people in the company increases with the company growth and the owner's authority is not sufficient for efficient management, negative effects of lack of hierarchy and division of tasks intensify, which leads to	precise organizational structure arises together with units and their tasks, procedures and regulations ordering the enterpise are created , authority is on the top management levels while the other workers are drawn away from management, which leads to	delagation of powers occurs, lower level managers become more active given more independence, smaller influence of top management on the company activity causes lack of coordination of the goals of part of the company with those of the whole enetrprise, which leads to	coordination of the functioning of a company occurs, introduced by means of new regulations, procedures and other improvements, organizational system expands and becomes less flexible, it is more and more difficult to control processes and units, top management interferes in managing, which leads to	in this phase problems of development are solved by creating workers' teams, there can be dangers of not satisfying the need for control, safety, limiting information scope, which leads to
crisis of leadership	**crisis of autonomy**	**crisis of control**	**crisis of red tape**	**Crisis of? (information?)**
because dynamic increase causes that many factors become a problem, strong manager is needed, who will efficiently solve problems inside the company and take control of the company.	which is the result of too strong management that excessively restricts competencies and is not willing to delegate powers and responsibilities, strong decentralization of management is essential.	because top management claims to have lost control over autonomous areas of the enterprise, manageres operate without coordinating plans or technologies, management coordination is essential.	in which there is no trust between workers and managers, lack of constructive cooperation is possibile, beureaucracised operational systems are criticised, there is a need for cooperation and accepting co-responsibility for the whole company.	it is assumed that the next crisis will surely occur, it is difficult to point to its character, it may be related to limited access to information, its overcoming can be the basis for further development of a company.

D. Felsenstein, D. Swartz – Development and barriers in its individual phases			
Prelaunch stage	**Start-up stage**	**Operating stage**	**Expansion stage**
enterpreneur determines the concept of a company operations; small need for capital.	the idea of enterpreneur starts to be realized; need for capital increases – financial barrier can arise.	company starts constant production, problems arise: financial or related to insufficient enterpreneur's competencies.	necessity to increase expenditure in all areas of a company– new capital requirements, infrastructure extension, need for information.

Source: Own preparation on the basis of: Białasiewicz M. (ed.), Rozwój przedsiębiorstw. Modele, czynniki, strategie, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2002, p. 49-50; Lachiewicz S. (ed.), Małe firmy w regionie…, op. cit., p. 107.; Szplit A., Fudaliński J., Markiewicz P., Smutek H., Strategie rozwoju organizacji, Antykwa s.c., Kraków 2002, p. 34-35; Bławat F. (eds)., Przetrwanie i rozwój…, op. cit., p. 88;Nogalski B., Macinkiewicz H., Zarządzanie antykryzysowe przedsiębiorstwem, op. cit., p. 43.

Phase models of life cycle of an organization point at complex and multidimensional nature of development processes of enterprises, which results in assuming many different variables and characteristics used to describe a company development. Multitude of views used in these models allows to comprehend more precisely changes taking place in the course of an enterprise development and also grasp the dynamics specific to occuring processes of growth.

4.3. Main barriers in successive phases of high-technology SMEs development

On the basis of phase models of life cycle of an organization presented above, mainly relating to SMEs, attempts can be made at analyzing barriers particularly dangerous to development processes of high-technology SMEs. Therefore, the following stages of their life and development cycles were assumed: pre-founding stage, stage of existence, survival stage, period of dynamic growth, take-off and expansion stage and maturity stage. The following model assumes that the description relates to high-technology small and medium-sized enterprises, which are characterized by the following features[119]:

- operate in high-technology area,
- are owned by entities belonging to private sector (private person or other economic entities from private sector, in the latter case capital relations between entities are of great importance),
- are aware they will function in turbulent, complex environment, which can be the source of various opportunities but also dangers for their development,
- are set on growth and development rather than on passive functioning, which results from the specificity of their environment as well as products and services they offer in the market.

The pre-founding stage is a period in which an enterpreneur[120] considers taking a decision about founding an enterprise. Proper assessment of market situation in branch as well as critical analysis of one's own predispositions and resources essential for starting business is particularly important. Basic internal barriers at this stage include psychological barriers, resulting mostly from fear of taking risk related to starting up one's own business, family resistance or excessive, unjustified optimism and belief in success of the venture, not supported by reliable market analyses. Limitations can also occur as a consequence of low competencies as well as low qualifications and knowledge of the enterpreneur ensuing mostly from difficulties in recognizing and assessing market conditions.

[119] the model focuses on considerations on the occurence of certain barriers to development assuming that, in individual stages, various development factors are overcome and used, which leads to the company development and moving to another phase of functioning. In order to enhance cognitive values, the model should be extended by the analysis of essential development factors in individual phases and indicating the possibilities to take actions supporting the development of high-technology SMEs.

[120] the enterpreneur is for the sake of this model a founder (owner) of the company – in case of individual business or a group of investors – initiators of enterprise – in case of partnership enterprises.

External barriers at this stage include social barriers, related to insufficeint enterprise culture and formal and legal limitations being the consequence of complex administration process of starting up a business. Information and educational barriers are also vital, resulting mainly from ineffective training programs hindering enterprise and not adapted to the needs of people wishing to start up a business and also being the consequence of limited information on support programs and instruments supporting foundation of enterprises developing high technologies. Therefore, various types of barriers to exit can be a big threat, both those related to legal system and also high requirements in the area where an economic entity begins to function.

If the decision about starting a business is positive, an enterprise begins its functioning and **enters a pioneer period of its activity**, which comprises two phases: start-up phase –shorter in time and the longer – survival phase. Among main obstacles in the functioning of SMEs in the first period of activiy, E. Stawasz includes [121]:

- shortages of economic and managerial knowledge of enterpreneurs,
- financial limitations and too low own capital needed to start up a company,
- employing improper people as far as abilities and efficiency of workers are concerned,
- too shallow and incorrect assessment of market situation,
- inability to allow business cycle phases in a company operations,
- mistakes made at the time of rapid growth of a company.

As a result of the registration process, an enterprise enters the **phase of existence**, in which necessary formal and legal actions related to establishing business (opening bank account, registry in Social Insurance Board, declaration in the National Labour Inspectorate, obtaining necessary powers and licences) are taken, first agreements with economic partners concerning e.g. venue lease, cooperation in the scope of business-related services (accounting office, legal service, law enforcement agency, marketing agency) are concluded, attempts are also made at developing and commercialization of innovative solutions provided by an enterprise. The enterpreneur is surrounded by a group of devoted people having the same vision of the venture. People in the company are optimistic and involved greatly in realization of primary market tasks. It seems that the team of workers does not have the sense of internal limitations, however, in practice, underdeveloped management system and system of coordination of individual actions taken at this stage can be problems.

External barriers include first of all market barriers resulting from difficulties in finding primary outlets and appropriate market partners. Technological limitations can be also a barrier of this kind, limitations resulting from difficult access to external technological thought or high costs of obtaining solutions from the field of R&D. The start-up phase is relatively short, though, it ends at the moment of completing all the necessary formal an legal actions and finding first business partners that enable to start firm business and concentrate on the most important market activities.

[121] Matusiak K., Stawasz E., Przedsiębiorczość i transfer technologii…., op. cit., p. 51.

The **phase of survival** is a longer phase of the pioneer period. It is an important period of first market verification of products and services offered by an enterprise. In the group of internal barriers, competence and knowledge weaknesses of the owner and workers can be particularly dangerous as well as limitations related to management process being the consequence of e.g. low information flow in the enterprise. Prime barriers can also appear as a result of size of business. They are: too low capital involved in the venture or too few resources. Innovation barriers can be particularly dangerous in this phase, e.g. low level of innovation awareness, limited creativity potential or insufficient expenditure on R&D sphere. The aim of activity of an economic entity in this phase is, first of all, creating first strategy of market activity, which includes: choosing between synoptic and incremental approach[122] and the choice of competitive strategy and functional strategies. At the same time, a company attempts more and more intensely at popularizing suggested technical solutions and searches for new market recipients.

Basic external dangers at this stage include all types of market barriers such as aggressive actions of competition, import of substitutes, difficulties in finding recipients and distributors. Financial barriers also appear at this stage, including first of all difficulties in obtaining additional sources of financing essential for extending the scale of market activity. Personnel barriers can also arise, which are related to finding proper marketing, service or customer service workers. Difficulties in obtaining patent protection for innovative technical and technological solutions suggested by a company can be also a limitation of some kind.

The survival phase lasts longer than the start-up phase and ends with market verification of the first offer suggested by the company. As high-technology market is very dynamic, in the case of responding positively to the offer, the enterprise stands a chance of moving to another stage of growth. Declining the offer by the market means the necessity to change direction of actions. Essential psychological barriers can arise at this moment, being the consequence of frustration and weak motivation of the enterpreneur for further company development. In case of sufficient resources, an entity can try to modify or change offered products provided that the resources are relevant, otherwise the enterprise can face fall and liquidation.

When a company has been successful in this phase, a company usually enters the **phase of dynamic growth**. This stage is characterized by enhancing growth quantity indicators such as the amount of the company turnover, number of workers, number of business contractors, introducing at the same time quality changes in organizational structure, management systems, systems of motivating people and control. Basic, permanent barrier at this stage include limitations related to the size of activity, e.g. too small financial and material resources of an enterprise, insufficient office space or the necessity to do costly renovations. As a result of dynamic development, limitations related to production also arise, regarding e.g. insufficient production powers or logistics and supply difficulties. Competence, knowledge ond qualifications barriers can also appear as a result of e.g. insufficient specialist and managerial qualifications as well as low tendency to learn. At this

[122] see: e.g. Obłój K., Obłój T., Bruton G., Chung Ming L., Strategie I praktyki zarządzania firm high-tech w różnych otoczeniach instytucjonalnych, „Przegląd Organizacji", nr 3/2008, p. 14.

stage, particularly dangerous internal dangers include personal problems of entepreneur such as health deterioration or dissatisfaction of his or her family.

External financial barriers are greatly noticeable in this phase as access to financial resources decides to a great extent about the possibility of dynamic growth. Because of high turnover and income as well as increase in employment, legal problems resulting from high tax and social insurance liabilities also intensify. Personnel barriers, no doubt appear, too. High dynamics of actiivity assumes the need for qualified workers and their great involvement in the company development. Reluctance to work in the SME sector, low mobility of workers or high staff fluctuation can be a limitation here. In case of choosing specific directions of market activity, barriers related to access to public procurement market can arise or international barriers, as a consequence of internalization of activity.

Dynamic development of an enterprise leads to inevitable changes in its organizational structure and management system. The enterpreneur's creativity and abilities are often not enough to manage a developed market entity on his or her own at this stage. Therefore, there is a need for decentralization of management and delegation of authority to professional managers. Potential investors can also turn up, interested in participating in successes of the enteprirse financially supporting at the same time its further development. These tendencies belong to the symptoms of a company entering the **phase of take-off and expansion**.

Main internal limitations are at this stage faults in management system resulting from ignorance of contemporary management methods, difficulties in defining strategic goals of a company or weaknesses of organizational structure. Obstacles related to legal form and form of accountancy can also appear, particularly in the case when it is necessary to gain external investors. Potential, essential barriers at this stage also include „monopoly position" of an enterpreneur and lack of support for development of intelectual capital in the company. Psychological barier is also essential, making it difficult to delegate authority, powers and responsibilities to professional managers and to lower management levels.

Although in market context an enterprise competitive position is rather good, another market verification of the company offer is probable soon. Therefore, essential barriers here include technical and technological limitations, related to rapid technical progress in branch, high cost of machinery, equipment and know-how or high cost of obtaining external solutions from R&D sphere. The company can decide about directions of market expansion, which can entail involving greater funds. As a large scale enterprise (often as a medium-sized company), the entity is more susceptible to probable political and economic barriers, which can hinder further development processes.

Successful introduction of changes in management systems, organizational structure and positive market verification of modified or extended market offer, results in a company entering into **maturity phase**. It is a period, in which a company owners must answer important questions regarding the future shape and directions of activity of the enterprise. Lack of support for intraenterprise, excessive number of red tape and formalization of activities leading to disappearance of the features of innovative and growing rapidly company, are some of the internal problems possible in this case. Another one is workers' resistance being the

consequence of proceeding anonymity and isolation from social system of the organization.

In external context, new, dynamic competitive enterprises, entering the market with pioneer offer and basing on flexibility of ation, can be a threat to a company. The company is susceptible to a great extent to influences of economic situation, both national and international. Management conditions lead to considerations on future shape of the organization. It seems that in conditions of dynamic environment and inevitable technological progress, high-technology enterprises face the dilemma of further development within large enterprise sector or making a legal division of the company into smaller entities accumulating and developing key competencies and capabilities.

5. ACTIONS REDUCING BARRIERS TO DEVELOPMENT OF HIGH-TECHNOLOGY SMES

5.1. General assumptions for the system supporting SMEs

It cannot be expected that small and medium-sized enterprises, including high-technology SMEs are able to surmount arising barriers to development without any outside support. It is often the case that creativity of owners and their pursuit after development chances and factors in the environment by using market niches or innovative technical or organizational solutions is not enough to support the possibilities of development. Limited resources of these enterprises are also an obstacle. As a result, market position of SMEs is often difficult and their development is determined to a great extent by barriers they face.

On the other hand, economists emphasize the positive economic and social role of SMEs and they ascribe exceptional abilities to strengthen the competitiveness of economies and influencing social and economic development of countries to innovation and high-technology enterprises. As a result, highly developed countries make attempts at **supporting development of high-technology enterprises**, as they stimulate economic growth, strengthen competitiveness in international arena and contribute to higher affluence of citizens. HTSMEs are a special group of companies included in support programs. They have significant innovation potential and they are dynamic and flexible in actions. They are pioneer in many fields and they determine new trends of market activity.

A country policy towards SMEs can be that of formal, independent declaration regarding supporting small business or can be a part of general economic government strategy. B. Piasecki includes in goverment tasks in this field[123]:

- working out a general concept of supporting development of SMEs,
- determining the most needed forms and directions of support,
- estblishing institutions whose task is to work out rules and implement instruments serving general aims of integrated support system.

In Polish conditions, general assumptions concerning forms and range of country suport towards SMEs are included in the Economic Freedom Act. According to it, the country should create conditions conducive to the functioning and development of SMEs particularly by[124]:

[123] Piasecki B., Przedsiębiorczość i mała firma. Teoria i praktyka, Wydawnictwo UŁ, Łódź 1998, p. 204.
[124] art. 103 ustawy z dnia 2 lipca 2004r. o swobodzie działalności gospodarczej, Dz. U. 2004, Nr 173, poz. 1807 z późn. zmianami.

- initiating changes of legal conditions conducive to development of SMEs, including those concerning access to financial means obtained from credit and loans and credit guarantees,
- supporting institutions which enable to finance a business on easy terms within realized government programs,
- equalizing the conditions of running a business with regard to public legal liabilities,
- enabling easy access to information, training and counselling,
- supporting institutions and organizations functioning for the benefit of enterprises,
- promoting cooperation of SMEs with other Polish and foreign enterpreneurs.

Countries belonging to the European Union structures aim in this way at strengthening the role of small and medium-sized enterprises in economy, among the others by creating legal, administration and technical conditions for establishing and development of SMEs, supporting cooperation among international SMEs and also ensuring specialized services to the benefit of SMEs.[125] Various types of business-related services rendered for the benefit of the smallest economic entities are the best examples.

In order to limit negative influence of barriers to development of SMEs, various solutions are also suggested in economic and management literature, e.g.[126]:

- solving the issue and improvement of obtaining information by enterpreneurs about support programs for SMEs, including high-technology SMEs. Information about the rules of using this support is also important,
- establishing strong organization taking care about the interests of SMEs,
- establishing advisory companies for the smallest businesses,
- mobilizing public and private capital and devoting it to the support of SMEs,
- eliminating difficulties in the access of SMEs to various types of training and consultancy.

Other postulated actions include: sensible use of financial tools, creating innovation policy which will positively affect reducing technological gap in relation to highly developed countries, creating proper tax policy and thus stimulating development of SMEs and creating interorganizational networks affecting reduction of functioning costs, gaining action assets and finally ensuring fuller and faster access to information[127].

The above direcions of action are directed, on the one hand, to reducing barriers to activity, on the other hand, they are meant to strengthen positive development factors (e.g. professional business-related services or economic cooperation and partnership relations). Their efficient realization can contribute to development of SMEs in the aftermath. However, the poblem concerns the type of beneficiaries the support should be directed to, which justifies the discussion in literature regarding common or selective promotion of small business. Bearing in mind their types, it is

[125] Klimek J., A co z naszą przedsiębiorczością?, Wydawnictwo Marszałek, Toruń 2005, p. 126.
[126] Balcerowicz E. (eds.), Mikroprzedsiębiorstwa – sytuacja ekonomiczna, finansowanie, właściciele, CASE - Centrum Analiz Społeczno-Ekonomicznych, Warszawa 2002, p. 145
[127] Jankiewicz S., Wspieranie rozwoju małych i średnich przedsiębiorstw jako priorytet polityki gospodarczej, Wydawnictwo AE w Poznaniu, Poznań 2004, p. 47-48.

possible to support all SMEs or some types of them, classifed according to certain criteria (e.g. technological, production companies, newly established firms or other)[128].

Innovation companies and those functioning in high-technology sector are particularly supported. Working out and impelmenting varied strategies and programs supporting this group of enterprises proves this. The programs are prepared at various levels, international, e.g. within the frame of the European Union policy[129], central and national level[130], as one of partial aims of macroeconomic policy of the country and at the level of local governments as the aim of activities and programs of territorial self-government units[131]. Their performance is ensured by support institutions which implement programs and are responsible for carrying them out. They operate at international, national, regional (provincial) and local level, as institutions cooperating directly with SMEs. The greatest part of organizations operating for the benefit of enterprises function on non-commercial basis. The institutions comprise e.g. units rendering services for SMEs i.e. non-governmental organizations, enterpreneurs' organizations, research institutes and academic centers[132]. Moreover, enterprises such as banks, leasing funds and venture capital, consulting companies and many other commercial entities are involved in supporting development of high-technology SMEs. External support actions can be also taken by informal organziations such as family or local society.

It is a starting point for the „support" concept in narrow and broad meaning as it is distinguished in literature[133]. The first group includes actions of non-commercial legal entities, whose statutory aims comprise support resulting from strategic directions of government actions and which have the necessary economic and technological potential and experience in this field. Support in broader meaning is provided by various organizations of business environment, formal (banks, lawyers, non-profit organizations, authorities, financial institutions and others) and informal sources (family, friends, local society and others).

As a result, high-technology SMEs are provided with **varied forms of external support**, whose aim is to limit certain barriers to development and strengthen factors stimulating development of this category of enterprises. In effect, these enterprises function in complex and dynamic environment, in which ability to take advantage of chances to support development determines greatly the success of these organizations as open systems.

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[128] Piasecki B., Przedsiębiorczość i mała firma. Teoria i praktyka, Wydawnictwo UŁ, Łódź 1998, p. 205.

[129] the Operational Program Innovative Economy 2007-2013 is the example. Development of Polish economy on the basis of innovative enterprises and increase in the use of information and communications technology in economy, are its aims.

[130] at national level, assumptions concerning the support of high-technology SMEs were made among the others within the framework of the program: "Directions for increasing innovativeness of the economy for 2007-2013", realized by the Ministry of Economy.

[131] Regional Innovation Strategy for the Lodz Province RSI Loris is the example.

[132] Jankiewicz S., Instytucje wspomagające rozwój małych i średnich przedsiębiorstw, a oczekiwania przedsiębiorców (na przykładzie aglomeracji poznańskiej), „Polityka Gospodarcza" nr 4/2000, p. 45.

[133] see e.g. Bieńkowska B., Instytucje wspierające funkcjonowanie małych i średnich przedsiębiorstw w powiecie bielskim, [in:] Otto J., Stanisławski R. (eds.), Szanse rozwoju polskiego sektora MSP na Jednolitym Rynku Europejskim. Tom II – Wspieranie rozwoju MŚP na Jednolitym Rynku Europejskim, Politechnika Łódzka, Łódź 2006, p. 190.

5.2. Selected institutions supporting development of high-technology SMEs

Centers for innovation and enterprise play a vital role in institutional system of supporting high-technology SMEs. They began to arise at the turn of the years 1989 and 1990 at the moment of political and economic changes. They were created following proven solutions functioning in countries with stabilized market economy in order to solve problems Polish enterpreneurs grappled with[134]. Centers for innovation and enterprise include training and counselling centres, loan funds, guarantee funds, business incubators, technological centres, technology parks, technology transfer centers or venture capital funds[135].

Training and counselling centers are organizationally isolated advisory, training and information units, operating for the benefit of enterpreneurship and improvement of competitiveness of private SMEs. They are non-commercial and they often function within foundations and societies operating for the benefit of local development. The systematizing concept of training and counselling centers relates to various types of entities operating under varied names e.g. enterprise supporting centers, business supporting centers, enterprise clubs and centers and others. Their offer includes courses and trainings in the scope of establishing one's own company, working out business plans, support in marketing, financial, tax and legal activity. Those who benefit from the support can take part in computer or language courses. There is a possibility to exchange cooperation, technological and patent information.

The role of **loan and guarantee funds** is to overcome financial barriers which SMEs have to face. Their task is to take the risk of giving loans to SMEs off the banks. Loan funds usually operate in the form of society or foundation whereas guarantee funds usually function as joint-stock companies and are connected wih local and regional non-profit institutions operating for the benefit of economic development.

Enterprise incubators are the next group of support institutions which help newly established companies and help to create new workplaces by offering their clients production and office space with certain standard for running a business. The role of incubators is also to teach enterprise by organizing courses and trainings, counselling in management or access to professional training programs. They offer their clients proffessional accounting and legal services, technological and substantial help at the moment of starting activity, help in trade contacts, technology transfer or contact with universities[136].

The role of **technology parks and centers** in supporting high-technology SMEs is also vital. They are organizations in which science, modern technology, modern industry and enterprise meet for the common good. The idea of technology parks/centers is to gather institutions oriented to creation and use of advanced, modern technologies by ensuring technical infrastructure, renting venues and

[134] Koncerewicz B., Inkubatory przedsiębiorczości w północno-wschodniej Polsce, „Ekonomika i Organizacja Przedsiębiorstwa", nr 6/1998, p. 12.
[135] Matusiak K. B., Zasiadły K., Ośrodki innowacji i przedsiębiorczości w Polsce, Ministerstwo Pracy i Polityki Socjalnej, Warszawa 1998, p. 7.
[136] Koncerewicz B., Inkubatory przedsiębiorczości…, op. cit., p. 12.

rendering office services. Technology transfer is supported by providing training and counselling services, also in the area of marketing, finance and law. Technology parks often create R&D centers, inter-discipline scientific teams, they promote scientific results and their commercialization[137].

Technology transfer centers are the next group of institutions supporting high-technology SMEs. Their mission is to support and assist the realization of technology transfer and all actions taken in this process, as a result of which they contribute to improvement of the dynamics of economic growth in regions and improvement of their competitivenes. As regards organizational issue, the centers are the most often isolated units considering various types of foundations, agencies or higher education institutes operating for the support of innovation and enterprise.

Venture capital funds also play important role in supporting high-technology SMEs. They are entities dealing with financing enterprises externally, enterprises which accept the form of new capital provided by proffesionally managed funds in return for shares. Venture capital funds complement large financial markets – shares, bonds and bank operations. They make high risk investments, typical of newly established SMEs and start activity in new spheres of business[138]. Therefore, the offer of venture capital funds is directed most of all to small and medium-sized enterprises which have the possibilities and are ready to develop, but, lack of funds is the main obstacle blocking all decisions related to company expansion. Involving high risk capital additionally increases the enterpreneur's credibility and can also enable using credit not accessible before, in case of improving condition of the company[139].

Activities reducing barriers to development are also taken up by economic self-government organizations. They include **economic chambers**, which represent interests of enterprises in them by supporting economic development of associated entities. Their task is to represent the interests of participants towards central and local state administration, initiate and recommend political and system solutions, give opinion on the functioning ones and design new mechanisms or economic solutions. Promotions in national economic market as well as inspiring and accumulating joint venture funds, particularly in the sphere of technological and organizational progress, are also important. **Employers' unions**, whose aim is to represent associated entities towards trade unions, state and self-government administration organs and to conduct group negotiations, conclude group agreements and other agreements concerning labour legislation, are also some examples[140].

Wide range of various services rendered for the benefit of SMEs are also offered by **bank institutions**. Their offers comprise both bank services such as giving credit on

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[137] Guliński J., Parki naukowe i technologiczne w Polsce, „Ekonomika i Organizacja Przedsiębiorstwa", nr 5/1998, p. 15-16.

[138] Tłoczyński D., Metody finansowego wspierania rozwoju small businessu, „Ekonomika i Organizacja Przedsiębiorstwa", nr 12/1999, p. 22.

[139] Mikołajczyk B., Instytucje wspomagające rozwój małych i średnich firm, Ośrodek Doradztwa i Doskonalenia Kadr, Gdańsk 1998, p. 35.

[140] Berliński L., Gralak H., Sitkiewicz F., Przedsiębiorstwo. Zarządzanie w otoczeniu, tom II, OPO, Bydgoszcz 2004, p. 229.

investments or sales, running bank account, domestic settlements, possibility to invest free funds and leasing or factoring.

Special economic zones and capital market institutions designed particularly for technological companies are other organizations supporting development and eliminating barriers to activity of high-technology SMEs. SMEs oriented to dynamic development can decide on taking chances given by modern instruments of capital market such as **NewConnect** financing. It is a new platform, organized by Warsaw Stock Exchange, platform of financing and sales for young companies with high growth potential, which perceive innovativeness as the chance to build the most inportant element of competitive advantage. This instrument arose with a view to young, dynamic companies, to which source of capital will give the possibility to use the potential inherent in their innovativenesss and the possibility to develop, ending in the group of large and valuable enterprises, as a result. NewConnect is assumed to be the market for companies[141]:

- in initial phase of development, which have only started building their market record,
- representing innovative branches based on intangible assets such as e.g. IT, electronic media, telecommunications, biotechnology, environment protection or alternative energy,
- with vision and chances for debut in Stock Exchange regulated markets in the future.

In order to coordinate support activities by various institutions at national level, the Polish Agency for Enterprise Development (PAED) was created, which administers the funds coming from the country budget and the European Union, designed to support enterprise and human resources development, particularly considering the needs of SMEs. The aim of this organization is to realize programs of economy development, particularly in the scope of supporting development of SMEs, export, regional development, use of new techniques and technologies, creating new workplaces, human resource development or counteracting unemployment. The Agency is responsible for taking actions leading to increase of innovativeness and competitiveness of Polish enterprises. It takes part in many programs directed to enterprises belonging to the SME sector[142].

In order to enhance the efficiency of support actions directed to SMEs, organizational infrastructure was also created – the network of cooperating support institutions operating as national service network for SMEs. It is a network of freely cooperating, financially independent non-commercial organizations which render various kinds of services for SMEs. These centers include: agencies for regional and local development, business support centers, chambers of trade and industry, R&D institutes, credit guarantee funds, loan funds, business schools, handicraft organizations, foundations or associations. All entities cooperating within national service network have accreditation of Polish Agency for Enterprise Development.In Poland in recent years, works over the extension of National Innovation Network

[141] Przewodnik dla emitentów, Informator NewConnect, http://www.newconnect.pl/pub/dokumenty_do_pobrania /przewodnik_dla_emitentow_newconnect_pl.pdf.

[142] Przedmiot działalności i kompetencje PARP, http://bip.parp.gov.pl/index/index/505 z dnia 25.09.2008.

have been conducted. The network consists of national service network centers, which specialize in rendering consulting, pro-innovative services. The services include help in creating conditions for transfer and commercialization of new technological solutions and realization of innovative ventures in SMEs. All National Innovation Network centers cooperate on regular basis with research institutions in the scope of rendering services or are organizationally isolated from a scientific center[143].

5.3. External forms of supporting development of SMEs

The role of institutions supporting development of high-technology SMEs is to activate endogeneous resources and fully use local development factors. These tasks are realized by various **forms of supporting enterprise and innovation**, which include e.g.[144]:

- spreading knowledge and capabilities by counselling, training, information within training and counselling centers,
- help in transfer and commercialization of technologies within transfer technology centers,
- financial help (including seed and startup) in the form of para banking loan and guarantee funds, often directed to people starting business or young companies without credit record,
- extensive consulting, technical and office space help for new entities in the first period of their activity provided by enterprise incubators and technology centers,
- creating clusters of enterprises and animation of innovative environment by combining in a given area business services and various types of help within technology parks, business zones or industrial parks.

The forms of supporting high-technology SMEs can also include: programs of financial government help for SMEs, special loans and credit preferences, preferences and reliefs in tax system, subsidies and reliefs for investments of these enterprises or innovative help[145].

Actions taken by national service network for SMEs are an essential group of such sevices. They include[146]:

- information services concerning among the others administration and legal aspects of starting and running a business, available sources of public support and other sources of financing, possibilities, range and rules of rendering other services available in national service network system,
- counselling pro-innovation services, including e.g. technological audit and service of technology transfer process,

[143] Bełdowska A., Forin A., Powałka W. (eds.), Przedsiębiorco skorzystaj, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2005, p. 12-13.
[144] Lisowska R., Bariery rozwoju działalności innowacyjnej małych i średnich przedsiębiorstw na terenach wiejskich na przykładzie województwa łódzkiego, [in:] Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa. Szanse i zagrożenia rozwoju, CeDeWu sp. z o.o., Warszawa 2007, p. 42.
[145] Berliński L., Zarządzanie strategiczne małym przedsiębiorstwem, OPO, Bydgoszcz 2002, p. 22.
[146] Informacje o KSU, http://ksu.parp.gov.pl/pl/o_ksu z dnia 25.09.2008.

- counselling pro-export services, including e.g. analyses of export potential of an enterprise or working out a plan of a company export development,
- financing services in the scope of giving loans, enabling to gain external financing by entities leading a business activity,
- financing services in the scope of giving guarantees, enabling SMEs to get additional credit or loan security.

Training services that have been offered by centers of national service network in recent years are another group of services directed to SMEs. This form of support can be provided by other institutions supporting development of SMEs.

Partnership economic cooperation is an important form of supporting development and eliminating barriers resulting mainly from small size of activity. It is perceived as an important factor supporting an enterprise internal resources[147]. Various types of strategic agreements, coalitions and cooperation networks give the possibility to concentrate resources of cooperating enterprises and the chance of optimal use of their key competencies. These types of relations are more and more often taken into consideration by SMEs[148].

As forms of support classified above are provided by external entities in relation to a beneficiary of support, we can talk about external forms of SME support. It should be remembered, though, that SMEs also have a range of internal solutions supporting development processes. They include, among the others, creative and innovative actions of owners and workers or implementation of contemporary management concepts and tools. Coordinated actions taken at national and local level serve mainly the extension of organizational infrastructure providing varied forms of external support for SMEs.

We should pay attention to the fact that although using external forms of development support can be the source of certain positive quantitative and qualitative changes in an enterprise, in the first phase it often entails the necessity to incur certain costs or even to lower temporarily the efficiency of functioning of organizations.Therefore, the use of forms of support should be based on **methodology of implementing organizational changes** and the period of getting support can result in temporary weakening of the organization, this being the consequence of the necessity to incur various types of costs, which include:

- expenditure on searching appropriate forms and institutions supporting development as well as the analysis of rules of their use,
- expenditure on adaptation to requirements resulting from the rules of using certain forms of support (including e.g. necessary expenses on getting required documents, preparing business plan, getting necessary securities and other actions),
- expenditure regarding direct use of forms of support (including e.g. costs of lost advantages, as a result of workers' participation in trainings),
- expenditure related to current use, including settling accounts from received support,

[147] Piasecki B., Przedsiębiorczość i mała…, op. cit., p. 183.
[148] Steinerowska-Streb I., Sytuacja małych i średnich przedsiębiorstw w Polsce, „Ekonomika i Organizacja Przedsiębiorstwa", nr 8/2006, p. 31.

– expenditure on monitoring and control of realization of support process as a result of requirements made by support institutions.

These costs can be one of the sources of failure in the use of forms of support and serious perturbation in this field can lead to an organization crisis. It can be assumed that using external forms of support of development of SMEs becomes a specific short-term, operational barrier in their functioning. Therefore, it is essential to search for forms of supporting development which will result in positive, long-term changes, being the foundation of a company development. The total amount of long-term effects must exceed expenditure incurred while getting support from a certain source. Assesing achieved results is not an easy task as their quantitative values, including economic and financial ones, are sometimes impossible to define and they often comprise qualitative results whcih are difficult to measure.

Therefore, it is important to adapt precisely forms of supporting development to arising development barriers and factors which determine development processes occuring in certain phases of a company life cycle. The efficiency of using forms and instruments of the support system should be considered at many levels: the level of owners and enterprises, of high-technology SMEs, local, regional, national or even international level.

6. THE CHARACTERISTICS OF THE RESEARCHED COMPANIES

6.1. The characteristic of the enterprise MakoLab Joint Stock Market[149]

6.1.1 The basic data and the subject of activity

The company MakoLab Joint Stock Market operates in the IT branch (IT) and specializes in the creation and implementation of the web solutions, using advanced program technologies and their own, innovative solutions. The company offers the services to support and manage the informatics resources (outsourcing IT). The basic data characterizing the company MakoLab Joint Stock Market is shown in Table 11.

Table 11. The basic data of MakoLab S.A.

Lp.	Specification	Information
1.	The whole name of the company	MakoLab Joint Stock Market
2.	Shortened name (in Polish)	MakoLab S.A.
3.	The date of the beginning of activities	1989 (MakoTypesetting), 1993 (MakoLab)
4.	The adress of the head office	46 Demokratyczna Street, 93-430 Łódź
5.	The departments	The company does not posses separated divisions and institutes
6.	The organ of registration	Regional Court for Łódź – Śródmieście in Łódź, XX Economy division. National Court Register. Registration in the list of entrepreneurs. .
7.	Data of registration in KRS	01-10-2007
8.	KRS nr	0000289179
9.	Initial capital	707.473,00 zł

[149] The characteristic of the company was prepared on the basis of the materials gathered from the web page of Makolab S.A. www.makolab.pl, the Status of Makolab Joint Stock Company, the Informational Document prepered for the needs of introducing the shares to the market NewConnect, Makolab S.A., 2007, Half year report MakoLab S.A. for the period 01.01.2008 till 30.06.2008, Makolab S.A. 2008, Annual report MakoLab S.A. for the year 2007, MakoLab S.A., 2008.

Lp.	Specification	Information
10.	The type of the representation of the company	In case of the Board which consists of many people it is required for the representation of the Company the cooperation of two members of the Board, or of one of the members of the Board together with the executive in case when the representation refers to the law regulation or to making the committement with the values exceeding 10% of the initial capital of the company. In case of the declarations of will which do not refer to the above stated value, each of the members of the company's board is personally entitled to represent the company. In case of the one-person Board the President of the Board represents himself the board.
11.	The members of the board	Wojciech Zieliński – the President of the Board Mirosław Sopek – the Vice President of the Board
12.	NIP	725-00-15-526
13.	Regon	471343117
14.	Teleadress data	phone. (42) 683 74 60, fax. (42) 683 74 99
15.	The Internet address	www.makolab.pl
16.	Address e-mail	info@makolab.pl; newconnect@makolab.pl

Source: Own preparation on the basis of the Status of MakoLab Joint Stock Market the information from the web page of the company MakoLab Joint Stock Market., www.makolab.pl, KRS-onliene, www.krs-online.com.pl/makolab -spolka-akcyjna-krs-275866.html.

MakoLab Joint Stock Market was set up on 22nd August 2007 (Authenticated Deed Rep. A Nr 2784/2007) as the result of the conversion from MakoLab M. and K. Sopek General Partnership into MacoLab Joint Stock Market. The company was registered by virtue of the Decision of the Regional Court for the city of Łódź- the center, XX Civil Department of the National Court Register from 1st October 2007.

In the law sense, the company does not possess the separated divisions and institutes. However, organizationally the activities are conducted in a few places:

- the head office of the Company in Łódź, 46 Demokratyczna Street, where the Board is situated, the office of the Company, the accountancy and the division of the internet services (the Data Center) and the departments which realize the systems of management,
- in Łódź, 270 Piotrkowska Street (from February 2008), where the trade department and the departments which realize the services connected with services and www portals,
- Trade Office in Warsaw, 4 Trębacka Street (from May 2008, the building of the Polish Chamber of Commerce).

The activities of MakoLab concentrate on four major areas. The first one is the creation and implementation of web solutions made on order which consists of the creation of the so called web services, portals and web pages and the complex visual projects. MakoLab is also the author of the system of management created for web technologies. There can be included: the system of management of sales processes

for the organizations with dispersed and diversified structure- Fractus, the family of systems supporting processes of establishment and management of estates- ColDis and the system of the management of the higer educational institutions- eSchola. The company offers also the solutions of Business Intelligence using Basic Objects Software and also sells and implements the systems for the management of the company COMARCH.

Apart from the creation and implementation, MakoLab maintains and manages the internet resources of the clients, which embrace hosting and management of www portals, the e-mail boxes, e-learning platforms, the services of technical support and collocation of the servers. For these reasons the company uses its own Data Center which fulfills all the required conditions of safety. Apart from the software activities, implementation and service activities, MakoLab sells specialist research software and it deals with the distribution of the telecommunication equipment and the network equipment of the company Patton from the USA.

The company operates on the international market offering their products for example for such clients as Renault-Nissan concern, RCI Banque Sogesma, Philips Lighting Poland, Apsys Polska, the companies of the group Cefik (Simon/Ivanhoe), YARAEL Polska (CEGEDIM group), ArtStore, Point S Polska Sp. z o.o. and many others.

6.1.2 The history and the development of the company

The company came into existence in 1989, when, named MakoTypesetting it stared to operate offering poligfrafic services (DTP). In 1993, already as MakoLab the company started the trade activities in the sphere of scientific software and slightly later also in the field of different software.

The first head office of MakoLab was a small local in the founder's and owner's house in Praska Street in Łódź. In 1993 MakoLab moved its head office to the city center, 102A Piotrkowska Street in Łódź. However, the local conditions which were not the best in Piotrkowska Steet at that time made the company move its head office , in 1997 to the old "factory" in 80 Gdańska Street. In the year 2005 after 16 years of operation in rented locals, MakoLab moved its head to their own, specious building in Demokratyczna Steeet.

In 1995 MakoLab started its software activities. The advanced research programmes are created which find very serious receivers such as HyperCube- (Canada/USA) or Fujitstu Kyushu System Engineering (Japan). In 1996 the company started to deliver services in the creation of web pages. In 1997 MakoLab started its own ISP and became and important supplier of Internet, first of all for the companies in the region of Łódź.

In 1998 the company starts the cooperation with Philips, for which it has created a modern web page. Slightly later the first business systems for Philips are created, including the base of trade contacts, which in fact is a CRM system, exploited until now the system for management of international projects TWS, the loyalty programs and many others. In 2001 MakoLab starts its cooperation with the company Renault. In the beginning phase there were realized the activities connected with the Internet

and Extranet of the Renault company in Poland. In 2002 MakoLab launched the new web page of the company Renault Poland, implementing the system RenaultSITe realized in the technology J2EE. In 2004 MakoLab launched the web pages of Renault Austria and Switzerland. In the year 2005 already six countries of Europe possed the web pages launched and maintained in DataCenter of MakoLab company. The company "Dacia" which is the main shareholder of Renault possess more then 20 national windows prepared and maintained by MakoLab.

In the year 2002 MakoLab signs a distribution agreement for the advanced technology with the telecommunication company Patton Electronics from the USA and starts the distribution of the devices of this company in Poland. In the very same year the trade office includes in their offer computer and different IT equipment.

In the year 2003 MakoLab starts its cooperation with the company Point-S, the Polish tyre company, which is a share holder of Point-S International- the international cooperation offering the so called quick car service. For the company Point-S MakoLab implemented a dispersed business system of ERP class MegaSale/MegaManage. In 2005 MakoLab signs a partnership agreement with the company COMARCH. The second event of that year is the creation of ColDis system, supporting the management of big commercial centers.

In 2007 MakoLab underwent a change and became a Joint Stock Market company and in December that year it debiutated on the market NewConnect of Warsaw Stock Exchange. In 2008 one can observe further development of the company, further foreign contracts are signed. From that year the company possesses 2 new trade offices: in Łódź and in Warsaw. Apart from the permanent development of the products offered, the company keeps on expanding its sales and marketing structures.

Currently the staff of MakoLab consists of 70 people- the majority of them are the young graduates of the universities of Łódź. The programmers constitute the most numerous group. The team also consists of: the managers of the projects, consultants, computer graphic designers and certified administrators of the computer networks. The company also employs the sales representatives in the trade offices in Łódź and Warsaw.

MakoLab is the winner of the title "The Leader of the Modern Technolgies 2007" and the laureate of the plebiscite "Solid Company 2007". What is more, the web page which was made by MakoLab for the Jewish Łódź Cementary was given an award of "Golden Page Title" of Wprost Magazine. Apart from the commercial activities, MakoLab is engaged in the social activities and it supports non profit organizations e.g. the Foundation Monumentum Iudaicum Lodense, Łódź Caritas, the Łódź Filharmany, the Musical Theater of Łódź and the Order of Benedictines.

6.1.3 The products technologically advanced

To the key informatics products of the company one can include:

- **Fractus system** designed to manage the sales and logistics in multi departments, geographically disperced companies,

- **ColDis System** (Collect and Distribute) - a solution which supports the management of big commercial centers,
- **E-schola-** the system to mange the course of studies, the didactical process and the personnel data of the students in higher education institutions.

Fractus is a modern, entirely Web-based dispersed system of ERP which serves to manage the process of the management of sales including the management of departments and to conduct the analysis of the turnover, supplies, settlements, reckonings and stock supplies. This solution gives the possibility of the integration of the company's sales with the external internet sales.

In Fractus system every department of the company, regardless of its localization with reference to the head office has its own SQL data base. The integration of the system is ensured by the unique and author's system of communication invented by MakoLab. It is based on the transfer of encoded XML files by means of the protocol http (or https). This system ensures the immediate transfer of every document which was prepared in any department, every change of the files of the client or the freight, the information about the leveles of good in all the stocks, the information of the account of the documents and many others.

Thanks to such an approach, every department or a Point of Sales disposes of all the data of a client introduced in another department. The client which was registered once is found, within the delay of communication, in all their data bases. In the moments when for the net reasons, telecommunication reasons or others the link does not work XML files are stored until its reactivation. It means that in practice every department can continue their work even a few days after the break down of the link.

The system documented every stage of sales and the documents which are generated are stored in the central files or in the respositories of the documents, which are automatically multiplied in the departments. The system has a completely web character, it allows for the permanent monitoring of economic information downloaded from the web and analyzing them taking into consideration the results of sales, the size of orders and the level of stock supplies. This function allows to act immediately e.g. during the change of the currencies rates and the adjustment to the market changes, to manage the processes in the company also when the person who manages the processes is abroad.

Coldis is a family of the advanced web system modules which support the processes of creation and management of real estates. The aim of this system is to take over the management of the estates and the automatization of the most difficult tasks connected with the conducting of the business:

- the managing processes- embracing the collection of costs and their distribution for the owners of estates and the settlings of tenants, the registration and the preparation of documents, the registration and handling of the payments and the realization of the budgets of the estates managed,
- the developers processes- it embraces the budgets of the investments together with the calculation and the control of the budgets, the registration of the administrative and project documents and the management of the system sales of the locals at every stage of the investment.

The system is based on the web solutions, which means that it is available for all the entitled people from every place all day long- on condition that they have access to the computer. The cohesion of the data introduced is ensured by the usage of the relational technology of the data base for all the parts. Thanks to this kind of solution, the system updates all the data of all the users all the time. The system is a multi language system, which enables its efficient work in international companies, and it cooperates with any software of finance-accounting type, which allows for compatibility and flexibility of usage.

The software **e-Schola** is an advanced, complex system to manage the course of studies, the didactic process and the personal data of a student in a higher education institution. The system can be accessible in the local institution net or by the internet. It consists of three basic panels: University, Student, Teacher. In the University panel the user has the following modules available:

- the Deans' Office, which manages all the data and documents connected with a student and their stay in the institution,
- the Didactics, which manages the plans of studies, creates the weekly plans of activities, groups of students and it analyses the usage of rooms and the workload of the academic teachers,
- the safe which ensures the correct management of the expenditures of the institution and the generating of the complete documentation connected with money flow and all the financial operations,
- the office of the institution, which gathers the data connected with the academic staff,
- pensum-the module calculates monthly salaries for the academic staff and it gives the possibility to calculate the workload for single academic teachers and programs,
- the statistics- the module which enables the analysis of the data collected in the system according to the different criteria.

The panel Student it is an informative part of the system designed for students. It includes their personnel information about the schedule, passed exams, payments, scholarships and other necessary information. The Panel Academic Staff is the part which allows to create and edit the profile of the academic staff. It allows also to retrieve the set of statistics based on the portfolio created.

6.2. The characteristic of the enterprises LTC Ltd.[150]

6.2.1 The basic data and the subject of activity

The company LTC Ltd operates in the informatics branch and specializes in the field of technologically advanced programs and computer services. The owners of the company are Ryszard Sztoch and Przemysław Stoch who is also the President of the

[150] The characteristic of the company was presented on the basis of the matarials from the web page of the LTC Ltd., www.finn.pl and the study about LTC Ltd and about the FINN systems, www.finn.pl/xml/kontatakt/ltc.

Board. The head office of the company and the accounting department are in Wieluń. The informatics laboratory, the sales department and the services department are located in Łódź. The basic data characterising the company LTC is shown in Table 12.

Table 12. The basic data of LTC Ltd.

Lp.	Specification	Information
1.	The whole name of the company	„LTC" Public Limited Company
2.	Shortened name	„LTC" Ltd.
3.	The date of the beginning of the activities	1990
4.	The adress of the head office	2 Narutowicza Street, 98-300 Wieluń
5.	The departments	1. the department in Łódź – informatics laboratory: 93-569 Łódź, 2T Wołowa Street. 2. the department in Częstochowa – accountancy office: 42-200 Częstochowa, 112 Jadwigi Street.
6.	The organ of registration	Regional Court for Łódź – Śródmieście in Łódź, XX Economy division. National Court Register
7.	Data of registration in KRS	27th February 2007
8.	KRS nr	0000196558
9.	Initial capital	5.000.000,00 zł
10.	The type of the representation of the company	The representing organ- the board. In case of the appointment of the board which consists of many people to declare and sign in the name of the company the declarations with committement and financial characters each of the members of the board is entitled individually.
11.	The members of the board	Przemysław Sztoch – the President of the Board
12.	NIP	827-000-78-03
13.	Regon	005267185
14.	Teleadress data	phone: (43) 843 24 41, fax: (43) 843 24 41
15.	The Internet address	www.finn.pl
16.	Adress e-mail	sekretariat@finn.pl

Source: The own preparation on the basis of LTC Sp. z o.o. and FINN systems, www.finn.pl/xml/kontakt/ltc, the web page LTC Sp. z o.o., www.finn.pl, KRS-online, www.krs-online.com.pl/ltc-spolka-z-ograniczona-krs-187540.html.

The basic activities of the company consist of the production of software and the creation of dedicated informatics system on the basis of technologically advanced solutions of informatics. Furthermore the company offers the following services: informatics, accounting, consulting, training and implementation. The range of the company's offer embraces:

- the delivery of the licensed software and informatics pieces of advice,
- the creation of advanced users' software on the clients' order and the implementation of the informatics systems,
- the trainings on the software offered and the work in the computer networks,
- the installation of the computer equipment and the computer networks,

- hosting services for internet services including the Bulletin of Public Information (BIP),
- the services of e-mails, service and hosting DNS,
- the advising in the range of investing projects co financed by the UE and in the range of IT,
- the accounting services. In the accounting team there are people who have the certified qualifications to conduct the books and the qualifications in the field of tax advising.

The company aims its offer first of all at offices and public institutions. Among the clients of LTC Ltd there are also accounting offices, accounting chancelleries, companies of tax advising, consulting rooms and the medical units (clinics and hospitals).

The company has been cooperating for many years with the doctors' governments. A few years ago they created the Central Register of Doctors which is used by the Polish Chamber of Physicians and Dentists and all the regional Chambers of Physicians and Dentists in Poland. The company LTC administrates also the NIL portal with is simultaneously the BIP service of the chambers of physicians and dentists, the information portal and the electronic form of Doctors Magazine and the electronic bulletins issued by the regional chambers of the physicians and dentists.

6.2.2 The history and the development of the company

The founder of the company LTC Ltd is Ryszard Sztoch and its beginnings date back until 1990. Already in the first year of operation the first sale of their own programmes took place among others of the system of stock-material management and cement plant. In 1991 there was a premiere of the module system FINN 3. The following versions of the software followed the dynamic development of the computer equipment and the operational and network services and were in accordance with the new tax system created after 1990 and they were anticipating the needs of the Polish businessmen and the divisions of the foreign companies which were created at that time.

Nowadays in the distribution there are versions of the program FINN.5 and FINN.6 working in the operational systems DOS and also operating on the basis of the relational data base SQL versions FINN.7 and FINN.8, working in the graphic operational systems of Windows or in the technology "poor-client" by means of the internet browser. From 1998 the company extended its activity for the public sector and professional board in medicine.

The organizational structure is based on the four departments which are dependent on the board. It consists of:

- the department of accounting,
- the department of sales and services,
- the informatics laboratory,
- the department of the quality control.

LTC possesses a structure of employment which allows for the conducting of simultaneous work of implementation-training and installation types in many places in Poland. It is able to deliver service in its branches and it is able to send emergency help to the places where it is needed. The staff of the company consists of about 20 people who all have a work contract. They are supported by a group of the producers of software who work on the basis of civil-legal contracts. These contracts often refer to concrete tasks and have been concluded since 1991.

The staff of LTC is supplemented by the staff of different cooperating companies (partners) located in the different places than the branches of the company. These are among others the sales representatives and the distributors of software, and people who have a lot of experience with the implementation. These companies also realize as the subcontractors bigger orders of implementation-installation type.

The basic part of the team of the company are the experienced staff members with the age from 30 till 50 and the young graduates of the informatics department of different universities. The majority of the staff has a degree of the higher education with the degrees issued both by universities and technical universities. The diplomas of different institutions, the earlier experience in different companies and in independent posts make them an experienced and responsible team. The company in the short time is able to increase the number of the staff and include the experienced specialists knowing the advanced informatics systems.

The company specializes in offering complex informatics services. What is more it is experienced with Windows, Unix, DOS and Novell. The offer in the range of projecting and doing network installations is aimed at three companies and firms which use modern telecommunication techniques and first of all the Internet. In the sphere of the informatics products LTC prepared many standards of the cooperation of the programs with calculation sheets Microsoft Excel and OpenOffice. Among the most important market achievements of the company LTC Ltd one can enumerate:

- the implementation of the electronic system of the documents' circulation in more than 100 units of territorial governments in Poland,
- the implementation for he Polish Chamber of Physicians and Dentists, the Central Registration of Doctors which cooperates with 24 Regional Registrations of the Doctors of all the Regional Chambers of Physicians and Dentists,
- the development of the internet wholesale of the registrations of doctors reporting the resources for the Ministry of Health and the Central Statistical Office,
- the realization of the contract signed with the Government of the Republic of Poland to create the computer system CELAB in the framework of the project Phare 2003/004-379/04.01.01- "the enhancement of the veterinary administration". The localization of the project: Main Veterinary Inspector, National Veterinary Institute in Puławy, Zduńska Wola and Bydgoszcz and in 40 units of Establishments of Veterinary Higiene all over the country,
- the realization of the contract signed with the Government of the Republic of Poland to prepare and implement the computer software for the bank of tissues

in the framework of the project 2004/016-829.01.05 "The establishment of the institutional control of the safety and the quality of human tissues and cells used in transplantations- the development of the National Center of Banking of Tissues and Cells",

- the delivery in the framework of the agreement from 23rd April 2007 signed with the Voievodship of Silesia (within the consortium of the company LTC Ltd and Aram Ltd) the solutions to projecting and realizing the System of Electronic Communication of the Public Administration in the Voievodship of Silesia (SEKAP). The company LTC has delivered the informatics solutions to 54 partners of SEKAP and to the Silesian Center of the Information Society. [151]

The company also implements the informatics platform- e-office, the Bulletin of Public Information and the electronic system of the circulation of documents for the structures of the doctors' government and for the administration of districts, cities and communes all over the country.

6.2.3 The products technologically advanced

The main product of the company LTC is the informatics system FINN 8 SQL Office- the system of the circulation of the documents (SCD) for the units of the territorial governments (municipalities, districts, voivodships). This program is available in two versions: as a sophisticated application client/server (C/S) operating in the Windows system and as a version based on web solutions- operating by means of internet browsers. The web browser version is the product which is younger and more advanced. It is intensely developed and it fulfills all the requirements of the clients.

The package FINN 8 SQL Web Office is a system operating in tree-layers architecture (Inter/Intranet) functioning in the popular internet browsers (Internet Explorer, Firefox). It is an integrated package of programs designed for offices of different sizes. The company has prepared standard versions, easy to implement version for the regional governments, municipalities and starostes offices. Nevertheless, the advanced tools functions enable the adjustment of the software for the needs of the integrated administration in voivodships. Within the system FINN 8 SQL the following platforms of services can operate:

- the System of the Circulation of the Documents (SCD) with the control of the flow of the tasks (workflow),
- e-services public platform (ESPP). This platforms makes available to the clients (customers) a multi- function contact box. It assures a feedback communication of e-services from the office to the clients,
- e-forms,
- Electronic Hand-in Box. This solution is the basic technical component which enables the realization of public e-services- it realizes the electronic correspondence toward the office,

[151] On 14th March the protocole of the final closure of the project System of Electronic Communication of the Public Administration in the Voievodship of Silesia (SEKAP) was signed.

- The Office Certification of the Recit (OCR),
- The Bulletin of the Public Information,
- E-learning courses.

The system eliminates for example the significant costs connected with putting the data into the Bulletin of the Public Information because the update on the web pages happens automatically form the registers offices of the program.

The software fulfills the requirements which are actually valid and the planned acts and executive regulations which refer to public e-services. ESP enables the activities of the electronic hand-in office (operating in SOD), realizing the basic requirement defined in the regulation of the Prime Minister from 29th September 2005 on the conditions of the organizational and technical requirements for handing in the electronic documents to public companies (Dz. U. 205, Nr 200, pos. 1651). The contact box in ESPP fulfills the requirements of the Regulation of the Ministry of Interior and Administration from 27th November 2006 on making and delivering the documents in the electronic forms (DZ.U. 2006 Nr 227, pos. 1664).

The software FINN is based on the databases SQL and XML files. The system of the circulation of the documents is installed in the office and the internet e-office is published on the internal services, it enables safe and efficient functioning techniques to serve the replications of the data and the exchange of e-documents, ensures the authorization of the access to the data and verifies the electronic signature.

On the basis of the libraries FINN 8 SQL Web were realized among others three big company's projects:

- SEKAP- the integrated system of SCD for almost 60 users of the municipalities and districts offices and the Silesia Voievodship,
- The system CELAB for the service of all the units of veterinary hygiene in Poland as far as the orientation of veterinary examinations is concerned,
- The Bank of Tissues- the system supporting the work of the National Center of Banking of Tissues and Cells.

The implementation of the software of the LTC Company by the offices of public administration allows to fulfill the binding provisions, reduces the costs and speeds up the process of the informatization of the company. The solutions which are proposed increase the general cohesion and ensures the standards in the whole information system in offices in cooperation with the internet Bulletin of Public Information on the basis of the electronic circulation of the documents. They support also the initiatives to implement by the offices the quality systems according to the ISO 9000/9001 norms.

7. DEVELOPMENT PRIORITIES AND EXTERNAL BARRIERS IN RESEARCHED ENTERPRISES

7.1. Barriers to entry and development priorities of researched enterprises

The respondents' assesment of potential **barriers to entry** for SMEs planning to function in high-technology sector, IT area in particular, was the first stage of the research. The questionnaire suggested six types of obstacles that enterprises beginning to function in IT services can encounter and gave the possibility to add one's own remarks and answers. The respondents assessed suggested barriers to entry in the following scale: 0 (this factor should not be a problem for new enterprises in their opinion), 1 (vary low barrier) up to 5 (very serious obstacle). Managers of both enterprises pointed to high market competition and high costs of investment into equipment and software needed for starting the activity as high barriers to entry. The results of the opinions of each barier to entry for SMEs planning to develop in IT high-technology sector are presented in Figure 6.

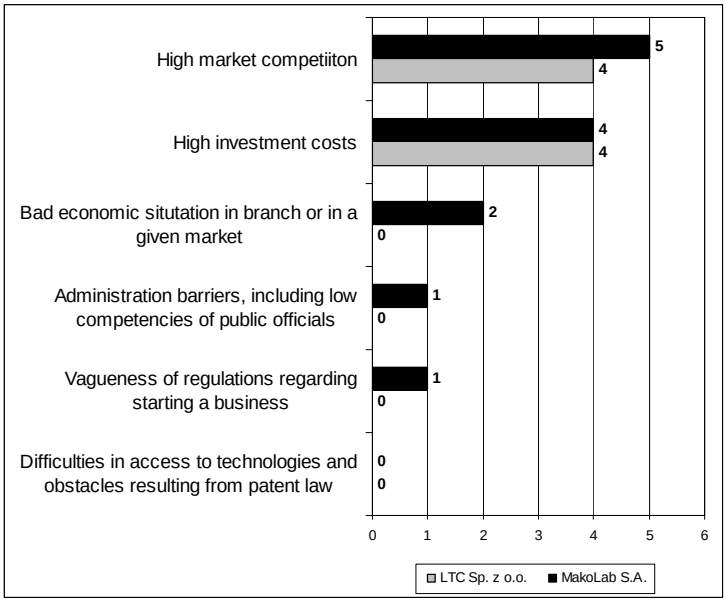

Figure 6. The respondents' opinions on barriers to entry for small enterprises planning to develop in IT high-technology sector.
Source: Own preparation on the basis of the research results .

Essential differences in the respondents' assessment[152] concern looping at the economic situation in IT area. The manager from MakoLab S.A. pointed to this barier as the low one while the respondent from LTC Sp. z o.o. pointed at lack of any type of danger in this area. It is probably caused by various segments of the market both enterprises function in. The MakoLab company directs its offer mainly to commercial entities market, in which fluctuations of economic situation are most noticeable, the results of probable recession are visible earlier and problems of payment blocks occur more often. On the other hand, LTC Sp. z o.o. operates in more stable, as far as market is concerned, public sector, which is, in turn, more dependent on political decisions and influences.

The rest of barriers were considered either as low or not important form the point of view of starting a business in IT high-technology sector. The manager from MakoLab S.A. paid attention to the fact that difficulties in access to technologies and obstacles resulting from patent law will appear later when the company is larger and more offensive as far as its market operations are concerned. The respondents did not point to other than suggested barriers for newly established companies.

The respondents assessed barriers to entry for high-technology SMEs functioning in IT area as **medium-level** ones (3,00 was the average answer for all barriers[153]). In this case, though, sustaining in turbulent and requiring implementation of continuous innovations in IT market is a challenge.

Identification of development priorities of the researched enterprises was the starting point for the assessment of barriers to development that currently exist. Although these assumptions are made by top management, the managers taking part in the research take part actively in realization of these plans, which enable to recognize actual problems and barriers on the way to realization of strategic golas. The respondents were asked to identify and assess development priorities of the researched companies on the basis of observations of the activity of the entities and their participation in management process. The assessed development directions in the scale: 0 (lack of such activity in the enterprise), 1 (very low meaning) up to 5 (very important direction).

Increase in market share measured by increased value of sales of products and services is the most important development aim of both enterprises. Figure 7 presents the respondents' assessment of development directions of the researched companies.

[152] At least 2-point scale differences in the managers' answers were considered as essential differences in the respondents' assessment.

[153] In order to present a complex assessment of barriers to entry, the average answer was given on the basis of the respondents' opinions which pointed to the existance of a certain barier (ans wers from 1 to 5).

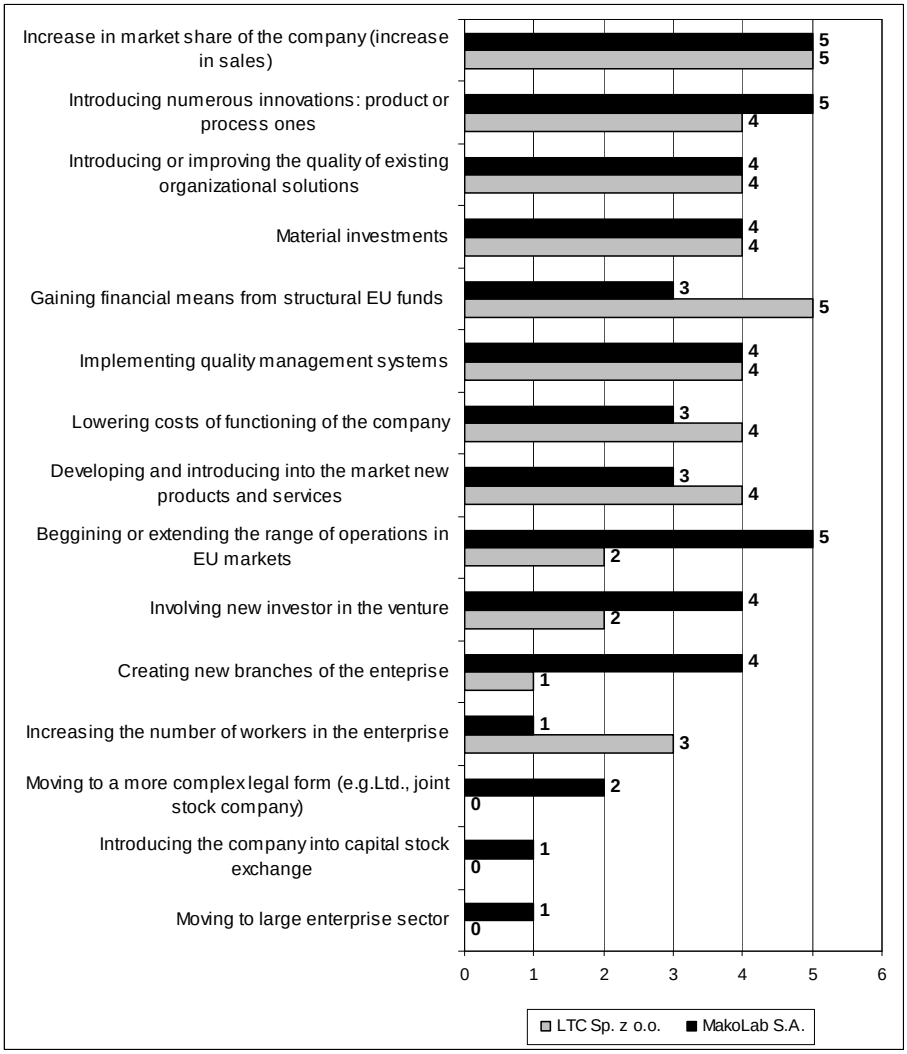

Figure 7. The respondents' opinions on development aims of the researched high-technology enterprises.
Source: Own preparation on the basis of the research results.

The respondent from MakoLab S.A. stated that introducing numerous product or process innovations is the necessary condition for enhancing competitiveness. Attention was also paid to the fact that varied organizational solutions e.g. project management (attempts are made at implementing Prince 2 methodology), advanced reporting system or settling up accounting for teams of workers are introduced and developed in the company. In the future, implementing quality management systems will be of great importance.

In LTC Sp. z o.o., good organization is identified with high quality of work and products and services resulting from it. As far as material investments are concerned, the LTC manager mentioned that new head office of the company is

being built in Pabianicka St. in Lodz. The development of quality systems in the enterprise is mostly done by applying internal procedures.

The most vital differences in the respondents' opinins concern these development directions:

- **Creating new branches of the enterprise**, particularly stressed by the respondent of the MakoLab company. The enterprise is now creating a partnership network whose aim is to support sales and development of intermediate sales. The LTC Co., on the other hand, intends to remain in the current place of running the business(in Lodz and Wieluń). A branch in Silesia is only being created and it is mainly caused by the necessity to serve clients from this region of the country.
- **Initiating or extending the range of activity in EU markets**. In this case, identifying differently by the researched enterprises target markets in geographical sense is the source of differences. The MakoLab company functions mostly in international market (it also expands into countries beyond European Union e.g. Turkey or Ukraine). The LTC company operates moslty in national market.
- **Moving to a more complex legal form**. In this case, LTC Sp. z o.o. does not intend to change its legal form and the transformation of MakoLab into a joint stock company was treated as a means of achieving other development aims.
- **Enhancing employment in the enterprise**, which is probably related to the number of workers employed in the researched companies currently. The manager from MakoLab S.A., employing greater number of workers, does not see enhancing employment as essential development direction. It can be stated that the company does not aim at enhancing the number of workers and its development is the consequence of other development actions rather than the aim itself. In the case of LTC Sp. z o.o., enhancing employment is a medium priority and the company puts emphasis frist of all to high workers' qualifications.
- **Involving new investors in the venture** is emphasized more by the MakoLab respondent. The enterprise attempts at gaining additional means for investments. Because of that, the company was introduced into capital Stock Exchange, although this operation was treated mostly as a means of gaining investors and because of that it has been assessed as development direction of very little importance.
- **Gaining financial means from EU structural funds**, which is particularly used by the LTC company. The manager of MakoLab paid attention to the fact that financing from EU funds was considered by the management, however, no decisions have been made in this area so far.

The respondents from the researched high-technology companies point to development priorities of their enterprises such as: increase in the company market share, introducing numerous product or process innovations, increasing the efficiency of organizational solutions, material investments or developing quality insurance systems. The achieved results proved the H1 hypothesis, according to which innnovation increase in the scope of products and organizational solutions is the basic development aim, although the respondents also emphasized greatly

achieving market results obtained from increasing the sales of products and services. The achieved results are similar to the results of other research conducted in the SME sector, according to which increase in market share as well as developing and introducing new products are the basic development directions[154]. However, high-technology enterprises encounter various types of barriers and limitations on the way to realization of these aims, which are identified and assessed in the next part of this research.

7.2. Identification and assessment of external barriers to development in the researched enterprises

The next part of the research provides identification and assessment of various types of barriers to development that occur in the researched enterprises. The respondents were asked to identify various barriers to development suggested in the questionnaire, systematized according to generic criterion, taking into account the direction of activity criterion. They assessed danger caused by each of the barriers in the following scale: 0 (no problem – a given factor is not considered as barrier to development), 1 (very low barrier) up to 5 (very high danger). The managers could also add their own remarks and answers.

Market barriers were the first group of barriers subjected to the analysis. From among the suggested barriers, the respondents regarded limitation of demand in the market they operate in as heavy obstacle. The manager from the MakoLab Co. stated that decline in purchasing power of enterprises is noticeable. On the one hand, the company clients claim they want to invest in advanced technological solutions, however, lack of financial means is often a problem. Therefore, they often ask for half measures or functionally restricted solutions. Both respondents considered diifficulties in finding outlets as medium-high barrier to development. The assessment of external barriers to development of the researched enterprises in the eyes of the managers are presented in Figure 8.

[154] The research was conducted in the year 2005 among owners and managers of 110 SMEs from the Lodz region, see.: Matejun M., Kierunki rozwoju firm sektora MSP w opinii przedsiębiorców z regionu łódzkiego, [in:] Lachiewicz S. (eds.), Zarządzanie rozwojem organizacji, tom II, Wydawnictwo Politechniki Łódzkiej, Łódź 2007, p. 19-29.

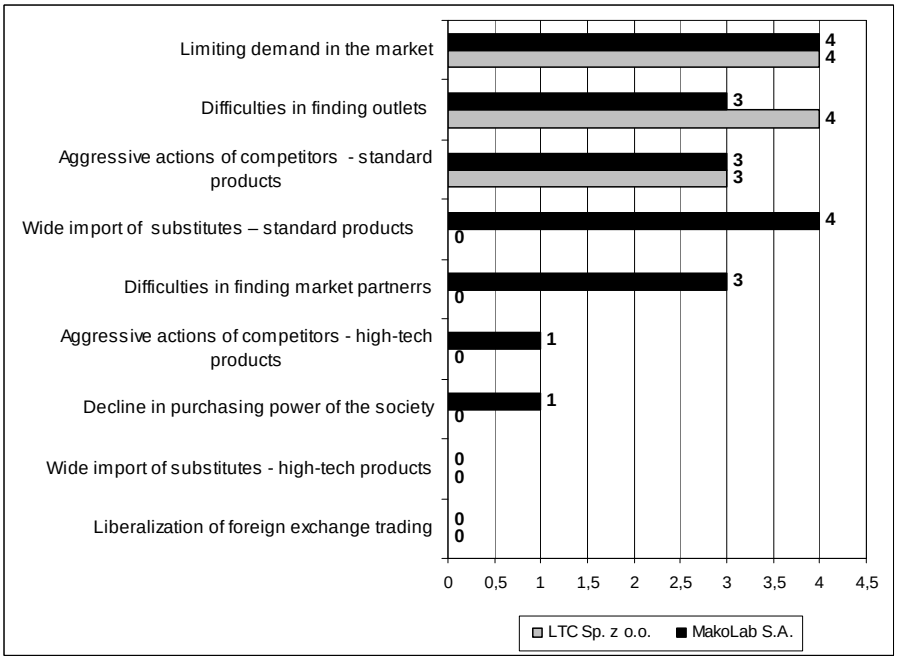

Figure 8. The managers' opinions on external market barriers of the researched high-technology companies
Source: Own preparation on the basis of the research results.

Analyzing the respondents' answers concerning competitors' actions and import of substitutes, differences of opinions were observed, depending on types of products. In relation to standard products (such as: Web page hosting, hoteling of servers, Web services), the managers notice some competition in the market as well as import of substitutes (which concerns MakoLab S.A.). These barriers are insignificant, though, as far as high-technology products are concerned. Both managers stated almost unanimously that, in fact, their products do not have market competition (in the form of imitation) and possibile similar solutions offered in the market are not a serious danger for them. Limited financial means of clients contribute mostly to restricting their implementation. The MakoLab respondent assessed barrier related to difficulties in finding market partners as medium one, it is currently eliminated by current extension of partnership network. A proper level of knowledge and qualifications of the partners which enables sales of high-tech products, can be a problem, though. The respondent also stated that liberalization of foreign exchange trading is not an obstacle for the company and, what is more, it can be treated as essential development factor, enabling to extend activity in international market.

Personnel barriers are the next group of external dangers subject to analysis. In this case, the respondents included high fluctuation of staff and low qualifications of potential workers in main barriers. The manager from the LTC company stated that it is sometimes the case that valuable workers leave, but the enterprise plans to raise salaries and increase flexibility of working time in order to retain them. The

respondent from MakoLab S.A. noticed that fluctuation of staff is particularly severe in case of workers dealing with high-tech products as completing the team with properly qualified people takes a lot of time and significant amounts of resources, including financial means. The assessment of external personnel barriers of the researched high-technology enterprises made by their managers is presented in Figure 9.

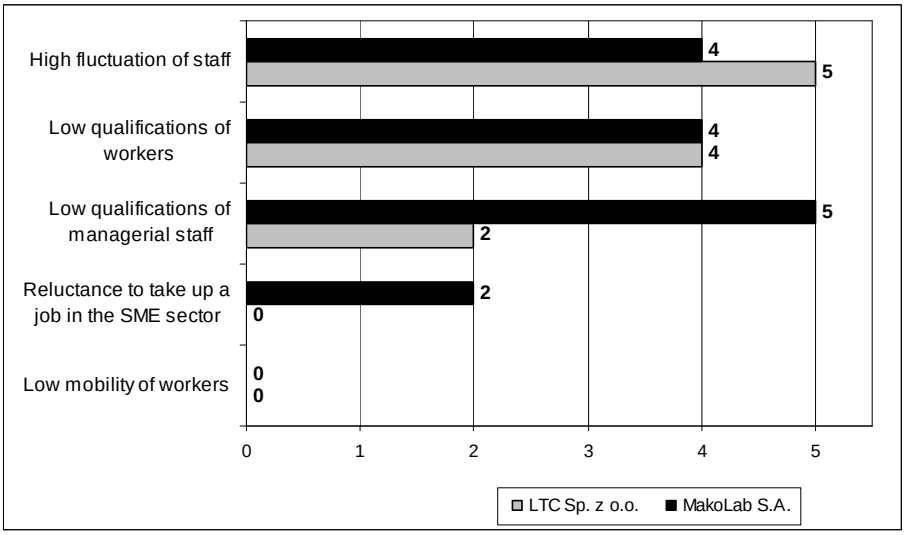

Figure 9. The managers' opinions on external personel barriers of the analyzed high-technology enterprises.
Source: Own preparation on the basis the research results.

The respondent from MakoLab S.A. indicated insufficient level of qualifications of potential workers. In the case of simple or standard products, this problem is rather insignificant but, in relation to high-tech solutions, workers' competencies are crucial. According to him, only 10% of job aplications meet the company demands and is taken into consideration in the process of candidates' selection. Low qualifications of potential managers have been also identified as a problem. In the opinion of the managers, low mobility of potential workers is not a barrier. According to the respondent of MakoLab S.A., programmers from various parts of Poland cooperate with the company and trainees from Germany, India or even Columbia are also admitted.

In the group of **social barriers**, the respondents included first of all negative consequences of emigration of valuable workers and specialists. The manager from MakoLab S.A. stated that salaries in the country are not that competitive yet as the ones offered by companies abroad. Moreover, he emphasized that factors such as low social prestige or negative perception of the enterpreneur should not concern the company in which he or she works as the enterprise is actually in Stock Exchange, it is known in the market and always tries to abide by market rules and operate in responsible and ethical way. Figure 10 presents the assessment of external social barriers of the researched high-technology enterprises made by the managers.

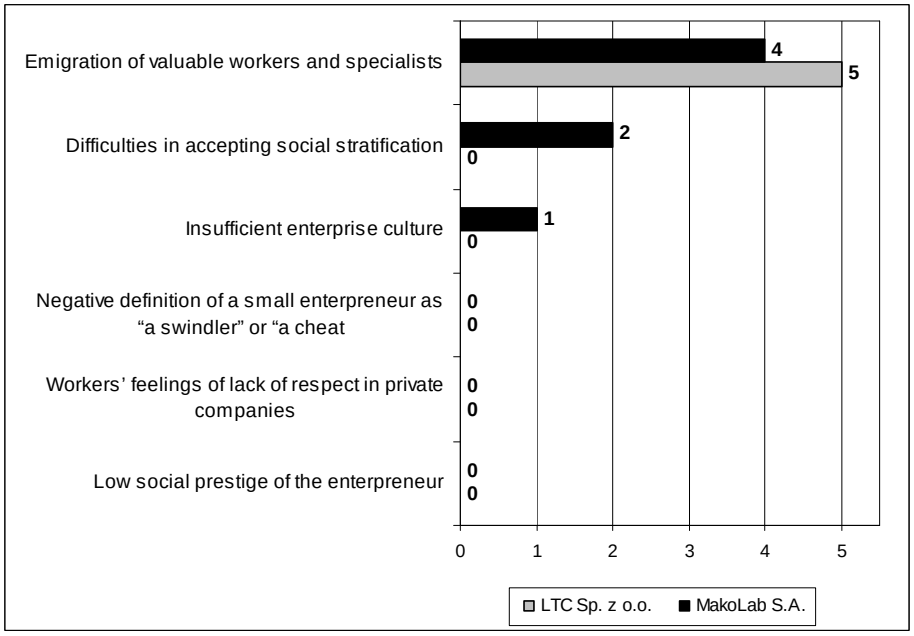

Figure 10. The managers' opinions on external social barriers of the researched high-technology enterprises.
Source: Own preparation on the basis of the research results.

Financial barriers are the next group of obstacles subject to assessment. Too long time to maturity was considered the most serious danger in this area. In case of other suggested barriers, great differences in opinions can be seen. The manager from MakoLab S.A. assessed individual dangers higher than the LTC company worker. It results mainly from various strategies used by the researched companies in the area of financing. The MakoLab company cooperates with financial institutions to a greater extent, taking advantage of the possibilities offered by capital market and bank credits. In this case, involving new investors to the venture is also an important aim. The respondent from this company stated that, in his opinion, gaining capital by means of Stock Exchange offer should be considered costly. When cooperating with financial institutions, it is also necessary to have high securities, e.g. ownership capital. The company additionally faces difficulty in qualifying for programs financing the development on the basis of European Union funds.

The LTC company takes advantage of the offer of commercial sector in the scope of financing much less, focusing on obtaining means for investments from EU funds. Being experienced in this kind of actions, they do not see any greater barriers in the use of financing from public sources. The assessment of financial barriers of the reserached high-technology enterprises made by the managers is presented in Figure 11.

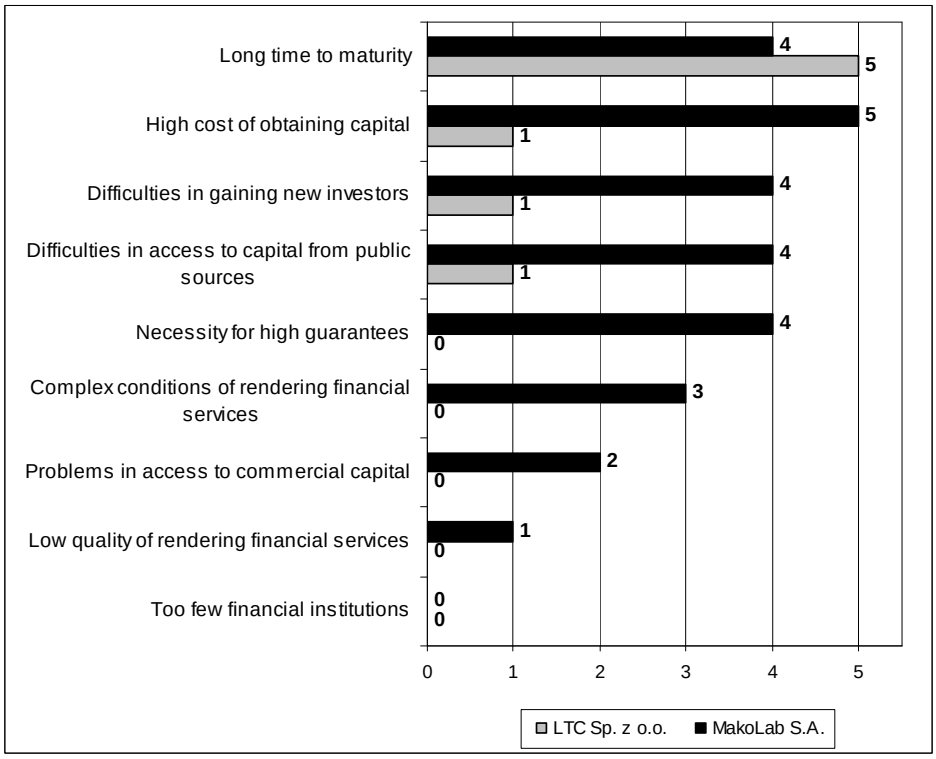

Figure 11. The managers' opinions on external financial barriers of the researched high-technology enterprises.

Source: Own preparation on the basis of the research results.

The next group of barriers subject to assessment are **political and economic** limitations. This group contained the highest number of low answers to each of the barriers. Among barriers, the respondents numbered only lack of clear position regarding fiscal policy, indifferent or negative attitude of local authorities towards business activity and some information shortages as far as solutions supporting SMEs are concerned. The rest of suggested answers was not identified by the managers as barriers to development of their enterprises. The assessment of political and economic barriers of the researched high-technology enterprises made by the managers is presented in Figure 12.

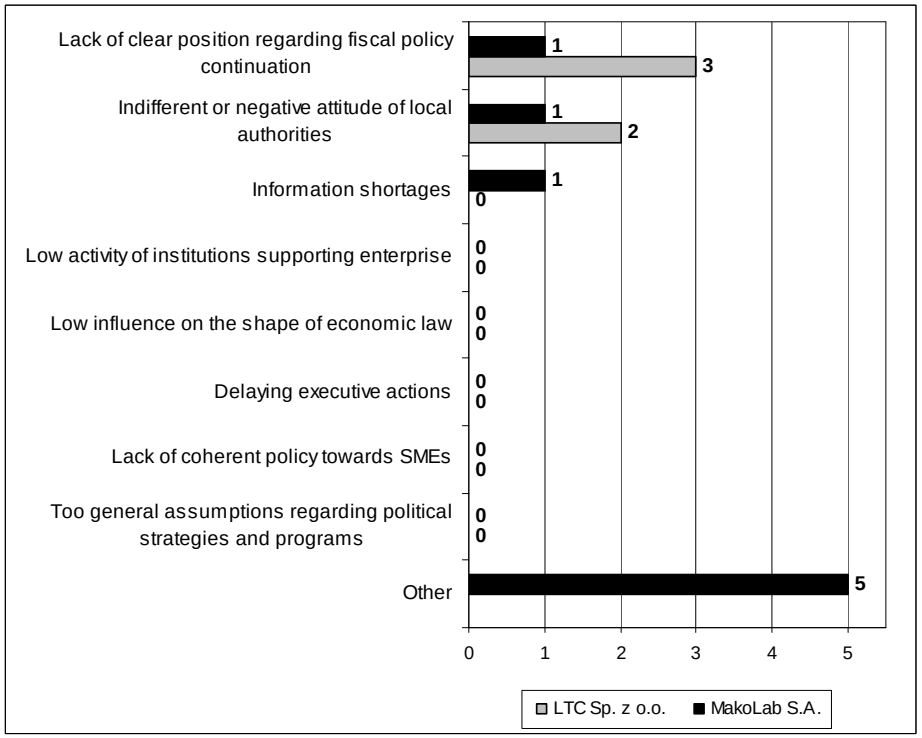

Figure 12 The managers' opinions on external political and economic barriers of the researched high-technology enterprises.
Source: Own preparation on the basis of the research results.

The respondent from MakoLab S.A. also paid attention to unfavourable (strong) zloty exchange rate. As the company functions in international market and derives significant income from export, this situation results in worsening of financial results. Fluctuations in this area is one type of risks identified by the researched enterprise, which could be levelled among the others by introducing Euro.

In the next part of the research, **legal barriers** are subject to assessment. According to the repondents, tax and social insurance liabilities are very high dangers in this area. Serious barriers also include inefficiency of administration of justice (particularly long duration of vindicatory actions), changeability of regulations and costs of adaptation to these changes. The managers' assessment of barriers related to interpreting regulations as well as working system and revenue office control systems is considerably different. The respondent from MakoLab S.A. assessed negative influence of these factors on the company development much lower. It results from the fact that the enterprise entered into partnership cooperation with accountancy office which is entitled to take care of settlements as well as tax and legal matters of the enterprise (outsourcing). After an appropriate partner has been chosen, diifficulties resulting from cooperation with revenue offices have lessened. The company also signed agreements regarding external service on a regular basis in the sphere of economic agreements and vindications. In the manager's opinion, partnership relations are conducive to limitation of barriers

related to these functional areas. The LTC representative additionally paid attention to complex and protracted building procedures related to building new head office of the company. The assessment of legal barriers of the researched enterprises made by the managers is presented in Figure 13.

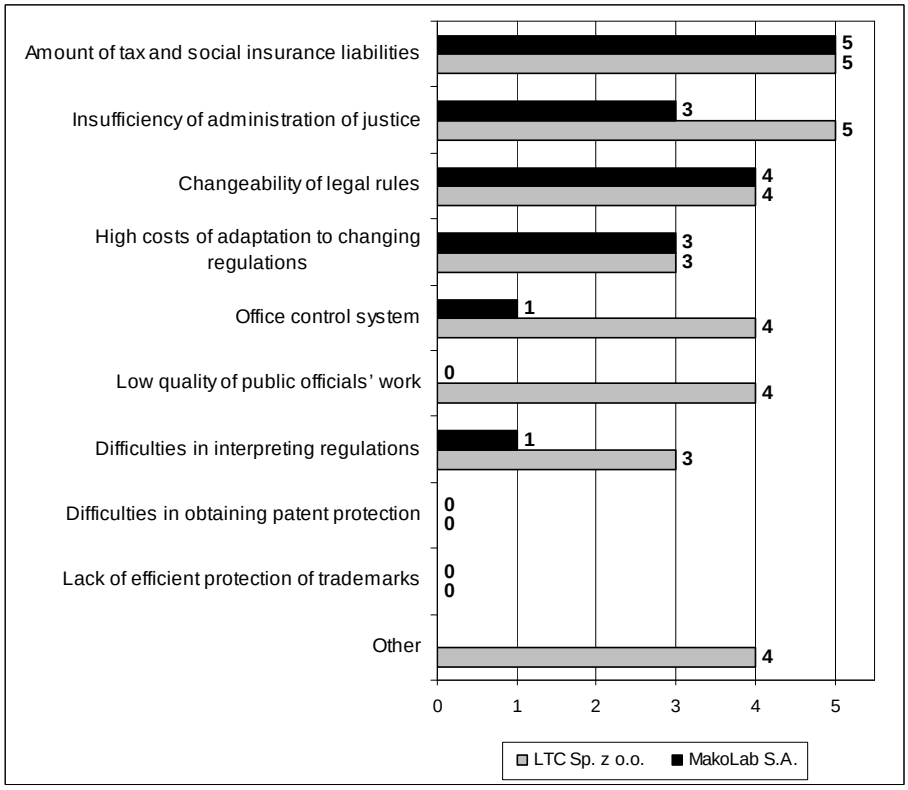

Figure 13. The managers' opinions on external legal barriers of the researched enterprises.

Source: Own preparation on the basis of the research results.

Both enterprises have protected trademarks. However, the managers do not see any problems resulting from lack of efficient protection of trademarks. The researched companies currently do not have any patents.

Crime-related barriers is the next group of barriers subject to analysis. In this case, the respondents assessed dishonesty of business contractors as high danger, meaning first of all delay in payment and also not performing agreements and economic promises or dishonest negotiations, when certain conditions are imposed but they are not realized in practice afterwards. The manager from MakoLab S.A. also considered the existance of grey economy in relation to standard products as high danger. He stated that e.g. Web page designing is well performed by students with whom no cooperation agreements are signed. However, in relation to high-tech products, (business systems offered) this barrier is basically not important. The assessment of barriers related to crime of the reserached enterprises made by the managers is presented in Figure 14.

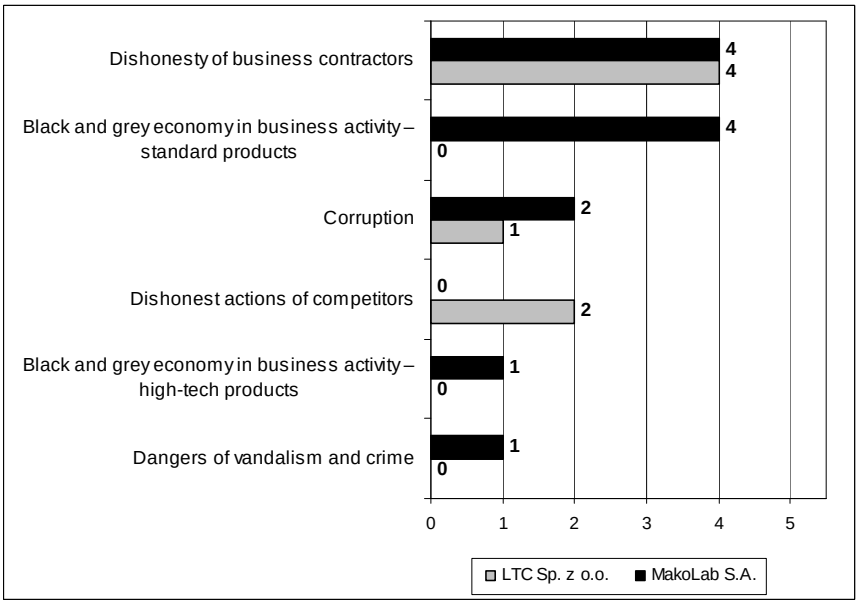

Figure 14. The managers' opinions on external legal barriers.
Source: Own preparation on the basis of the research results.

The remaining factors are of smaller importance according to the managers. The MakoLab representative mentioned that attemtps have been made twice at bribing their valuable workers. There hase been also a burglary in the company. Nothing was stolen but the enterprise incurred some expenses as a consequence of this incident. The company is currently under surveillance of external company providing protection services by means of monitoring and intervention patrols.

Essential differences in the respondents' answers can be seen in the group of **barriers related to access to public procurement market**. As in the case of financial barriers, it results from various types of strategies of both enterprises in this area. The LTC company bases mainly on contracts obtained from public orders. The manager of this company assesses higher the danger caused by the barriers than the respondent of MakoLab S.A., which does not take part in tenders so often. The MakoLab company cooperated within the range of public procurements e.g. with the Lodz Phillharmonic, Musical Theatre, Institute of Occupational Medicine or Dialogue of Four Cultures Festival, most of the company procurements come from business contractors, though.

The manager of the LTC company assessed barriers related to public procurement market as medium ones (the average answer was 3,00 in this case). He stated, moreover, that in the case of the LTC company, difficulties in access to public procurement market may prove positive as the company, experienced in tender procedures, stands greater chances of achieving success than inexperienced competitors. The assessment of barriers related to public procurement market for the researched enterprises made by the managers is presented in Figure15.

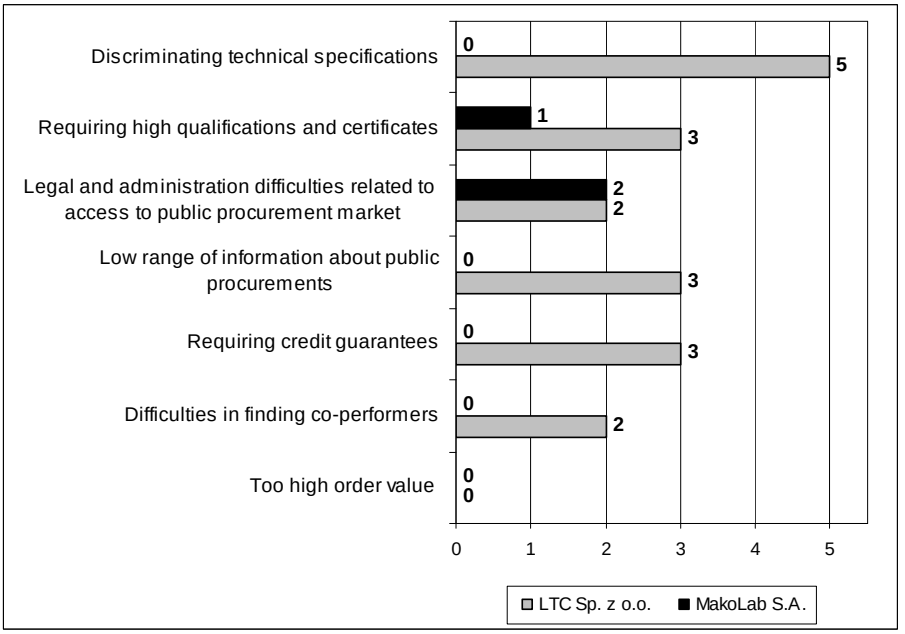

Figure 15. The managers' opinions on barriers related to access to public procurement market.
Source: Own preparation on the basis of the research results.

Technical and technological barriers are the next group of obstacles subject to analysis. Both enterprises regarded high costs of machinery, equipment and technological thought as medium obstacle. However, most of the remaining barriers were assessed as more serious by the respondent of MakoLab S.A. The LTC company representative stated that technical progress in the company and solutions from R&D area are being well developed inside the enterprise and very fast technical progress in the area is not only a low barier but can be also conducive to limitation of market competition, eliminating entities which do not follow market development.

The manager from MakoLab S.A. stated, on the other hand, that sustaining technological delay in some areas is a serious barier to development. Potential clients are not ready yet for implementation of IT solutions offered by the company as a result. High demands as far as technological safety is concerned, particularly in relation to data and personal information, were indicated as medium dangers. The assessment of technical and technological barriers of the reserached enterprises made by the managers is presented in Figure 16.

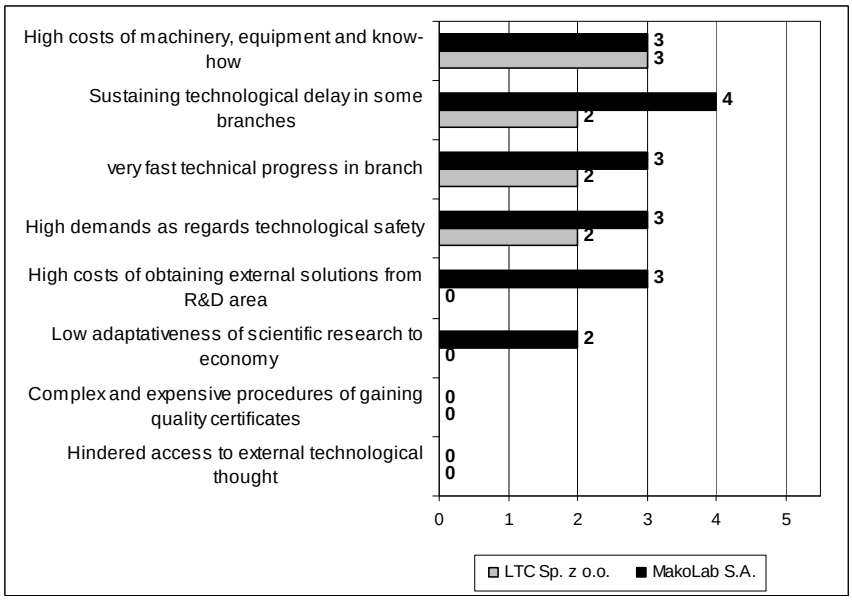

Figure 16. The managers' opinions on technical and technological barriers of the researched enterprises.

Source: Own preparation on the basis of the research results.

Within the group of **information and education bariers,** the respondent form MakoLab S.A. pointed at higher danger. The assessment of these barriers of the researched enterprises made by the managers is presented in Figure 17.

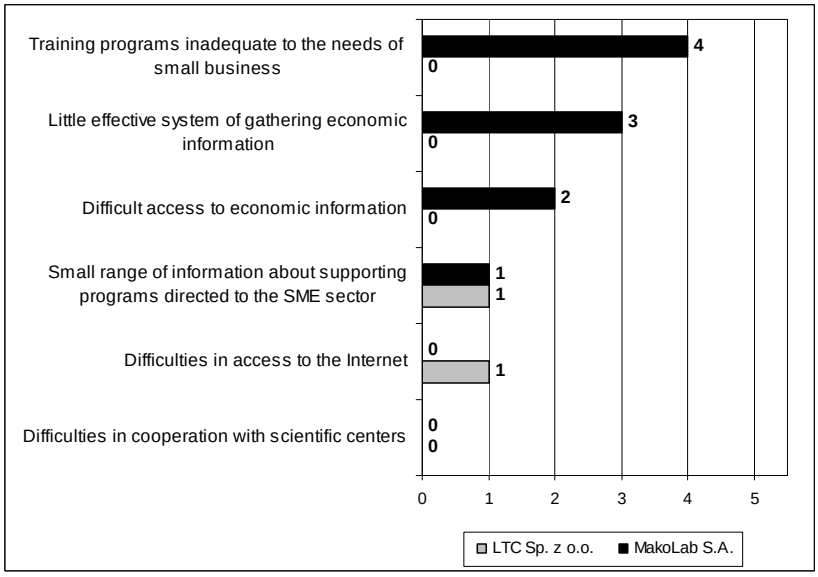

Figure 17. The managers' opinions on information and education barriers of the researched enterprises.

Source: Own preparation on the basis of the results of the research.

The respondent from MakoLab S.A. regarded training programs inadequate to the needs of business as high barier as it results in low qualifications of potential workers. According to him, little effective system of gathering economic information offering not very valuable information from the point of view of the company activity, is medium obstacle. The respondent emphasized that MakoLab S.A. cooperates with univeristies. In case of scientific institutions wanting to increase cooperation, the company is ready to extend the sope of cooperation.

The LTC Sp. z o.o. representative pointed only to very low problems resulting from small range of information about supporting programs directed to the SME sector and difficulties in access of the company clients to the Internet. In his opinion, very valuable for the company information concerning public tenders is widely accessible.

In the group of **barriers related to infrastructure,** the respondents regarded lack of highways as well as bad road conditions as serious problems. Increasing costs of transport and shortages within other types of infrastructure are less significant barriers. The respondent from MakoLab S.A. considered faults within telecommunications infrastructure as siginificant factor of the company development as IT systems offered by the company are directed to enterprises that want to strenghten telecommunications solutions. The assessment of barriers related to infrastructure made by the managers is presented in Figure 18.

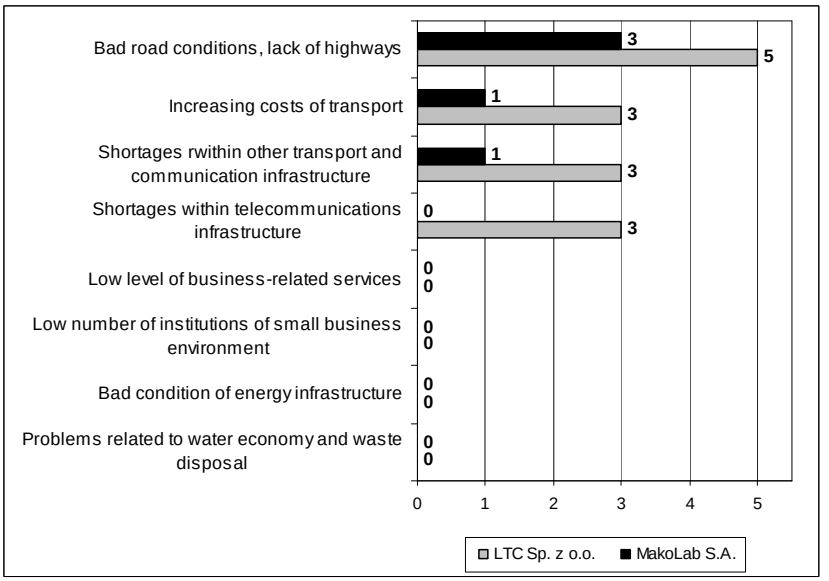

Figure 18. The managers' opinions on barriers related to infrastructure.
Source: Own preparation on the basis of the research results.

Barriers ensuing from natural environment are the next analyzed group of obstacles. In this case, only the respondent from the MakoLab company indicated changeable weather conditions as low danger for the company development. The enterprise deals with Internet hosting in data center and its servers can be exposed to probable lightnings. The assessment of barriers ensuing from natural environment made by the managers is presented in Figure 19.

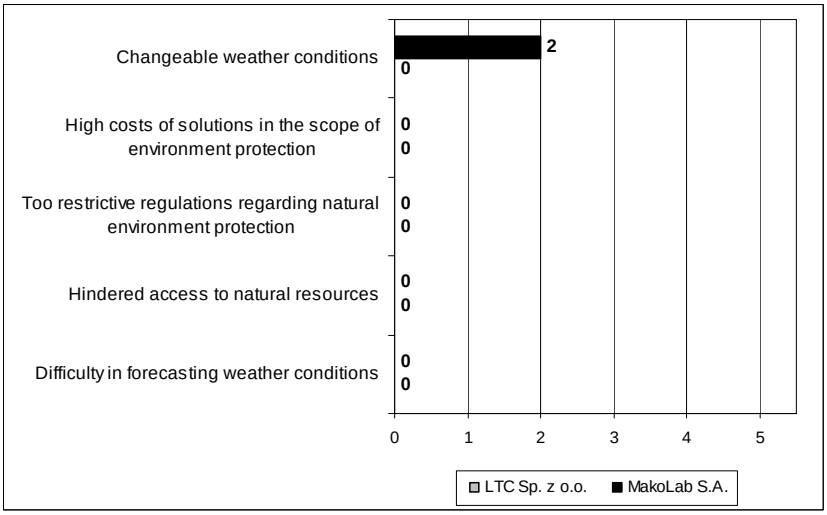

Figure 19. The managers' opinions on barriers resulting from natural environment.
Source: Own preparation on the basis of the research results.

International barriers are the last group of analyzed external barriers to development of the researched high-technology enterprises, also assessed very low by the respondents. In this case, only the manager from MakoLab S.A. pointed to the existence of cerain insignificant dangers, which are presented in Figure 20.

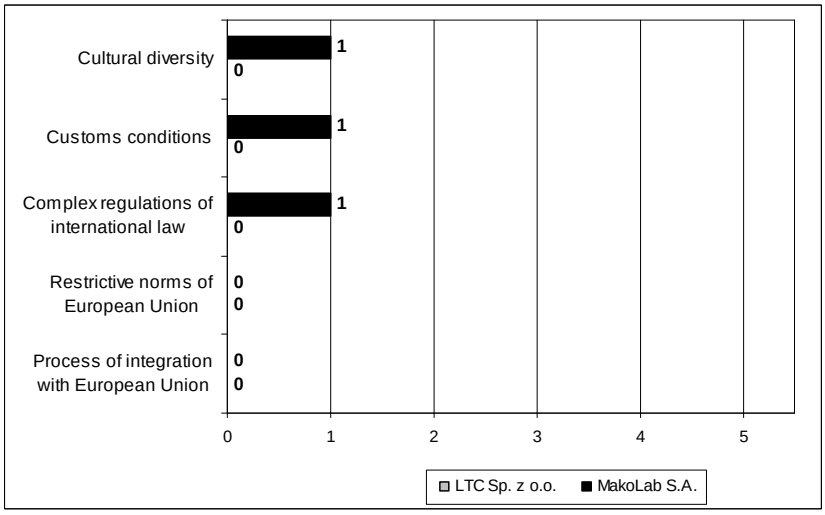

Figure 20. The managers' opinions on international barriers of the researched enterprises
Source: Own preparation on the basis of the research results.

The representative of MakoLab S.A. pointed at the existance of certain symptoms of cultural diversity in the course of cooperation with Turkish companies, stressing at the same time that the process of integration with European Union is a significant factor for the company development, similarly to liberalization of foreign trade exchange.

8. INTERNAL BARRIERS AND ACTIONS LIMITING NEGATIVE INFLUENCE OF DEVELOPMENT INHIBITORS

8.1. Identification and analysis of internal barriers to development of the researched enterprises

In the course of the interview, internal barriers to development of high-technology enterprises were also subject to identification and assessment. The respondents assessed danger caused by barriers suggested in the questionnaire in the following scale: 0 (no danger – a given factor is not treated as a barier to development), 1 (very low barrier) up to 5 (very high danger). Similarly to external obstacles, in the course of the interview the managers could add their own remarks and answers.

Management barriers are the first analyzed internal barriers to development of the researched enterprises. Two inhibitors were assessed as serious dangers to development of the entities. The rest of management barriers were assessed by the managers as low or were not identified as obstacles to development at all, which is presented in Figure 21.

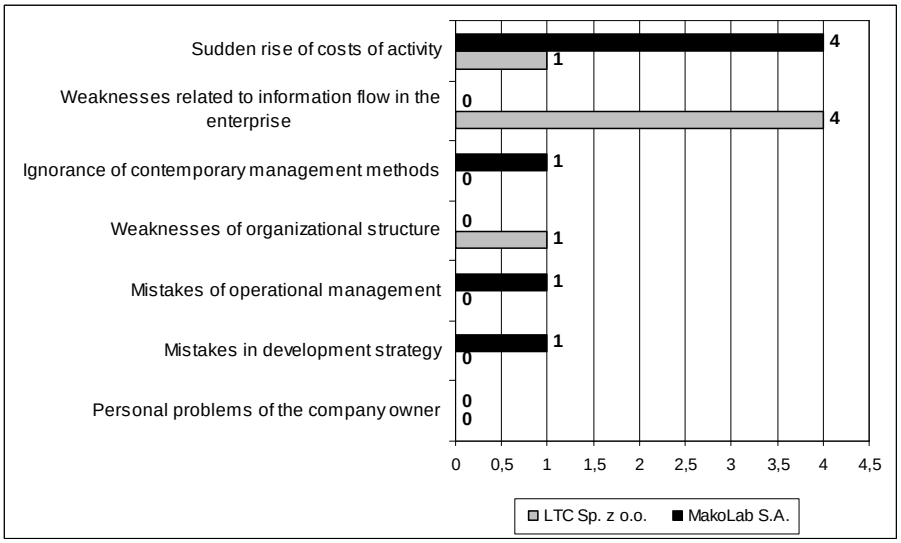

Figure 21. The managers' opinions on internal management barriers of the enterprises.
Source: Own preparation on the basis of the research results.

The manager from MakoLab S.A. pointed at sudden rise of costs of running the business. The LTC company representative emphasized the existance of some weaknesses related to information flow in the company. In his opinion, typical mistakes of the workers sometimes occur, which consist in lack of communication with other team members as regards performing or not performing of certain actions.

The next group of internal obstacles are **barriers resulting from competence, knowledge and qualification weaknesses** of the enterprise members. The managers assessed danger caused by these inhibitors as low or medium. The respondent from the LTC company stated that the enterprise does not employ professional managers and IT specialists play the role of managers, which sometimes causes difficulties in making decisions. In his opinion, it is difficult to define unequivocally qualifications of the workers as the company employs several very capable people, excellently prepared on the merits while the rest of the workers are motivated and encouraged for further professional development. However, the question of high staff fluctuation, identified previously, can ba a problem. The assessment of internal barriers ensuing from competence, knowledge and qualification weaknesses made by the managers is presented in Figure 22.

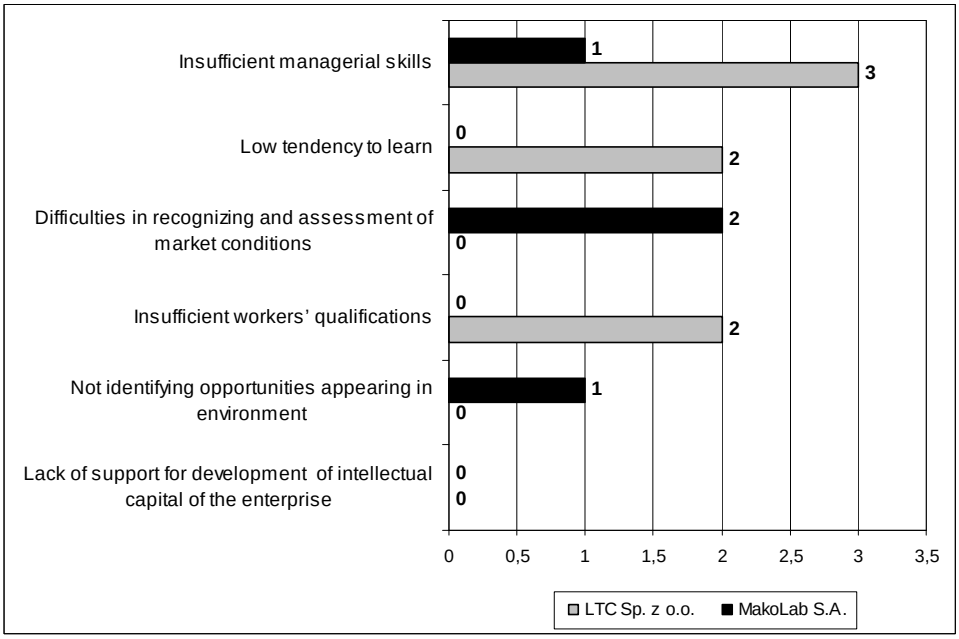

Figure 22. The managers' opinions on internal barriers resulting from competence, knowledge and qualification weaknesses.
Source: Own preparation on the basis of the research results.

Both managers stated that in their enterprises, programs supporting development of intellectual capital are developed. The workers are encouraged to take part in training, conferences and branch seminars, access to training materials, books and knowledge is enabled.

Within the group of **psychological barriers**, the respondents identified only two types of limitations: excessive optimism is a characteristic of both companies, the manager of the LTC company indicated additionally the existence of certain fears of taking risk, mainly by managerial staff. These barriers were regarded as low ones, medium in one case. The respondents additionally paid attention to very high motivation of the owners and top management for development of enterprises. The managers' opinions on the existence of psychological barriers is presented in Figure 23.

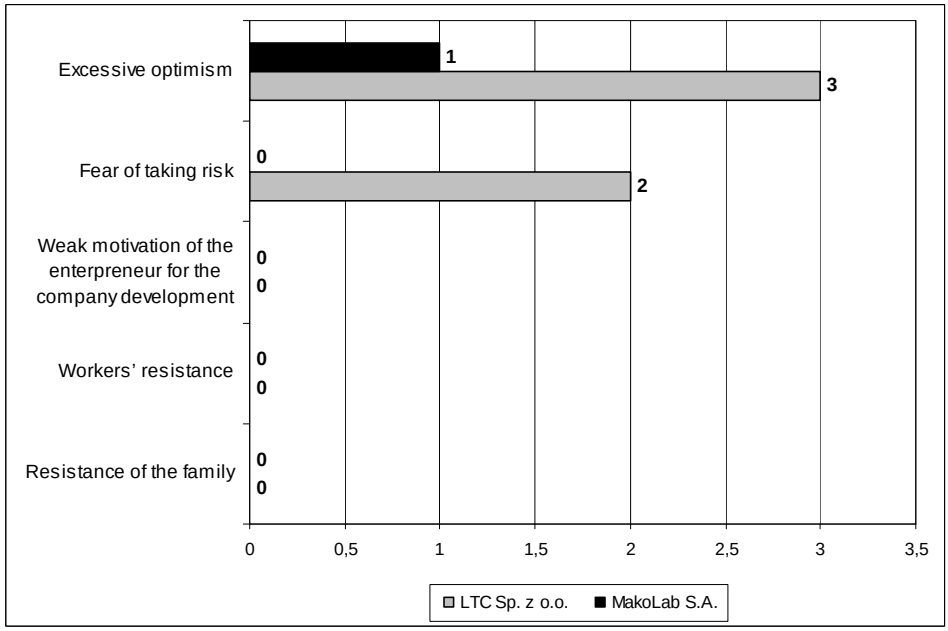

Figure 23. The managers' opinions on psychological barriers in the researched companies.
Source: Own preparation on the basis of the research results.

Production barriers are the next group of limitations subject to assessment, within which the respndents identified only one obstacle, i.e. insufficient production powers, which is presented in Figure 24.

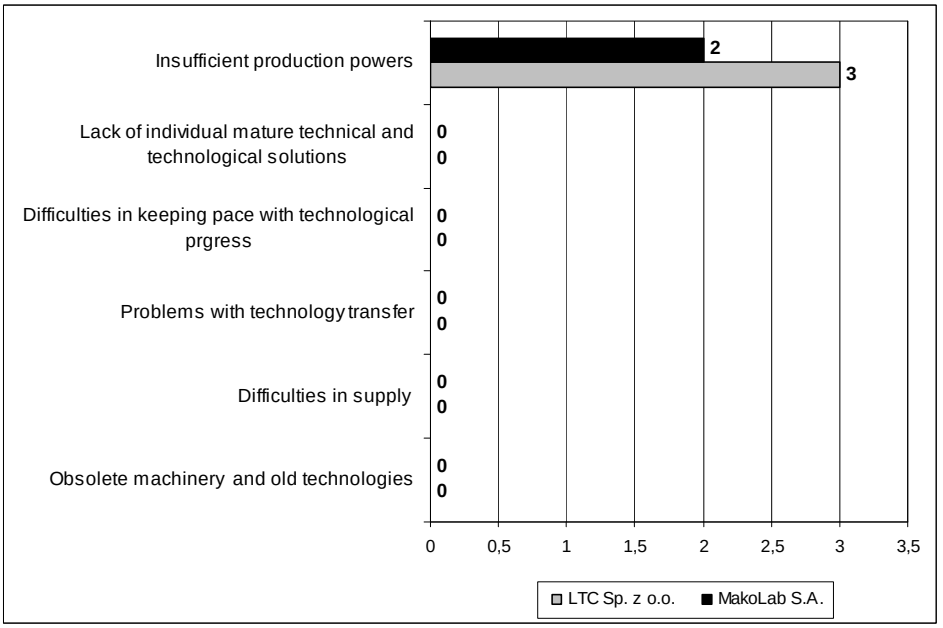

Figure 24. The managers' opinions on internal production barriers in the researched companies.

Source: Own preparation on the basis of the results of the research.

The manager from MakoLab S.A. stated that the occurrence of this type of barier is eliminated by recruitment of new workers (which, in turn, contributes to increase in employment in the company), engaging trainees or starting cooperation with subcontratcors. In his opinion, the company is highly innovative and its solutions arouse technical progress in the market.

The respondent identified insufficient office space in the enterprises as medium **barrier related to size of business**. In case of the MakoLab company, this problem has reapeted for many years. Despite removals and continuous enlargement of office space, it is still an obstacle. The LTC company is currently building its new head office and the barrier can be eliminated after moving the office. The assessment of barriers related to size of business made by managers is presented in Figure 25.

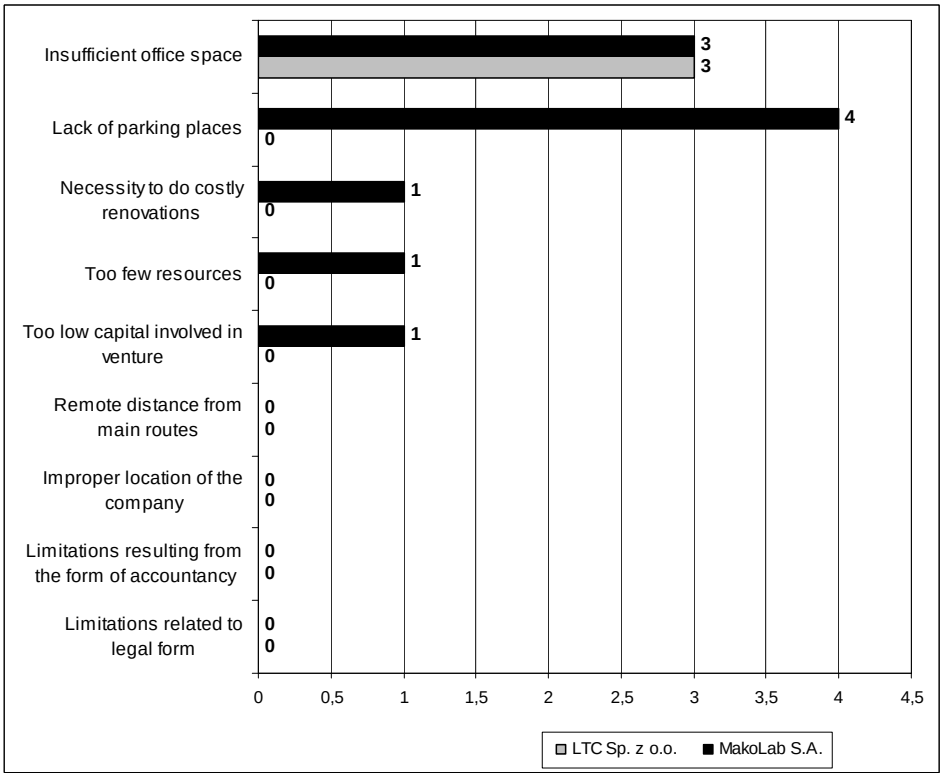

Figure 25. The managers' opinions on internal barriers related to size of business of the researched companies.
Source: Own preparation on the basis of the research results.

The manager from MakoLab S.A. pointed at the question of small number of parking places next to the enterprise office, assessing this issue as high danger to the company development. As a result, all parking places around the company are taken by the cars of workers, clients and guests, which disturbs the neighbours and nearby school. The company will soon try to solve this problem by adapting larger part of land for the car park. He also mentioned that obstacles resulting from too small initial capital, legal form or the form of accountancy occurred in previuos stages of the company development when the enterprise functioned as general partnership and kept Book of Income and Expenditure. In its present form of joint-stock company and as a result of introducing the company into capital market, their negative meaning for the company development disappeared.

In the last group of internal obstacles – **innovation barriers**, the respondents did not identify any negative development factors. Both managers pointed to positive actions, particularly those supporting intra-enterprise, e.g. certain time given to a worker for individual development and various creative initiatives (in MakoLab S.A.) as well as flexible working time and especially friendly atmosphere within team of workers (in LTCSp. z o.o..).

8.2. The synthesis of conducted research and the results of comparative studies

The research included verification of theoretical model of barriers to development of high-technology SMEs, according to generic criterion. The respondents identified a number of obstacles to development of the enterprises they work in, pointing to and assessing both external and internal barriers. The managers regarded danger caused by the existance of the barriers for the enterprise as medium, the average answer for all the factors inhibiting development was 2,63. The influence of **external barriers** on hindering the development processes is more negative in the respondents' opinions. In this case, the repondents identified over 50% of factors suggested in theoretical model as influencing the enterprises' development in a negative way, treated them as factors of medium significance (the arithmetic mean for externall barriers equalled 2,79). In case of internal barriers, fewer factors were identified as barriers endangering development processes and the danger caused by these factors was also assessed lower. It is presented in Figure 27.

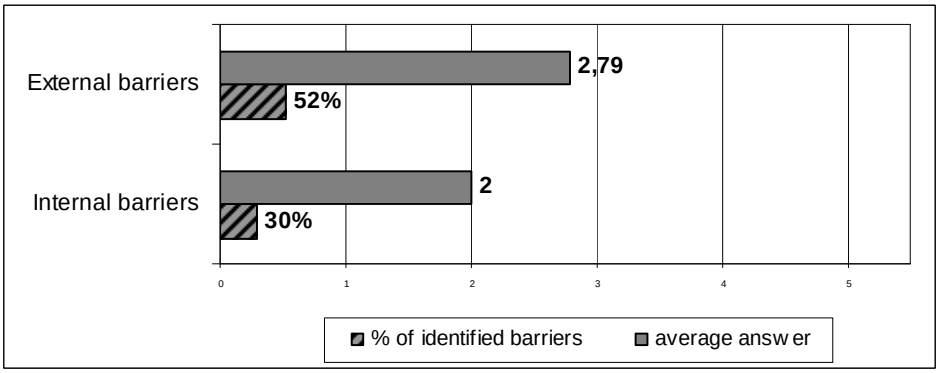

Figure 26. The respondents' identification and average assessment of danger caused by the barriers according to the direction of their occurance in the researched enterprises.
Source: Own preparation on the basis of the research results.

In the group of external barriers, the highest number of negative factors from the list suggested in the model were identified within legal and personnel barriers (in both cases over 70% of suggested answers were identified as development inhibitors). The dominant negative force impeding development processes derives from personnel barriers (the average respondents' answer was in this case 3,7) and legal barriers (the average answer was 3,5). It seems, therefore, that legal and personnel factors inhibit the achievement of development aims of the researched enterprises the most (according to the respondents, the danger is medium-high). Among other barriers influencing impeding the development of the researched high-technology companies in a medium way, the respondents indicated market, social and financial barriers. In this case, the scope of identification of negative factors in relation to the amount of suggested inhibitors was lower than in case of personnel and legal barriers, however, the force of negative influence was defined as medium. The comparison of the range of identifying barriers in relation to model assumptions and average indications to each group of

external barriers in the researched enterprises, according to the managers, are presented in Figure 27.

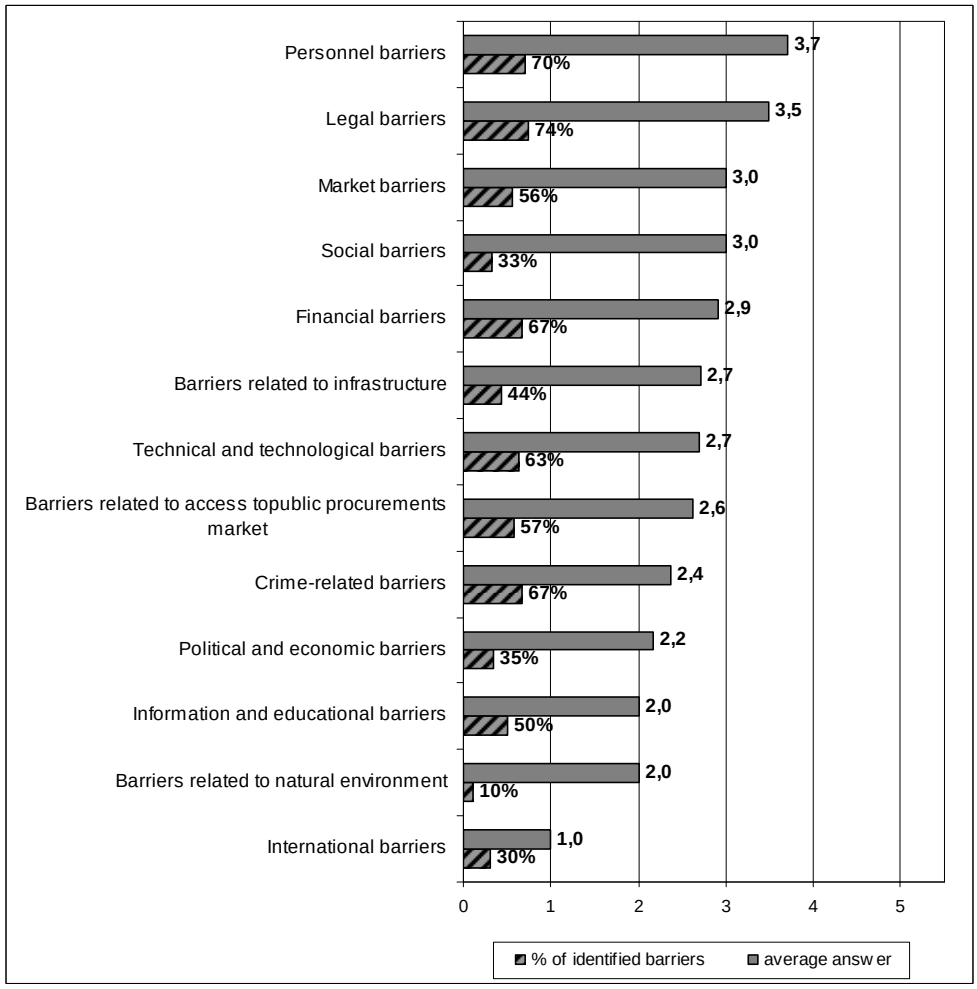

Figure 27. The comparison of the scope of identifying barriers in relation to model assumptions and average indications to each group of external barriers in the researched enterprises.
Source: Own preparation on the basis of the research results.

The achieved results prove the H2 hypothesis, according to which market, legal and financial obstacles are basic barriers to development of technology-based SMEs. In the researched companies personnel barriers are also more more and more important. The manager from the MakoLab company stresses their importance slightly more, which agrees with the second part of H2 hypothesis. It is also worth mentioning that the respondents assessed the influence of social barriers as medium, which is related to emigration processes that started at the time Poland joined European Union, they influence the functioning of enterprises, though.

In the group of external barriers, the respondents regarded the amount of tax and social insurance liabilities as the most serious danger, measured by the average assessment of influence (the average answer of both managers was 5 in this case). Long dates to maturity, emigration of valuable workers and specialists as well as high fluctuation of staff were considered the next most serious problems (the average answer was 4,5). The remaining barriers to development of the researched high-technology enterprises, assessed as high or very high by the managers, are presented in Figure 28.

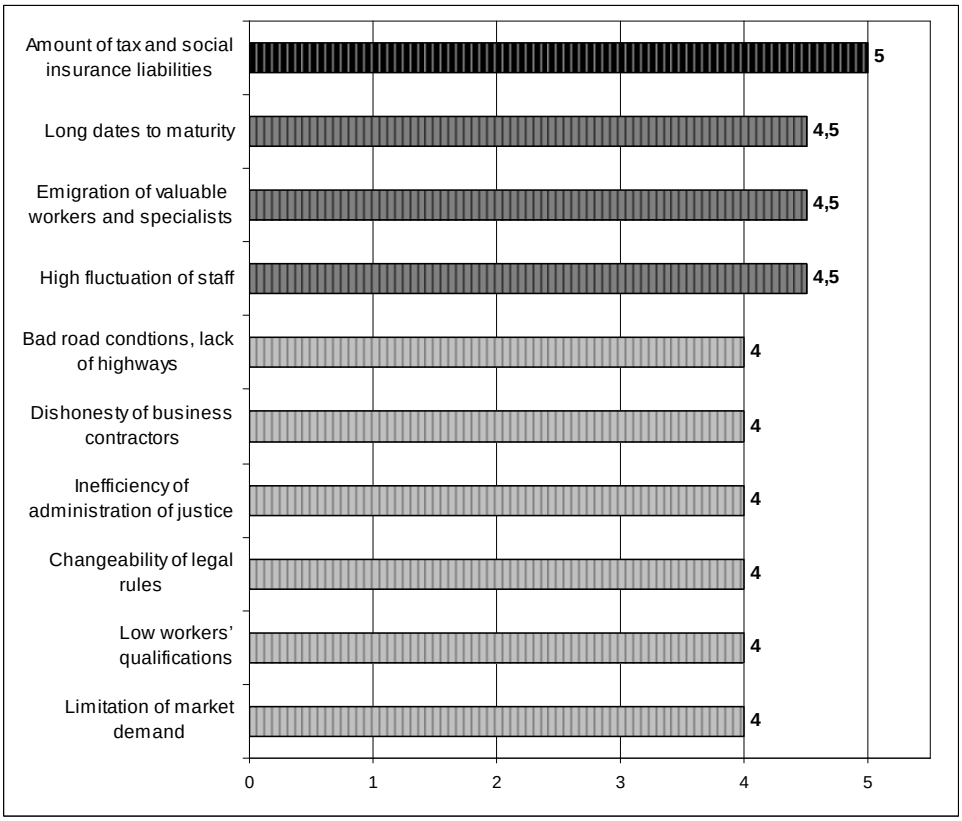

Figure 28. The most serious external barriers to development of the researched enterprises according to the managers.
Source: Own preparation on the basis of the research results.

Analyzing the most serious external barriers from the point of view of the criteria suggested in multidimensional systematics of barrieres to development of SMEs, it should be noriced that they are mostly macro inhibitors which belong to national barriers subcategory. They are either passive or acttive, which entails the necessity for various ways of reacting of enterprises to their occurance.

They are mainly artificial barriers, arising as a consequence of political or economic decisions. To a lesser extent, they are a result of some processes ensuing from market forces (these obstacles were qualified as neutral). From the point of view of individual entity, the barriers are difficult or even impossible to overcome,

which can cause frustration when they are long-term barriers. In extremely unfavourable conditions, they can lower motivation to act, particularly in the scope of taking innovative and enterprise actions.

The comparison of the most serious external obstacles in the respodents' opinions, according to the criteria suggested in multidimensional taxonomy of barriers to development of SMEs, is presented in Table 13.

Table 13. The most serious external obstacles of the researched companies according to the criteria suggested in multidimensional systematics of barriers to development of SMEs.

Barrier to development	Division criterion				
	Level of barriers	Activity	Way they are created	Efficiency	Durability
Amount of tax and social insurance liabilities	national barriers	passive barriers	artificial barriers	barriers impossible to overcome	long-term barriers
Long dates to maturity	barriers in sector	active barriers	artificial barriers	barriers impossible to overcome	long-term barriers
Emigration of valuable workers and specialists	international barriers	active barriers	natural barriers	barriers difficult to overcome	long-term barriers
High fluctuation of staff	barriers in sector	active barriers	natural barriers	barriers difficult to overcome	long-term barriers
Bad road conditions, lack of highways	national barriers	passive barriers	artificial barriers	barriers impossible to overcome	long-term barriers
Dishonesty of business contractors	national barriers	active barriers	artificial barriers	barriers difficult to overcome	long-term barriers
Inefficiency of administration of justice	national barriers	passive barriers	artificial barriers	barriers difficult to overcome	long-term barriers
Changeability of regulations	national barriers	active barriers	artificial barriers	barriers impossible to overcome	long-term barriers
Low workers' qualifications	national barriers	passive barriers	artificial barriers	barriers difficult to overcome	long-term barriers
Limitation of market demand	national/ international barriers	passive barriers	natural barriers	barriers impossible to overcome	long-term barriers

Source: Own preparation on the basis of the research results.

Relating the meaning of each group of barriers to lifecycle phases of organizations, the manager from MakoLab S.A. stated, on the basis of interview with the company owner, that in pre-foundation phase and early phases of development, numerous political and social obstacles occurred, as a result of centrally planned economy and, in general, reluctance towards people running their

own business. Low number of financial institutions, high inflation or difficult access to technologies and qualified workers were main problems.

As far as the phase of dynamic development of the company is concerned, the most serious dangers included market, personnel and legal barriers. As it is regarded that handing over the company to proffessional managers led to the company being in the take-off and expansion phase, the respondent stated that, at this stage, the choice of people for managerial positions was particularly difficult. The attempt to relate the results to individual phases of a company lifecycle shows that the enterprise numbers external barriers which originate in market, legal, social and economic environment among the most serious barriers, throughout the whole period of its functioning.

The comparison concerning the identification of internal barriers in relation to model assumptions and average answers for each group of barriers in the researched enterprises, according to the managers, is presented in Figure 29.

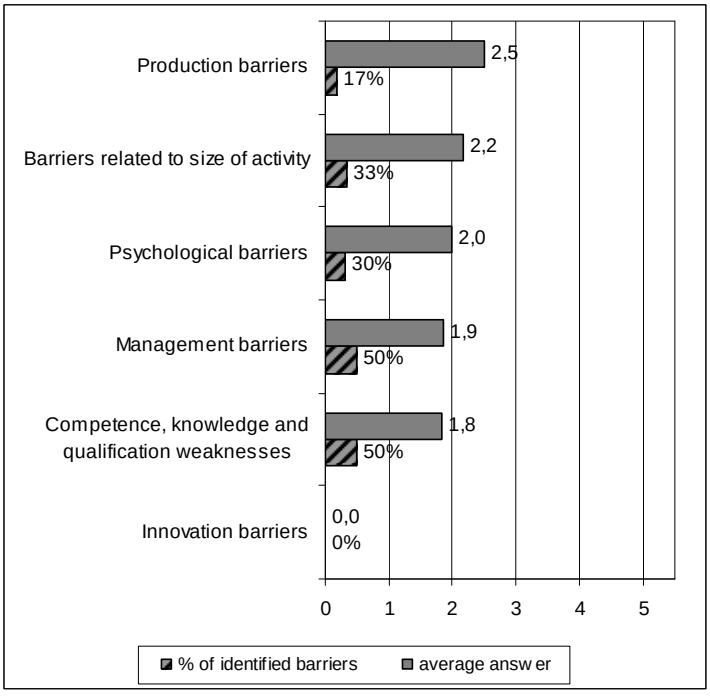

Figure 29. The comparison concerning the identification of barriers in relation to model assumptions and average answers for each group of barriers of the researched enterprises.
Source: Own preparation on the basis of the research results.

In the comparison of internal limitations, the highest number of negative factors presented in the model were identified in the group of competence, knowledge and qualification weaknesses, their negative influence on development processes was assessed as low at the same time. In case of production barriers, the influence on development of the researched enterprises is low-medium, although they concern almost exclusively insufficient production powers.

In the group of internal barriers, insufficient office space was regarded as the most serious danger (although assessed as medium). Insufficient production powers and difficulties in predicting increase in costs of activity were assesed slightly lower. Internal barriers to development identified in the researched companies, assessed by the managers as the most serious, are presented in Figure 30.

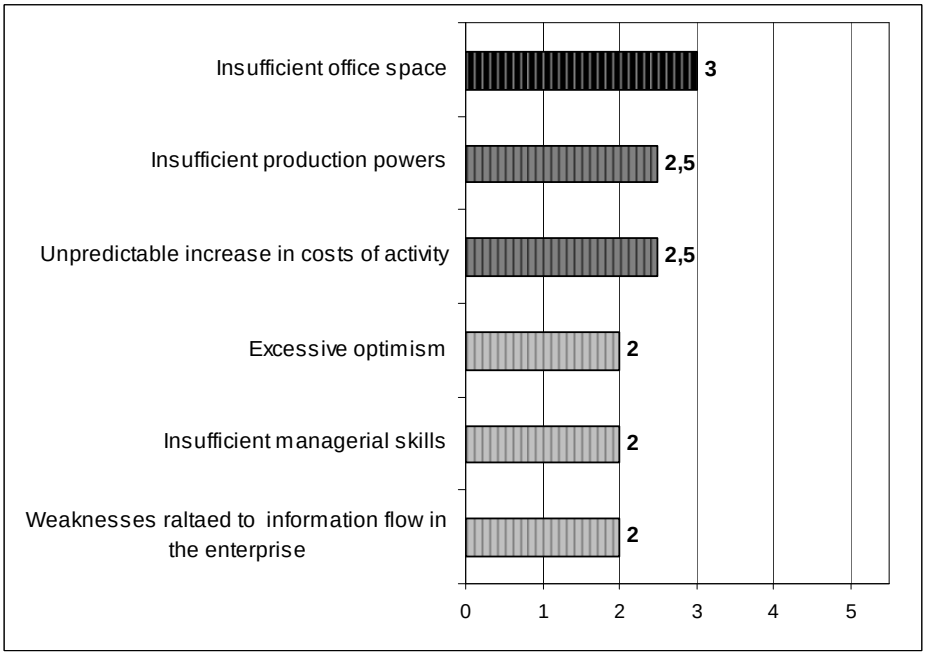

Figure 30. The most serious internal barriers to development of the researched enterprises in the managers' opinions.
Source: Own preparation on the basis of the research results.

All of the internal barriers presented above are micro barriers, therefore, they are related to a particular enterprise. They are mostly passive and they are artificially created by managers' decisions taken in the course of running a business. In comparison with external barriers, it is possibile to overcome most of them by realizing proper protective actions. The results of the research indicate that the researched companies are taking various actions, the aim of which is to ease internal barriers to development. The most serious barriers identified and assessed as the highest by the managers are both long-term and short-term ones. The comparison of the most serious internal barriers in the opinion of the respondents, according to criteria suggested within multidimensional taxonomy of barriers to development of SMEs, is presented in Table 14.

Table 14. The most serious internal barriers of the researched companies, according to criteria suggested within multidimensional taxonomy of barriers to development of SMEs.

Barrier to development	Division criterion				
	Barrier level	**Activity**	**Way they are created**	**Efficiency**	**Durability**
Insufficient office space	micro barriers	passive barriers	artificial barriers	barriers difficult to overcome	long-term barriers
Insufficient production powers	micro barriers	passive barriers	artificial barriers	barriers possibile to overcome	short-term barriers
Unpredictable increase in costs of activity	micro barriers	passive barriers	artificial barriers	barriers difficult to overcome	long-term barriers
Excessive optimism	micro barriers	active barriers	artificial barriers	barriers possibile to overcome	short-term barriers
Insufficient managerial skills	micro barriers	passive barriers	artificial barriers	barriers possibile to overcome	long-term barriers
Weaknesses related to information flow	micro barriers	passive barriers	artificial barriers	barriers possibile to overcome	short-term barriers

Source: Own preparation on the basis of the research results.

The results of the research presented in this work prove and develop the analyses conducted within previous empirical works. However, attention should be paid to the fact that comparative studies in the scope of assessment of barriers to development of enterprises are made difficult. The difficulties are caused mainly by **methodological differences**, which concern mostly:

- differences in the choice of respondents. In most of the works, the owners take part in the research (initial capital begginners), which in connection with the statement about subjectivity of development, can be the cause of differences in perceiving barriers to development of enterprises,
- sector and branch differences among the researched enterprises. As varied barriers occur in particular areas, the results of opinions given by various entities can differ essentially,
- differences in chosen assessment scales and methods of counting the results. Research tools apply varied scales of assessment and various methods of counting are used in the process of working out the results, e.g. taking into account (or not) the results of opinions showing no barriers identified,
- substantial differences which consist in qualifying individual barriers to various aggregate categories.

One of the research, to which the results of this work can be related, was conducted by M. Martin in the group of 45 technology-based SMEs, located in the Lodz agglomeration. The research was conducted in the form of interview with enterpreneurs. A different scale of assessing barriers was applied: 1 – not important,

2 – very low importance, 3 – low importance, 4 – medium importance, 5- high importance, 6 – very high importance, 7 – basic importance. When counting the average results, the answers showing that a barier is not important (is neutral) for the enterpreneurs was taken into account[155].

Taking into account the average, the enterpreneurs numbered the following barriers as the most serious dangers for their development: **market barier** (including factors related to limited national demand and high level of competition) and **barrier resulting from the country policy** (including legal rules and regulations, taxation level). The results presented by M. Martin and proportional conversion of 7-points grading scale to the one with the range from 0-5 is presented in Table 15.

Table 15. The most serious barriers to development of technology-based SMEs in the research conducted by M. Martin.

Group of barriers	Average results by M. Martin for the companies				Conversion of average results of all companies to 5-grade scale	Results obtained in this work
	micro	low	medium	all		
Market barrier	4,1	4,1	5,0	4,3	3,1	3,0
Barrier resulting from the country policy [156] (legal)	2,9	3,0	4,4	3,2	2,3	3,5
Financial barrier	2,9	3,2	3,1	3,1	2,2	2,9
Human barrier (personnel)	1,7	2,2	4,7	2,5	1,8	3,7
Corruption barrier	2,2	2,3	3,0	2,4	1,7	2,4
Information barrier	2,1	2,0	2,7	2,2	1,6	2,0
Infrastructure barrier	2,0	2,2	1,9	2,1	1,5	2,7
Management barrier	2,1	2,0	1,9	2,0	1,4	1,9
Production barrier	1,7	2,2	2,0	2,0	1,4	2,5
Office space barrier	1,6	1,5	1,7	1,6	1,1	2,2
Psychological barrier	1,8	1,3	1,6	1,5	1,1	2,0

Source: Own preparation on the basis of the research results. and Martin M., Relacje pomiędzy podstawowymi…, op. cit., p. 39-41.

After proportional conversion of the results to 5-point grading scale has been made, some analogies to the results of research works presented in this thesis can be noticed. In both cases, the respondents (despite differences in their properties) included **legal and market barriers** in the most serious dangers to development. Differences in assessment concern groups of limitations such as: personnel, production barriers, barriers related to crime (corruption barriers) or size of activity (office space bariers). The managers' assessment of obstacles points at higher

[155] See: Martin M., Relacje pomiędzy podstawowymi charakterystykami małych firm technologicznych a głównymi barierami ich rozwoju, "Zeszyty Naukowe Politechniki Łódzkiej", no. 42/2006, p 39-45, Martin M., Staniec I., Główne bariery rozwoju…, op. cit., p. 110-115.

[156] As this barier includes also legal regulations and taxation level, it belongs rather to the category of legal barriers defined in this work.

danger caused by these factors. It may result from certain social changes (workers' migration) or M. Martin's taking into account also answers pointing at neutral barriers.

When analyzing broader context of barriers to development of SMEs, attempt has been made at comparing results achieved in this work in relation to larger group of SMEs. Research conducted in the year 2005 in 110 SMEs of the Lodz region by the author of this work was used. The most of the researched enterprises are private persons leading business activity (68%). Among other organizational and legal forms of the researched enterprises, civil partnerships (20%) and limited liability companies (9%) occurred.

103 owners of enterprises and 3 hired managers (4 respondents did not define their realtion to ownership sphere) took part in the research. They were mostly men (63%), people aged 41 – 50 years (43%), with secondary education (47%) with technical education (61%). The majority of the researched enterprises are micro enterprises employing 0-9 people. The researched companies operate mostly in the service sector (35%) as well as trade and production (27% each). Entities with low range of activity, operating in local market were dominant (38%)[157].

In the course of this research, the respondents assessed negative influence of each barrier on development of their enterprises in scale: 0 (lack of danger), 1 (vary low barrier) up to 4 (very high danger caused by a barrier). When determining the average answer, answers indicating danger caused by barriers were taken into account, eliminating neutral answers. In the group of 10 most serious barriers to development of SMEs, the following obstacles were identified: high tax and social insurance liabilities, unpredictable rise in costs of running the business, changeability of legal rules and others. The results concerning 10 most serious barriers to development of 110 SMEs functioning in various area and proportional conversion of 4-point trading scale to 5-grade one, are presented in Table 16.

Table 16. The most important barriers to development of 110 SMEs in the year 2005.

Group of barriers	Average results from the year 2005	Conversion of results to 5-grade scale	Results obtained in this work
Amount of social insurance liabilities	3,77	4,71	5
Amount of tax liabilities	3,49	4,36	5
Increase in costs of running the business	3,41	4,26	2,5
Changeability of legal rules	3,33	4,16	4
Lack of coherent economic policy towards SMEs	3,30	4,13	0
Lack of clarity of legal rules	3,30	4,13	2
Strong market competition	3,29	4,11	0,5 - 3
Corruption and dishonesty	3,04	3,80	1,5 - 4
Difficulties in finding outlets	2,83	3,54	3,5
Too low initial capital of the enterprise	2,72	3,40	0,5

Source: Own preparation on the basis of the research results.

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[157] Matejun M., Rola outsourcingu w zakresie…, op. cit., p. 225-226.

In both cases, the respondents considered high fiscal liabilities and those related to social insurance system as the most serious barriers to development of enterprises. Changeability of legal rules or difficulties in finding outlets are also obstacles. Attention should be paid to the fact that the respondents that took part in the research in the year 2005 assessed negative influence of most of the barriers on development of their enterprises more seriously. It may be related to smaller size of companies and lower scale of their market activity, which can result in higher market competition or too low ownership capital of the company.

It seems that actions in high-technology area determine the occurrence of certain barriers to development, which regards among the others, market competition. In the research presented in this work, the respondents from technology-based companies assessed this problem as low as regards high-technology products, at the same time, assessing it higher in relation to standard products. The manager from the MakoLab company emphasized clearly that market offer of the company as far as contemporary technological solutions are concerned is unique enough and the company in fact is not bothered by arising competition.

8.3. Actions taken by the researched enterprises limiting negative influence of barriers

In the course of the research, the respondents were asked what forms of limiting barriers and supporting development are the best for high-technology SMEs in their opinion. The managers assesed the efficiency of these forms in the scale: 1 (very low importance) up to 5 (very high efficiency). The respondents' opinions on the efficiency of varied forms of supporting development of technology-based SMEs are presented in Figure 31.

The managers considered creative and innovative ideas of the company owners and workers, developing knowledge and capabilities by taking part in trainings, implementing contemporary management concepts and tools, developing partnership economic cooperation, loans and tax reliefs as the most important methods of overcoming barriers and limitations to development.

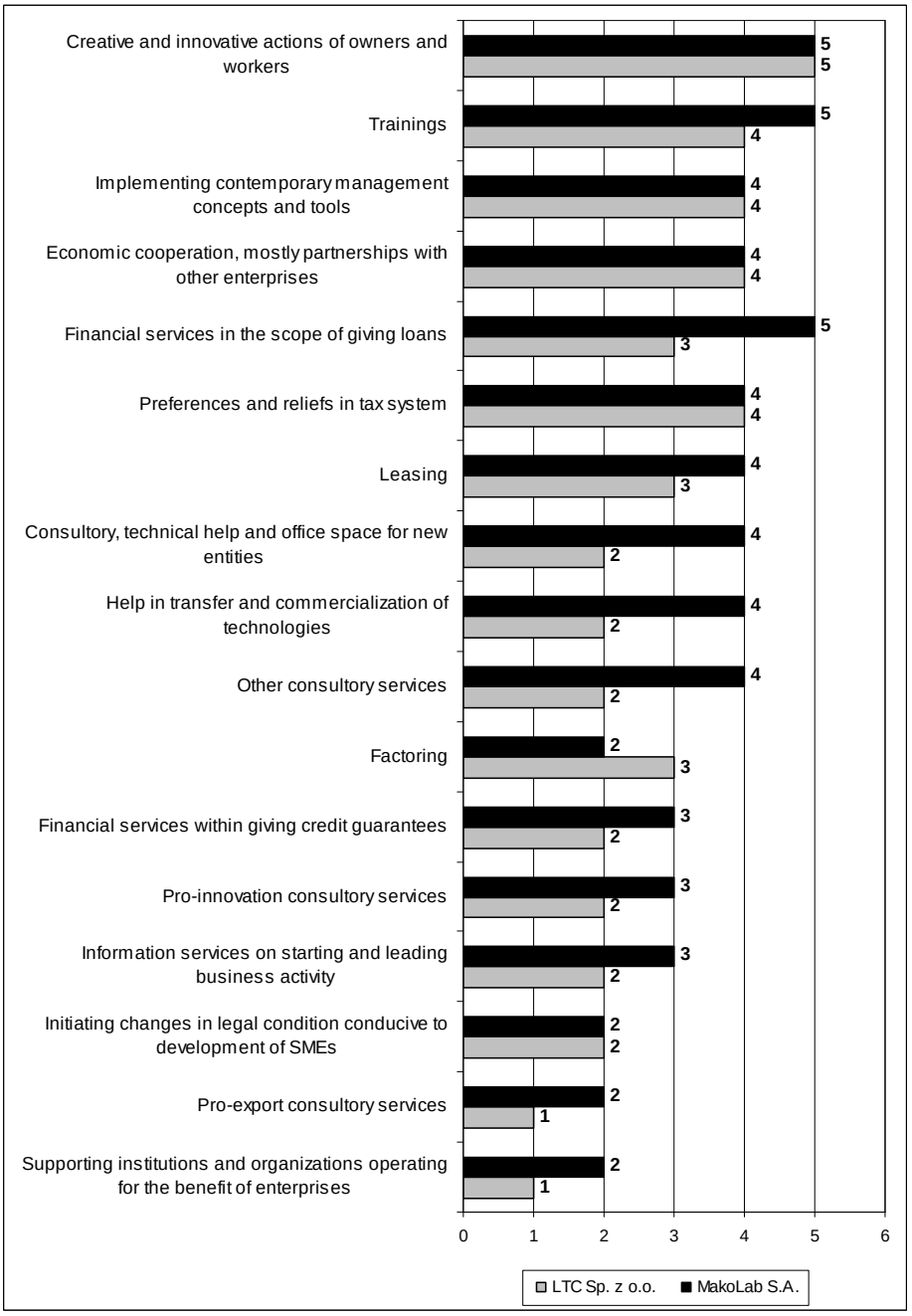

Figure 31. Actions allowing to overcome barriers to development of high-technology SMEs in the managers' opinions.

Source: Own preparation on the basis of the research results.

The respondent of MakoLab S.A. paid attention to the fact that it is difficult to assess unequivocally the efficiency of forms of supporting development of

enterprises as various instruments can be used with various result in individual phases of a company lifycycle. In his opinion, in the first phase of development, information services concerning administration and legal conditions of taking up a business activity as well as accessible sources of commercial and public suport, are important. On the other hand, actions such as pro-export services, proffesional legal consulting services or factoring gain importance at further stages of a company development. Some forms can be also identified, which can be well used at every stage of development. Proper preferences and tax reliefs are some examples.

The last stage of empirical works was defining support institutions, whose services the researched enterprises used in order to limit negative influence of barriers to development. MakoLab S.A. took advantage of the support of the following institutions:

- in the past, the company used the services of technology park as regards hire of large venues for conferences or larger meetings. This form of support was assessed very high by the respondent,
- the company all the time uses bank services within giving credit for business activity. The respondent assessed high the efficiency of this from of supporting development,
- support in the form of the company share in NewConnect capital market is currently taken advantage of. The manager asessed the efficiency of this form as medium. He stated that the company incurs high expenses resulting from its share in capital market and quotation can be subject to speculative actions in the market. In spite of this, the company intends to take part in open capital market also in the future.

In LTC Sp. z o.o., using two forms of supporting development was identified:

- the enterprise constantly uses financing of the European Union, mostly ragarding financing development investments. Using public funds is also planned in the future and this form of support was assessed very high by the manager,
- in the past, the company used bank credits.This form of support was assessed as very high and the company intends to use this instrument also in the future.

Within analyses of using forms of support of development, problems and costs arising as a result of using support instruments by the researched companies was also assessed. The managers stated that obtaining help both from commercial sector and public sources is related to the appearance of some barriers, which were assessed in this scale: 0 (lack of problem), 1 (very low barrier) up to 5 (very high barrier). The respondents' opinions on barriers in the use of forms of supporting development are presented in Figure 32.

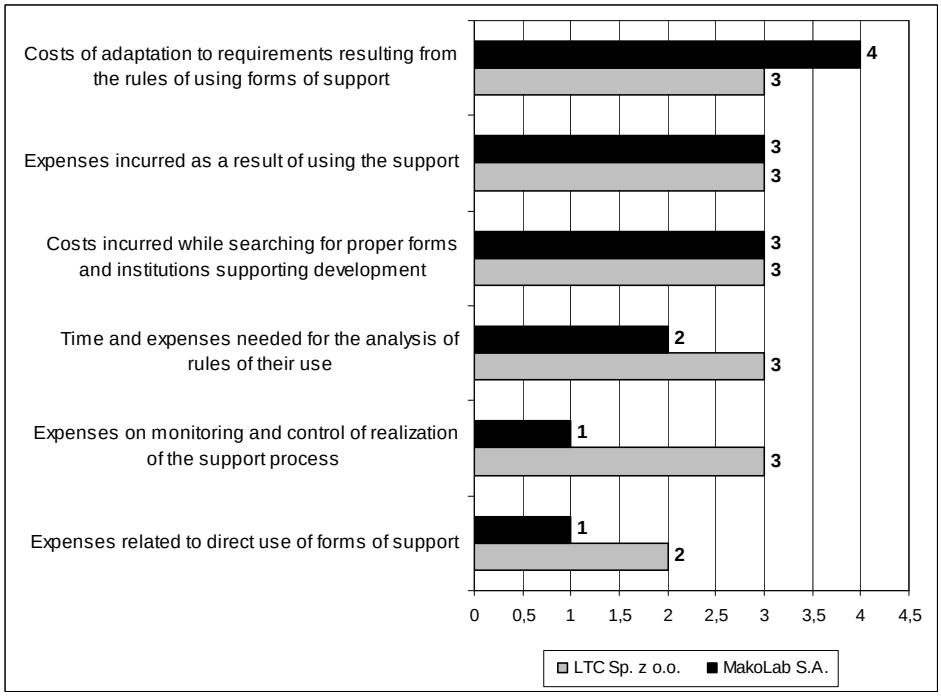

Figure 32. The manager's opinions on external barriers resulting from the use of forms of supporting development.
Source: Own preparation on the basis of the research results.

According to the respondents, costs of adaptation to requirements concerning the rules of using forms of support are the most serious barriers. They include e.g. expenses needed to collect all the necessary documents, preparing business plan or obtaining necessary certificates. The costs of searching for proper forms and institutions supporting development and also expenses resulting from achieved support are medium problems in the managers' opinions. The achieved results prove the H3 hypothesis, according to which the researched entities take advantage of the offer of institutions supporting enterprise to a small extent. Among barriers resulting from using support, costs of adaptation to requirements of cooperation are the greatest limitations but difficulties resulting from searching for proper forms of support is also a danger, considered as medium, and this can indicate information shortages in this area.

SUMMARY

This work aimed at analysis of barriers to development of high-technology SMEs. As a starting point for these considerations, this category of economic entities were characterized and quantitative and qualitative criteria of their distinction from the whole economy were defined. High-technology SMEs are defined as creative ventures, operating in the field of industry or services regarded as high-technology ones. High market competition and stormy environment compel them to implement innovations continually, which causes that they invest particularly in development research, trainings, education and workers' progress. Due to that, knowledge, which often reduces demand for money capital or even material resources, is their main asset. These entities are numbered among innovative, expanding enterprises and their activity should be geared to permanent development understood as the process of complementary qualitative and quantitative changes, assessed positively from the point of view of aims of an enterprise.

Development processes of high-technology SMEs are determined by various factors, which stimulate development if their influence is positive, however, in some cases, they can restrict and make it diffiult for SMEs to function, becoming thus barriers to functioning. It seems that barriers specific to high-technology SMEs will be related to technology transfer, innovativeness, enterprise and creativity of actions, certain legal conditionings including those related to patent law, challenges resulting from internalization of activity or access to information.

On the one hand, barriers to development of enterprises are the consequence of market competition, on the other hand, they result from faults in political, legal, social or economic systems. Mistakes made by an enterpreneur in the process of development or limitations (resource, process and other) of a company itself, are essential sources of them. Preliminary analysis of literature revealed theoretical gap in characteristics of barriers to development of economic entities. It seems that there are no extended typologies of barriers to development of enterprises, which makes analysis of these occurences difficult and causes difficulties in interpretation. Due to that, theoretical part provides the model of multidimensional taxonomy of barriers to development of SMEs, taking into account high-techology SMEs in particular. The aim of this sytematics is to introduce a kind of theoretical order and enable to make analyses and comparisons within vertical research, paying attention to certain methodological assumptions.

In further part of the work, attempt was made at identifying barriers that occur and are particularly dangerous for development processes of high-technology SMEs in individual lifecycles phases of organizations. It should not be expected that SMEs

cope with arising barriers to development without any outside support. Therefore, highly developed countries try to support development of these entities as they stimulate economic growth, strenghten competitiveness in international arena and contribute to increase in affluence of citizens.

This leads to identification of variuos forms of external support of high-technology SMEs, the aim of which is to limit certain barriers to development and strengthen factors stimulating development of this category of entities. Among institutions supporting development of high-tech enterprises, training and consultory centers, loan funds, guarantee funds, business incubators, technological centers, technology parks, technology transfer centers or venture capital funds, which offer a range of varied instruments and forms of supporting development, can be distinguished.

Empirical research conducted in two purposely chosen high–technology enterprises from IT branch were conducted for the sake of the aim of this work and verification of hypotheses put forward. The empirical stuff was obtained by means of interviewing. Two managers working at development and implementation of high information technologies were interviewed. The questionnaire technique was used as a research method and extensive questionnaire was a research tool. The presented results of empirical research and verification of hypotheses put forward lead to formulation of a number of detailed conclusions, which are presented below:

- basic and highly assessed by the respondents barriers to entry to the market of high-technology entities included high market competition and high costs of investment, including costs of buying equipment and technological solutions,
- aiming at increase in market share by increasing sales or introducing product and organizational innovations and material investments were considered as the most important development directions of the researched enterprises. These results prove hypothesis H1, according to which increase in innovativeness as far as products and organizational solutions are concerned, are basic aims of development, although the respondents emphasize also high meaning of market aims of business activity,
- development priorities of the researched enterprises become diffierent depending on defined target markets or strategies chosen in capital and ownership strategy, which proves that development of an organization is seen as multidimensional process of various types of changes. This occurence is subjective and can be assessed differently by individual groups of interested people,
- in the respondents' opinions, external barriers influence impeding development processes of analyzed entities more than internal barriers. Within external obstacles, personnel barriers were regarded as factors strongly impeding development of the researched companies and legal, market, social and financial obstacles were regarded as inhibitors whose influence is medium. Therefore, obtained results prove hypothesis H2, according to which basic barriers to development of high-technology SMEs include market, legal and financial obstacles and larger companies more and more often face problems related to sufficient qualifications of workers and difficulties in gaining qualified staff,

- when analyzing individual external barriers, the managers considered the amount of tax and social insurance liabilities as very strong barier to development, long maturity dates, emigration of valuable workers and specialists as well as high fluctuation of staff, which makes it difficult to ensure continuity of a company activity were in further positions. The most serious external limitations belong to category of national barriers. They are either passive or active, which entails the necessity to use various methods of reacting to their occurrence,
- differences in assessment concern barriers related to simple and technologically advanced products. In case of standard products, the respondents considered danger caused by activities of competitive companies or import of substitutes as high. Qualifications of workers or market partners are of smaller importance. These barriers are asessed totally differently in relation to high-tech products. The respondents pay attention in this case to lack of market competition, emphasizing at the same time the importance of qualifications and knowledge of staff. It seems that the specificity of functioning in high-technology sector influences in a way perceiving barriers to development by the researched eneterprises,
- assessment of barriers to development is also dependent on development strategies chosen by the companies, which concerns e.g. financial or international barriers. The manager from the MakoLab company assessed e.g. financial barriers higher, due to specific conditions that occur as a result of using by the enterprise financing at the level of open capital market. Differences in perceiving barriers result also from established partnership relations with other entities, the example of it is much lower assessment of negative influence of difficulties in interpreting the rules or system of control over offices after establishing cooperation between the MakoLab company and accountancy office,
- the managers stress that barriers of their enterprises can also result from problems of clients, the example of it can be limited access to the Internet for clients of the researched companies. It shows that the analysis of barriers to development of enterprises should not be limited to the level of entity but it should comprise broader context of economic relations occuring between an organization and its stakeholders.,
- production barriers are the most serious group of internal limitations (although assessed by the respondents as relatively low). Barriers related to size of activity and psychological barriers have low but still essential influence on enterprises. The comparison of internal barriers shows that the respondents regarded insufficient office base, insufficient production powers and unpredictable rise in costs of leading activity as the most serious barriers, assessed as medium ones. The most important internal barriers are passive and they are artficially created by decisions of the managers taken in the course of functioning of enterprises. As compared to external barriers, it is possibile to overcome most of them by realizing proper precautionary actions,
- the obtained results and comparative studies show that the nature of dominant barriers to development of enterprises evolves in time and results from social

and economic changes happening, which requires applying vertical research to analyze these occurrences. However, differences in the choice of respondents for the research, sector and branch conditionings and differences in chosen assessment scales and methods of counting results, which makes it difficult to compare the research conducted by various authors, are problems,

- the most effective ways of overcoming barriers to development according to the respondents include creative and innovative ideas of the owners and workers of the enterprises, enhancing knowledge and capabilities of workers by taking part in trainings, implementing contemporary management concepts and tools, developing partnership economic cooperation and loans and reliefs in tax system,
- the researched entities take advantage of the offer of institutions supporting SMEs to a small extent. The obtained results prove, therefore, hypothesis H3, especially as the respondents identify certain barriers being the consequence of using forms of support. Costs related to adapting to the requirements of cooperation are the biggest obstacle, difficulties ensuing from searching for proper forms of support, which can show information shortage in this area, are medium danger.

The issue of analysis of development problems as well as possibilities to overcome them by high-technology SMEs seems to be up-to–date and justified. Research conducted in this area quickly become outdated due to changeable social and economic conditions. The results of primary and secondary research show that the respondents from high-technology enterprises assess barriers to development as medium, which should be regarded as positive.

However, it is possibile that in the process of company development, these enterprises do not use use stimulators of increase enough, particularly chances related to using varied external forms of supporting SMEs. The choice of proper instruments of supporting development to the nature of individual phases of a company lifecycle is a problem, the more so because using instruments of support entails certain expenses. Therefore, it is necessary to conduct further empirical research in this area, particularly in relation to high-technology enterprises, which function in complex and dynamic environment, in which the ability to use opportunities of supporting development can determine the success of an organization as an open system.

REFERENCES

1. Adizes I., Corporate Lifecycles. How and Why Corporations Grow and What to Do About It, Prentice-Hall, Englewood Cliffs 1988.
2. Andrzejczak T., Lachiewicz S., Zdrajkowska H., Dynamika rozwoju sektora małych i średnich firm w województwie łódzkim w latach 1994 – 1997, „Zeszyty Naukowe Politechniki Łódzkiej" nr 799/1998, Łódź 1998.
3. Balcerowicz E. (eds.), Mikroprzedsiębiorstwa – sytuacja ekonomiczna, finansowanie, właściciele, CASE - Centrum Analiz Społeczno-Ekonomicznych, Warszawa 2002.
4. Bełdowska A., Forin A., Powałka W. (eds.), Przedsiębiorco skorzystaj, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2005.
5. Berliński L., Gralak H., Sitkiewicz F., Przedsiębiorstwo. Zarządzanie w otoczeniu, tom II, OPO, Bydgoszcz 2004.
6. Berliński L., Zarządzanie strategiczne małym przedsiębiorstwem, OPO, Bydgoszcz 2002.
7. Berniker E., Understanding Technical Systems, Paper presented at Symposium on Management Training Programs: Implications of New Technologies, Geneva, Switzerland, Nov. 1987.
8. Białasiewicz M. (eds.), Rozwój przedsiębiorstw. Modele, czynniki, strategie, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2002.
9. Biczyński S., Miedziński B. (eds.), Słownik ekonomiki i organizacji przedsiębiorstwa, PWE, Warszawa 1991.
10. Bieniek-Koronkiewicz E., Sieńczyło-Chlabicz J., Działalność gospodarcza i przedsiębiorca na gruncie ustawy prawo działalności gospodarczej, „Przegląd Prawa Handlowego", nr 04/2000.
11. Bieńkowska B., Instytucje wspierające funkcjonowanie małych i średnich przedsiębiorstw w powiecie bielskim, [in:] Otto J., Stanisławski R. (eds.), Szanse rozwoju polskiego sektora MSP na Jednolitym Rynku Europejskim. Tom II – Wspieranie rozwoju MŚP na Jednolitym Rynku Europejskim, Politechnika Łódzka, Łódź 2006.
12. Bilski J., Stawasz E. (eds.), Bariery w korzystaniu z usług bankowych w finansowaniu działalności małych i średnich przedsiębiorstw, Wydawnictwo UŁ, Łódź 2006.
13. Bławat F. (eds)., Przetrwanie i rozwój małych i średnich przedsiębiorstw, Scientific Publishin Group, Gdańsk 2004.
14. Bojewska B., Małe i średnie przedsiębiorstwa jako podmiot sprawczy przedsiębiorczości regionalnej, [in:] Strużycki M. (eds.), Małe i średnie przedsiębiorstwa w gospodarce regionu, PWE, Warszawa 2004.
15. Bolesta-Kukułka K., Jak patrzeć na świat organizacji, Wydawnictwo Naukowe PWN, Warszawa 1993,.
16. Brook C., The Rapidly Changing Field of High Technology Development and Science Parks, Oxford Polytechnic, 1983.
17. Cavusgil S.T., Differences among Exporting Firms Based on their Degree of Internalisation, „Journal of Business Research", nr 12 (2), 1984.

18. Chodyński A., Zarządzanie rozwojem firmy. Strategia jakości ekologicznej, Wyższa Szkoła Zarządzania i Marketingu, Sosnowiec 2002.
19. Churchil N., Lewis V., The Five Stages of Small Business Growth, „Harvard Business Review", May-June 1983.
20. Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa. Szanse i zagrożenia rozwoju, CeDeWu sp. z o.o., Warszawa 2007.
21. Debenham J., Tewson A., Chinnocks S., High Tech Myths and Realities – A Review of Developments for Knowledge Based Industries, Information Services Department, London 1983.
22. Definicja małych i średnich przedsiębiorstw, Załącznik nr 1 do Rozporządzenia Komisji Wspólnot Europejskich NR 364/2004 z dnia 25 lutego 2004 r.
23. Dokument informacyjny sporządzony na potrzeby wprowadzenia akcji do obrotu na rynku NewConnect, Makolab S.A., 2007.
24. Dominiak P., Sektor MSP we współczesnej gospodarce, PWN, Warszawa 2005.
25. Dominiak P., Wasilczuk J., Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa w obliczu internacjonalizacji integracji gospodarek europejskich, Scientific Publishin Group, Gdańsk 2005.
26. Duraj J., Podstawy ekonomiki przedsiębiorstwa, PWE, Warszawa 2000.
27. Fabiańska K., Rokita J., Planowanie rozwoju przedsiębiorstwa, PWE, Warszawa 1986.
28. Felsenstein D., Swartz D., Constraints to Small Business Development Across the Life Cycle; Some Evidence from Peripheral Areas in Israel, Hebrew University of Jerusalem, 1993.
29. Garofoli G., New Firm Formation and Local Development: the Italian Experience, Pavia 1992 [by:] Bławat F. (eds)., Przetrwanie i rozwój małych i średnich przedsiębiorstw, Scientific Publishin Group, Gdańsk 2004.
30. Greiner L., Evolution and Revolution as Organizations Grow, „Harvard Business Review", July-August 1990.
31. Griffin R.W., Podstawy zarządzania organizacjami, Wydawnictwo Naukowe PWN, Warszawa 2001.
32. Guliński J., Parki naukowe i technologiczne w Polsce, „Ekonomika i Organizacja Przedsiębiorstwa", nr 5/1998.
33. Hahn D., Wachstumspolitik industriellen Unternehmen [in:] Betriebswirtschaftliche Forschung und Praxis, 11/1970, [after:] Kortan J. (eds.), Podstawy ekonomiki i zarządzania przedsiębiorstwem, C.H. Beck, Warszawa 1997.
34. Hanks S., Watson C., Jansen E., Changler G., Thightening the Life-Cycle Construct: A Taxonomic Study of Growth Stage Configurations, High-Technology Organizations, Entrepreneurship Theory and Practice, Winter 1993.
35. Hatch M.J., Teoria organizacji, PWN, Warszawa 2002.
36. Hatzichronoglou T., Revision of the High-Technology Sector and Product Classification, OECD, Paris 1996.

37. Hilin C.L., Roznowski M., Organizational Technologies: Effects on Organizations' Characteristics and Individuals' Responses, [in:] Cummins L.L., Staw B.M. (eds.), Research in Organizational Behavior, Vol. 7, Greenwich, Conn, JAI Press 1985.
38. Informacje o KSU, http://ksu.parp.gov.pl/pl/o_ksu z dnia 25.09.2008.
39. Informacje o LTC Sp. z o.o. i systemach FINN, www.finn.pl/xml/kontakt/ltc.
40. Jackson J.H., Morgan Cp.P., Organization Theory. A Macro Perspective for Management, Prentice Hall, 1982.
41. Janiuk I., Strategiczne dostosowanie polskich małych i średnich przedsiębiorstw do konkurencji europejskiej, Difin, Warszawa 2004.
42. Jankiewicz S., Instytucje wspomagające rozwój małych i średnich przedsiębiorstw, a oczekiwania przedsiębiorców (na przykładzie aglomeracji poznańskiej), „Polityka Gospodarcza" nr 4/2000.
43. Jankiewicz S., Wspieranie rozwoju małych i średnich przedsiębiorstw jako priorytet polityki gospodarczej, Wydawnictwo AE w Poznaniu, Poznań 2004.
44. Kaczmarek B., Organizacje – polityka, władza, struktury, Międzynarodowa Szkoła Menedżerów, Warszawa 2001.
45. Kaczmarek B., Sikorski Cz., Podstawy zarządzania. Zachowania organizacyjne, Absolwent, Łódź 1995.
46. Klimek J., A co z naszą przedsiębiorczością?, Wydawnictwo Marszałek, Toruń 2005.
47. Knight G.A., Cavusgil S.T., The Born Global Firm: A Challenge to traditional Internationalization Theory, „Advances in International Marketing", 8/1996.
48. Koncerewicz B., Inkubatory przedsiębiorczości w północno-wschodniej Polsce, „Ekonomika i Organizacja Przedsiębiorstwa", nr 6/1998.
49. Kortan J. (eds.), Podstawy ekonomiki i zarządzania przedsiębiorstwem, C.H. Beck, Warszawa 1997.
50. Kozłowski R., Przeobrażenia struktur organizacyjnych przedsiębiorstw zaawansowanych technologii, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2006.
51. Koźmiński A.K., Jemielniak D., Zarządzanie od podstaw, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2008.
52. Kreikebaum H., Strategiczne planowanie w przedsiębiorstwie, PWN, Warszawa 1996.
53. KRS-online, www.krs-online.com.pl/ltc-spolka-z-ograniczona-krs-87540.html.
54. Lachiewicz S. (eds.), Małe firmy w regionie łódzkim, Wydawnictwo Politechniki Łódzkiej, Łódź 2003.
55. Lachiewicz S., Firkowski M., Zdrajkowska H., Cykl życia małego przedsiębiorstwa, [in:] Lewandowski J. (eds.), Zarządzanie organizacjami gospodarczymi w warunkach globalizacji, Wydawnictwo „Elipsa", Łódź 2000.
56. Lisowska R., Bariery rozwoju działalności innowacyjnej małych i średnich przedsiębiorstw na terenach wiejskich na przykładzie województwa łódzkiego, [in:] Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa. Szanse i zagrożenia rozwoju, CeDeWu sp. z o.o., Warszawa 2007.

57. Łuczka T., Bariery rozwoju małych i średnich przedsiębiorstw w Polsce, [in:] Łuczka T. (eds.), Małe i średnie przedsiębiorstwa. Szkice o współczesnej przedsiębiorczości, Wydawnictwo Politechniki Poznańskiej, Poznań 2007.
58. Machaczka J., Podstawy zarządzania, Wydawnictwo AE w Krakowie, Kraków 2005.
59. Machaczka J., Zarządzanie rozwojem organizacji, PWN, Warszawa-Kraków 1998.
60. Marciniak E. (eds.), Etapy rozwoju małej i średniej firmy, A Vista Group sp. z o.o., Warszawa 2006.
61. Martin M., Charakterystyka pojęcia wysokich technologii – ujęcie retrospektywne, „Zeszyty Naukowe PŁ", nr 42/2006.
62. Martin M., Relacje pomiędzy podstawowymi charakterystykami małych firm technologicznych a głównymi barierami ich rozwoju, „Zeszyty Naukowe Politechniki Łódzkiej", nr 42/2006.
63. Martin M., Staniec I., Główne bariery rozwoju małych firm technologicznych, [in:] Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007.
64. Masłyk-Musiał E., Zarządzanie zmianami w firmie, Centrum Informacji Menedżera, Warszawa 1996.
65. Matejun M., Analiza zewnętrznych prawno-podatkowych barier rozwoju firm sektora MSP, „Zeszyty Naukowe Politechniki Łódzkiej", nr 43/ 2007.
66. Matejun M., Bariery rozwoju małych i średnich przedsiębiorstw (na podstawie badań w aglomeracji łódzkiej), [in:] Piech K., Kulikowski M. (eds.), Przedsiębiorczość: szansą na sukces rządu, gospodarki, przedsiębiorstw, społeczeństwa, Instytut Wiedzy, Warszawa 2003.
67. Matejun M., Kierunki rozwoju firm sektora MSP w opinii przedsiębiorców z regionu łódzkiego, [in:] Lachiewicz S. (eds.), Zarządzanie rozwojem organizacji, tom II, Wydawnictwo Politechniki Łódzkiej, Łódź 2007.
68. Matejun M., Rola outsourcingu w zakresie rachunkowości i doradztwa podatkowego w rozwoju małych i średnich przedsiębiorstw, rozprawa doktorska, Katedra Zarządzania, Politechnika Łódzka 2006.
69. Matejun M., Rola sektora MSP w rozwoju dużych organizacji gospodarczych, [in:] Lachiewicz S., Staniec I., Sytuacja ekonomiczna organizacyjna i kadrowa dużych organizacji gospodarczych w aglomeracji łódzkiej, Politechnika Łódzka, Łódź 2007.
70. Matejun M., Wewnętrzne bariery rozwoju firm sektora MSP, [in:] Lachiewicz S. (eds.), Zarządzanie rozwojem organizacji, tom II, Wydawnictwo Politechniki Łódzkiej, Łódź 2007.
71. Matusiak K. B., Zasiadły K., Ośrodki innowacji i przedsiębiorczości w Polsce, Ministerstwo Pracy i Polityki Socjalnej, Warszawa 1998.
72. Matusiak K., Stawasz E., Przedsiębiorczość i transfer technologii; polska perspektywa, Katedra Ekonomii Uniwersytetu Łódzkiego, Łódź-Żyrardów 1998.
73. Mikołajczyk B., Instytucje wspomagające rozwój małych i średnich firm, Ośrodek Doradztwa i Doskonalenia Kadr, Gdańsk 1998.

74. Nogalski B., Karpacz J., Wójcik-Karpacz A., Funkcjonowanie i rozwój małych i średnich przedsiębiorstw, Wydawnictwo AJG, Bydgoszcz 2004.
75. Nogalski B., Macinkiewicz H., Zarządzanie antykryzysowe przedsiębiorstwem, Wydawnictwo Difin, Warszawa 2004.
76. Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw na rynkach Unii Europejskiej, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007.
77. Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007.
78. Nogalski B., Szpitter A., Karpacz J., Stymulatory i bariery aktywności innowacyjnej małych przedsiębiorstw w ujęciu regionalnym, [in:] Nogalski B., Rybicki J. (eds.), Kształtowanie konkurencyjności małych i średnich przedsiębiorstw na rynkach Unii Europejskiej, Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk 2007.
79. Oakey R., Rotwell R., Cooper S., The Management of Innovation in High-Technology Small Firms, Pinter Publishers Limited, London 1988.
80. Obłój K., Obłój T., Bruton G., Chung Ming L., Strategie I praktyki zarządzania firm high-tech w różnych otoczeniach instytucjonalnych, „Przegląd Organizacji", nr 3/2008.
81. Oviatt B.M., McDougall P.P., Toward a Theory of International New Ventures, "Journal of International Business Studies", 25/1994.
82. Penc J., Leksykon biznesu, Agencja Wydawnicza Placet, Warszawa 1997.
83. Penc. J., Przedsiębiorstwo w burzliwym otoczeniu, Część 1., Oficyna Wydawnicza OPO, Bydgoszcz 2002.
84. Piasecki B. (eds.), Ekonomika i zarządzanie małą firmą, PWN, Warszawa-Łódź 2001.
85. Piasecki B., Przedsiębiorczość i mała firma. Teoria i praktyka, Wydawnictwo UŁ, Łódź 1998.
86. Piasecki B., Rogut A., Smallbone D., Mocne i słabe strony małych i średnich przedsiębiorstw produkcyjnych w Polsce w 1995 roku. Raport z badań, maszynopis, Łódź 1996.
87. Piekarec T., Rot P., Wojnicka E., Sektor przedsiębiorstw wysokiej techniki w Polsce, Polska Regionów Nr 26, Instytut Badań nad Gospodarką Rynkową, Gdańsk 2001.
88. Pierścionek Z., Strategie rozwoju firmy, Wydawnictwo Naukowe PWN, Warszawa 1996.
89. Popczyk W., Przedsiębiorczość globalna a wzrost firmy, [in:] Lachiewicz S., Zakrzewska-Bielawska A. (eds.), Teoria i praktyka zarządzania rozwojem organizacji, Wydawnictwo Politechniki Łódzkiej, Łódź 2008.
90. Przedmiot działalności i kompetencje PARP, http://bip.parp.gov.pl/index/index/505 z dnia 25.09.2008.
91. Przewodnik dla emitentów, Informator NewConnect, http://www.newconnect.pl/pub/dokumenty_do_pobrania/przewodnik_dla_emitentow_newconnect_pl.pdf.

92. Przychocka I., Małe i średnie przedsiębiorstwa w Polsce, wybrane problemy, Wydawnictwo „Comanim:, Warszawa 2002.
93. Pszczołowski T., Mała encyklopedia prakseologii i teorii organizacji, Wydawnictwo Ossolineum, Wrocław 1978.
94. Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce w latach 1998-1999, Polska Fundacja Promocji i Rozwoju Małych i Średnich Przedsiębiorstw, Warszawa 2000.
95. Raport półroczny MakoLab S.A. za okres 01.01.2008 – 30.06.2008, Makolab S.A., 2008.
96. Raport roczny MakoLab S.A. za 2007, MakoLab S.A., 2008.
97. Rizzoni A., Technological Innovation and Small Firms: A Taxonomy, „International Small Business Journal", vol 9/1991.
98. Romanowska M. (eds.), Leksykon zarządzania, Difin, Warszawa 2004.
99. Różański J., Inwestycje rzeczowe w procesach rozwojowych przedsiębiorstw, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 1998.
100. Safin K. (eds.), Zarządzanie małym i średnim przedsiębiorstwem, Wydawnictwo AE we Wrocławiu, Wrocław 2008.
101. Science, Technology and Industry Scoreboard 2005, OECD, www.oecd.com.
102. Scott M., Bruce R., Five Stages of Growth in Small Business, „Long Range Planing", Vol 20, No 3 1987.
103. Senge P., Piąta dyscyplina, Dom Wydawniczy ABC, Warszawa 1998.
104. Skowronek-Mielczarek A., Małe i średnie przedsiębiorstwa. Źródła finansowania, Wydawnictwo C.H. Beck, Warszawa 2003.
105. Śliwa J., Szanse rozwoju małych i średnich przedsiębiorstw, „Wynagrodzenia", dodatek miesięczny nr 1.
106. Smid W, Leksykon menedżera, Wydawnictwo Profesjonalnej Szkoły Biznesu, Kraków 2000.
107. Stabryła A., Zarządzanie rozwojem firmy, Akademia Ekonomiczna w Krakowie, Kraków 1996.
108. Stankiewicz B., Sektor wysokich technologii w Polsce – nadzieje a rzeczywistość, [in:] Lachiewicz S., Zakrzewska-Bielawska A. (eds.), Zarządzanie przedsiębiorstwem w warunkach rozwoju wysokich technologii, Wydawnictwo Politechniki Łódzkiej, Łódź 2008.
109. Statut firmy MakoLab Spółka Akcyjna.
110. Stawasz E., Innowacje a mała firma, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 1999.
111. Stawasz E., Pojęcie i źródła finansowania MSP, [in:] Bilski J., Stawasz E. (eds.), Bariery w korzystaniu z usług bankowych w finansowaniu działalności małych i średnich przedsiębiorstw, Wydawnictwo UŁ, Łódź 2006.
112. Steinerowska-Streb I., Sytuacja małych i średnich przedsiębiorstw w Polsce, „Ekonomika i Organizacja Przedsiębiorstwa", nr 8/2006.
113. Strategor, Zarządzanie firmą, PWE, Warszawa 1999.
114. Strona internetowa firmy LTC sp. z o.o., www.finn.pl.
115. Strona internetowa firmy MakoLab S.A., www.makolab.pl.
116. Strużycki M. (eds.), Małe i średnie przedsiębiorstwa w gospodarce regionu, PWE, Warszawa 2004.

117. Sudoł S., Nauki o zarządzaniu. Węzłowe problemy i kontrowersje, TNOiK, Toruń 2007.
118. Szablewski A.T., Czy konsolidacja energetyki nie zaszkodzi rynkowi?, „Nowe Życie Gospodarcze", nr 7/2001.
119. Szplit A., Fudaliński J., Markiewicz P., Smutek H., Strategie rozwoju organizacji, Antykwa s.c., Kraków 2002.
120. Tłoczyński D., Metody finansowego wspierania rozwoju small businessu, „Ekonomika i Organizacja Przedsiębiorstwa", nr 12/1999.
121. Toffler A., Toffler H., Budowa nowej cywilizacji, Wydawnictwo Zysk I s-ka, Poznań 1996.
122. Ustawa z dnia 11 marca 2004r. o podatku od towarów i usług, Dz. U. 2004, Nr 54, poz. 535.
123. Ustawa z dnia 2 lipca 2004r. o swobodzie działalności gospodarczej, Dz. U. 2004, Nr 173, poz. 1807 z późn. zmianami.
124. Ustawa z dnia 29 września 1994r. o rachunkowości.
125. Wachowiak P. (eds.), Funkcjonowanie przedsiębiorstwa w gospodarce rynkowej, Stowarzyszenie Księgowych w Polsce, Warszawa 2006.
126. Wasilczuk J., Wzrost małych i średnich przedsiębiorstw. Aspekty teoretyczne i badania empiryczne, Politechnika Gdańska, Gdańsk 2005.
127. Weick K.E., Making Sense of the Organization, Blackwell Publishing, 2001.
128. Weick K.E., Technology as Equivoque: Sensemaking in New Technologies, [in:] Goodman P.S., Sproull L.S. (eds.), Technology and Organizations, Jossey-Bass, San Francisco 1990.
129. Williams J.F., A Review of Science Parks and High Technology Developments, Drivers Jonas, London 1982.
130. Wojnicka W., Klimczak P., Wojnicka M., Dąbkowski J. (eds.), Perspektywy rozwoju małych i średnich przedsiębiorstw wysokich technologii w Polsce do 2020 roku, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2006.
131. Wożniak M., Instrumenty wspierania małych i średnich przedsiębiorstw na rynku zamówień publicznych, [in:] Daszkiewicz N. (eds.), Małe i średnie przedsiębiorstwa. Szanse i zagrożenia rozwoju, CeDeWu sp. z o.o., Warszawa 2007.
132. Zeleny M., High Technology Management, [in:] Noori H., Radford R.E. (eds.), Readings and Cases in the Management of the New Technology: An Operations Perspective, Prentice-Hall, Englewood Cliffs, 1990.
133. Żuber R., Zarządzanie rozwojem przedsiębiorstwa, teoria i praktyka, Difin, Warszawa 2008.

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Problematyka rozwoju małych i średnich przedsiębiorstw stanowi w ostatnich latach istotny obszar rozważań na gruncie nauk ekonomicznych, w tym również nauk o zarządzaniu. Szczególną podgrupę w tej zbiorowości stanowią małe i średnie firmy zaawansowanych technologii (MSPT), które istotnie wpływają na zwiększanie konkurencyjności gospodarki na arenie międzynarodowej, są głównym źródłem innowacji i postępu technicznego oraz wpływają pozytywnie na inne trendy gospodarcze i społeczne. Mogą być one zdefiniowane jako podmioty działające w mniejszej skali w dziedzinach i branżach, które uwzględniają dorobek współczesnej nauki i techniki. Są to firmy wysoce innowacyjne i przedsiębiorcze, organizacje uczące się, które działają na styku gospodarki i nauki, dokonując rynkowej komercjalizacji rozwiązań opartych na badaniach naukowych.

Rozwój małych i średnich firm technologicznych jawi się jako złożony, wielowymiarowy proces zmian zachodzących w czasie. Ważnym komponentem procesów rozwojowych stają się różnego rodzaju bariery i ograniczenia (inhibitory), które utrudniają, bądź uniemożliwiają wprowadzanie pozytywnych zmian. Wywołują one określone skutki dla funkcjonowania przedsiębiorstw wpływając na zwiększanie się luki rozwojowej i hamując procesy wzrostowe. Biorąc pod uwagę powyższe rozważania jako cel pracy wyznaczono wielowymiarową analizę barier rozwoju małych i średnich przedsiębiorstw zaawansowanych technologii, ocenę ich wpływu na procesy rozwojowe tych podmiotów oraz zgłoszenie propozycji działań ograniczających bariery rozwoju firm MSPT.

Realizacji celu pracy oraz weryfikacji postawionych hipotez badawczych poświęcono badania empiryczne prowadzone w formie metody opisu pojedynczych przypadków w dwóch przedsiębiorstwach zaawansowanych technologii zaliczanych do sektora MSP: firmie MakoLab S.A. oraz LTC Sp. z o.o. Materiał empiryczny w przedsiębiorstwach zebrano za pomocą metody wywiadu. W pracy przedstawiono wyniki dotyczące preferowanych kierunków rozwoju badanych przedsiębiorstw, identyfikacji i oceny barier rozwojowych, a także podejmowanych działań ograniczających negatywny wpływ ograniczeń rozwoju.