Competencies Driving Innovative Performance of Slovenian and Croatian Manufacturing Firms

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Abstract

The paper discusses innovative performance of firms and underlying competencies, namely technological, marketing and complementary. Competencies as a broader concept are regarded as networks of capabilities and other firm assets and can be used for cross-industry comparisons. The study is based on a survey carried out among 86 established Slovenian and Croatian manufacturing companies addressing competencies which they employ in their 105 distinct product lines. Three distinct segments of firms are established based on innovative performance indicators. Used are techniques of multivariate statistics, including cluster analysis and analysis of variance. The results imply that the most innovative firms simultaneously develop technological, marketing and complementary competencies. They operate in industries in which new technologies offer considerable new opportunities. Weaker technological competencies can be to some extent compensated by strong marketing and complementary competencies. The findings also support the notion of Slovenia and Croatia being technology follower economies, primarily relying on imitation as a source of innovation.

Key words: Competencies, Innovative Performance, Technology Followers, Technology Leaders

1 Introduction

In the last decades competence based view gained considerable attention in the literature on competitive advantage (Prahalad and Hamel, 1990; Hamel and Heene, 1994; Sanchez at al., 1996; Hafeez et al., 2002; Sanchez, 2004; Hafeez et al., 2007). It is also claimed that a combination of technological and marketing capabilities and competencies can create such competitive advantage (Chang, 1996; Dutta et al., 1999; Song et al., 2005). A firm with strong technological competencies is capable of using scientific knowledge to promptly develop products and processes that offer new benefits and create value for customers (McEvily et al., 2004). A firm with strong marketing competencies is able to use its deep understanding of customer needs to foster development of new products and organize marketing activities that provide a unique value to consumers (Day, 1994; Vorhies, 1998). In addition to each of the direct effects discussed above, technological and marketing capabilities operate also in an integrated manner (Fisher and Maltz, 1997; Rothaermel, 2001; Wang et al., 2004; Song et al., 2005).

Competencies influence firm performance by affecting the rate and success of innovation (Tidd and Bodley, 2002). The knowledge represented by these competencies contributes to

speed and flexibility of the development process and results in competitive products. As proposed by Swink and Song (2007) there is substantial impact of both marketing and technological capabilities in each stage of product development which in turn is associated with higher project return on investment. Competencies not only influence product competitive advantage but also project lead times.

Greenly and Oktemgil (1997) suggest that as a moderating effect external business environment may severely influence managerial choice. Managers are expected to formulate strategies in accordance with the relevant information about the environment. It is argued that successful new product development depends on the characteristics of the competitive environment in which the industrial firm operates (Langerak et al., 1997), more specifically technological and market turbulence (Calantone et al., 2003).

The main contributions of the paper are twofold. Firstly, based on data from Slovenian and Croatian manufacturing companies we determined segments of companies based on their innovative performance characteristics and pointed out the differences in the competitiveness of their technological, marketing and complementary competencies. Distinctions were made between firms in the positions of technology followers and leaders. Technological and market turbulence as key factors in strategy planning for new product development were also analyzed. Furthermore, we compared firms within segments based on the country they are from and analyze the differences.

2 Background theory

Competencies as such refer to the ability to utilize resources that spread across multiple functions, products and markets in a sustainable and synchronized manner. They differ from company to company, yet represent a broader, more general perspective on strategy and are not strictly industry specific. Their main constituents are capabilities, a portfolio of capabilities, respectively. Capabilities are repeatable patterns of actions in the use of assets to create, produce and/or offer products to a market (Grant, 1991). Only those key capabilities that are relatively unique and common to various business functions, products and business units are likely to form competencies of a company (Sanchez, 2004). These are industry specific and can be identified by using internal and external knowledge of experts (managers) (Hafeez et al., 2007; Prašnikar et al., 2008).

Technological competencies incorporate practical and theoretical know-how, as well as the methods, experience and equipment necessary for developing new products (Wang et al., 2004). They encompass a portfolio of technological capabilities concerning the capacity of the company to utilize scientific and technical knowledge for research and development of products and processes, which leads toward greater innovativeness and performance (McEvily et al., 2004). According to Swink and Song (2007) technological competencies influence all four stages of the new product development process. At the first stage of business/market analysis technological competencies help address the technical feasibility of products in question. Technical development stage incorporates product and process engineering studies and continues with establishing product designs and specifications, prototyping the product and approving final designs. In all of these tasks technological competencies have a central position. During the third stage of product testing technological competencies are of secondary importance, still, they influence the design of consumer tests and interpretation of

the results. At the last stage of product commercialization they are key for production plans and production ramp-up.

Companies with well developed marketing competencies are well aware of customer needs and are capable of value creation on all elements of a product or service that are relevant to the customers (Day, 1994). Constituent marketing capabilities are therefore an interwoven system based on knowledge and skills that allow the company to generate customer value and also facilitate timely and effective response to the marketing challenges (Vorhies, 1998; Vorhies and Harker, 2000; Song et al., 2005). At the business/market analysis stage marketing competencies provide an evaluation of market impacts of product feature options (Kahurana and Rosenthal, 1997) as the aim is to understand the competitive positioning of the future product. During the technical development stage marketing competencies facilitate product feature decisions. Marketing usually takes a leading role in product testing which encompasses selection of key customers and sites, testing of markets and result analysis. Marketing plans, product promotion and distribution are tasks that require marketing competencies for product launch at the product commercialization stage (Paul and Peter, 1994; Swink and Song, 2007).

Some authors treat complementary capabilities and competencies[1] as an interaction between technological and marketing capabilities and competencies (e.g. Song et al., 2005), however, various studies have now identified them as an independent group. Complementary competencies reflect the degree of fit between the two groups. They should be treated as a distinct network of capabilities and a failure to value them properly can lead to a deficient identification of key capabilities. The role of complementary competencies according to Wang et al. (2004) is to: 1) integrate different technological specialties; 2) combine different functional specialties; 3) exploit synergies across business units; 4) combine in-house resources with external capabilities required and 5) integrate the dynamic competence building process for superior performance. To align the new product features (technological aspect) with potential customers' needs (marketing aspect) is the role of complementary competencies at the first stage of new product development. They are also employed in the assessment of the needed investment and accompanying risks (Swink and Song, 2007). Similar complementarity of technological and marketing knowledge is also key during the second stage of technical development. At the same time it proves to be positively related to translating testing results into product and process design modifications (Song et al., 1998) during the product testing. Integration of both streams of competencies contributes to better coordination of production planning and demand management activities during product commercialization.

Firms' new product portfolios balance between new products based on incremental innovation and fundamental innovation (Ali et al., 1993; Schewe, 1996). Development of new generation products based on radical innovations and development of products shaping new industry trends draws from substantially different and novel technologies. In the case of incremental modifications of products "market pull" provides the information on customers' preferences, while "technology push" prevails with completely new technologies that address customers' latent needs (Tidd and Bodley, 2006). Since consumers buy products for the benefits they gain from them, "technology push" still has to observe customer needs. Therefore, customer and market analysis are crucial also for technologically more novel innovations (Bacon et al., 1994).

[1] Complementary capabilities and competencies are referred to in literature also as integrative, integration or combinative capabilities and competencies.

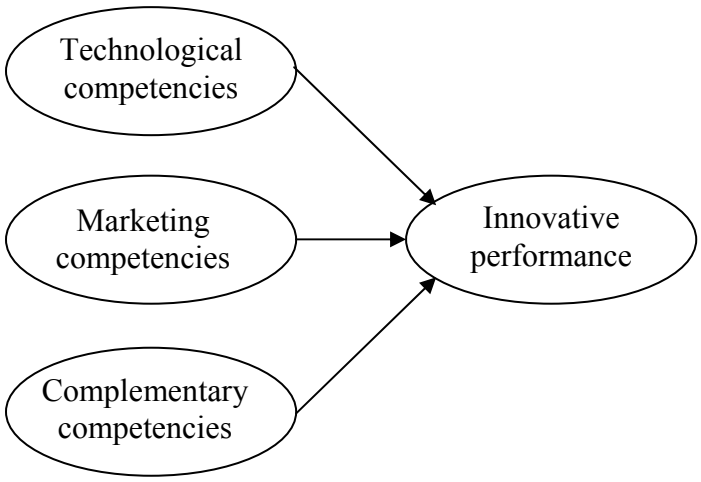
Innovation and corresponding competencies demonstrate some specific characteristics when a distinction is made between firms that are technology leaders and those that are technology followers. Forbes and Wield (2000) state that basic research and applicative research enable technologically advanced companies – technology leaders – to create new knowledge and to promote new technologies. The followers, on the other hand, develop indigenous technology learning capacity or in other words the abilities to use existing technological solutions in a more efficient manner. It is therefore characteristic that technologically advanced companies introduce new products, which are new for the market, by using new technologies and by transforming existing technological solutions into new ideas. Being a technology leader demands substantial investments that are risky due to their large likelihood of failure. The followers tend to rely more on incremental than on radical innovation based on basic and applicative research as well as on industrial design that provides these firms with an opportunity to supply market niches and achieve high value added.

How managers perceive the environment will also reflect in their actions and innovative strategy they choose to pursue. It is important that firms recognize environmental changes and adapt accordingly (Leonard-Barton, 1992). Technological and market turbulence are those two moderating effects that influence new product development strategy planning (Calantone et al., 2003). Technological turbulence refers to the perception whether a firm is able to accurately predict and thoroughly understand specific aspect of the technological environment. Technological and complementary competencies are key for addressing changes and achieving superior performance in environments with high technological turbulence (Wang et al., 2004). Market turbulence, on the other hand, reflects rapidly changing buyer preferences, wide-ranging needs and wants, competition intensity and constant emphasis on offering new products (Hult et al., 2004). Firms operating in high market turbulence therefore tend to constantly produce innovations in order to respond to the changes in demand and strong competition. They need to develop superior marketing competencies together with strong complementary competencies.

A successful new product development process contributes to financial success of the product and consequently to overall business success of a firm via two paths (Brown and Eisenhardt, 1995). A productive process lowers costs and enables lower and more competitive prices. A faster process further ensures strategic flexibility and shorter lead times. Product effectiveness, on the other hand, is demonstrated through product characteristics, among them low-cost, unique benefits and fit with firm competencies. Products with these characteristics are also more appealing to the consumers (Zirger and Maidique, 1990). Empirical studies provide evidence that both radical and incremental innovations contribute to firm's survival, growth and profitability (Varadarajan, 2008).

On the basis of the conceptual framework on the influence of technological, marketing and complementary competencies on the innovative performance, the following operational model can be constructed (see Figure 1).

Figure 1 Operational model on the influence of technological, marketing and complementary competencies on innovative performance



Innovative activity of Slovenian and Croatian firms

According to the innovative activities of the firms in Slovenia and Croatia, both economies are regarded as technology followers what is reflected the most in the technology firms possess and their innovations. The analysis of data from polls on innovation and research and development (R&D) activities in Slovenian firms from the manufacturing and service sectors from year 2002 finds that there are only 21% of innovative companies. There is a positive bias for large companies, companies that are partially owned by foreigners and for export-oriented companies. Innovation and R&D expenditures have been stagnating and are lower than in developed European countries. The majority of Slovenian manufacturers (66%) employ medium-low or low technology according to the OECD classification. The gap in comparison with some European countries (Austria, Finland) is particularly large in classes of companies that use medium-high and medium-low technology. The share of external expenditure for R&D in innovation expenditure is less than 10%. There is weak cooperation with other companies in technological knowledge formation and in drawing knowledge from the academic environment (Stanovnik & Kos, 2005). Similar findings are reported also by Kotnik (2004) and Prašnikar and Kotnik (2006).

By European standards Croatia ranks well in comparison to other CEEC countries, however the country has recently not made any significant progress in its innovation potential and policy. Data for the period 2001-2003 reveal that low-tech sectors with limited spillover effects are still more important drivers of economic growth than dynamic medium- and high-tech manufacturing and services. As obstacles are recognized unfavorable structure of innovation expenditure, widespread occurrence of intra-organizational constraints to innovation and failures in commercialization. The share of innovative firms increases with firm size, what is also true for collaboration in R&D (Račić et al., 2004). The links between the vast national R&D base on the one side and educational system and business needs on the other are not established. R&D expenditures are insufficient. Presently there is also no incentive for firms to strategically turn to the market (Radas et al., 2006).

3 Research methodology

Sample and data collection

The study is based on a cross-industry survey carried out among medium sized and large manufacturing firms in Slovenia and Croatia. The population targeted in the survey was obtained from the databases of legal entities registered in each of the respective countries. Included were firms that have not been registered later than by the years 2002 and have been operating through the whole period 2002-2006 with products under code D (manufactured products) without codes that refer to product related industrial services. For problems arising from product finishing industries such as production of clothing items, several further product codes were excluded. This is to avoid the confusions stemming from aligning the design function in these companies with the definition of the traditional R&D function and related activities in manufacturing firms. The target population thus consisted of 382 Slovenian and 512 Croatian firms. The study is carried out on valid responses received by 50 Slovenian and 36 Croatian firms. 20% of Slovenian firms in the sample are in majority foreign ownership compared to 39% in the case of Croatian firms. Further data collection to increase the sample size is still underway.

Respondents were management level employees in charge of company R&D. The questionnaire was initially tested in 12 firms. Its main segments referred to firm competencies and innovative performance. As especially big firms try to take advantage of synergies and economies of scale and scope, many diversify into different businesses. The firms were thus asked to provide data for individual product lines where applicable, yielding a sample of 65 product lines for Slovenian firms and 40 product lines for Croatian firms.

The interviewees evaluated their competencies on a five-point scale relative to their main competitors and thus estimated the competitiveness of their individual competencies within the industry (Song et al., 2005). The time frame for data gathering (data for competencies, innovations and R&D activities) is a three-year period from 2004 to 2006.[2]

Variables

Variables to simulate the proposed theoretical concepts were selected on the basis of economic, organization and management literature. In devising indicators of competencies we predominantly relied on surveys used in related studies (Chang, 1996; Wang et al., 2004; Song et al., 2005). The selected indicators of the concepts included in the model, enable a multi-industry analysis of the manufacturing sector.

Research shows that technological competencies usually encompass three categories: 1) how advanced research and development is (RD_ADVAN); 2) number of available technological capabilities inside the firm or through strategic partnerships (TECH_CAP_NQ), and 3) how good the company is at predicting technological trends (TECH_TREND_F) (Eisenhardt and Martin 200; Wang et al., 2004).

Marketing competencies capture marketing research as well as other marketing activities (Paul and Peter, 1994). To include marketing research and forecast competencies, the

[2] This is in compliance with OECD classification innovation activity methodology (OECD, 1997).

indicator "obtaining information about changes of customer preferences and needs" (INFO_CUST) was applied. The competitors' patterns of activities are illustrated with "acquisition of real time information about competitors" (INFO_COMP), customer relationship management with "establishing and managing long-term customer relations" (CUST_RELAT) and supplier relations using an indicator "establishing and managing long-term relations with suppliers" (SUPP_RELAT). Selected indicators to some degree reflect Porter's competitive forces.

Complementary competencies represent the congruence between technological and marketing competencies. The internal environment is measured with "good transfer of technological and marketing knowledge among business units" (TECH_MRKT_KN). Indicator "the intensity, quality and extent of research and development knowledge transfer in co-operation with strategic partners" (RD_STP) evaluates dynamic perspective and competence acquisition through strategic partnerships. The efficiency of economic utilization of technological and marketing resources engaged in the product development is evaluated through "cost efficiency of product development" (RD_COST_EFF). Organizational focus is measured with indicator "how clearly are defined the activities of the business units in the corporate strategy of the firm" (ACT_STRAT).

The general extent of innovative performance was measured by “number of modified, improved and new products” (NO_CH_PROD) representing new product variety or level of innovation. Technical performance was added and included by variable “quality of products” (QUAL_PROD). A number of studies in the operations management literature, namely, confirm the relations between product development and product innovation and quality, whereby high levels of innovation are associated with high levels of product quality (Dumaine, 1989; Clark and Fujimoto, 1991; Koufteros and Marcoulides, 2006). While product innovation as such refers to competence responsible for introducing new products and features, product quality or technical performance stands for respective competence of a firm to produce products that would satisfy customer needs for quality and performance (Hall et al., 1991; Kim et al., 2005).

The indicator "time needed to develop an improved product" (TIME_IMPR) was applied to determine effectiveness of improving existing products (incremental innovation). Time refers to the development project lead time and not to the array of products developed as with general indicator NO_CH_PROD. Similarly, the effectiveness of new product development referring to radical innovation is measured by "time needed to develop a completely new product" (TIME_NEW).[3] The role of innovativeness of the firm in the industry was represented by indicator "firm’s substantial contribution to world trends in the industry« (TRENDS). With indicator TRENDS we assume for the market pioneers with innovations their competitors find worth imitating. Additionally, the variable of the extent of imitation and innovation was used to represent the innovative strategy firms tend to pursue in new product development.

The success of innovations mirrored in the price premium the firm is able to attain for its new products on the market was assessed by the indicator value added (ADD_VAL) which in accounting sense represents the difference between revenues and costs of goods/services sold (Treacy and Wiersima, 1993). Respondents ranked this indicator the same way as competencies. While cost efficiency of the firm stands for the efficiency the company tries to

[3] Indicators correspond to the strategic factors applied by the Strategic Planning Institute in the PIMS database (Chang, 1996).

increase by exploiting all of the resources at its disposal (Ravald and Grönroos, 1996) it was included as a self assessment indicator of the overall performance of the firm (BP_COST_EFF).

Four different indicators were applied to each category of the environmental turbulences (Calantone et al., 2003; Wang et al., 2004; Song et al., 2005). In the case of technological turbulence were measured speed of change in technology, opportunities arising due to new technologies, ability to predict technological change and extent of technological change in the industry. Question regarding market turbulence referred to market uncertainty, predictability of changes in demand, predictability of competitors' activities and competition intensity.[4]

Segmentation

In order to obtain segments of firms' products lines based on their innovative performance, we carried out a clustering procedure[5] on variables N_CH_PROD and QUAL_PROD. We identified three distinct segments which we further compared through competencies to obtain a deeper understanding of the differences between them.[6] In Table 1 pluses (+ in the table) below the average values of variables for segments denote if the differences between segments are statistically significant. If they are not, the same number of pluses is given to the segments. If differences are established, segments are given different number of pluses, the one with the most pluses being the segment with the highest mean value. Looking at the variable N_CH_PROD we can conclude that there are no statistically significant differences observed regarding this variable between the first and the second segment (both denoted by one plus [+]). However, there are differences between the first two segments on one side and the third segment, which is denoted by two pluses [++], on the other.

We identified the following three segments (Table 1):

I. Technology followers with weak competencies
II. Technology followers with strong competencies
III. Technology leaders

Based on indicators of innovative performance we can observe that the first segment of technology followers with weak competencies introduced the smallest number of new products as well as of the poorest quality relative to their main competitors (both indicator scores are below the level of main competitors, that is value 3). The other extreme is the third segment of technology leaders that surpasses main competitors according to both indicators (values above 4 – better than main competitors). While the second segment is lagging behind in the number of innovations, it appears to compensate for the lack of new product variety to some extent with the high quality of those fewer new products. What further implies that we are dealing with technology followers in the case of the first two segments is their predominant strategy of imitation (values below 3 – balanced innovation) which is technologically less demanding.

[4] Indicators of environmental turbulence were evaluated on a five-point Likert scale.
[5] Applied was agglomerative hierarchical clustering procedure using Ward's procedure with Squared Euclidian Distance.
[6] Segments were compared using ANOVA and »post-hoc Duncan test« (equal variances assumed), $P<0,05$ (see Table 1).

Table 1 Segments for firms' product lines based on innovative performance

Variables \ Segments	I.	II.	III.
No. of product lines	**43**	**30**	**36**
No. of different companies	**39**	**23**	**34**
Innovative performance			
Number of modified, improved and completely new products in period 2004-2006 (N_CH_PROD)	2,79* +**	2,93 +	4,25 ++
Quality of products (QUAL_PROD)	2,88 +	4,33 ++	4,22 ++
Technological competencies			
Advancement of R&D (RD_ADVAN)	2,65 +	2,86 +	3,65 ++
Number of quality technological capabilities inside the firm or through strategic partnerships (TECH_CAP_NQ)	2,81 +	3,30 ++	3,92 +++
Prediction of technological trends (TECH_TREND_F)	2,70 +	3,07 ++	3,92 +++
Marketing competencies			
Obtaining information about changes of customer preferences and needs (INFO_CUST)	2,74 +	3,23 ++	3,86 +++
Acquiring real time information about competitors (INFO_COMP)	2,93 +	3,07 +	3,56 ++
Establishing and managing long-term customer relations (CUST_RELAT)	3,14 +	3,67 ++	4,11 +++
Establishing and managing long-term relations with suppliers (SUPP_RELAT)	3,21 +	3,67 ++	4,00 ++
Complementary competencies			
Good transfer of technological and marketing knowledge among business units (TECH_MRKT_KN)	2,79 +	3,47 ++	3,56 ++
The intensity, quality and extent of research and development knowledge transfer in co-operation with strategic partners (RD_STP)	2,69 +	3,10 ++	3,58 +++
Cost efficiency of product development (RD_COST_EFF)	2,53 +	2,97 ++	3,42 +++
Clearly defined activities of business units in the corporate strategy of the firm (ACT_STRAT)	2,86 +	3,43 ++	3,78 +++
New product development			
Time needed to develop an improved product (TIME_IMPR)	2,81 +	3,23 ++	3,72 +++
Time needed to develop a completely new product (TIME_NEW)	2,65 +	3,10 ++	3,94 +++
Contribution of the firm to industry trends (TRENDS)	2,62 +	2,77 +	3,47 ++
Imitation VS innovation strategy***	2,14 +	2,57 ++	3,23 +++
Other			
Added value of new products (ADD_VALUE)	2,55 +	3,20 ++	3,53 +++
Cost efficiency of the firm (BP_COST_EFF)	2,81 +	3,37 ++	3,78 +++

Note: All variables were evaluated in comparison relative to the main competitors of the firms on the five-point scale with values: 1 - considerably worse than the main competitors, 2 - worse than the main competitors, 3 - same as main competitors, 4 - better than the main competitors, 5 - considerably better than the main competitors.

* Variable mean value for the segment.

** Pluses denote segments with statistically significant differences. Applied was ANOVA, »post-hoc Duncan test«, $P<0,05$.

***Variable was evaluated on a five-point scale with values 1 – only imitation, 2 – predominantly imitation, 3 – balanced, 4 – predominantly innovation, 5 – only innovation.

We can see a distinct gap between the first and the third segment when analyzing all three groups of competencies, the first having poorer competencies than competitors and the third having better developed ones. When addressing technological competencies it is interesting to

note that the second segment is less competitive from the viewpoint of R&D advancement (RD_ADVAN) while keeping up with the main competitors when TECH_CAP_NQ and TECH_TREND_F are taken into account.

In the case of marketing competencies the second segment, technology followers with strong competencies, is again maintaining the level of the main competitors. Both types of customer oriented competencies (CUST_INFO and CUST_RELAT) are significantly different from the other two segments. At the same time competence INFO_COMP of this segment is similarly developed to that of the first segment and SUPP_RELAT to that of the third segment. Obtaining information about competitors thus proves to be problematic, however, long-term relations with suppliers are the strongest marketing competence of the firms with product lines in the second segment. Moreover, marketing competencies seem to be the most competitive competence group for the second segment. It is also important to note that relations with both customers and suppliers are the only two competitive competencies for the first and also the weakest segment (mean values above 3).

Among complementary competencies RD_EFF could be described as a competitive disadvantage of the second segment being below the level of main competitors. This segment has a clear and well defined strategy (ACT_STRAT) and advantageous competence TECH_MRKT_KN which is developed as well as that of the technology leader segment. ACT_STRAT is the best developed complementary competence for each of the three segments. However, enhancing RD_STP could lead to improvements in RD_EFF. One of the reasons is sharing risks and costs of the development process with strategic partners. Strategic technologic partnerships also enable firms to gain access to technological capabilities this way speeding up the learning process. Not only do strategic technologic partnerships have the potential to benefit TECH_CAP_NQ but also RD_ADVAN due to availability of new knowledge.

The segment of technology followers with strong competencies is also competitive when it comes to new product development lead times. Unlike technology leaders, this segment as expected does not substantially contribute to the trends in the industry. First and second segments appear to be better in the development of incremental innovation compared to completely new products, whereas technology leaders are especially competitive when developing completely new products.

Taking indicator ADD_VALUE as an appropriation of the positioning of the new products, we can conclude that it is favorable for the last two segments. Firms are able to obtain added value either on the level of their main competitors or even a bit higher. The values of BP_COST_EFF leads us to believe that innovative firms in our sample are at the same time overall cost efficient what speaks in favor of their competitiveness and business performance.

Comparing indicators of environmental turbulence among the three segments (see Table 2) reveals that there is only one indicator of technological turbulence according to which the segments differentiate themselves. Technology leaders namely report the opportunities arising from new technologies to be the most prominent in their industries. However, the other two segments also do not fail to see opportunities in their respective industries (values above 3). While a possible implication could be that the firms in the third segment of market leaders operate in high-tech industries, the indicator of the extent of technological changes shows that all segments similarly find incremental innovation to be representative of technological advances in their industries. Variable “speed of change in technology” leads to the same

conclusion. Firms are also able to predict technological changes. This also shows that companies in the sample represent the technology follower nature of Slovenian and Croatian economies.

Table 2 Environmental turbulence according to the segments

Segments / Variables	I.	II.	III.
No. of product lines	**43**	**30**	**36**
No. of different companies	**39**	**23**	**34**
Technological turbulence			
Technology in the industry is changing rapidly	2,83*	2,73	3,14
New technologies have a high impact on business operations and competition and bring about big opportunities.	**3,35 +****	**3,47 +**	**4,11 ++**
Difficult to predict technological changes in the next 2 to 3 years	2,72	2,67	2,78
Smaller technological changes represent technological advances in the industry	3,72	3,77	3,25
Market turbulence			
Extremely high market uncertainty	3,26	3,80	3,33
Almost impossible to predict accurately the rapidly changing tastes and demands of consumers	2,95	2,93	2,78
Activities of major competitors are unpredictable	2,91	3,27	2,89
The competition in the industry is very intense	4,26	4,53	4,47

Note: Variables were evaluated on a five-point Likert scale: 1 – strongly disagree, 2 disagree, 3 – neither agree nor disagree, 4 - agree, 5 – strongly agree.
* Variable mean value for the segment.
** Pluses denote segments with statistically significant differences. Applied was ANOVA, »post-hoc Duncan test«, P<0,05.

Despite reporting on rather high market uncertainty, firms do not seem to have problems predicting either changes in demand or competitors' activities. Interestingly, all three segments perceive intensity of competition in their industries to be very high. As already mentioned, environmental turbulence perceptions depend on how well the managers know and understand the environment. It is therefore possible that a firm with weaker marketing competencies does not have the capabilities to understand the market and therefore evaluates market turbulence to be higher as it would otherwise.

We further compared product lines within each segment depending on the country their corresponding firms are from (see Table 3).[7] Here we have to stress that our results are somewhat biased due to the disproportionate representation of the firms from both countries in the sample and therefore limitedly conclusive. The most balanced is the first segment with 22 Slovenian and 17 Croatian firms, while there are only 7 Croatian firms in the second segment and 16 Slovenian firms.

[7] Applied was Independent samples T-test with grouping variable country and Levene's test for equality of variances, P<0,05.

Table 3 Comparison of segments between Slovenian and Croatian firms

Variables \ Segments	I.		II.		III.	
	SLO	**CRO**	**SLO**	**CRO**	**SLO**	**CRO**
No. of product lines	**24**	**18**	**19**	**9**	**22**	**13**
No. of different companies	**22**	**17**	**16**	**7**	**21**	**13**
Innovative performance						
Number of modified, improved and completely new products in period 2004-2006 (N_CH_PROD)	2,75*	2,89	2,89	3,00	4,27	4,15
Quality of products (QUAL_PROD)	2,96	2,78	4,21	4,44	4,18	4,13
Technological competencies						
Advancement of R&D (RD_ADVAN)	2,79	2,47	**3,16 ++****	**2,12 +**	**3,86 ++**	**3,18 +**
Number of quality technological capabilities inside the firm or through strategic partnerships (TECH_CAP_NQ)	2,67	3,06	3,32	3,11	4,09	3,69
Prediction of technological trends (TECH_TREND_F)	2,62	2,78	3,00	3,33	3,95	3,92
Marketing competencies						
Obtaining information about changes of customer preferences and needs (INFO_CUST)	2,92	2,50	3,26	3,22	3,91	3,83
Acquiring real time information about competitors (INFO_COMP)	3,00	2,89	3,16	2,89	**3,27 +**	**4,00 ++**
Establishing and managing long-term customer relations (CUST_RELAT)	3,25	3,00	3,79	3,33	4,14	4,15
Establishing and managing long-term relations with suppliers (SUPP_RELAT)	**2,88 +**	**3,67 ++**	3,58	4,11	**3,68 +**	**4,54 ++**
Complementary competencies						
Good transfer of technological and marketing knowledge among business units (TECH_MRKT_KN)	2,75	2,83	3,32	3,67	3,55	3,62
The intensity, quality and extent of research and development knowledge transfer in co-operation with strategic partners (RD_STP)	**2,46 +**	**3,00 ++**	3,00	3,33	3,55	3,69
Cost efficiency of product development (RD_COST_EFF)	2,75	2,28	**3,37 ++**	**2,56 +**	3,59	3,23
Clearly defined activities of business units in the corporate strategy of the firm (ACT_STRAT)	2,79	2,88	3,58	3,11	3,68	3,92
New product development						
Time needed to develop an improved product (TIME_IMPR)	2,71	2,89	3,21	3,33	3,77	3,62
Time needed to develop a completely new product (TIME_NEW)	**2,42 +**	**3,00 ++**	**2,63 +**	**4,22 ++**	3,73	4,23
Contribution of the firm to industry trends (TRENDS)	**2,33 +**	**3,00 ++**	**2,47 +**	**3,33 ++**	3,32	3,77
Imitation VS innovation strategy***	2,21	2,06	2,74	2,44	3,41	3,00
Other						
Added value of new products (ADD_VALUE)	2,42	2,71	3,05	3,33	3,64	3,38
Cost efficiency of the firm (BP_COST_EFF)	**2,54 +**	**3,11 ++**	3,26	3,44	3,68	3,92

Note: All variables were evaluated in comparison relative to the main competitors of the firms on the five-point scale with values: 1 - considerably worse than the main competitors, 2 - worse than the main competitors, 3 - same as main competitors, 4 - better than the main competitors, 5 - considerably better than the main competitors.

* Variable mean value for the segment.

** Pluses denote whether the differences between the two countries within one segment are statistically different. Applied was Independent samples T-test, $P<0,05$.

*** Variable was evaluated on a five-point scale with values 1 – only imitation, 2 – predominantly imitation, 3 – balanced, 4 – predominantly innovation, 5 – only innovation.

For the first segment we did not observe any differences between the two countries regarding technological competencies. Croatian firms in the sample are however much more successful in establishing long-term relations with suppliers (SUPP_RELAT) than their Slovenian counterparts. The same can be concluded for complementary competence RD_STP and for indicators TIME_NEW and TRENDS and BP_COST_EFF. In a similar way as explained before, RD_STP, possibly also through cooperation with suppliers, can significantly contribute to the speed, level and quality of R&D activities what would explain the gap for the remaining three indicators.

As mentioned, the differences established in the other two segments are not to be generalized. What we can still say about the sample is that unlike Croatian firms, Slovenian technology followers with strong competencies witness competitive scores with values above 3 for technological competence RD_ADVAN and complementary competence RD_COST_EFF. However, again TIME_IMPR and TIME_NEW are very much different and in favor of Croatian firms. Together with higher values of indicator RD_ADVAN we can attribute this to R&D activities in Slovenian firms being more complex and lengthier. Worse results for indicators RD_COST_EFF, TIME_IMPR and TIME_NEW are therefore not surprising. In the third segment, Slovenian firms have once again better scores for RD_ADVAN among technological competencies, but lag behind Croatian firms with respect to INFO_COMP and SUPP_RELAT among marketing competencies.

4 Conclusion

In our study we have identified three distinct segments of Slovenian and Croatian firms (more precisely their product lines) according to their innovative performance. We found that the segments significantly differ in their competencies, while in terms of innovative strategy they are hardly affected by the perceptions of environmental turbulence. The most innovative firms simultaneously develop all three types of competencies. To some extent firms can compensate weaker technological competencies with strong marketing and complementary competencies. Based on innovative performance and other traits of new product development of the firms in the sample we can also conclude that even firms with well established and competitive competencies seem to have developed their own competence centers, but they can be hardly denoted as technology leaders successfully producing radical innovation. They are typically followers that intensively follow technological and marketing trends and build their market position through inventions, often based on independent design, or imitation. In terms of differences between the two countries, conclusion can be made about the segment of technology followers with weak competencies. Croatian firms within this segment are comparably more competitive at establishing and managing long-term relations with suppliers and in co-operation through strategic technological partnerships which can both be important sources of external knowledge.

Our results can help firms understand what competencies they need to develop in order to pursue an innovation strategy of their choice or to examine their existing competencies and identify possible gaps. Technological firms may pay less attention to marketing and complementary competencies than to technological competencies but it can be a great disadvantage if they are not systematically being developed along the way.

The question that remains is how should a technology follower country approach its growth strategy, narrow the gap with technology leaders and increase its competitiveness. The Lisbon

strategy as an action and development plan for the European Union proposes increasing public and private investments in R&D as well as developing innovative climate and entrepreneurship (Commission of the EC, 2005). By focusing on quantative goals such as share of R&D expenditure in GDP, there exists a danger that investments will not effectively translate in concrete actions.

Based on our findings we are able to make several conclusions that support strategies proposed by the Agenda. Namely for technology follower countries technological competencies may be costly and time consuming to acquire. Yet marketing and complementary competencies can successfully facilitate the process of catching up via incremental innovation. Firms can thus choose imitation as a strategy for developing technological capabilities and bridging the gap to a certain extent. Furthermore, incentives for firm cooperation in new product development can help firms overcome the limitations imposed by their in-house competencies. Encouraged should be innovations based on good market expertise, meaning they respond to concrete market needs and are positioned with a solid understanding of competitors' strategies. In order to take on and maintain the position of a technology leader, firms need to constantly simultaneously develop technological, marketing and complementary competencies.

As we intend to increase the sample size, we also intend to further test the correlations between the competencies, innovative performance and business performance.

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