INNOVATION IN TRANSITION COUNTRIES: HOW TO CATCH UP?

Prof. Darko Tipurić, PhD, Jasna Prester, Phd, Prof. IVICA VEŽA, Phd.

University of Zagreb
Faculty of Business and Economics
Trg J. F. Kennedy 6, Zagreb, Croatia
dtipuric@efzg.hr, jprester@efzg.hr

University of Split
Faculty of Electrical Engineering, Mechanical
Engineering and Naval Architecture
Ruđera Boškovića bb, 21000 Split, Croatia
Ivica.veza@fesb.hr

ABSTRACT

Innovations are a core competence today (Loewe, Dominiquini, 2006). Dobni (2006) found more than a thousand recent books and articles on innovation that show a recent+ positive trend in this field of research. There are breakthrough innovations, and there are incremental innovations. There are innovative new products and innovative new technology. According to Hamel (2006), technology and product innovation tend to deliver small-caliber advantages, unlike management innovations that create long-lasting advantages. McKinsey (2005) urges that Asia is no longer a competitor based on low-cost labor but it is fast becoming a source of competitive advantage based on management innovation. On the contrary, Reichstein and Salter (2006) consider that no innovation is possible without an accompanying process innovation. A crucial question is how to foster innovation, and what specific innovation strategy to pursue. It is an important question for developed countries and it is even more important for small countries like Croatia, still looking for its sustainable strategy.

This paper is part of a research project titled the European Manufacturing Survey conducted in most European countries and led by the Fraunhofer Institute, Karlsruhe, Germany. Therefore, the results presented in the paper refer to the Croatian sample only. The survey instrument is developed by the Fraunhofer Institute and is conducted in parallel by all participating countries in order to facilitate cross-country comparisons. In this work we only consider questions addressing innovation and try to find in what way Croatian companies should seek and foster innovation given the fact that Croatia has a problem of a significant lack of investment resources. The questions we address are divided into four groups which will later become latent variables. The first variable is a construct from thirteen questions on process innovation; the second variable is constructed from thirteen questions addressing management innovations; the third product variable is constructed from five questions addressing new product launch and development and the fourth latent variable is represented by the respondents' answers to four questions on some financial indicators, i.e. R&D investments, exports, return on sales and a share of overhead costs in total costs.

Our primary hypothesis is that Croatia should pursue management innovations by educating their managers as this raises the probability of management innovation. It seems that of all the three types of innovation this one might be the cheapest and yet brings the fastest benefits. We constructed a model with the three previously mentioned variables –

process innovations, management innovation and the new product. With structural equation modeling we investigated the impact these variables have on the result variable.

The paper firstly focuses on the whole innovation process and not on only one aspect of innovation activity such as the most explored or most attractive product innovations. Secondly, the paper explores the Croatian context for which there is no previous research available. Finally, this work will be the basis for cross-country comparisons.

Preliminary results show that Croatian companies do not have resources for radical innovation. New products (products new to the market) are launched but this is not for growth but for bare survival. Also, such new product launches are mostly in the low innovation sector defined by Cozzarin (2006, p. 10). Croatian companies concentrate on incremental innovation, depend on leading technological providers for process innovation, and are starting to cooperate with universities on management innovations. Yet, benefits from management innovations are not as high as expected.

1. Introduction

For long we taught our Operations Management students that there are only four manufacturing core competences, these being time, cost, quality and flexibility. Last year, a new core competence was introduced – mass customization – based on the Dell model. But recent case studies based on the Dell model show substantial problems. Dell lost the European market and failed to attract the corporate market. Therefore we look further, because obviously these four competences are not enough for sustainable growth.

The importance of innovations is not a new idea. Drucker (1998), Levitt (1963), Pearson (1988) and Hamel and Prahalad (1994) wrote about it as a necessity to stay ahead of competition. Innovations are the basis for economic growth and, as a result, the regular identification and evaluation of innovations are amongst main tasks of economic policy makers. The introduction of new manufacturing processes, products and services or their improvements are prerequisites for a survival in the world market both for developed economies and those in transition such as Croatia (CCE, 2006).

During this last decade, numerous works showed that innovations are really necessary, that SMEs are better in disruptive innovations, that creativity is not enough and that a lot of hard work is needed before a new idea successfully comes to the market. Big companies are better at incremental innovations and given the bigger investment resources and diversification of investments, less risk is involved. But this is not enough for a new product to be manufactured; the manufacturing process also has to be innovated and new technologies adopted. Naturally, all these manufacturing changes also require new ways of organization and management, which calls for management innovations.

Since 1993, the Fraunhofer Institute has been tracking manufacturing innovations. More and more countries have joined the project seeing that valuable conclusions can be reached by such research. The research was conducted over two years. In 2004, the research was renamed the European Manufacturing Survey as many European countries joined and the sample was broadened to encompass the whole manufacturing sample and not just piece industries.

The research is important for Croatia as we are a candidate country preparing to accede to the European Union. If our companies cannot compete on an equal footing with their European counterparts, most of the Croatian manufacturing sector is likely to disappear leaving a lot of people unemployed.

Given the fact that successful innovations are combinations of many factors, we propose, on the basis of literature research, an innovation model, which we then test with structural equation modeling. The test results should show where Croatia, as a transition country, should focus its scarce resources.

2. Innovations

2.1. Type of innovations

Since our aim is a cross-country comparison it is only natural to refer to innovations defined by the OECD's Oslo Manual (1997, p. 31). The definition of innovations in the manual is as follows: "technologically implemented new products and processes and significant technological improvement in products and processes". In our paper, we therefore refer to new products and processes as defined by the OECD. By new products and processes we consider new products and new processes relative to the market. In other words, a product new to the firm, but not new to the market is not considered as an innovation. For this work we broaden the innovation meaning to incorporate management innovations which according to Hamel (2006, p. 48) may create a considerable competitive advantage.

Innovation is a complex, diversified activity with many interacting components, and sources of data need to reflect this (OECD, 1997). Therefore a closer and more precise operational definition is needed here.

First of all, let us explore the difference between product and process innovation. According to Martinez-Ros, (1999, p.223) product and process innovations are closely linked. However, according to Becheikh *et al.* (2006, p. 648) product and process innovations follow different processes and do not necessarily have the same determinants. Therefore, authors recommend investigating those innovations separately. Reichstein and Salter (2006, p. 653), Becheikh *et al.* (2006, p. 648) also find that process innovations are considerably understudied. In their research 37% authors investigate product innovations, while only 1% investigates process innovations. Reichstein's and Salter's (2006, p. 653) definition of process innovation is "new elements introduced into the organization's production or service operations". This means that process innovations may be associated with the introduction of new machinery, improvements in manufacturing operations or changes in the process of production.

Management innovation, on the other hand, is defined by implementation of new management practices, processes and structures that represent a significant departure from current norms (Birkinshaw and Mol, 2006, p. 81). Not only do Birkinshaw and Mol cite Schumpeter (1947) who said that management innovations are as important as technological innovations, but they also pose a bold proposition that management innovations are bottlenecks to progress (p. 82). According to their research of the Business Source Premier Database, 0.01% of authors focused on management innovation while all other authors discussed technological innovations. Most often mentioned management innovations cited in literature are Toyota Lean systems, ISO quality standards, Motorola's Six Sigma, Schneiderman's Balanced Scorecards and so on. Edquist *et al,* (2001, p. 15) argue that process and management innovations should be investigated separately because process innovations are usually technologically based while management innovations only involve coordination of human resources. Yet, although we separately investigate those innovations (product, process, and management), we strongly believe that these innovations are interrelated and it is difficult to sustain such a distinction.

2.2. Innovation measurement

Traditionally, innovation has often been measured by using two indirect indicators: research and development expenditures and patent data. However, these indicators have shown many shortcomings over time. Becheikh *et al.* (2006, p. 649) on the grounds of work of Archibrugi and Pianta (1996), Coombs *et al.* (1996), Hagedoorn and Cloodt (2003), Kleinknecht *et al.* (2002) Michie (1998) and Patel (2000) gave a good summarization of disadvantages of each innovations research indicator. We present their summarization as a whole.

Table 2.2.1 Disadvantages of measures of innovation

INDICATORS		DISADVANTAGES
Indirect measures	R&D	All innovations do not come from R&D. Not all R&D activities lead to innovation. R&D expenditures are largely favored by large companies.
	Patents	Patents measure invention rather than innovation Propensity to patent differs across sectors Not all innovations are patented
Direct measures	Innovation count	Major (product) innovations are privileged rather than small process ones Excludes unsuccessful innovations Expert judgment on the value of innovation is needed
	Firm based surveys	Depends on the return rate and representativeness Is an unqualified dichotomous measure of innovation

Source: Becheikh *et al.* (2006, p. 649)

The firm-based survey is becoming a standard method for collecting direct information on innovation. This is primarily due to the impact of the OECD manual and the Eurostat in their effort to standardize the methods and information collected for such surveys (Becheikh *et al.* 2006, p. 650).

Moreover, Fynes *et al.* (2005, p. 9) on the grounds of the work of Dess and Robinson (1984) and Venkatraman and Ramanujam (1986) argue for the use of the survey instrument because several research papers have shown that there is no significant difference between values obtained from external sources and the responses provided by the questioned participants.

In this work we use the survey instrument designed by the Fraunhofer Institute, which is updated every two years to encompass all the new innovations (process, product and managerial innovations). The questionnaire includes questions on new or improved products and process, acquisition of machinery, equipment or other technology linked to innovation, industrial engineering or industrial design for innovation, tooling up and production start up linked to innovation, and training linked to innovation. On the other hand, it also contains questions about R&D expenditures, so that the best aspects of all the measures above are included in the questionnaire. The questionnaire further asks about profits and usual financial measures, which we use for making our conclusions. The appropriateness of use of this measure we found in Cozzarin (2006, p. 8) who shows that profit measure has a high impact ratio, and while other performance variables were statistically significant, they had a negligible effect on innovation outcomes. One more argument in favor of investigating innovation through economic growth can be found in Perunovic and Christiansen (2005, p. 1051) who find that significant theoretical effort has lately been put into discovering and defining correlation between innovations and economic growth.

2.3. Innovations and industries

Not all industries have the same propensities to innovate. This is mentioned by Becheikh *et al.* (2006, p. 649) and Cozzarin (2006, p. 10). Cozzarin explicitly proves it on a sample of 5,220 Canadian manufacturing companies having over 20 employees and more than 250,000$ in sales. The table below displays R&D intensities based on 320 Spanish manufacturing firms with over 20 employees:

Table:2.3.1 Industries propensity for innovation

Industry	Percentage of world-first innovations (Cozzarin)	R&D intensity (Huergo)	Degree of innovation
Food	4.7	0.67	Low innovation
Textile	6.9	1.95	
Wood-paper	4.4	1.02	
Non-metal	7.1	1.12	
Metal	6.5	1.08	
Furniture	5.6	0.73	
Petrochemical	11.2	3.23	Medium innovation
Plastics	10.8	1.20	
Vehicles	10.7	4.09	
Machinery	17.7	2.86	High innovation
Electric-computer	20.9	3.29	
Misc	16.3		

Source: Modified on basis of Cozzarin (2006, p. 10) and Huergo (2006, p. 1383)

We find this question important because not all industries have the same profit ratio, which should be taken into account in cross-industry comparisons. On the bases of this table and our sample we will develop weighting factors to compare industries more closely. Moreover, Lundvall *et al.* (2002, p. 219) found that innovation is of great importance in low-technology sectors, and that in the Danish industry a considerable growth is noticed and important priority given particularly to such traditional sectors. The difference is that in that sector incremental innovations are more common than science-based radical innovation.

3. Methodology

As we have explained and presented arguments for, we use Fraunhofer's instrument, which is based on the Oslos manual. The questionnaire has six pages and considers new technologies, new organizational and managerial concepts, detailed description of the production process and the degree of which services are included in the final product. One section is devoted to the description of most important innovations. A new section is added to investigate cooperation in research activities. Another section is devoted to human resources capital and their distribution in activities like R&D, design, production and after sale services. Finally, a substantial portion deals with economic indicators.

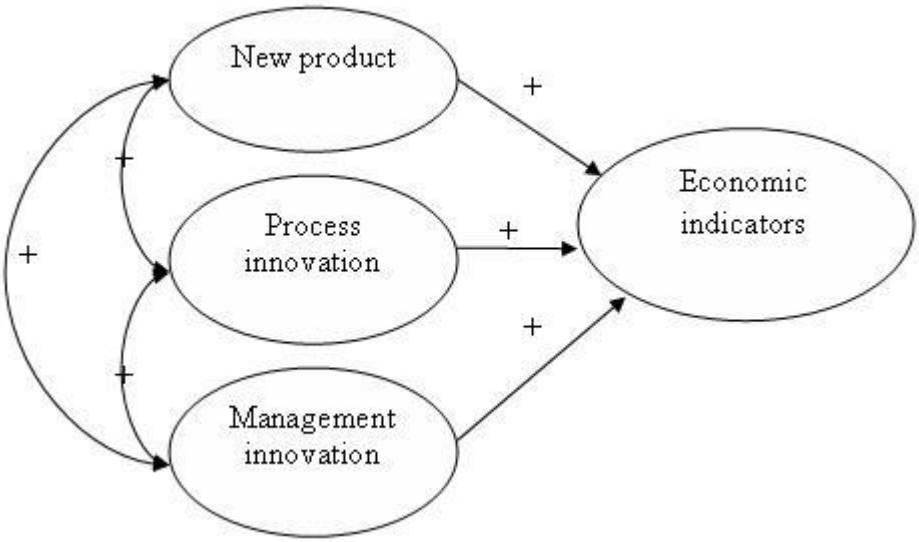
All manufacturing industries with more than 20 employees were investigated. The data about those companies were obtained from the Croatian Chamber of Economy, the number was 1,507 companies. We obtained 108 usable responses which represents a 7.2% response rate.

We use descriptive statistics to describe the sample. After that, we group the most important innovation questions into three categories, namely product, process, and management

innovation. We intend to establish, on the Croatian sample, which of these innovations give the best economic results. That could be done with simple regression and ANOVA analysis, but we decided for structural equation modeling because these three types of innovation are usually interrelated. By posing this model and testing the model fit on economic parameters, we can obtain the same result. Also, Becheikh *et al.* (2006, p. 649) who studied in detail the methods used in innovation research in the last decade show that structural equation modeling is increasingly used as a method. On the other hand, most of their research works (37%) used ordinary least square regression. OLS regression actually measures to what extent a curve fits the hypothesized curve on the basis of the least square analysis. Even though this regression is widely used it has shown some shortcomings. Everitt (1984) shows that discrepancy function values are not *scale free* — different scaling of the manifest variables can produce different discrepancy function values. Therefore, we ruled out the OLS method, since we will also compare samples with different scaling. SEM modeling is especially useful for analyzing correlation so we decided to use that method.

The model we test is as follows:

Figure 3.1 Innovation model and hypothesized relationships



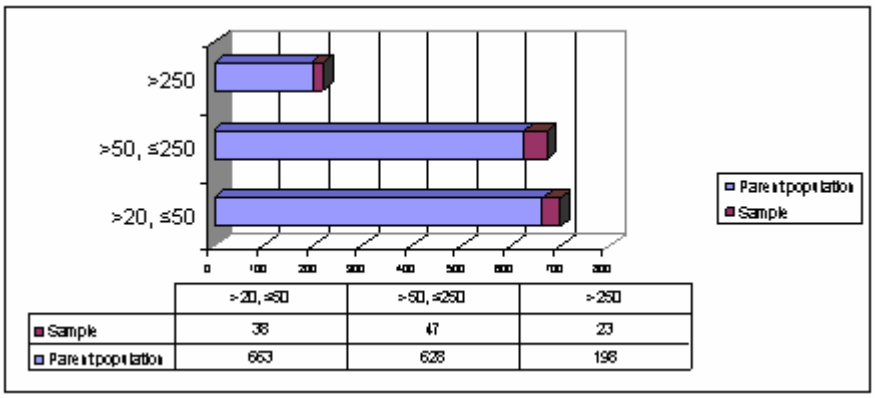
Product innovation is measured with questions related to new product launches, their number, impact on sales, and time needed for development. There is also a distinction between a market-new or firm-new product.
Process innovation is measured by 13 detailed questions about process and production technology which for now describe the latest technological producing processes.
Management innovations are also measured with 13 latest management and organizational concepts.
For economic indicators we use total sales, return on sales, sales of products abroad, machinery and equipment investments and R&D expenditures.

4. Description of the sample

A cover letter and the questionnaire were sent to 1,507 manufacturing companies. The answers were collected during two months with follow up calls and we obtained 108 usable answers, which represents a 7.2% response rate. This response rate is low, but it exceeds the threshold level prescribed by the Fraunhofer Institute for Croatia, which was set on 100 companies.

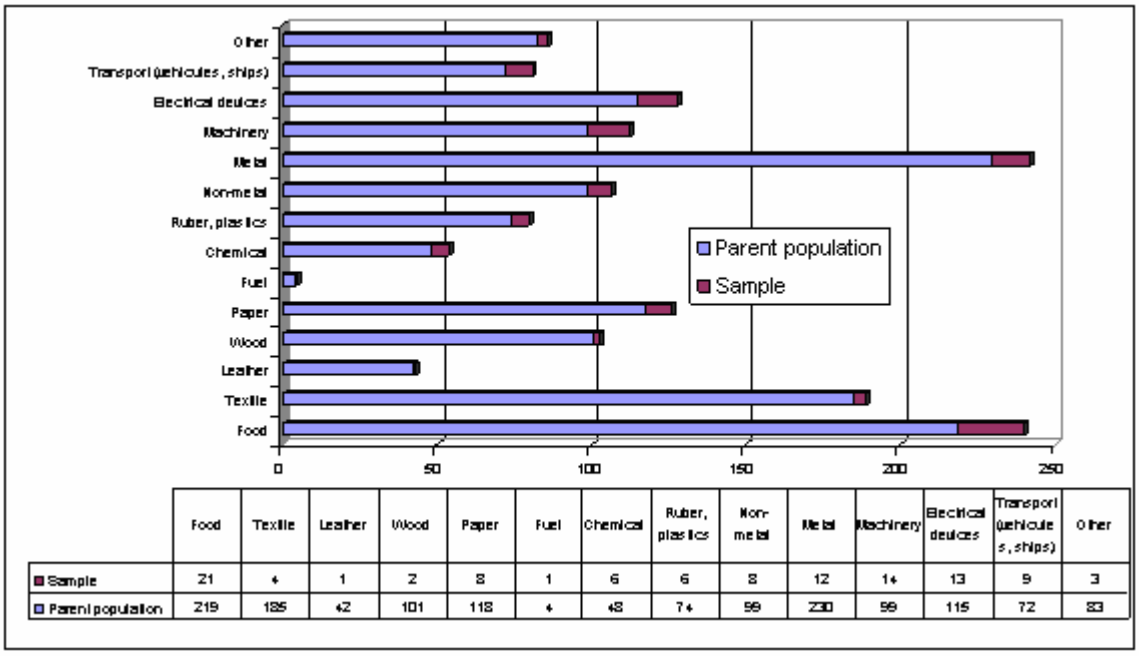
We checked the sample for representativeness according to size and industry. Both analyses show that the sample is representative, even with this low response rate. We present these results on the following graphs.

Figure 4.1 Representativeness by size



	>20, ≤50	>50, ≤250	>250
Sample	38	47	23
Parent population	663	628	198

Figure 4.1 Representativeness by industry



	Food	Textile	Leather	Wood	Paper	Fuel	Chemical	Ruber, plastics	Non-metal	Metal	Machinery	Electrical devices	Transport (vehicules, ships)	Other
Sample	21	4	1	2	8	1	6	6	8	12	14	13	9	3
Parent population	219	185	42	101	118	4	48	74	99	230	99	115	72	83

Over half of the surveyed companies (54.63%) had expenditures for R&D and on average the investments in R&D were 0.55% of their revenues. The highest investments in R&D were 10% of revenues and the lowest 0.

Apart from R&D, the most important investment areas are into new technology (58.33%), management and organizational innovations (22.22%) and employee education (19.44%).
New product development is most important to 42.59% of companies, while others pursue more process innovations in order to reduce expenses, improve quality, shorten lead time or increase flexibility.

5. Results

Before any analysis was done we checked reliability of our constructs. We obtained the following values which show good reliability. We checked our data with Crombach alpha and we did a confirmatory factor analysis on our constructs. General least square estimation method was used as it is more robust than the maximum likelihood alternative (Girardi *et al.*, 2005, p. 473)

Table 5.1 Reliability and confirmatory factor analysis

Construct	No. of items in scale	Crombach alpha	χ^2 (df)	RMS Standard Residual	Joreskog GFI
Technology	13	0.99	166.46 (54)	0.00025	0.793
Management innovations	13	0.98	829.97 (55)	0.0814	0.548
New product launch	5	0.77	141.08 (5)	0.237	0.692
Financial results	3	0.78	380.77 (44)	0.0715	0.644

We conclude that data is reliable according to Crombach alpha which has to be over 0.7. Non-significant chi-square indicates a good fit of the model to the data. However, since there are authors who question the significance of such statistics, we used two more measures for testing, i.e. RMS Standard Residual, which has to be less than 0,1 (Kline, 1998) and Joreskog GFI, which has to be over 0.95 (*Statistica, electronic manual*). Seeing these tabulated results, with different acceptance criterions, we cannot positively say that we have a good fit.
If we look at the RMS Standard Residual then all constructs except "New product launch" are valid. Looking at Joreskog GFI, all variables are under the threshold value of 0.95 indicating that we have only a fit but not a good fit.

Finally, while checking the whole model we obtained interesting results.

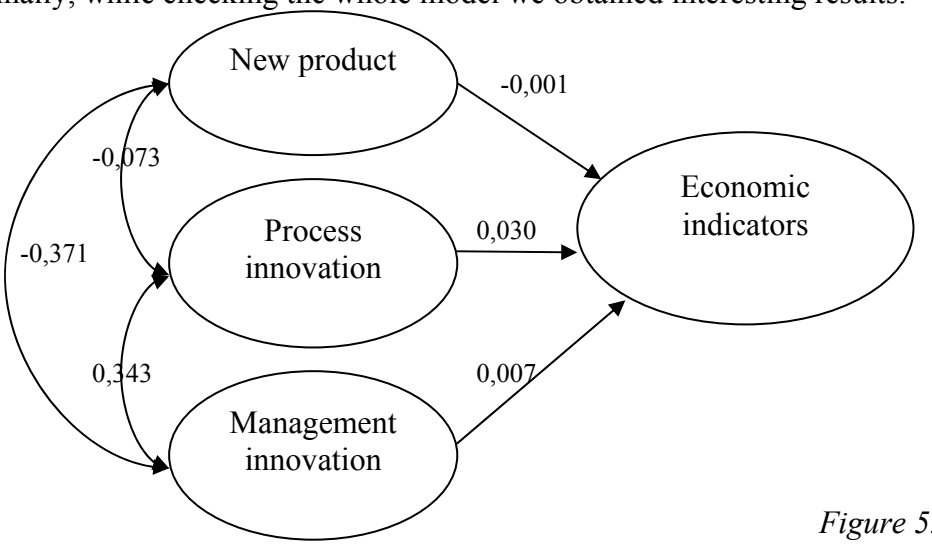


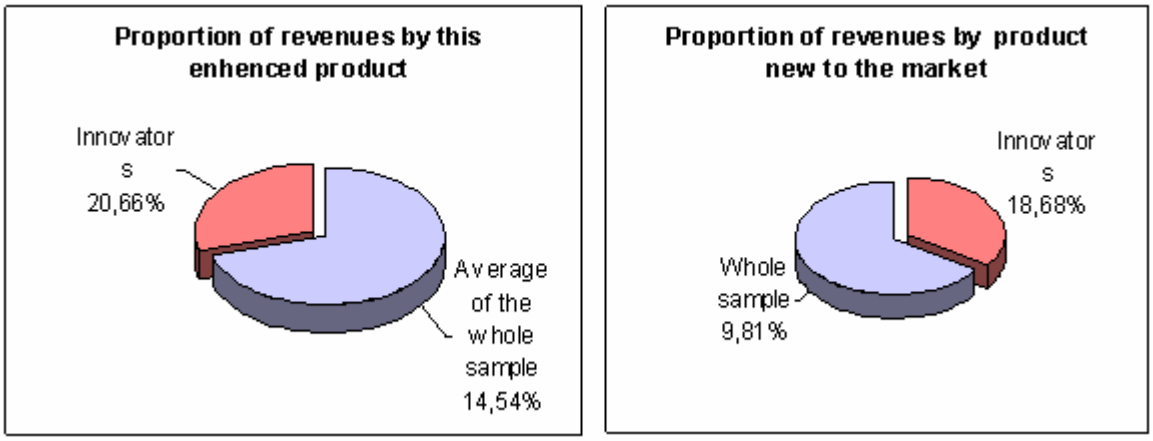
Figure 5.1 Model results

What we see in Figure 5.1 is in contradiction with recent suggestions that innovation should be a core competence for companies. The best financial results in Croatia are obtained by process innovation, mostly by acquiring some new modern manufacturing technology. Management innovations follow, even though their impact on results is low. The surprising part is "New product launch" which unfortunately has a negative influence on economic predictors. This might be explained by large expenditures in new product launch, which is obviously negatively correlated with the return rate as one predictor.

Interesting are also the relationships among latent variables. While process and management innovations positively interact, and we therefore can conclude that they are usually introduced in parallel, new product launch is negatively correlated with both variables. It should be noted that this friction between new product variable and process innovation variable is almost negligible. Management innovations and new product launch are also in collision. This might be explained by different stages and work groups involved in new product design. A larger and maybe less attractive work is necessary and responsible for bringing an idea into a successful new product (Drucker, 1998, Levitt, 1963).

We further investigates the new product statistics. We first looked only at those that introduced enhanced products, manufactured with new materials, changes in product's functions, or significantly improved products. In our sample, 70.37% of responders introduced such products in the last three years. To those innovators, on average, revenues from these products amount to 20.66% of overall return. The real innovators, who launched products new to the market in the last three years are only 34.26% of the overall sample. More worrying is the fact that the proportion of sales generated by those new products is 18.68%, which is actually lower than the return generated by enhanced products (20.66%). By these figures one could conclude that it is more profitable only to modify the existing products rather than launch a new product.

Figure 5.2 Proportion of revenues generated by enhanced and new products



This analysis shows that, in Croatia, new product development and launch cost far more than our companies can afford to reap the benefits of a successful launch. That means that the

current state of Croatian manufacturing companies is that they are rather generic companies and adopters of new technologies rather than developers and technology leaders. Their scarce resources should be invested into new technology, enhance their production and management processes. With their existing and enhanced products they have more chance to sustain stable returns. This statement is reinforced by the fact that we found negative correlation between a new product (new to the market) and the rate of return (r=-0.1669). Therefore, the goal should be set on increasing productivity, which according to Vivero (2002), is significantly impacted by process innovations.

With regard to intercorrelation between process innovations and management innovations, we can positively say that they are correlated and this finding can be reinforced by Reichstein and Salter (2006, p. 655) who argue that these innovations usually come together. New technology usually involves new ways of handling and organizing resources and work.

The negative correlation between the new product variable and the management innovation variable should be further explored. At this point, the negative correlation between the two variables might be explained by the fact that both compete for the same scarce financial resources of the firm. New product development and launch requires financial inputs in the design phase, and then, if it passes all tests successfully, more financial resources are needed for the marketing campaign. On the other hand, management innovations usually depend very much on the education of managers, which is also costly. Management innovations might also come as a good new idea by a manager, but the probability rises with raising manager's education.

Finally, we looked at innovation by industry. We looked only at new product launch, being the most important innovation

Table 5.2 Industry distribution of companies who launched new products (new to the market) in last three years

Industry	Percentage
Electric-computer	24.32%
Food	21.62%
Misc	16.22%
Wood-paper	16.22%
Plastics	8.11%
Metal	5.41%
Petrochemical	2.70%
Textile	2.70%
Vehicles	2.70%
Total	100.00%

Comparing table 5.2 with table 2.3.1, we see that the highest percentage of firms launching new products are in low-innovation industries, like food, wood-paper, and Misc (which are dominantly manufacturers of furniture). The only similarity is in electric-computer industry. Might this be the answer why new product launch does not bring appropriate benefits? Is new product launch actually a survival question for those companies?

Finally, we intend to address the question of the peculiarity of the Croatian market. Like Slovenia, most Croatian companies sold their products on the ex-Yugoslav market. There was a high protection of domestic manufacturers against foreign competitors. With the War for

Independence, Croatian companies, like Slovenians lost a significant market, and were bound to their local markets. Today, fifteen years after Croatia gained its independence, Croatian companies face new problems. How to survive in the European Union, which Croatia wants to join, and Slovenia already is a member state, when there will be no borders, and European products, can freely come to Croatia's small market?

According to Bastič (2004, p. 73), Slovenian customers decide for a new product if it is better than the competitor's, if it reduces their costs, or the product has a lower price. In contrast, Bastič (2004, p. 73) found that in Canada customers make their buying decisions based on the features of the product and its quality. Therefore, provided that the Croatian and Slovenian markets can be compared, and that customers in the two countries are very price sensitive, companies should invest in competitive process innovations in order to reduce overall customer spending, both in terms of costs related to the product use and its price.

6. Conclusion

This work represents a preliminary analysis of the Croatian innovation landscape. It shows that innovations, process innovations, innovation through new product and management innovations are all present in Croatia.

However, innovations are not a core competence for Croatian companies but a survival strategy while coping with foreign competition. Our results show that the highest impact on business performance is through process innovations in the form of acquiring new technologies. Management innovations also affect the company's performance, yet not to the same extent. These two types of innovations are correlated, which means that process innovations are usually accompanied by some management innovations. Therefore, our hypothesis that management innovations could bring benefits faster and cheaper is not confirmed.

As far as new product launch is concerned, the results demonstrate that this is negatively correlated with the financial indicators observed in our research. One explanation can be that large financial resources are required for new product launches, which significantly impacts a company's financial position. The proportion of revenues generated by these new products is only around 18%, which represents a small fraction of revenues. That new product development is a necessity and not a competitive advantage is shown by looking only at the companies that launched a new product (new to the market) in the last three years. One peculiarity of Croatia is that the highest new product launch is in the manufacturing industry characterized by a low level of innovations. This might suggest that Croatia counts on the manufacturing sector for bare survival and not for profit.

In conclusion, we might say that most beneficial investments for Croatia are in process innovations involving new technology, which could increase productivity and/or lower the prices of products thus retaining customers. However, Croatia cannot develop new technology by itself and therefore depends on foreign partners. The data from European Manufacturing Survey should be further explored to investigate innovations on country levels, cross country analysis which could further help raise European competitiveness.

7. References

1. Bastič M., (2004), Success factors in transition countries, *European Journal of Innovation Management,* Vol. 7, No. 1, pp. 65-79
2. Becheikh N., Landry R., Amara N., (2006), Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993-2003, *Technovation*, No. 26, pp. 644-664
3. Birkinshaw J., Mol M., (2006), How Management Innovation Happens, *MIT Sloan Management Review*, Vol. 47, No. 4, pp. 81-88
4. CCE (Croatian Chamber of Economy), 2006, The Innovation Environment of Croatia, www.hgk.hr, Sector for Industry and Technology, accessed 31.12.2006
5. Cozzarin B.P., (2006), Are world-first innovations conditional on economic performance?, *Tehnovation,* article in press
6. Dess G. S., Robinson R.B., (1984), "Measuring organizational performance in the absence of objective measures", *Strategic Management Research* ,Vol. 5, No 3, 265-273 – taken from Fynes *et al.* (2005, p. 9)
7. Dobni C.B., (2006), The innovation blueprint, *Business Horizons,* Vol. 49, pp. 329-339
8. Drucker P.F., (1998), The Discipline of Innovation, *Harvard Business Review On Point Edition,* Product no. 3480, pp. 3-12
9. Everitt B. S., (1984), An introduction to latent variable models, *London: Chapman and Hall.*
10. Fynes B., Voss C., Burca S., (2005), The impact of supply chain relationship dynamics on manufacturing performance, *International Journal of Operations & Production Management,* Vol. 25, No. 1, 6-19
11. Girardi A., Soutar G.N., Ward S., (2005), The validation of a use innovativeness scale, *European Journal of Innovation Management,* Vol. 8, No. 4, pp. 471-481
12. Greenhalgh C., Rogers M., (2006), The value of innovation: The interaction of competition, R&D and IP, *Research Policy*, No. 35, pp. 562-580
13. Hair J.F.Jr., Anderson R.E., Tatham R.L., Black W.C., (1998), Multivariate Data Analysis, *Prentice Hall*
14. Hamel G., (2006), The Why, What and How of Management Innovation, *Harvard Business Review,* No.2, 2006, product no. 3420, pp. 45-62
15. Hamel G., Prahalad C.K., (1994), Competing for the Future, *Harvard Business Review On Point Edition,* Product no. 4929, pp. 2-11
16. Huergo E., (2006), The role of technological management as a source of innovation: Evidence from Spanish manufacturing firms, *Research Policy,* No. 35, pp. 1377-1388
17. Kline R.B., (1998), Principles and Practice of Structural Equation Modeling, *Guildford Press*
18. Levitt T., (1963), Creativity Is Not Enough, *Harvard Business Review On Point Edition,* Product no. 1628, pp. 15-28
19. Loewe P., Dominiquini J., (2006), Overcoming the barriers to effective innovation, *Strategy and Leadership*, Vol. 34, No. 1, pp. 24-31
20. Lundvall B-A., Johnson B., Andersen E.S., Dalum B., (2002), National system of production, innovation and competence building, *Research Policy,* No. 31, pp. 213-231
21. Martinez-Ros E., (1999), Explaining the decisions to carry out product and process innovations; The Spanish case, *The journal of High Technology Management Research,* No. 10, pp. 223-242
22. McKinsey Quarterly, (2005), Innovation from Asia, *The McKinsey Quarterly,* No. 1, 2005, pp. 4-5
23. OECD, (1997), Proposed guidelines for collecting and interpreting technological innovations data: Oslo Manual, OECD, Paris

24. Pavitt K., (1984), Sectoral patterns of technological change, *Research Policy,* No. 13, pp. 343-373
25. Pearson A.E., (1988), Tough-Minded Ways to Get Innovative, *Harvard Business Review On Point Edition,* Product no. 1636, pp. 29-39
26. Richstein T., Salter A., (2006), Investigating the sources of process innovation among UK manufacturing firms, *Industrial and Corporate Change*, Vol. 15, No. 4, pp. 653-682
27. Tidd J., Bessant J., Pavitt K., (2001), Managing Innovation: Integrating Technological, Market and Organizational Change, *John Willey,*UK
28. Venkatraman N., Ramanujam V., (1986), ., (1984), "Measuring of business performance in the absence of objective measures", *Strategic Management Research,* Vol. 11, No 4, 801-814 – taken from Fynes *et al.* (2005, p. 9)
29. Veža I., Prester J., (2005), Innovation in Croatia: What do financial results show?, *Unpublished paper*
30. Vivero R.L., (2002), The impact of process innovations on firm's productivity and growth: the case of Spain, *Applied Economics,* No. 34, pp. 1007-1016