

# Improving Management Functions in Developing New Products in Medium-Sized and Large Enterprises (A Comparative Study of Bulgarian and American Processing Industry)

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**Abstract** Product and process innovations are viewed as a key factor for the competitiveness of organizations and regions and for achieving economic growth. The efforts of researchers in this area are focused on identifying good practices, related to the management of new products development (NPD), and bringing out those with high success rate. A number of studies on the NPD process prove that the increased research and development activeness (R&D) increases the comparative advantages and is the basis for market approval of industrial enterprises-innovators. This determines the interest of authors in studying the area of efficient management of the NPD process in industry. They research practices applied in Bulgarian industrial enterprises with the aim to prove the significance of the technology and organization for NPD and use it to synthesize and summarize a set of specific quality parameters for improving the management functions, applicable in medium-sized and large enterprises for the processing industry in approving their performance, compared to the competitors in the sector concerned.

**Keywords** Competitive advantage · Industry studies · Innovation · Innovation process · Research and development · Technological innovation

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## Introduction

The efficient management of each phase, in which the innovation process has been decomposed, is directly related to the management of new products development (NPD), providing an advantage in the continuously changing environment, where the organizations function. Good NPD practices have been studied from idea generation to production by a number of researchers (Tzokas et al. 2004; Damanpour and Wischnevsky 2006; Chang and Cho 2008; Visser and Weerd-Nederhof 2010; Durmusoğlu and Barczak 2011). Cooper (1996, 1998) and Cooper and Campbell (1999) has conducted profound worldwide studies on what separates successful new products from those which fail. Researchers have directed their efforts to finding common practices and ways that could lead to the creation of new successful products by the organizations.

The authors' research is based on several earlier surveys in this field. One of the organizations, focused on improving the efficiency of individuals and enterprises for developing and managing new products, as well as encouraging their development, is Product Development and Marketing Association (PDMA). PDMA's mission is creating and spreading knowledge for managing and improving the processes for developing new products. A primary analysis of the product design state was first made by PDMA in 1982, and then in 1995 under the guidance of Griffin (1997). A third wave of research on the tendencies in new product development and good practices in the USA was done by PDMA in 2003 (Barczak et. al. 2009). G. Barczak, A. Griffin, and K. Kahn were project coordinators. The research done proves that using a formalized process in developing new products, availability of a specific strategy for this development, measuring the results, and putting in more efforts, using mixed teams, as well as applying a combination of marketing research on the market and consumer attitudes, computer-aided design, and using rewards, are practiced. This has direct influence on the success in new product development.

These surveys challenge the authors to conduct research among Bulgarian industrial enterprises with a focus on NPD process. The survey card used for the comparative survey has been developed by PDMA (2003). The general NPD process in enterprises is surveyed, as well as the management of innovation product portfolios, NPD process through outsourcing, NPD organization, and methods used.

## Framework

When choosing the objects for sector analysis and the size of the organizations surveyed, we sought parallel to the surveys cited, conducted in the USA in order to achieve comparability and commensurability of the results obtained. The object of the experimental survey in Bulgaria has been medium-sized and large enterprises

(selected by the number of their personnel), which according to the National Classifier of economic activities (KUD—2008) are registered in sector C —“Processing industry,” and operate in the following sections: 10 “Production of food”; 16 “Production of timber, wood and cork products, excluding furniture, production of straw products and knitting materials”; 17 “Production of paper and cardboard articles”; 22 “Production of rubber and plastics”; 28 “Production of machines and equipment with general and special purpose”.

The total set of companies comprises 559 organizations. The information about them has been provided by the National Statistical Institute of the Republic of Bulgaria (NSI). Since the survey has been conducted in five different sections, to submit statistically significant results for each of them, the sample should be representative for the general set of organizations and for the companies belonging to each section. To check the statistical significance, the Raosoft calculator (Sample size calculator) has been used. It makes the calculation of survey sample volume (*n*) possible. The statistical error embedded is  $p = 5 \%$ , with confidence coefficient  $\gamma = 0.95$ .

The respondents of the survey proper are 234 organizations. A direct contact has been established with them on the basis of in-depth interviews. The results can be accepted as statistically significant both for the general set and for each section. The level of activeness is 63 %, and is shown in Table 1 by sections.

Answers have been obtained by respondents targeted in advance: Executive manager/manager, brand manager, or R&D manager. The choice of respondents has been based on the conviction, where this is the circle of people, who are acquainted with the wide range of activities of the respective organization.

This paper is focused on comparing the results from the survey conducted among American and Bulgarian organizations. The common process of new product development, managing portfolios of innovative products, and the organizational activities of developing new products are analyzed. In particular, the authors comment on the results obtained from rubber and plastics producers, due to the wide range of applications of their products in the manufacturing activities of Bulgarian industrial enterprises, including automotive industry and other related industries.

**Table 1** Level of activeness

Section	No. of enterprises general set ( <i>N</i> )	Estimated no. of companies surveyed ( <i>n</i> )	Number of companies surveyed	Completion (%)	Refusals number	Refusals (%)
10	335	179	125	70	54	30
16	26	24	16	67	8	33
17	33	30	8	28	22	72
22	79	66	35	53	31	47
28	86	70	50	71	20	29
Total	559	369	234	63	135	37

## Results and Discussion

A number of studies on new products prove that the level of novelty may vary. Following the methods of PDMA (Griffin 1997), we have been using the following categories of new products: Products which are world novelty; Product lines which are new for a given organization; Additions to existing product lines; Major modifications and next-generation products; Gradually improved products; Re-positioning of products; and Reduced cost products manufactured by the company. The new products in the organizations under survey fall into three categories—world novelty, adapting, and imitating innovations.

On analyzing the fuzzy front end (Stoycheva and Antonova 2012), the authors have reached the conclusion that it is of crucial importance for the Bulgarian industrial enterprises in the process of new product development, due to the following reasons: (1) The greatest opportunities for improvement of the entire innovation process are concentrated in its starting stage. If the companies are not efficient in their generating stage, in spite of their excellent technological development, there is a great probability of the product to fail in the financial, strategic, or trade expectations (Khurana and Rosenthal 1997; Koen et al. 2001; Antonova 2009; Oliveira and Rozanfeld 2010; Ho and Tsai 2011); (2) The search for efficiency on the innovation process, achieved in a relatively short time, also presupposes a strong accent on the generating stage, when the changes in the conceptual model of the new product can be achieved at a relatively low cost; (3) The possibility to create a complex procedure for evaluating new variants in the generating stage requires a constant flow of quality new product ideas, which would guarantee successful innovative solutions for the organizations in the future. In this way, costly blunders at a later stage of the innovation process will be avoided. Financial, strategic, and marketing risks will be reduced significantly.

In the American organizations, the process of new product development is highly structured. A strong accent is put on the fuzzy front-end stage. The organizations surveyed pass through the stages of the new product development process subsequently, namely, generating of ideas, screening of ideas, business analysis, tests, development and reliability of the new product, and commercialization. About 14 % of the ideas generated turn out successful. The American organizations determine accurately the time needed for the new product to go through each stage of development. Results show that American enterprises dedicate 2 years (104 weeks) on average for developing world innovative products, for adapting innovations—62 weeks and for imitating innovations—29 weeks. From the new products developed to the stage of commercialization, 54 % are identified as ultimately successful. In comparison to earlier surveys, the time for developing new products has been reduced by 42.5 %, which has contributed to their success. The situation with the Bulgarian industrial enterprises is disparate. Results show that the enterprises surveyed cannot accurately determine the time needed for developing new products, as well as the time necessary for each stage of the innovation development process. No analysis is done to identify the stage, when new ideas fall

off; hence, it is impossible to determine the number of new product ideas, which have turned successful and reached market realization. The result obtained may be due to the fact that the processing industry enterprises in Bulgaria demonstrate conservative attitude to new products and focus their efforts mostly on developing adapting and imitating innovations. Only fewer than 5 % of the new products developed in these enterprises belong to the group of world innovative products. These organizations do not invest in creating radical innovations, due to a lack of financial resources. They have used a considerable financial resource and expensive equipment for their development, compensating the lack of qualified staff and working in conditions of increased risk. All this casts some doubt on the survival of the organizations today, which is hard anyway.

In particular, in the production of rubber and plastic articles, those of which are world novelties are less than 1 % (0.86 %). From the adapting innovations, product lines which are new for the organization make 15.45 %; the additions to existing product lines hold the highest percentage—27 %. The major modification and next-generation products are 13.63 %. From the imitating innovations, the share of the products gradually improved is the highest—26.45 %, followed by the repositioned products—12.17 %, and those with reduced cost 4.14 %. The results obtained confirm the general tendency and characteristic of the enterprises from the Bulgarian processing industry.

The generating and the technological aspect of NPD is becoming more and more critical element of the overall corporative strategy. This is inextricably linked to the strategic direction of the company and facilitates the identification of its competitiveness range.

The availability of a written general strategy of the company facilitates making innovative decisions. With the American organizations, 74 % of the respondents have a complete strategy in developing new products, which confirms once again the fact that these organizations pay specific attention to the process of developing new products. For Bulgaria, 71 % of the respondents' surveyed use a complete strategy for developing new products, which directs and integrates the whole development process. Although the percentage of organizations using a complete strategy is close, the difference of 9 years between the two surveys should be taken into consideration. This gap is evidence that Bulgarian industrial enterprises are lagging behind. With the manufacturers of rubber and plastic products, 74.29 % (26) from the respondents apply the entire NPD strategy. 54 % (14) of the organizations insist on being market product and technological leaders, although not all their efforts turn successful. They share that they react fast to early signals concerning opportunities. 8 % (2) of the companies describe their innovative strategy as careful observation of the activities of their major competitors. Rarely they are the first to offer new products on the market, but they are fast to follow (imitators), which guarantees higher profitability and even more innovative product modifications. 38 % (10) organizations are trying to discover and maintain a secure niche for a relatively stable product or service. They defend their position by offering higher quality, accurate service, and lower prices (Table 2).

**Table 2** Duration of documented NPD process

Years	0–1	2–3	4–5	6–10	Over 10
Producers of rubber and plastic articles (%)	8	16	24	28	24

From the results obtained, it follows that the implementation of documented NPD is not an unknown phenomenon for the producers of rubber and plastic articles and it has its traditions. A significant number of the organizations surveyed (53 %) conduct a timely update of the NPD process, which leads to its overall improvement.

Development of new products is based on ideas from various sources. The data provide evidence that the main sources of innovative ideas are the consumers and clients. This is the one more proof that the organizations surveyed do not create knowledge, but expect ready solutions from the clients, which they will then develop, sure in the innovation success.

In particular, Table 3 presents the results (through a 5-point Likert scale), in the production of rubber and plastic articles, connected to identifying the source of new product ideas.

**Table 3** Emergence of ideas for new products

Ideas for new products	Not at all important				Extremely important	Producers of rubber and plastic articles
Coworkers in the firm	1	2	3	4	5	2.83
User or customers	1	2	3	4	5	4.80
Competitors	1	2	3	4	5	3.57
Internal research and development	1	2	3	4	5	2.29
Cooperation with other companies	1	2	3	4	5	2.29
Suppliers	1	2	3	4	5	2.14
Internal marketing group	1	2	3	4	5	2.49
Consultants	1	2	3	4	5	2.20
Internet network	1	2	3	4	5	3.40
Top management	1	2	3	4	5	4.49
University or Research institutes	1	2	3	4	5	1.69
Internal manufacturing	1	2	3	4	5	2.94
Acquisition of new equipment	1	2	3	4	5	3.63
Professional journals	1	2	3	4	5	2.74

The results obtained confirm the general tendency that the main sources of innovative ideas are the consumers and clients. Another generator of ideas is the top management, who makes the decision whether one idea should be developed or not, taking into account the opinion of different functional departments. Acquiring new equipment, as well as tracking the branch competition activities, is also innovation sources. The results provide evidence that the relation between science and real business practice is very weak or practically nonexistent. A proof for the predominant creation of adapting or imitating innovations is the weak influence of the internal R&D, i.e., the organizations do not invest in its development.

For the American organizations, the application of nonfinancial stimuli is characteristic. The most common rewards are holiday gatherings, opportunities for future work in larger teams, as well as commendable messages in the company bulletin.

Concerning the methods used for stimulating the leaders and the members of a given innovation project, the results obtained for the Bulgarian respondents surveyed testify that besides the financial stimuli, the nonmaterial means of reward such as praise, nonfinancial rewards, project photographs, and festive gatherings are not widely used among producers of rubber and plastic products. This trend is characteristic of a number of other sectors in Bulgaria. In this respect, a system for adequate evaluation of teams, which deal with new products, should be developed. The fact that motivation is high only when a financial system of remunerations is supported has been unanimously accepted. We should not forget that the reward in NPD should be dependent on specific results. Besides, we should be aware that the reward with NPD should be related to specific results, and the formally developed system of rewards in the organizations does not work when new products are created.

## Conclusion

Unlike the American organizations, the Bulgarian processing industry enterprises do not create completely new knowledge. They do not direct their efforts to developing radical innovations, but focus their production on adapting and imitating innovations. They ought to take into consideration the fact that in order to survive in a competitive environment, they should change their orientation from ready solutions, coming from outside, to generate knowledge.

The present study brings out results concerning the state of NPD process for the manufacturers of rubber and plastic ware on the territory of Bulgaria compared in general to processing industry enterprises from the USA. The results obtained outline the characteristics of the production of new products in the sector. Contrary to initial expectations, the organizations producing rubber and plastic ware have a complete NPD strategy, which determines the success of those companies both on the domestic and on the foreign markets. 74 % of the respondents apply a complete strategy when developing new products. This shows that the NPD process is

approached with particular care. It is structured, currently updated, and traditional in the sector. The results give grounds for assuming that a great part of the good image and high financial results, as well as the participation in a number of international joint projects of the enterprises from rubber and plastics sector, is due to the successfully formalized NPD process.

The quality management and the establishment of an efficient system for motivating the teams, creating innovations, are important factors, reflecting the state of a company. In this respect, the Bulgarian companies have to undertake steps to build and implement a system for staff rewards, as a powerful management tool, leading to creating successful innovations.

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