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Procedia Engineering 181 (2017) 951 – 958

Procedia Engineering

www.elsevier.com/locate/procedia

10th International Conference Interdisciplinarity in Engineering, INTER-ENG 2016

Particularities of the Technologies Portfolio Management in Industries Representative for Romania

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Abstract

The current technologies are diverse, they are combined easily, transferred quickly from one industry to another. Even if, usually, the technologies are expensive and their creation is gradually becoming a business itself, can not overlook the fact that technology is the most important instrument for sustaining the competitive advantage of the companies with the potential to change the structure of the existing industries and to create new industries. All this dynamic challenges for the companies' management born on the need the replacement of the old technologies, the assessment of the existing ones into the market, the integration of the new technologies, taking into account the strategic objectives of the business.

The paper aims to identify a number of aspects relevant to the analysis of a portfolio of technologies of a company and to do an analysis of how these issues differ at the level of the industrial branch. Within the paper, two representative industries were chosen, namely the machine building industry and the IT & C industry, they are representative for Romania through dynamics and the economic impact.

The paper work is part of a more complex approach that aims to extend the analysis to several industries in Romania.

Peer-review under responsibility of the organizing committee of INTER-ENG 2016

Keywords: technologies management; the management of the technologies portfolio; the machine building industry; the IT & C industry.

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Peer-review under responsibility of the organizing committee of INTER-ENG 2016
doi:10.1016/j.proeng.2017.02.492

1. The concept of the management of the technologies portfolio

The European Institute of Technology and Innovation Management (EITIM) defines the processes of technology management such: identification, selection, acquisition, research, use and protection of the required technologies to obtain and maintain market position and business performance in accordance with the business goals [1].

Technologies Management (TM) handles the company's portfolio of technologies, namely of the whole set of resources and technological capabilities disseminated within the organization. The aim of the technologies management refers to activities such as:

- the forecast of the technologies,
- the exploration, creation and development of the technologies,
- the acquisition, operation (use), dissemination, sale, transfer, implementation and replacement of the technologies through technological innovation so that the organization becomes more flexible towards the implementation of new know-how, innovation, entering new markets, or better resistance to the competitors.

The management of the technologies portfolio (MTP) is the task of all engineers, technicians and researchers, both from the R&D department, and the production one [2].

The MTP's benefits are the following [3]:

- it supports the process of making decision as it increase the ability of the managerial team to evaluate the impact of the investments on the firm's programs, finances and its IT infrastructure;
- it identifies the technology which is outdated, underutilized, redundant, absent, or coming near to the end of its life cycle. It helps in determining the technology which follows to be eliminated, kept, or replaced. Also, it may be identified new technology opportunities;
- it reduces the maintenance of the assets which provides free time, resources for other value-added work;
- it is used to focus on the technology spending and the level of funding for each technology. Thus, the costs are aligned with the organization's values.

2. Presentation of the research

2.1. Objective and usefulness of the research

The research hypothesis: The importance given by the employees of the firms in the two industries is different for a number of determined criteria for analyzing the technologies portfolio management within the respective firms.

The research purposed to follow the way in which firms attach importance to the aspects mentioned in the previous point (the 8 aspects identified in the literature) in the quest to manage of the technologies portfolio.

The analysis period was January-February 2015, and the population sample consisted of 82 respondents, managers and staffs from IT&C companies, most of them are foreign-owned and 56 respondents, managers and staffs from machine building companies (seen in Table 2). The population's sample participating in the study was located in the South - East of our country.

2.2. Defining the framework of the analysis - bibliographic research

In this research, it is wished to be identified a number of aspects from the literature which have impact on the management of the technologies portfolio.

A1. The firm's interest for recent technological changes in the industry through the presence at fairs or similar events.

A technologies scan consists of querying of a range of sources for ideas on technologies and applications that could be relevant to the business. Selection and prioritization of the ideas comes later. The sources are including: companies that do analyses, the consultants, presentations of the vendors, the government and the universities' labs,

the press which has subjects on trade and science, conferences, networking with other partners within and outside the organization on technology. In order to improve the quality of the scans of the technologies, companies can divide the work among some groups and interested people by assigning part-time responsibility for monitoring [4]:

- Application areas (e.g., knowledge management, customer relationship management, business intelligence, security, supply chain management);
- Information sources (e.g., conferences, magazines, lists of e-mails);
- Technology areas (e.g., portals, Web services, data mining and user interfaces, wireless).

A2. The classification of the technologies that are relevant to business in terms of their potential of development, the risks, the costs and the market attractiveness for the understanding and their potential use.

For each potential interesting technology identified during a technologies scan, the advanced technology groups should develop a technology profile to document the investigation. The initial profile may be just a note of the technology, its definition, and potential areas of relevance within the business.

A technology profile may include the following characteristics:

- the name and definition of the technology;
- the business application;
- the benefits for the company:
  - are moderate, when provides incremental but significant improvements to the established processes,
  - are high, when enables new ways of performing specific business applications either horizontally or vertically within an organization,
  - the incrementally or radically change of the technology can influence the business processes, as a result, it is achieved the altering of the competitive dynamics of an industry,
  - reduced costs,
  - increased revenue,
  - increased profits,
  - positive impact to one business unit or across the entire company, because of a successful exploitation,
  - it has a transformational character, because facilitates new ways of doing business among industries.

The technology scorecard is a more detailed approach for assessing the relative value of the technology which appeal to costs, risks and benefits. It is a suitable technique for the prioritization of the developed projects already evaluated.

A3. The employees' access, particularly of those in the technical department, at the latest knowledge in the business, having a technical nature, offered by the firm.

When it is wanted to create an inventory of the portfolio of the technologies should be considered the following key features [5]:

- the name of the technological component and its supplier,
- the version or model,
- the type of the component: operating system, databases, development tool and others,
- the applications supported by the IT,
- the number of the users which are served,
- the amount spent per year to pay operators' salaries, licenses and renewals of the used versions,
- the sourcing: internal, hosted, cloud and others.

A4. Knowing the role of the different technologies in achieving the company's objectives.

The technology management deals with putting in practice of the strategic business objectives through technology with an impact on the achieved outcomes. In this case, the managerial tasks refers to: ensuring the conditions for obtaining efficiency, supervising regularly and daily optimization of the technological projects, processes and components [6].

Generally, organizations use common technologies that help them to achieve objectives. Among the main factors contributing to the company's development are the investments in the human capital, the new technologies, the intangible assets, and the sharing of knowledge [7].

A5. Knowledge of the main strengths and weaknesses of the technologies used by the employees compared with those used by the competitors.

Benchmarking is a method of comparing the performance of an organization with the best practices and technological applications of others. For the proper application of this method, it is recommended deep understanding of the own processes and then comparing own performance to the ones achieved by others.

Also, can be used the best practices that are based on standards and specifications resulting from the study of the scientific and business literature, in order to identify relevant technologies and information. For a easier comparison of similar products or technologies may be taken as a starting point the volumes of some conferences and journals in which the specific indicators are presented.

A6. Technical capabilities of the firm and the accumulation of the employees' knowledge are regularly analyzed, e.g., through technological audit.

The audit tool of the technological capability is a measurement tool for the assessment of an organization based on nine key areas of technological activity [8]:

1. The need to improve technologies;
2. The search according to the external opportunities and threats;
3. The building of distinctive competences on the base of the core capabilities;
4. The development of a strategy based on technology to support the business;
5. The evaluation and selection the adequate technological solutions;
6. The acquisition and introduction of the technologies within the organization;
7. The implementation and utilization of the technologies;
8. The learning from experience in order to improve technology;
9. The building relationships with a network of researchers, suppliers and partners.

A7. Using business intelligence tools (e.g., the development of the scenario, the trends analysis, the benchmarking etc.)

It is recommended as the technologies portfolio management to begin with the identification of the technology and to assess the scenarios of the investment before the innovation of the technology. When the technology projects are interdependent, the difficulty of the integration or the disintegration with even a moderate number of projects having a small number of key objectives and constraints may have major effects on sales results [6,9].

A8. The existence of the procedures for the selection of the new technologies, risk analysis and allocation of the resources for their implementation.

In the literature a number of terms are used, among them were *the risk of technology, the technical risk.*

The technology risk is given by the probability, that a technology needed for a capability, will not mature within a determined period of time.

The technical risk is about the probability that a system will not achieve its objectives of performance, capability, cost or schedule due to the technology risks, which arise at the integration of the critical technologies and/or of the sub-systems dependent on them [10].

2.3. The choice of industries subject to research

The products of the automotive industry, as part of the machine building industry, were ranked first among the Romanian exports in the first quarter of the year 2015, their value exceeding 6.127 billion Euros, according to the data published on the website of the Ministry of Economy, Trade and Tourism (METT).

Since 1990 till 2014 in Romania were founded more than 30,000 companies in the IT sector, focused on the achievement the products and services. The financial performance of this sector has steadily increased, reaching an average annual turnover of about 2.8 billion Euros. The IT industry in Romania is made up of [11]:

- hybrid companies that make *outsourcing and production* (46%);
- domestic companies that *produce and sell software* (11%) (Siveco, BitDefender);
- companies that have *development centres* (Intel, Adobe, Ixia);
- companies that *sell solutions in our country* (Microsoft, Oracle, SAP etc.).

The software segment of the product development holds 48% of the total net profit of the IT sector. The profit amounted to 260 million Euros in 2012. The less profitable segment of the IT is the one of maintenance and repair, with a return of 11 times smaller than the one of software of the product development [12].

2.4. The results of the research

For the issues A1-A8, the respondents had to choose among the values:

1. appearance is not important in the management of the technologies portfolio,
2. appearance is less important,
3. appearance is important and
4. appearance is very important in the management of the technologies portfolio.

At first view, it can be said that are given a greater importance of the assessed areas in the IT & C industry than in the machine building industry, the evidence being the sum of the averages of the analyzed aspects 25.23 than 24.17 (seen in Table 1).

Table 1. The importance of the analyzed aspects at the industry's level

	The machine building industry			The IT&C industry		
	Mean	Std. Deviation	Position	Mean	Std. Deviation	Position
A1. The firm's interest for recent technological changes in the industry through the presence at fairs or similar events.	3.09	.900	2	3.15	.862	5
A2. The classification of the technologies that are relevant to business in terms of their potential of development, the risks, the costs and the market attractiveness for the understanding and their potential use.	3.07	.759	4	3.30	.842	3
A3. The employees' access, particularly of those in the technical department, at the latest knowledge in the business, having a technical nature, offered by the firm.	2.96	.934	7	3.38	.764	2
A4. Knowing the role of the different technologies in achieving the company's objectives.	3.12	.689	1	3.40	.682	1
A5. Knowledge of the main strengths and weaknesses of the technologies used by the employees compared with those used by the competitors.	3.09	.959	3	3.16	.808	4
A6. Technical capabilities of the firm and the accumulation of the employees' knowledge are regularly analyzed, e.g., through technological audit.	2.77	.914	8	2.79	.978	8
A7. Using business intelligence tools (e.g., the development of the scenario, the trends analysis, the benchmarking etc.)	3.02	.924	6	3.00	1.030	7
A8. The existence of the procedures for the election of the new technologies, risk analysis and allocation of the resources for their implementation.	3.05	.796	5	3.05	.865	6
The sum of the averages	24.17			25.23		

Source: SPSS processing

In the practice of the IT&C companies, the following aspects: *A2, A3 and A4, are much appreciated.*

An average attention is given to the issues: *A1, A5, A7 and A8*.

Somewhat *less attention* is observed to the issue: *A6.*

In *the practice of the machine building companies* there are not aspects of the analysis whose are associated a high importance.

An average attention is given to the issues: *A1, A2, A4, A5, A7 and A8*.

Somewhat *less attention* is observed to the issues: *A3 and A6.*

It is considered that there is some consensus among industries when they are envisaged the issues A1, A5, A7 and A8 seen as important, and A6 seen as a less important one. Major differences arise in the case of A3, which is seen as a much more important aspect in the IT & C industry, than in the machine building industry and vice versa when it is analyzed A1 (seen in Table 1).

Statistical interpretation of the results:

By the application of the process of the Independent Samples T-Test in SPSS, the process applied to two independent samples consist of respondents from the two analyzed industries, it was tested whether the averages of the two industries are equal for each analyzed aspect (seen in Table 2 and Table 3).

While the Sig. Value for all the analyzed variables is greater than 0.05 means that the variability in the two conditions (the two analyzed industries) is about the same and it can be read in the first row in the Table 2.

Because the Sig (2-Tailed) value for A1, A2, A5, A6, A7, A8 is greater than 0.05 it can be concluded that there is no statistically significant difference between the averages of the two analyzed industries.

The Sig (2-Tailed) values for A3, A4 are less than 0.05 and the intervals of the difference not contain zero, also, it can be concluded that for the two variables exist big differences between the averages of the two analyzed industries.

Therefore, the two variables differentiated significantly at the level of analyzed industries are: "A3. The employees' access, particularly of those in the technical department, at the latest knowledge in the business, having a technical nature, offered by the firm" and "A4. Knowing the role of the different technologies in achieving the company's objectives".

Table 2. Group Statistics

	Branch of activity	N	Mean	Std. Deviation	Std. Error Mean
A1 Interest - technological changes	the machine building	56	3.09	.900	.120
	the IT & C	82	3.15	.862	.095
A2. Classification of the technologies	the machine building	56	3.07	.759	.101
	e IT & C	82	3.30	.842	.093
A3. Employees' access to the technical knowledge	the machine building	56	2.96	.934	.125
	the IT & C	82	3.38	.764	.084
A4. The role of the technologies	the machine building	56	3.13	.689	.092
	the IT & C	82	3.40	.682	.075
A5. Knowledge of the used technologies	the machine building	56	3.09	.859	.115
	the IT & C	82	3.16	.808	.089
A6. Analysis of the technical capabilities	the machine building	56	2.77	.914	.122
	the IT & C	82	2.79	.978	.108
A7. Usage of the business intelligence tools	the machine building	56	3.02	.924	.124
	the IT & C	82	3.00	1.030	.114
A8. Existing procedures for the selection of the technologies	the machine building	56	3.05	.796	.106
	the IT & C	81	3.05	.865	.096

Source: SPSS processing

Table 3. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
A1. Interest - technological changes	Equal variances assumed	.075	.785	-.375	136	.708	-.057	.152	-.358	.244
	Equal variances not assumed			-.372	114.918	.711	-.057	.153	-.361	.247
A2. Classification of the technologies	Equal variances assumed	2.177	.142	-1.664	136	.098	-.233	.140	-.511	.044
	Equal variances not assumed			-1.697	125.851	.092	-.233	.138	-.506	.039
A3. Employees' access to the technical knowledge	Equal variances assumed	.110	.741	-2.853	136	.005	-.414	.145	-.701	-.127
	Equal variances not assumed			-2.747	102.293	.007	-.414	.151	-.712	-.115
A4. The role of the technologies	Equal variances assumed	1.710	.193	-2.336	136	.021	-.277	.119	-.512	-.043
	Equal variances not assumed			-2.331	117.529	.021	-.277	.119	-.513	-.042
A5. Knowledge of the used technologies	Equal variances assumed	.098	.755	-.482	136	.631	-.069	.144	-.353	.215
	Equal variances not assumed			-.476	113.501	.635	-.069	.145	-.357	.219
A6. Analysis of the technical capabilities	Equal variances assumed	.295	.588	-.150	136	.881	-.025	.165	-.351	.302
	Equal variances not assumed			-.152	123.379	.879	-.025	.163	-.348	.298
A7. Usage of the business intelligence tools	Equal variances assumed	.509	.477	.104	136	.917	.018	.171	-.321	.357
	Equal variances not assumed			.106	126.239	.915	.018	.168	-.314	.350
A8. Existing procedures for the selection of the technologies	Equal variances assumed	.028	.869	.029	135	.977	.004	.146	-.284	.292
	Equal variances not assumed			.029	124.419	.977	.004	.143	-.279	.288

Source: SPSS processing

The T-Test assumes that the means of the different samples are normally distributed; it does not assume that the population is normally distributed.

3. Conclusions

The evolution of the statistical data reveals that in the last period in Romania can talk about a fast pace of development in the two industries, namely automotive industry and the IT&C industry.

Currently, not only cars are manufactured in the building machine industry, engines, mechanical elements, turbines, mechanical equipment, industrial machinery for special purpose, household appliances are also achieved. All these products require different technologies, usually they are brought as direct investments by the representative companies in the world (Renault, Ford, Continental, Mercedes etc.). In this industry, dominated by globalization, the technology transfer is a little harder than in the IT&C industry and the investments in the R&D and production are time-consuming and multiple risks are considered, as it can be seen in the Ford case in Craiova.

On the other hand, the IT&C industry is an industry with less tradition in Romania, but which has become the largest generator of business and jobs in Romania (it has much many IT engineers per capita than the US, India, China or Russia, with a growth averaging 9% per year) enjoy the benefits arising from offshore contracts, taking advantage of leading technologies, without financial efforts too high, given that the companies producing software make possible the access to technologies from distance by the specific nature of the Internet.

By their complex nature the two industries appeal to many technologies developed internally or acquired from the external sources, their identification, knowledge and evaluation, decision making of the replacement of the existing ones timely, finding technological solutions that build on the strengths and leading to capabilities without generate major financial efforts represent challenges for the management of the research and development and production of any company.

This research has revealed that there are major similarities between the two industries with a small plus in case of the IT&C industry. Regarding the importance of the aspects of the technologies portfolio management, there were identified two important distinctions: 1) the employees' access to the latest knowledge of technical nature is more difficult in the building machine industry, and 2) a more visible presence of the representatives of the companies from the building machine industry at fairs and similar events that focus on the technological changes.

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