THE INFLUENCE OF INNOVATION, TECHNOLOGICAL AND RESEARCH PROCESSES ON THE PERFORMANCE OF SLOVENIA’S WOODWORKING INDUSTRY

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ABSTRACT

The objective was to estimate the most important factors aimed at achieving optimal business performance in the wood processing industry in Slovenia, and in this we have focused on innovation, technology and R&D processes. The research was carried out in five steps. Initially, a group of statistical variables was selected, and then some additional ones were defined. In the third step, the variables were dispersed among the following categories: input, process, indirect output and direct output variables. In the fourth step, reciprocal correlations among particular variables were calculated prior to the final selection of the most important correlations and their interpretation. On the basis of illustrated methodology, the influential input and process variables were estimated, and these indicate not only the sequence of activities but also particular areas where additional effort needs to be invested. The research also has a practical implication for enterprises as well as national policy makers.

KEY WORDS: wood, processing, innovation, R&D, technology, benchmarking.

INTRODUCTION

According to the aims of Lisbon declaration and statistical indicators from 2004 (Scoreboard 2004), the European Union is still losing ground in business exploitation of knowledge and creativity to the United States and Japan. The situation in countries in transition as well as Slovenia proves to be even worse. (Eurostat 2003). As innovation is a keystone for achieving a more competitive and dynamic knowledge-driven economy, there is a growing ‘innovation’ gap between the EU and US/Japan. According to statistical data (Scoreboard 2004, SURS 2004) only 21% of Slovenian companies are innovative. When examining the wood-processing industry, it has been established that in this sector (statistical class No. 20), and the production of fibres, paper and paper products sector (No. 21), respectively only 19.2% and 3% of companies are actively engaged in innovation (Hlavaty 2002).

The literature touches numerous types of approaches in pursuing innovation. One of the basic approaches is through analysis of innovation processes according to input, process and output groups of indicators. The selection of the latter remains varied. Input indicators – the
so-called “investment” - encompass, for example, expenditure on R&D or the training given to employees (Carayannis et al. 2003). The process indicators cover the organisation or management of innovation processes, the application of adequate management techniques (market research, techniques of problem analysis and idea creation, forecasting techniques and suchlike), as well as the innovation environment within the company. While the output indicators define the results, for example the number of patents and new products, market share, revenues from the sales of innovations and innovative products and suchlike (Fatur 2005). Even though there are many approaches directed towards solving the mentioned problem - establishing the key influential factors, the appropriate method has not been developed so far. Another important limitation of the mentioned methods is that they were tested on a relatively small sample of companies and were not focused on the wood processing industry.

MATERIAL AND METHODS

The research presented herein is based on standardized procedures and methodology that has been applied in the EU and also Slovenia (Statistical Office of the Republic of Slovenia - SURS) for many years - Community innovation survey (CIS 2001, SURS 2003). The data provided by SURS represented a basis for the systematic and in-depth analysis in our research. In accordance with the Classification of Products by Activity (Hlavaty 2002), our research encompassed 116 Slovenian companies from the statistical classes 20 and 21. The purpose of this research was to establish which are the most important factors that influence the innovative capacities of a company.

The research was conducted in five steps. Initially, a group of variables was selected from among the statistical data collated using the SURS/Eurostat methodology. In addition to the SURS variables, some additional ones were defined and then grouped in the following categories: input, process, output indirect and output direct variables. The results of simple statistics encompassed number of companies included, mean value and standard deviation. The crucial part pertains to the comparison – through correlation – of input, process and output variables. The Spearman's coefficient of correlation (henceforth: SCC) was applied in calculating the correlation coefficients. The SCC were defined with restriction to those with SCC>=0.2 and p<=0.05.

So-called retrospective demonstration was selected to be applied in our analysis (see Fig. 1). The expected results, which are presented as “output direct” variables, served as a starting point. The focus was given to a part of these variables which were regarded as dependent: enterprise’s revenues arising from new product or service/net revenues from sales, market’s revenues arising from new product or service/net revenues from sales, enterprise’s profit and increased market or market share.

On the basis of these selected variables, the influential independent “output indirect” variables, which are related to “output direct” with the highest SCC. Pursuant to thus defined “output indirect” variables (in this step dependent), the process was repeated and defined “process” variables (independent) connected with “output indirect” variables.

After defining these important “process” factors, attention was paid to their correlation with “input” variables. The procedure was repeated and “input” variables (independent), which correlate with “process” (now dependant) variables, were thus defined.
RESULTS AND DISCUSSION

This study of connections between input-output variables supports our contention that a clear decision by management is a cornerstone of innovation. Improvement in corporate strategies (implemented in a mere 14.7% of companies) seems to be closely related to the next step – the introduction of improved management techniques (characteristic of 30.2% of companies) and improved organisational structure (introduced in 37.1% of Slovene companies). New or significantly improved strategy is also connected to improved organisational structures and, consequently, to improvements in the quality of products (15.5% of companies) and processes (12.9%), as well as important positive changes in sales (29.3%).

The proportion of intramural expenditure on R&D, even though this remains relatively low (accounting for - on average - only 0.3% of all expenditure), is supposed to have an extremely beneficent influence, which is manifested in improvement in product quality. Enhanced product quality is also assumed to be positively influenced by expenditure earmarked for the acquisition of machinery and equipment (1.1% of all corporate expenditure), and the proportion of expenditure allocated for design and other preproduction investment (which remains negligibly low). A personnel training seems to be an imperative. At the same time, it was established that the quality of products could be additionally improved through the application of information regarding technologies (a lack of this was observed in 75.2% of companies!).

Yet, at the same time, we suppose that improved products are not enough, since the responsiveness of the market to such improvements continues to be unfavourable. Analysis points out to the consequences of insufficient integration of external R&D organisations (negative correlations). This may be explained with the frequent approach of “self-sufficient” companies in which corporate strategy is technology and production driven and insufficiently market driven or oriented. Therefore, it might be the strategy that is inconsiderate to market needs. The finding is supported by the following statement: new or significantly improved products do not characteristically lead to any increased market share, which should be one of the fundamental objectives of innovation. Co-operation with external development organisations as well as external consultants obviously brings fresh approaches and consequently novelties, which are better accepted by the market (in absolute terms, the proportion of extramural expenditure on R&D is, on average, negligibly low). This is an important finding which speaks in favour of strengthened co-operation between industry and academia.

Based on the results, significant opportunities seem to remain unexploited, particularly as
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regards intramural expenditure on R&D, expenditure earmarked for the acquisition of machinery and equipment, the proportion of expenditure allocated for design and other pre-production preparations. Directing resources into these areas might lead to the creation of products and services which are more attractive to the market, an attribute which would - at the same time - appropriately utilise internal resources and capacities.

Increases in the proportion of intramural expenditure on R&D and personnel training appear to yield positive returns as regards amelioration of environmental impacts as well as enhanced health and safety at work, and in the long run this is of extreme importance from the perspective of employees and the environment. At the same time apposite employee education and training may also be expected to yield economic returns.

The previously stated findings which disclose that companies in the wood processing sector are not sufficiently oriented towards market needs and demands is clearly confirmed also by the data on the effectiveness of expenditure apportioned for the acquisition of machinery and equipment necessary for implementation of innovation. Regardless of the fact that the proportion of such expenditure is not negligible (1.1% of all company expenditure, which represents merely half of the average for the manufacturing sector as a whole), it exhibits a negative correlation with per-employee profit – which remains one of the most important consequences of innovation endeavours.

When speaking about the successful introduction of new or significantly improved products, it can be assumed that the strongest factor influencing improvement is investment in innovation (2.3% of all expenditure, which still proves to be only one third of the average for the manufacturing sector). Obviously this is not enough for achieving innovation of a magnitude that would reflect in a better bottom line. The most important indicator – profit – is negatively linked to the proportion of expenditure earmarked for innovation. This is confirmed by the fact that besides inadequate development and exploitation of technology, a sizeable part of innovation endeavours remain directed inappropriately.

The explanation for poor financial results might be explained by extremely strong hindering factors, such as the organisational rigidity of the company and (in)capability of exploiting sources of information re innovation within the organisation, which is itself related to inadequate education. Differentiation between large, medium or small companies is also of essential importance. Larger companies may afford to earmark a greater proportion of expenditure for R&D, more substantial investments in machinery and equipment related to innovation, and consequently develop new or improve existing products – either of which may still fail to be manifested in an improved bottom line. At the same time, larger companies have to deal with the problems of organisational rigidity.

From one perspective this means that larger companies are suggested to focus on areas in which they fail to operate well, and indeed any invention-innovation chain is only as strong as its weakest link. In addition to this, the state should continue to implement measures for encouraging development, innovativeness and increased learning within SMEs. All of this is in conformity with the findings and measures being implemented in EU states, as well as the allocation of a large proportion of assets into improving these fields. Yet it all depends on the individual company, and whether the company as such is able to direct such resources into appropriate fields and exploit them accordingly.
CONCLUSIONS

On the basis of all the aforementioned, there can be no simple conclusion or magic formula. Yet the results illustrate the path that a company needs to take as well as the important governing factors. The first step is definitely a decision reached by management, a clear innovation strategy combined with a systemic approach (Mulej 2002, Markič 2003). According to the research results, an adequate training (Kern 2003, Mulej 2005), which is also one of the priorities of the European Union programmes, is one of the important steps. Further steps are related to the establishment of adequate organisational environment (which the SURS research fails to encompass). It is also crucial to use all available resources - national and international and to strive towards improving cooperation with organisations having knowledge (universities, R&D institutes), also of forthcoming technologies. It definitely leads to a significantly increased value added! At the same time, we cannot neglect the influence of lost/stolen ideas and intellectual property rights which has become more and more important (Trcek 2006). It is essential to implement numerous activities, namely a rise in creativity (also not encompassed by SURS/Eurostat) and appropriate R&D investment. We are strongly convinced that creative thinking with regard to knowledge and determination proves to be the most important factor.

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