

Сумського державного університету. Серія Економіка. – 2009. – № 2. – С. 105–112. 8. Kuzmin, O.Ye., Melnyk O.H., Shpak N.O., Mukan O.V. The concept of creation and use of the polycriterial diagnostics systems of the enterprise activity // *Econtechmod: An International Quarterly Journal on Economy in Technics, New Technologies and Modelling Processes*, 2012. – Vol. 01, № 4. – P. 23–28. 9. Podolchak N., Melnyk L., Chepil B. Improving administrative management costs using optimization modeling // *Econtechmod: An International Quarterly Journal on Economy in Technics, New Technologies and Modelling Processes*, 2014. – Vol. 01, № 1. – P. 75–80.

УДК 330:147

П. Філіповіч

Краківська гірничо-металургійна академія

ІННОВАЦІЙНІСТЬ ВИСОКО- ТА НИЗЬКОТЕХНОЛОГІЧНИХ ВИРОБНИЧИХ ПІДПРИЄМСТВ: ГАЛУЗЕВІ ВІДМІННОСТІ У ВИКОРИСТАННІ РЕСУРСІВ

© Філіповіч П., 2014

Конфігурація ресурсів організації є однією з найпоширеніших сфер досліджень, що стосуються архітектури процесу проінноваційного управління. На основі аналізу фінансової звітності вивчено роль ресурсів і можливості процесу проінноваційного управління у вибраних високо- та низькотехнологічних виробничих підприємствах Польщі. Отримані результати показують різний ступінь інтенсифікації використання матеріальних і нематеріальних ресурсів компаній, опосередковано підтверджуючи існування гетерогенності процесу управління високотехнологічних виробничих підприємств.

Ключові слова: високо- та низько технологічні виробничі підприємства, ресурси, інноваційність, проінноваційний менеджмент, кореляційний аналіз, гетерогенність.

P. Filipowicz

AGH University of Science and Technology

INNOVATIVENESS OF HIGH AND LOW TECHNOLOGY MANUFACTURING COMPANIES: SECTORIAL RESOURCES UTILIZATION DISSIMILARITIES

© Filipowicz P., 2014

Organization resource configuration becomes of the most exploited areas of research concerning the pro-innovation management process architecture. Hence this study exploring the role of resources and capabilities in pro-innovation management process referred to the chosen Polish high and low technology manufacturing firms, based on the financial statements analysis. The obtained results show also the different degree of company tangible and intangible resources utilization intensification, indirectly confirming the existence of high technology company management process heterogeneity.

Key words: high and low technology manufacturing companies, resources, innovativeness, pro-innovation management, correlation analysis, heterogeneity.

Intorduction. Innovative and technology-oriented companies impacts to business model are realized by the company offering, in terms of added value and customer needs satisfaction. Also company

competitive position and created business values require the efficiency and productivity enabled by technology. The resultant products and services strongly cause the markets in the form of innovations, technology competitiveness and technology life-cycles, which can significantly change the value creation process and also the customer attitude. Assuming the importance of these factors, emerging pro-innovation technology management conception should prevail the firm resources configuration as the source of market growth realized through the customer oriented services and products. New technology is continually advancing and is likely to affect all aspects of firm performance, yet not only the research and development processes but also the management process. Its impact concern not only the greater production efficiency, but also the strategy formation process. This suggests that technological change is a critical factor for superior value creation in competitive environment. Adaptation of those rules, leads to contend that the strategic planning processes of high technology firms will differ from those of low technology firms. Hence the possible emphasis on the strategic planning. Realized research aim is to show and examine the differences in resources utilization of chosen high and low technology Polish companies. More specifically, this paper contends that firms can be divided according to the level of technology deployed in their manufacturing activities and that the level of technology impacts on the firm management process and its performance, here defined as the sales dynamics.

Organization resources and innovativeness – RBV perspective. While there are many similarities in the problems that face high and low technology firms, they both operate in the same business environment, there is a lack of empirical research on the emphasis given to the drivers of strategy in both types of firms (O'Regan and Ghobadian, 2005). That why is very interesting to analyze with the holistic perspective the company factors influencing the sales process and in consequence to determine the possible gap in organization resources utilization between the high and low technology firms, indirectly revealing the particularity of pro-innovation management process. While there is a consensus that high technology firms emphasize technological activities and technology-based innovations, there is a lack of agreement in the literature about the specific criteria to be used in deciding which firms should be included in this category and in classifying firms according to their technology level. Lacking clear guidance, some researchers simply used a firm's industry membership as the defining criterion (Grinstein and Goldman, 2006). Seeking to define a high technology firm faces the dilemma that any attempt to develop a universally accepted industrial classification is unlikely to totally address the issue in the medium to longer term as industrial boundaries are rapidly changing. The standard industrial classification provides an industrial classification code for all firms, both service and manufacturing, but do not readily indicate the degree of high technology inherent in the companies under classification heading. O'Regan and Simsb (2008) contend that the adequate approach to this problem is to use the Resource-Based View (RBV), which focuses on the use of distinctive capabilities as a means of effectively developing a high technology approach. Studies on RBV have proved that the competitive positions of firms are at least in part a function of the resources they possess, which implies that such resources need to be identified, nurtured, deployed and exploited if the firm assumes to maximize the opportunities inherent in its external operating environment. In such perspective, the resources are key inputs into a firm's production process, such as capital, equipment, the skills of individual employees, patents, finance and talented managers and they can be either tangible or intangible in nature, and are assets or inputs to production that an organization owns or accesses (Helfat and Peteraf, 2003). Which confirms Prahalad and Hamel (1990) presumption that the core competencies as companywide technologies and production skills empower organization to adapt quickly to environment changing opportunities and provide customer benefits. This perspective states that the organizational strategy is driven by resources, capabilities and competencies rather than by external environment factors, thus the adaptability of technological capabilities corroborates organizational performance in market demand satisfying. Radauer and Streicher (2007) claims that the strait link between innovation and economic growth ensue from High Technology industries, because High-Technology industries grow faster than Low- or Medium- Technology industries and secondly that structural change in the economies of the developed countries favors High-Technology companies, as Low- and Medium-Technology activities are outsourced to less developed nations with lower labor costs. To differentiate High-Technology from Low- and Medium-Technology industries, the OECD draws on the R&D

intensity of a company. A company is said to be High-Technology, if the R&D expenditures exceed 3% of Sales revenues. Low- and Medium-Technology industries are, consequently, those where the companies show, on average, R&D intensities of less than 3%. The significance given to R&D relies on the assumption that new products and services implicitly emerging from firm innovation activities, are an important driver of growth and that R&D is a necessary prerequisite for creating innovations and new technologies, which unfortunately seems to be too simplistic assumption. According to the so-called linear model, which is underlying this view, the innovation process is made up of three different consecutive phases: basic research, applied research and development and implementation. Damanpour and Wischnevsky (2006) suggest that the differences between the processes of generation and adoption of innovation are associated with important distinctions between organizations that engage primarily in one process or the other. The critical innovation issue is to manage the innovation project in a timely and efficient fashion in order to create a new product, service or technology, it is to manage the assimilation of the innovation extensively into the organization in order to produce the desired organizational change. While the innovation-generating organization aims to match the organization's technological capabilities with new product and market opportunities, the innovation-adopting organization aims to match the organization's strategic requirements with capabilities and potentials of the innovations available in the market. As a result, it is possible to admit that firms are more innovation-generating organizations and low tech firms are more oriented to the innovation adapting process. Hence the possible difference in cost structures of those companies, particularly in overhead expenses. D'Angelo (2012) analyzing the internationalization of High Technology firms underlines the specific role of innovation in a firm's product mobility across national boundaries. This approach is confirmed by innovation definition proposed by the Oslo Manual (OECD-Eurostat, 2005), also described as the implementation of a new or significantly improved product (good or service), process or business function such as marketing methods and organization changes or external relations. In high technology sector, the pro-innovation management perspective emphasizes the important role of collaborations with external partners and in consequence importance of export intensity of these firms. The discussion about the innovation role in high tech firm and low and medium technology firm is continued by Santamaría, Nietob and Barge-Gil (2009). Their research shows that innovation process in Low and Medium Technology sectors has its own specifics based on the view non-R&D activities are crucial to understanding the innovation process of these firms. Although internal R&D emerges as a fundamental source of innovation, the importance of other sources based on external contracting and collaboration cannot be neglected. The greatest differences between Low & Medium Technology and High Technology firms are observed in the context of process innovations. The use of consultants, the hiring of personnel and external R&D are particularly significant external sources of innovation in Low & Medium Technology industries. In the case of product innovations, consultants are a significant factor for Low & Medium Technology firms, but not for High Technology firms. The difference of innovation process between Low & Medium and High Technology firms consist on the nature of used sources. In case of Low & Medium Technology sectors, the innovations have more exogenic characteristic, and are less depending on the own R&D activities. Additionally, in Low & Medium Technology sector R&D seems to be only one of the innovation determinants, and also depends on other activities and sources, along with environmental and market related factors. Lockett and Thompson (2001) finds out that some users of the RBV distinguish fully appropriable resources, such as physical capital or brand names, from less tangible assets, such as organizational routines and capabilities. Because each firm's resource configuration is unique, the consequence of its past managerial decisions and subsequent experience, it follows that so is each firm's opportunity set. Thus, strategy, may be considered as the process of determining, exploiting and developing the firm's opportunity set.

Dynamics of innovativeness – case of chosen polish companies. Concepts such as high or low technologies and the activities of various business sectors with regard to developing innovation based economies have become a matter of frequent debate among management academics. According to GUS (Polish Government Statistics Office), in 2011, 35% of the Polish labour force worked in knowledge based services or in industrial production in the High and Medium-High Technologies Sectors. Of this, the number employed in the High Technologies Sector was 2.85% of the labour force. According to Eurostat,

participation in knowledge based services or in industrial production in the High and Medium-High Technologies Sectors in Poland was below the EU average which for 2011 was estimated to be around 44.6%. Therefore, development of the High and Medium-High Technologies Sectors is important not only because of the growth of the generally understood level of technological development but also provides an opportunity to reduce the unemployment rate (Gazinska and Mojsiewicz, 2012 a). The structure of production sold by Polish businesses in the years 2005 - 2011 has remained fairly stable with no radical increases in volumes generated by the Medium and High Technologies Sectors. What is worth noting however, is the declining role of the Low Technologies Sector in industrial output in the period 2009 - 2011 which could have been caused by the crisis in 2008 and the pressure for price reduction on this sector caused by a fall in internal demand and an increase in low-cost imports. A result of this process is that businesses are more able to orient themselves on more advanced sectors. However, analyzing ownership structure it is apparent that Public Sector participation in businesses in the Medium and High Technologies Sectors is declining, whereas for businesses in the Low Technologies Sector which produces close to 70.6% of industrial output in 2011, it is increasing. An effect of this is the decline registered by Eurostat in R&D expenditure in Polish Public Sector businesses (European Commission, D.G.R.I., 2013). This redirection could also explain the increasing participation of foreign capital specifically in the High Technologies Sectors in Poland which grew from 7.5% in 2006 to 9% in 2011. Comparing 2011 to the previous year, there was a decline in the participation of high technology products both in Polish exports and in imports. The most significant Polish high technology exports are computers, office equipment and communication electronics as well as scientific research and test equipment with the same products figuring as the most significant imports. According to the Government Statistical Office, the balance of trade in computers/office equipment declined compared to 2010 (Gazinska and Mojsiewicz, 2012 b). What is significant, however, is the growth in aerospace exports in the same period. The increasing participation in exports of computers/office equipment, scientific research and test equipment, electrical and non-electrical machinery may indicate the market attractiveness of these technologies. The positive trend in the participation of chemicals, due perhaps to an increasing focus on bio and nanotechnologies, is also worth noting. On the other-hand, the declining export participation of pharmaceuticals and defense equipment may be a reflection of the lower technological content of these products or a consequence of the high degree of integration of target markets or of restrictions of an administrative or legal nature. In 2011 of Polish businesses operating in the High Technologies Sector, 35,1% were innovative and 15,6% invested in their own R&D activities. For the same year, analogous percentages for the Medium-High Technologies Sector were 33,1% for innovation and 9,2% for own R&D investment. In the case of businesses in the Medium-Low and Low Technologies Sectors the percentages were respectively: 17,8% and 2,4% and 10,3% and 0,7% (Gazinska and Mojsiewicz, 2012 a). Investments in technology transfer by Polish businesses operating in industrial processing, were concentrated on licenses or on automation which indicates a focus on improving the effectiveness of production processes or on improving product portfolios. Purchase of research was less common than purchase of consulting services which may indicate a preference for exogenous innovation resource. A lower rate of R&D activity transfer is associated with a higher timeline and cost pressure development risk and so businesses prefer to invest in activities where commercialization seems more secure than to carry out themselves a complete innovation process. Analyzing technology transfer by Polish businesses, sales of technology are significantly lower than purchases which could indicate a significant openness of the Polish business market environment to imported technology. In the current climate in Poland, businesses may not see the benefit of internal R&D development as a source of future income. One can also notice that the main sources of technology transfer for Polish businesses are either within Poland or within the EU. Polish businesses are the recipients of technologies which are ready for implementation which is a characteristic of organizations at an early stage of development which is characterized by, for instance, the dynamic growth of Polish industrial production. Technological diversification will become important when the markets into which these businesses sell, become saturated. This fact does not alter the situation that Polish businesses are becoming an attractive market for technology producers. The increase in intellectual property registration and court processes for infringement may be a by-product of the development of the Polish industrial sector and the accompanying need to modernize technologies connected with the specific business activities, lower labor costs as well as the high degree of

openness and readiness to absorb characterized by the Polish market in comparison with other countries within the EU.

Sample description. In analyzing how businesses approach innovation development it becomes important to identify differences in the management process between companies with varying levels of innovation. The classification by technology sector presented earlier can only provide a foundation for this because the basis for this classification is the degree of concentration on R&D activities. For this reason one can state that the management process in the case of businesses in the High Technologies Sector is more focused on innovation growth and development than in the case of businesses in the Low Technologies Sector. If this is the case, this in turn, should correlate to differences in how resource or operating cost allocation takes place between businesses in these two sectors. To verify whether this was the case, a comparative analysis was carried out on the financial statements of 60 businesses (30 in the Low Technologies Sector and 30 in the High Technologies Sector) for the years 2008–2011.

In this 2008–2011 period, Polish businesses in the High Technologies Sector sold about 5% of Polish Industrial Production. Production of computers, electronic and advanced optical equipment was a significant sub-sector. For this reason, 22 businesses were selected from this sub-sector with the remaining 8 selected from the pharmaceuticals sub-sector. In the case of the Low Technologies Sector, representing around 32 % of Polish Industrial Production over this period, the most significant sub-sectors were food and food derivatives of which 12 businesses were selected and the wood, paper and furnishings sub-sector from which 14 businesses were selected. The analyzed businesses in the High Technologies Sector employed on average a total of 7.000 people over the period being around 64 % of the equivalent figures for the businesses in the Low Technologies Sector. In spite of this difference in employment, whilst all the businesses generated positive margin throughout this period, gross margin for the businesses selected in the High Technologies Sector was around 40 % higher than for the businesses selected in the Low Technologies Sector. Analyzing the data presented, one of the first points to be noted is the increase in Sales with, for both major sectors, the increase accelerating from 2009. The increase in the Low Technologies Sector is stronger than that in High Technologies Sector although it must be stated this faster increase is accompanied by lower asset base utilization. Further, businesses in both sectors, reduced inventories in 2009 which could have been a result of the 2008 financial crisis causing changes in the ways commercial activities were financed. An additional steep reduction is apparent in analyzing High Technologies Sector businesses in 2010 which was, most probably the result of the equally steep rise in sales of this group of products. Internal capital growth is higher in the High Technologies Sector which may indicate a conservative financing strategy based on using internally generated funds as opposed to external funding. This seems to be confirmed by working capital dynamics where the change is stronger for businesses analyzed in the Low Technologies Sector perhaps indicating that these businesses were more able to reduce dependence on external financing.

For businesses in both sectors, the increases in net Sales described earlier took place concurrently to reductions in both Selling and General & Administrative Expenses. For the businesses in the Low Technologies Sector, in a business climate of increasing Sales, Costs ranged between 43,14 % to 38,28 % of net Sales. For the businesses in the High Technologies Sector this range was between 8,31 % and 5,25 % and was also accompanied by increased sales. This inverse relationship to Sales implies that businesses in these sectors are in a different competitive environment and market configuration and may confirm that the High Technologies Sector is more attractive plus indicate a larger degree of cooperation within this sector. Another difference also worth noting becomes apparent when analyzing Fixed Assets across businesses in both sectors. These differences in rate and growth as compared to net Sales may be key in identifying differences in the management process between the Low Technologies and the High Technologies Sectors. Analyzing the differences by sector it becomes apparent that the overall decrease in Assets is accompanied by an increase in Current Assets in the Low Technologies Sector where increased Sales resulted in an increase in Receivables compared to the High Technologies Sector which may perhaps confirm differences between the sectors in their development timeline. Looking more closely just at Fixed Assets, it became apparent that the increase in net Sales resulted in differences in the Fixed Asset structure between the businesses (tab. 1). Growth of Fixed Assets was comparable for businesses in both sectors with the proviso that from 2009

onwards, one could observe that investments by businesses in the High Technologies Sector were higher than those by businesses in the Low Technologies Sector. A significant part of this investment being spent on intellectual property i.e. in areas directly connected with knowledge acquisition and development.

Table 1

Changes in assets structure of analyzed low and high manufacturing sector chosen polish companies. source: OWN

Technology Sector		Low				High			
Year (2008 = 100 %)		2008	2009	2010	2011	2008	2009	2010	2011
Change in Total Fixed Assets		100,00	88,30	89,66	92,98	100,00	92,95	111,18	124,28
Part of intangible Assets in Total Fixed Assets		27,06	21,28	20,89	21,18	66,71	59,94	62,85	62,29
Part of tangible Assets in Total Fixed Assets		72,94	78,72	79,11	78,82	33,29	40,06	37,15	37,71
Part of PPE (property, plant, and equipment) in Total Fixed Assets		26,64	30,21	31,54	31,16	16,49	20,35	19,93	20,28
PPE Structure	Land	0,79	0,86	0,74	0,71	0,78	1,17	1,58	1,15
	Buildings and constructions	12,32	14,06	14,03	13,67	9,40	10,16	10,26	11,04
	Machinery and Technical Equipment	12,30	13,87	15,34	15,27	4,91	7,48	7,11	7,15
	Transport	0,82	0,98	0,99	1,03	0,87	0,93	0,44	0,34
	Other Fixed Assets	0,41	0,45	0,45	0,49	0,41	0,60	0,54	0,61

A subject worth noting in this context is that per Polish Accounting Law, intellectual property to be accounted in Fixed Assets must fall under one of three categories:- intellectual property which is purchased to enable a business to carry out its statutory activities, intellectual property which increases the value of the business, cost of completed R&D activities to be used directly in product development or implementation. Under Polish Law, intellectual property includes copyright and related authorship rights, licenses, licensed use of inventions, patent licensing, trademarks and related signs, symbols, designs or prototypes plus acquired know-how all of which can be directly or indirectly related to the introduction of new technologies. Over the same time period that businesses in the High Technologies Sector significantly increased their Non-material Assets as compared to businesses in the Low Technologies Sector there was a lower comparable increase in Material Assets indicating significant differences in approach between the two sectors which directly relates to differences in the production processes. The analysis also confirmed a subject indicated earlier about differences in the structure of Selling expenses and General and Administrative expenses. Another area worth noting were investments in Plant & Machinery where taking account of increased Sales revenues the rate of investment is similar in both sectors. Businesses undertake investments in technical equipment at a similar level however, in the High Technologies Sector, these investments are accompanied by an increase in intellectual property assets. Finally, investments in Land & Buildings were compared to complete the review of Fixed Assets investment and these investments were found to be on similar levels for both sectors.

Empirical analysis and results. Continuation of the analysis of differences between the two sectors regarding their Asset and Operating Costs profiles necessitates a more detailed review of the methodology. Ghani and Jayabalan (2000) discussing the role of manufacturing technologies in the context of developing economy, proposed the framework presenting the inter-relationship among the variables technology, structure, and employees with intervening variable planned change that could be analyzed and empirically investigated. Hence, their suggestion that adoption of advanced manufacturing technology is not the guarantee of higher company performance and will further require appropriate changes in the firm's structure and its employees' behavior, which implies also the use of specific management process configuration in the case of those companies. Galbreath (2005) commenting the resource based view theory, contends that tangible resources can be readily purchased by any number of competing firms in the factor markets or can be easily imitated by competitors, it may be expected that resources other than tangible ones will contribute more significantly to firm success. In consequence, he underlined the importance of intangible assets, which difficult to duplicate are often the composites of firm strategy or

particular business model. The finding of his research based on the correlation analysis, suggests that contrary to resource-based theory, tangible assets may significantly impact on a given firm's success, relative to intangible assets. However, his research findings confirm that capabilities contribute more significantly to firm success than either intangible or tangible assets. Moreover Galbreath and Galvin (2008) comparing the resource based view to the competitive forces approach as key company strategy determinant suggest that the firm strategy has to be based on evaluation and selection of tangible and intangible resources and then this competition inimitable configuration confronted to environmental dynamics is the business key success.

Accordingly, the main aim of realized research is to determine the differences in relationship between the firm sales growth and the management process configuration in the case of high and low technology companies sector. The specifics of management process will be described with the use of correlation analysis to demonstrate the different intensification of used resources and capabilities (companies assets and costs structure) and to examine indirectly the firm level innovativeness as key factor of used management strategy. As a result, correlation analysis could be applied to assess the relationship between those financial reporting parameters felt to be critical. This in turn enabled correlation coefficients to be calculated giving the possibility of expressing the degree and direction of the relationship between selected variables.

The following variables were therefore chosen separately for the Low and the High Technologies Sectors: Intellectual and other non-material property (A0), Land (A1), Buildings, offices and engineering structures (A2), Technical equipment and machinery (A3), Transportation equipment (A4), Other under construction or advances for fixed assets under construction (A5), Selling expenses (KS), General and Administrative expenses (KZ), Own capital (KW), Working capital (G1), Inventories (ZAP), Net sales value (Q), Time (T) and finally a variable (W) to enable separate classification of the different sectors. The analysis presented below shows the different correlation coefficients calculated for each sector.

Analysis of the businesses in the Low Technologies Sector revealed a strong positive correlation impact on Sales revenues for the following variables: Buildings, Technical equipment and machinery, Land, Transportation equipment, Internal capital (tab. 2). What is perhaps worth noting is the weak negative correlation with regard to Selling expenses and General and Administrative expenses. This low or negative correlation value could indicate that these businesses operate in markets which are customer dominated where, given the significant impact of both cost items on net Sales revenues, these businesses are not obliged to build their organizations and to develop marketing. Correlations coefficients for the other variables confirmed relationships which characterize food or base commodity producers with low conversion levels and therefore, where the production infrastructure plays a fundamental role. Another correlation to be noted is between Sales and Internal capital which highlights the trend, described earlier, for these businesses to use internal funding to finance their business activity.

Table 2

Correlation matrix of chosen variables for the analyzed low technology sector manufacturing companies in the period 2008-2011 (two-tailed tests. * $p < .05$). source: own

T	A0	A1	A2	A3	A4	A5	G1	ZAP	KW	KS	KZ	Q	
1	-0,0168	-0,0488	0,0162	0,0369	0,0091	0,0132	0,0356	0,0519	0,0339	0,0208	0,0329	0,0638	T
	1	-0,1545	-0,1559	-0,1455	-0,1231	-0,1062	0,7477	0,8673	0,7523	0,539	0,5532	-0,1112	A0
		1	0,5925	0,4654	0,6037	0,6058	-0,0452	-0,0411	0,0533	-0,1644	-0,1336	0,6191	A1
			1	0,7885	0,3982	0,2927	0,0326	0,0142	0,1993	-0,1702	-0,1635	0,8665	A2
				1	0,3405	0,3516	0,0624	0,0414	0,2635	-0,1553	-0,142	0,8587	A3
					1	0,8492	-0,0848	-0,0773	-0,0203	-0,1359	-0,0907	0,4148	A4
						1	-0,0621	-0,0477	0,0028	-0,1028	-0,0501	0,34	A5
							1	0,9316	0,9388	0,8893	0,8969	0,1257	G1
								1	0,8962	0,7896	0,7948	0,1045	ZAP
									1	0,7125	0,742	0,2935	KW
										1	0,9758	-0,1171	KS
											1	-0,0951	KZ
												1	Q

An analogous model was developed for the businesses in the High Technologies Sector. This turned out to be more complex showing more variables with significant correlation relationship to Sales revenues dynamics (tab. 3). Analyzing the businesses in the High Technologies Sector, what became apparent was a strong positive correlation for the following asset classes listed by size of correlation coefficient: Technical equipment and machinery, Buildings, Land, Other fixed assets. These were followed by: General and Administrative and Selling expenses, ending on Transportation equipment, Internal capital and Working capital (weak correlation).

Table 3

**Correlation matrix of chosen variables for the analyzed
high technology sector manufacturing companies
in the period 2008-2011 (two-tailed tests.* $p < .05$). source: own**

T	A0	A1	A2	A3	A4	A5	G1	ZAP	KW	KS	KZ	Q	
1	0,0779	0,1001	0,1266	0,148	-0,1192	0,0541	0,0232	-0,0491	0,102	-0,0945	-0,0565	0,177	T
	1	-0,1008	-0,103	-0,1011	-0,0704	-0,0846	0,6115	0,1345	0,7799	0,2078	0,3346	-0,0089	A0
		1	0,7626	0,8186	0,0808	0,7029	-0,0323	0,1092	0,1206	-0,1412	0,0018	0,5057	A1
			1	0,8725	0,2549	0,7716	-0,0145	0,1422	0,1998	-0,0518	0,0288	0,5147	A2
				1	0,1103	0,6861	0,0006	0,1584	0,1907	-0,0703	0,1002	0,5999	A3
					1	0,2542	-0,0364	0,0083	0,0256	0,3416	0,31	0,3533	A4
						1	-0,027	0,0868	0,1441	0,0102	0,145	0,4562	A5
							1	0,763	0,8402	0,677	0,6377	0,1668	G1
								1	0,3959	0,6834	0,4906	0,2739	ZAP
									1	0,3931	0,5783	0,2109	KW
										1	0,7142	0,3562	KS
											1	0,4462	KZ
												1	Q

There was a weak negative correlation between Sales revenues and Intellectual property. With the exception of Intellectual property, the strength of the correlation confirms a strong dependency between Sales revenues and Fixed assets whereas the weak negative correlation with Intellectual property reflects how assets of this nature are used to safeguard the manner in which Fixed assets are used. This interpretation of the correlation underlines the importance of the other asset classes and, as a result, enables their more effective application in production processes in the High Technologies Sector. The asset classes with the highest positive correlation were Technical equipment and machinery followed by Buildings and land which indicated that for businesses in the High Technologies Sector production processes were less dependent on raw materials or on semi-processed product. The strong positive correlation between Sales revenues and General and Administrative and Selling expenses, confirmed that for businesses in the High Technologies Sector these positions were significant factor of revenue generation which underlined indirectly a significant difference with the Low Technologies Sector. Continuing the comparison of businesses in the Low and High Technologies Sectors one can note that, for the Low Technologies Sector, the correlation relationship between assets and Sales revenues is more conventional in that Sales revenues increase is to a large extent dependent on fixed asset growth. Other differences between businesses in the two sectors are in Technical equipment and machinery where there was a strong positive correlation for those in the High Technologies Sector implying they are more efficient with a lower direct labor content. A third area where differences could be noted was in Selling expenses and General and Administrative expenses, which probably reflect the greater importance of intangibles resources use for businesses in this sector. Differences can also be observed for the other asset classes. Businesses in the High Technologies Sector invested more in technical equipment and machinery and in transportation equipment thus confirming the assumption that for these businesses Sales revenues growth is more dependent on technical capabilities. Another point worth noting is the lack of differentiation between the two models in the factors which affect sales growth. This similarity between the two models may reflect general trends in innovation development among Polish businesses and is confirmed by the fact that Poland is in the group of EU countries with “moderate” levels of innovation. This lack of strong variation between the models could also indicate that businesses in both sectors have similar goals and thus significant communalities in their strategic models. Although, significant differences in variables between the sectors would have indicated

that businesses in the High Technologies Sector have significantly different strategic goals not necessarily based on sales growth by gaining competitive advantage through increased market share. In the case of the businesses analyzed, this fact could also indicate a narrower perspective by gaining competitive advantage based on cost. In this context, the value of Intellectual property and non-material assets which, for businesses in the High Technologies Sector, has a more significant participation in fixed assets than that for businesses in the Low technologies Sector. This indicates the increasing importance of these assets to these businesses thus confirming the increasing significance of technology transfer as an element differentiating their business process. It is thus possible to conclude firstly, that increasing application of innovation will result in increased Sales which, in turn will result in clearer differentiation of the management process between businesses in the High Technologies Sector and those in the Low Technologies Sector. And secondly, that this increase will be accompanied by a decrease in the value of correlation between these variables and sales growth. However, a condition for reaching this level may well be reconfiguration of the management process so that it is reoriented in a more pro-innovation manner. An indicator that this reorientation is taking place will be when businesses start to define their goals in terms of competitive advantage through unique combinations of capabilities designed to enable a high sales growth based on products which are high-value and which are also highly differentiated from those already offered on the market. A confirmation of the effectiveness of this approach is the discussion earlier of High Technologies Sector businesses in countries with a high level of innovation. A key factor enabling this differentiation is a business model capable of identifying and developing appropriate technology either in or outside the business and what characterizes Polish businesses in the High Technologies Sector is their reliance to a large extent on technologies which are internally developed which can be a characteristic of businesses in the early stages of the innovation cycle.

Conclusion. The Increase in business environment dynamics and complexity implies that many firms seek new ways of conducting their business through the innovation as the base of technology changes and product variety proliferation are part of the characteristics of the new manufacturing environment. While High Technology sector manufacturing companies can often invest in new technologies and equipment, providing world-class skills, training to their workforce and winning new markets this is hardly the case for Low Technology sector companies. The presented research focuses on the RBV resulting relationship between sale dynamics and the degree of firm assets utilization, following the rule, that being innovative implies the different way of organization resources used in business activity configuration. The results of the study show that High Technology sector manufacturing companies used their assets more intensively and that the cost structure is also different than in case of low technology firms. The reason of those dissimilarities is that Low Tech manufacturing companies take a more defensive market position. However, another possible reason may relate to market development phase, which this study cannot confirm and is the subject of further investigation. The use of RBV optics can confirm the role of firm heterogeneity implying that innovativeness is more attractive strategic option than market share maximalization. The realized correlation analysis suggests that tangible assets have still more important impact on the sales growth, than the intangible assets that is not evident to RBV. According to the relative differences in expenses structure of analyzed firms, it is also indirectly possible to confirm that capabilities contribute more to firm revenues growth in the case of High Technology sector. This fact can explain the complementary role of capabilities in management process and also accentuate the importance of strategy formulation specifics in the case of innovation based business. The specifics, which empowers the importance of resources and capacities versus environmental dynamics.

1. D'Angelo A. *Innovation and export performance: a study of Italian high-tech SMEs* // *The Journal of Management and Governance*. – 2012. – №16. – P. 393–423. 2. Damanpour F., Wischnevsky J.D. *Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations* / *Journal of Engineering and Technology Management*. – 2006. – № 23. – P. 269–291. 3. *European Commission, D.G.R.I., Research and Innovation Performance in Poland Country profile, European Union, Brussels, 2013.* – P. 2. 4. Galbreath J. *Which resources matter the most to firm success?*

An exploratory study of resource-based theory // Technovation. – 2005. № 25. – P. 979–987. 5. Galbreath J., Galvin P. *Firm factors, industry structure and performance variation: New empirical evidence to a classic debate // Journal of Business Research.* – 2008. – № 61. – P. 109–117. 6. Gazinska M., Mojsiewicz M. *Nauka i technika w 2011, Informacje i opracowania statystyczne, G.U.S., Urząd statystyczny w Szczecinie.* – Warszawa, 2012 a. 7. Gazinska M., Mojsiewicz M. *Nauka i technika w 2010, Informacje i opracowania statystyczne, G.U.S., Urząd statystyczny w Szczecinie.* – Warszawa, 2012 b. 8. Ghani K.A., Jayabalan V. *Advanced Manufacturing Technology and Planned Organizational Change // The Journal of High Technology Management Research.* – 2000. – Vol. 11, № 1, P. 1–18. 9. Grinstein A., Goldman A. *Characterizing the technology firm: An exploratory study // Research Policy.* – 2006. – № 35. – P. 121–143. 10. Helfat, C.E., Peteraf, M.A. *The dynamic resource-based view: capabilities lifecycles // Strategic Management Journal.* – 2003. № 24. – P. 997–1010. 11. Lockett A., Thompson S. *The resource-based view and economics // Journal of Management.* – 2001. – № 27, P. 723–754. 12. O'Regan N., Ghobadian A. *Strategic planning — a comparison of high and low technology manufacturing small firms // Technovation.* – 2005. – № 25. – P. 1107–1117. 13. O'Regan N., Sims M.A. *Identifying high technology small firms: A sectoral analysis // Technovation.* – 2008. – № 28. – P. 408–423. 14. OECD-Eurostat, *Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition, 2005.* 15. Prahalad, C.K., Hamel, G. *The core competence of the corporation // Harvard Business Review.* – 1990. – Vol. 68. – № 3. – P. 79–91. 16. Radauer A., Streicher J. *Low-Tech, innovation and state aid: the Austrian case // International Entrepreneurship Management Journal.* – 2007. – № 3. – P. 247–261. 17. Santamaría L., Nietob M.J., Barge-Gil A. *Beyond formal R&D: Taking advantage of other sources of innovation in low- and medium-technology industries // Research Policy.* – 2009. – № 38. – P. 507–517.