EMPIRICAL EVIDENCES OF NEW TECHNOLOGIES ADOPTION IN ROMANIAN INDUSTRIAL FIRMS

EMPIRIJSKI DOKAZI USVAJANJA NOVIH TEHNOLOGIJA U RUMUNSKIM INDUSTRIJSKIM PREDUZEĆIMA

PhD Eng., Ec., Gabriela Lobonțiu, Associate Professor[127]
PhD Eng. Adrian Petrovan, Lecturer[128]

Abstract: *The paper is arguing that it's possible to build a successful strategy based on innovation as a source of competitive advantage. And since adopting new technologies can be one such source of building a competitive advantage based on innovation, the paper aims to investigate the degree to which a random sample of industrial firms from North-west Romania are inclined to adopt new technologies and analyses the potential strategic benefits of such a behavior.*

Key words: *competitive advantage, new technology adoption, strategy*

Sadržaj: *U radu je izneto da je moguće izgraditi uspešnu strategiju zasnovanu na inovacijama kao izvoru konkurentske prednosti. Pošto usvajanje novih tehnologija može da bude jedan izvor izgradnje konkurentske prednosti na osnovu inovacija, rad ima za cilj da istraži stepen do kojeg preduzeća u slučajnom uzorku industrijskih firmi iz severozapadne Rumunije su sklona da usvoje nove tehnologije i analizira potencijalne strateške koristi ovakvog ponašanja.*

Ključne reči: *konkurentska prednost, usvajanje nove tehnologije, strategija*

1. THE RELATIONSHIP BETWEEN TECHNOLOGY AND COMPETITIVE ADVANTAGE

The globalization of markets has raised strong competitive pressures. The rapid evolving technology, the fast changing markets and the more demanding customers, require developing high quality new products more efficiently and effectively [1]. Taken that every firm can be represented as a bundle of resources, skills and competencies [2], the effect of innovation is to transform a firm's inner capabilities, making it more adaptive, better able to learn, to exploit new ideas. This need to innovate has become clear by now.

Besides the fierce global competition that characterizes today's economy, the European economy must also face the severe competition exercised by China and other emerging economies. As strategic behavior, these latter countries are still based on costs domination

[127] Technical University of Cluj-Napoca, North University Centre of Baia Mare, Str. Dr. V. Babes nr.62A, 430083 Baia Mare, Maramures, Romania

[128] Technical University of Cluj-Napoca, North University Centre of Baia Mare, Str. Dr. V. Babes nr. 62A, 430083 Baia Mare, Maramures, Romania

(with the benefit of sufficient domestic demand, which allows the orientation toward mass production and achieving powerful economies of scale). Since the firms operating in EU countries are unable to achieve cost cuts and scale economies comparable to those of China, for example (due to labor costs, which are considerably higher in Europe), the most viable strategic alternative to counteract a competitor which is based on low costs remains product differentiation. Product differentiation is based on "uniqueness" [3], i.e. a perception that locates distinctly the company / product in the minds of buyers.

Differentiation can be achieved through [3]: design or brand image, technology, functional characteristics of the product, customer service, distribution network etc.
Understanding the sources of sustained competitive advantage for firms is one major area of research in the field of strategic management even since the 80s (see [4], [5]). Also, a new competitive landscape is developing largely based on the technological revolution and increasing globalization [6]. So keeping the pace with new technologies seems to be one logical step in pursuing the achievement of a sustained competitive advantage.

Chen argues [7] that the main reason why the U.S. steel industry lost, in the post-war period, its competitive advantage to Japan lay in the fact that the Japanese steel industry, a lagging country at the time, seized the opportunity of a major technological innovation and overtook the leading country. So what Chen proves [7] is that adopting new technologies constitutes a major source of gaining a competitive advantage, regardless the scale (as a national economy, or as an individual firm).

Even more, in strategic management, the resource-based view of the firm is emphasizing the links between the internal resources of the firm, its strategy, and its performance [8]. According to Barney [9], resources fall into three categories: physical capital resources, human capital resources, and organizational capital resources. Physical capital resources consist of such things as the firm's plant and equipment, technology and geographic location. Human capital resources include such things as the experience, judgment, and intelligence of the individual managers and workers in the firm. Organizational capital resources consist of such things as the firm's structure, planning, controlling and coordinating systems, and the informal relations amongst groups within the firm and between

Gabriela Lobontiu
Currently, Associate Professor within Engineering Faculty, Department of Engineering and Technology Management from Technical University of Cluj-Napoca, North University of Cluj-Napoca, and member of Council Board of the faculty.
Graduate of Industrial Engineering and also Management of Firm (a second BSc), got her PhD in Industrial Engineering in 2008, with a thesis that covered small business management aspects.
Formerly a small company manager, and also activated as a guest researcher at Copenhagen Business School. For 4 years, appointed as Quality Manager within university.
Her current research interests include small business management, strategic management, management of technology, technology's diffusion.

the firm and other firms in its environment. In the resource-based view of the firm, these resources are sources of competitive advantage [8], [9].

Consequently, innovation and new technology diffusion play a central role in attaining and sustaining competitive advantage. These two factors are a major driving force for the economic growth and expansion of companies.

2. THE DEGREE OF NEW TECHNOLOGIES´ ADOPTION IN ROMANIAN COMPANIES

Methodology and survey instrument

Looking to identify the level of new technologies adoption amongst industrial firms located in Maramureș area in Romania (NUTS3 level – RO114), we initiated an empirical investigation, based on the survey method.

Due to difficulty in studying the whole population, we adopted the survey method, considering purposive sampling technique, in order to get first hand information from the respondents.

Adrian, Petrovan
Is a lecturer at the Department of Electrical Engineering and Computer Science at the Technical University of Cluj-Napoca, North University Center of Baia Mare. He obtained his MSc in applied mathematics and his PhD in mechanical engineering. His research interests include knowledge engineering, problem-solving methods and ontologies, diagnosis and planning.

The investigated sample of firms contained 20 items, selected from the Maramureș County Council's database, using the industry affiliation as selection criteria. Since we were investigating the level of new technologies adoption, the incidence of the manufacturing industry was prevailing.

Also, seeking to perform a transversal study, a self-administered questionnaire, with multiple-choice answers, consisting of two sections and a scale of 6 items, was designed. Section I began with general items querying the firm's characteristics: its legal form of existence, the industry to which it belongs, the number of employees. In Section II, the items elicited information regarding the sources of documentation on new technologies that are used by the firms, the "age" of the latest implemented technology, the intention of renewing equipment and technology in the future, as well as the strategic intentions regarding firm's development. The average firm of the investigated sample is a medium-sized manufacturing firm (with 20-249 employees). The distribution of firms based on the industry affiliation and size are as follows - see charts 1a, and 1b, where the division into the categories was made in accordance with the Commission Recommendation 2003/361/EC [10].

It can be noticed that the most present industry is manufacturing (90% of the sampled firms belonging to this sector), while service industry accounted only 10% of the total amount of firms. Regarding firms' size, 20% of the sample is constituted of small firms, 55% of medium sized firms, respectively 25% of big firms.

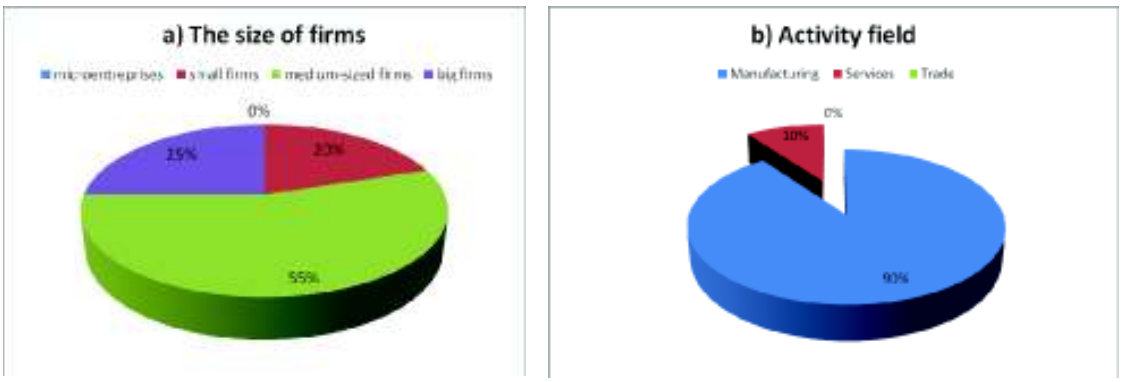

Figure 1: The investigated sample structure
(a) according with size (by no. of employees); (b) according to the activity field

Practical Results

The importance of technology for economic development is widely recognized, given the impact that technology can have on the success or failure of business survival of the companies, especially in an environment of intense competition and global. So, when asked if they are aware of the evolution of technology in their field, all managers surveyed said they would (see figure 2).

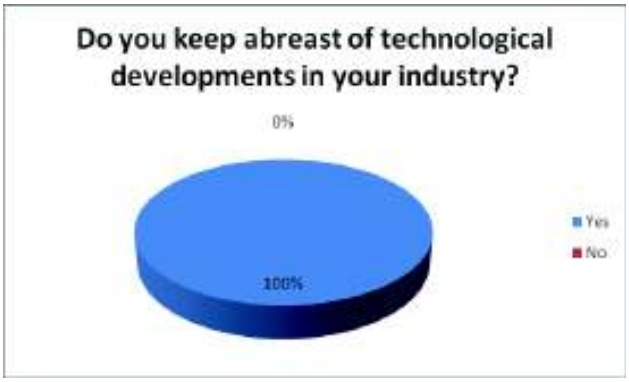

Figure 2: The concern on technological novelties

Technology has become a major agent for restructuring markets and industries. Over 50% of long-term growth comes from technological changes that increase productivity and leads to the development of new products, processes or industries. Therefore, a constant preoccupation of business leaders to keep pace with technological developments seems fully justified.

Going further with the investigation, we asked managers which sources of information they prefer when documenting on technological developments (see figure 3).

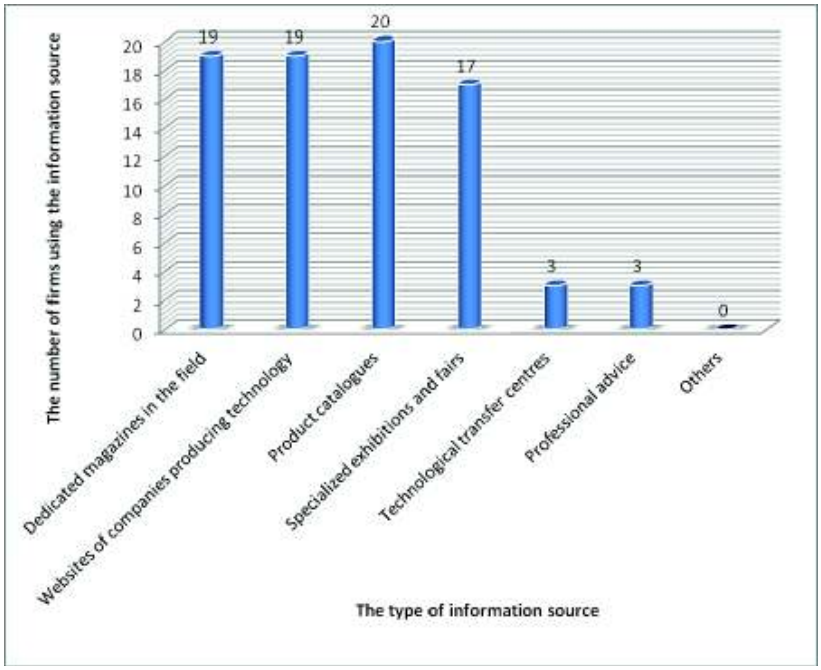

Figure 3: The types of information sources used by the investigated sample

The figures shown by the chart above indicate that managers prefer a less interactive way of documenting when they seek information about technological developments, since a wide majority mentioned product catalogues, magazines, and producer´ websites as the main source for collecting information. A leading place amongst managers´ preference for a certain type of information source is also taken by specialized exhibitions and fairs (17 managers), and this adds a certain interactivity in the documentation process, but still technological transfer centers and professional advice are poorly represented, only 3 managers declaring they use this type of sources. The shortcomings of such a behavior during the documentation process lay in a limited understanding the manager may encounter when judging the alternatives, which, in the absence of a real dialogue, can't be compensated through professional counseling or by the intervention of producer´ experts. Also, a passive type of documentation can be more time consuming than a constructive dialogue with experts and professionals.

Trying to learn the importance managers are placing on the adoption of newly launched technologies from their industry, we asked them how old the latest technology implemented in their company is. The centralized answers are introduced by the figure below.

As shown in figure 4, a big majority of the investigated firms (15 firms, which means 75% of the sample) are using recently launched technologies (currently or one year ago). Since both innovation and new technology diffusion play a central role in attaining and sustaining competitive advantage, grounding competitive strategies such as differentiation, the interest managers' show towards adopting new technologies is fully entitled.

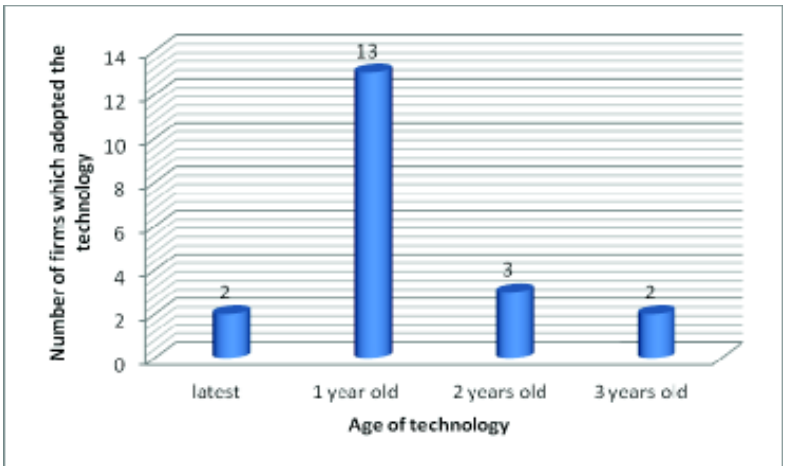

Figure 4: Age of the latest implemented technology

Furthermore, we tried looking at the strategic intentions the managers manifest concerning technology renewal. So, we asked when they plan to implement a new technology. The answers are graphically represented below.

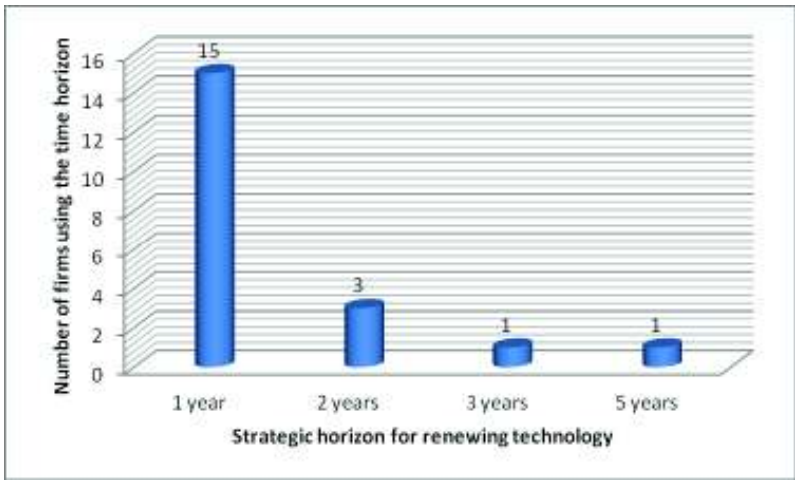

Figure 5: Time horizons used in the process of renewing technology

Even though the big majority of firms (75%, as shown in figure 4) adopted new technologies quite recently, ninety per cent of them (18 firms – see figure 5) plan to implement a new one in a maximum time horizon of two years.

So, the managers from our investigated sample seem to be aware that a rapid adoption of new technologies is one major condition in reaching the strategic flexibility required by the 21st century organization working in the current new competitive landscape. To develop strategic flexibility and competitive advantage, requires exercising strategic leadership, building dynamic core competences, focusing and developing human capital, effectively using new manufacturing and information technologies, employing valuable strategies (exploiting global markets and cooperative strategies) and implementing new organization structures and culture (horizontal organization, learning and innovative culture, managing firm as bundles of assets), Hitt, Keats, and DeMarie argue [6].

In the new competitive landscape, businesses can no longer expect to be stable and long lived. Managers now face the task of creating a balance between the stability necessary to allow development of strategic planning and decision processes and instability that allows continuous change and adaptation to a dynamic environment [6].

But one fundamental objective that every firm must pursue nowadays is continuously development. When forced to cope with such an instable and competitive environment, stagnation can lead, on long term, to business failure. Consequently, the last question we addressed to managers from the investigated sample was linked to their intentions concerning the development of company's production capacity over the next 3 years (see figure 6).

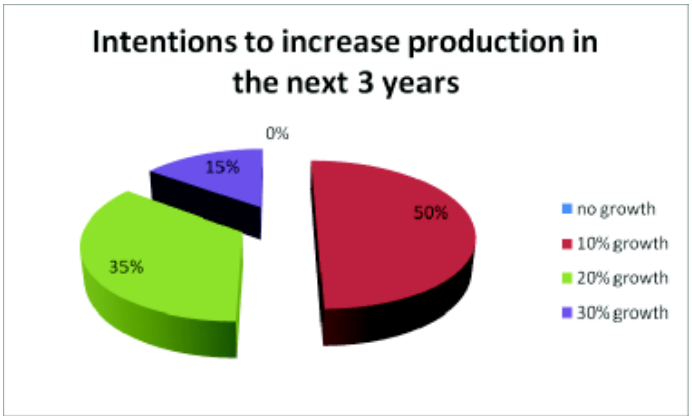

Figure 6: Intentions of growth

An important aspect that emerges from the above data (figure 6) is that none of the companies aims to preserve the current status by not growing. Half of the companies target only a ten percent increase in capacity, while the other half has a more offensive approach and aims for a more consistent development of the firm. Bringing new products and services to the market is a necessity in global markets because of the large number of competitors and increasing emphasis on innovation in these markets. So any successful firm is strongly required to grow, develop and change.

3. CONCLUSIONS

To summarize, the current paper provides an empirical proof that a sample of Romanian managers recognize the importance of new technologies adoption in order to sustain their future organizational development strategies. The performed survey mainly showed that the oldest technology implemented by the investigated firms is 3 years old, a big majority of the firms (75 percent) intending to renew their technology within 1 year period, and also unanimously aiming to increase the production capacity in the next 3 years, ranging from a 10 percent increase (the majority of firms falling into this category) to 30 percent increase.

The paper is also providing a tested methodology that can be further used to perform such researches at a larger scale (regional, or national level), in order to draw broader conclusions concerning the behavior of Romanian industrial firms concerning the adoption of new technologies.

REFERENCES

[1] Maravelakis, E., Bilalis, N., Antoniadis, A., Jones, K.A., and Moustakis, V. (2006) Measuring and benchmarking the innovativeness of SMEs: A three-dimensional fuzzy logic approach. *Production Planning & Control*, Vol. 17, No. 3, April; pp. 283-292.

[2] Neel, A., and Hii, J. (1998) *Innovation and business performance: A literature review*. The Judge Institute of Management Studies, University of Cambridge.

[3] Porter, M. (1980) *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: Free Press.

[4] Porter, M. (1985) *Competitive advantage*. New York: Free Press.

[5] Rumelt, R. (1984) Towards a strategic theory of the firm. In R. Lamb (Ed.), *Competitive Strategic Management*: 556-570. Englewood Cliffs, NJ: Prentice-Hall.

[6] Hitt, M. A., Keats, B. W., and DeMarie, S. M. (1998) Navigating in the new competitive landscape: Building strategic flexibility and competitive advantage in the 21st century. *Academy of Management Executive*, Vol. 12, No. 4; pp.22-42.

[7] Chen, Z. (1996) New Technology, Subsidies, and Competitive Advantage. *Southern Economic Journal*, Vol. 63, No. 1 (July), pp. 124-139.

[8] Wright, P.M., McMahan, G.C., and McWilliams, A. (1993) *Human Resources and Sustained Competitive Advantage: A Resource-based Perspective*. A CEO Publication G93-19 (239). Los Angeles: Marshal School of Business, University of Southern California, November.

[9] Barney, J. (1991) Firm Resources and Sustained Competitive Advantage. *Journal of Management*; 17, 99. Published by: http://www.sagepublications.com, on behalf of Southern Management Association.

[10] European Union (2003): Commission Recommendation 2003/361/EC, in: *Official Journal of the European Union*, L 124, 36.