

## THE CHALLENGE FOR PRODUCT INNOVATION IN MEDIUM SIZED ENTERPRISES IN CROATIA

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### 1. Introduction

Croatia is one of the transition countries and was part of the former Republic of Yugoslavia whose economic system was based on socialist self-management and on the social ownership of production factors. After Croatia gained independence, its transition into a market-driven economy has led to considerable structural changes. These have been characterized by the shift from social to private industry, from industrial to service economy, from large to medium and small companies, the redirection from mostly Yugoslav markets to the more developed European markets as well as by the shift from a supply driven economy into a demand-led one [Bakotic 2005].

The Croatian medium sized enterprises represent a new wave of progress, which can be the base for further development of the Croatian economy. These medium sized enterprises have mainly been established in the last 15 years. They are found by the restructuring of large enterprises, which were state owned. Another group of them was established after the introduction of market oriented economy and encouragement of entrepreneurship. Their business functions are developed enough to overcome problems of small companies, and they are more flexible but not burdened with the problems of large companies.

But unfortunately, all of these enterprises have the same problems regarding getting loans, lack of managerial knowledge and experience and inadequate or indefinite corporate strategies.

Competitiveness is mostly attained by low prices and less by new designs, product innovation or new manufacturing methods [Bakotic 2005]. The majority of them do not change their size very much. In spite of unfavourable conditions medium sized enterprises, which manage to develop appropriate economics of scale or acquire some other competitive advantage through learning process, expand [Bastic 2004].

In order to support this expansion companies have to rely on strong and well-defined strategies and to find adequate ways of financing. The key intangible determinants of (export) competitiveness in the manufacturing industry are not low costs (especially low wages), but investment in technological development, effective distributions systems, successful marketing campaigns, superior product design and quality, flexible management structure, sound knowledge of new markets and customer needs, and wage systems that spur employee creativity [Bejakovic et al. 2004].

In 2002 the Dutch and Croatian Ministries of Economic Affairs agreed to launch a capacity building project in Croatia to improve the competitiveness of Small and Medium-sized Enterprises (SMEs) and to prepare them for the competition of the European Market. Under the umbrella of this initiative, three in-company demonstration projects with regard to product development and innovation took place in Croatian SMEs.

## 2. The Project

Three product innovation demonstration projects have been initiated within Croatian companies. The aim of the projects was to offer a template for case studies in which Croatian companies demonstrate to be successful in applying product innovation in their daily practice. The specific goal of the demonstration projects was:

- a. To raise the awareness among Croatian companies about how they can be competitive, not only through financial efficiency but also through improvement of their products and processes.
- b. Implementation of innovation processes in the participating Croatian companies
- c. Developing suitable advises and products for the participating companies

This approach asks for innovation management. The aim of innovating is to guarantee the sustainability of a company. But what is innovation? On a product level, a *market-based product innovation* can be defined as a product that results from combining skills and resources in such a way that customers perceive a lasting improvement of the relationship between price and value, relative to competing products. As a consequence, we define a market-based *process innovation* as investing in skills and resources in such a way that it enacts market-based product innovation and/or lowers costs in producing perceived value.

By innovating at the right time the company can prevent a strategic gap between the current situation and the near future. This gap will be caused by a decreasing profitability of the current products. Sustained high profitability may result when a firm repeatedly introduces valuable innovations that service previously unmet customer demands. While the returns to the firm from each innovation may erode over time, innovation ensures that, overall, the firm maintains a high performance position.

## 3. Company cases

Three experts and five master students from the Faculty of Industrial Design Engineering of Delft University of Technology have been working closely with the three companies in order to introduce and test the product innovation process in their enterprise environment. Additionally several students from Zagreb University were joining the Delft students in the project. In order to realize a sustainable effect it was decided to invite both Croatian consultants and a knowledge institute in Croatia, Zagreb University. The university cooperated through the participation of students from engineering departments.

### 3.1 Companies

The three companies involved in the project were:

- Adriacink, located in Split, Croatia, produces and offers services for the metallurgy industry. Its production at the moment mostly consists of manufacturing and galvanizing semi-finished products for the business-to-business market, for the local market in Croatia as well as the foreign market in France and Germany. The reason why Adriacink participated in this project was to let their engineers experience not just the IDE approach in the Netherlands, but especially the way of thinking, the way of organizing, from idea to final product. How complex it is and what should be included. They had to think broader: market reaction, costs, and reasons of redesign. See [Kastkarel 2005] and [Most 2005] for an extensive description of the case.
- DIN, located in Novoselec, south of Zagreb, is a timber and wood-processing industry, which processes wood from raw logs to completely finished end products such as parquet and furniture. The company participated in this project because they are interested in developing their furniture factory and entering the market with their own products. The company acknowledged that it lacks experience in product development and hoped to learn from this project and to put the newly acquired skills into practice. See [Boschloo 2005] and [most 2005] for an extensive description of the case.
- Instrumentaria, located in Zagreb, is a manufacturer and distributor of medical instruments and utensils. Their product portfolio incorporates over 5000 products including 4 different

groups of products: implants, prosthesis, surgical instruments and sterilizers. They also distribute products from other companies into the Croatian market. The project fits into the vision of the new manager to restructure the company and to encourage employees to show initiative in order to achieve the targets of Instrumentaria. See [most 2005] for an extensive description.

With these three companies a broad spectrum of industrial activities were covered: instruments for the professional market (Instrumentaria), the business-to-business market in the metallurgy industry (Adriacink), and finally the consumer market regarding the furniture manufacturing (DIN).

### 3.2 Method

In a period of 6 to 8 months each of three innovation projects were managed by a team, built of a Master student, a company manager, and the three Delft experts [Cristiaans 2003]. The project was divided in three parts according to the three phases of the product-development process [Roozenburg 1995]:

1. *Analysis*. The innovation process started with a systematic analysis of the companies' internal and external status quo. Data from benchmarking, SWOT analysis and portfolio analysis provided insight in the actions to be taken by the companies.
2. *Product conceptualization*. Depending on the direction in which the innovation should be looked for, the companies develop during this phase innovative ideas. Several creativity techniques were used to facilitate this process. The efforts resulted in clear product and process concepts. At the end of this phase decisions were made which of these concepts will be further elaborated and detailed.
3. *Elaboration and detailing*. During the third phase the Master student and company engineers together worked out the concept(s) in such a way that at the end of this phase it is (they are) available for feasibility testing.

In Table 1 several methods are presented which were applied in the three companies during the phases of analysis and conceptual design.

**Table 1. Methods applied during analysis and synthesis phases in the three companies**

Adriacink	DIN	Instrumentaria	<i>Explanation</i>
BCG Matrix	Life Cycle Analysis	BCG Matrix	<i>Analyzing product portfolio</i>
	Ansoff Matrix	Ansoff Matrix	<i>Determining current situation, defining innovation strategy and future direction</i>
SWOT Analysis	SWOT Analysis	SWOT Analysis	
Product use/User Analysis	Product use / User Analysis	Product use / User Analysis	<i>Exploring search fields</i>
	Collages		
		Morphological Box	<i>Combining different partial solutions (diverging)</i>
Requirements + Wishes	Requirements + Wishes	Requirements + Wishes	<i>Structuring and guiding the generation and evaluation of ideas</i>
Harris Profile	Harris Profile		

Each phase started with a workshop conducted by the Delft experts, aiming to introduce the project phase and (with the second and third workshop) to evaluate the outcomes of the foregoing phase.

## 4. Evaluation of experiences

In order to evaluate the effects of the IDE approach in the three companies the whole project was monitored [6]. During and after the project all people directly involved were interviewed: company management and co-workers, Dutch and Croatian students, and the Delft experts. Moreover, several group interviews were conducted. The most important results of this evaluation are presented here.

### 4.1 Product development

In each case, the questions per phase (analysis, concept development and elaboration) and on each level (internal, micro and macro environment) are slightly different.

The first main question in the analysis phase: 'What kind of product?' was in the cases of DIN and Instrumentaria relatively simple: for DIN it would be a product of oakwood, most probably furniture;

and for Instrumentaria a kind of ‘medical instrument’. The second main question: Who will be the future customer? Is for Instrumentaria relatively simple to answer (hospitals, and maybe other medical applications), but DIN had no determined group of customers. For Adriacink both questions were difficult, because ‘a product of steel’, even ‘a galvanised steel product’ is less determined than ‘oak furniture’ or ‘medical instrument’. As for DIN, Adriacink had no defined circle of customers. So, for Adriacink both questions were open, for Din the second question was open, and for Instrumentaria the second question was more or less easy to answer.

The first decision in the case of Adriacink was to develop a product for marinas, based on the growing tourist market in Croatia and the governmental plans to build more marinas in the coming years (knowledge of macro environment). The second decision was to develop a boat cradle, based on observations of current ways of storage the yachts (knowledge of micro environment).



**Figure 1. Boat cradle for Adriacink**

The analysis in the Din case concluded with the decision to develop oak furniture for young Croatians with some money to spend.

In the second phase the deliberate choice by all three companies was made to aim for an incremental rather than a radical degree of innovation. In Instrumentaria the team initiated this, whereas at Adriacink and DIN the company stimulated the choice of one search field. On the one hand the projects were intended to be examples of innovation, but on the other hand, if the final products would be too far from the current activities of the companies, actual implementation was unlikely.

The graduate students were more reluctant to develop a product that was relatively close to the company activities, as they preferred their graduate project to result in an innovative product.

In the final phase the project of Instrumentaria did, so far, not result in a final design. The other cases, however, resulted in detailed final designs and even prototypes. In Adriacink everyone was unanimously enthusiast about the final design. DIN did have some small remarks about the construction, but they as well were positive about the design.



**Figure 2. Furniture for DIN**

#### 4.2 Raising awareness about IDE in Croatia

The first objective of the innovative product development project was to raise awareness among Croatian companies about how they can be competitive, not only through (financial) efficiency but also through the improvement of their products and product development process.

Looking first at the participating companies, all of them had from the beginning a very positive attitude towards the project. It can be concluded that the companies have gotten acquainted with Industrial Design Engineering. They have gained insight in the possibilities of IDE and this will be helpful if they ever wish to restructure their companies to enable innovative product development.

Second, in order to achieve a sustainable effect of the IDE approach for SMEs in general local Croatian consultants and students from Zagreb University were invited to participate in the project. They were thought to spread the knowledge about IDE in the future and to raise awareness among companies. It was expected that local consultants would be interested in learning about the IDE approach in order to be able to apply this knowledge in their future projects. However, not all consultants have been involved in the project because most of them were only prepared to participate if they were paid for their consults. The participating students from Zagreb University were only voluntarily involved, without obligations from their university and even not getting any credit points. For that reason the Dutch students couldn't rely on them. Nevertheless, they were impressed by the IDE approach.

#### 4.3 Implementation of an innovative design process

In order to evaluate the contribution of IDE in Croatia project to the implementation of IDE in the participating companies, three aspects will be addressed, (1) the IDE knowledge transfer, (2) the companies' intentions with the students' design in the light of the possible change from a capacity company towards a product company, and (3) the future innovation strategy.

*Knowledge transfer about IDE.* Adriacink was positive about the knowledge transfer. Those who were intended to learn about IDE however – the engineers within the company - did not share this opinion. Within DIN and Instrumentaria, the management, who had been closest to the students, were rather positive. In the interviews they indicated that they had obtained sufficient insight in Industrial Design Engineering to be able to instruct future employees. However, at this moment IDE has not yet been implemented nor has the knowledge been internalized by those who are intended to implement IDE methodology in the near future.

*From capacity company to product company.* The prototype of the boat cradle, which has been designed for Adriacink was received with enthusiasm on the Croatia Boat show and some company contacts had already indicated to be interested in placing an order. The impression is, however, that the product will be sold on demand, possibly tailor-made for each specific customer. Also within DIN mass production of student's design has not been planned yet. They will simply adopt the same approach as usual and try to interest several individual clients. Consequently, without plans for mass production including a sales and distribution network, a marketing strategy and an optimized production that results in a stock of readily produced products, the actual change to a product company is still far from achieved.

*Future innovation strategy.* The participating companies have been convinced of the need for Industrial Design Engineering in Croatia. In spite of this awareness, however, it is not expected that IDE will soon be implemented, at least not in the near future. Most participants felt that the companies are not ready yet to implement IDE. For now they will continue with their current activities, while addressing the different challenges the companies are facing, such as an improvement in human resources, strategic partnerships and restructuring the company's documentation.

Although IDE is not expected to be fully implemented in the (near) future, the student's projects did make a contribution to the process of restructuring the companies and they did affect the attitude towards innovative product development. Within Adriacink for instance the collaboration between the different departments has been improved thanks to this project, while within DIN the manager was definitely convinced that the link between marketing and product design was essential for future product development. Altogether no major changes have been effectuated, but the insight the companies obtained in IDE will be used in their future development.

#### 4.4 Strategic innovation advice

In all three cases the team experienced difficulties in determining the best innovation advice and the most suitable direction for further projects. The companies were acting on many different markets without a clear strategy, leaving the team with an abundance of possibilities. Additionally the analysis was complicated by the language barrier and the lack of proper company documentation. The companies were all impressed by the thoroughness of the analysis, although the management claimed to be aware already of the internal and external situation the students described. As they were unable to decide on the best strategy for the company themselves, they fully understood why the team did not succeed in providing them with a perfect strategic advice.

One particular recommendation that the team expressed was the need for insightful and structured company data. All companies are lacking useful management systems, reason why knowledge and experience get lost.

### 5. Conclusions

#### 5.1 Background and willingness to attitude change

*There are many different parties involved. These all have different backgrounds regarding for instance education, profession and nationality. How do these differences in background influence the project? What will be the effect on collaboration, communication and the knowledge transfer? What are the differences in attitude and expectations?*

The most important consequence of the different backgrounds has been the attitude towards the project. The people responsible for product development in the company (engineers and other highly skilled workers) did not feel responsible for analyzing the internal and external situation of the company in order to determine interesting search-fields as a focus for new product development. They were reluctant to be involved in this first phase of the project or to take into account the consequences of their design for future users. They didn't look interested in obtaining knowledge about IDE. An obvious reason for their attitude might be that, because of the socialistic past of Croatia, the mentality of the employees is characterized by reluctance to change and a lack of motivation, responsibility and initiative. However, an even more plausible explanation can be found in the differences in educational background: (mechanical) engineers are educated to design and construct products based on specifications (the product has to carry a weight of x tons... etc). In most cases other people determine these specifications (the customer or the management of the company). The engineers of Adriacink have been educated to determine the dimensions of for example a cradle to support a boat with a length of y meter, a weight of z tons, and in weather conditions when the wind blows with strength w. They are not educated to study the way a boat is transported from the water to the cradle (how it is done, who does it, how often, etcetera), or to analyse the market possibilities (how many marinas? How much yachts? How much is a boat owner willing to pay for a good cradle? Who will buy the cradles, the boat owners or the management of the marinas?). The theory of IDE is that this kind of information is indispensable for a good cradle design.

The communication did not suffer greatly from the differences in *national* background; nobody mentioned serious miscommunications. The differences in language was not much of a problem in the communication of the parties directly involved, as it was a prerequisite of the IDE in Croatia project to be able to speak English fluently. But because the students did not speak Croatian, they could not communicate with the common workers, which restricted their insight in the company.

#### 5.2 Cultural gap

*The students are mainly used to developing products in the Dutch context. They are experienced in analyzing the Dutch market, companies and end users. Will it be possible to get insight in the specific Croatian context? Will the resulting products and advices be suitable for the companies and their context?*

Innovative products cannot be developed in the blind. A player on the market needs a lot of information about the market, while at the same time a free competitive market needs institutions that

provides this information [9]. The IDE methodology is based on the presumption that the necessary information is available. The students had to deal with a Croatian context they did not know, and the information needed was hard to find or not available. Nevertheless, the students did obtain a sufficient insight in the Croatian context to decide on the direction for their projects. During their projects they also provided several useful advices and recommendations. Their analyses did, however, not result in strategic advices that contributed to solving the dilemma the companies were facing regarding their strategy for the future. The resulting products were suitable for the production facilities of the companies, they were a good addition to the existing product portfolio and they were well tuned to the developments on the market. In order for the products to be suitable for implementation in the companies, the choice had been made to stay close to the companies' current activities and aim for incremental innovation.

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