

IPROD

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**Improvement of Product Development Studies
in Serbia and Bosnia and Herzegovina**



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UNIVERSITY OF NIŠ
FACULTY OF MECHANICAL ENGINEERING

**Required competences and learning outcomes of curriculums
in field of Management of Product Development, Innovations
management, Eco-product Development, and Industrial
Product Development**

REPORT

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Introduction

With a goal of investigation of knowledge about the product development and the innovative management, application of the product development strategy, needs of novel technologies, standards, quality and human resources managements follow-ups, as well as informing about the opinion of industrials which skills and knowledge have to have modern engineers, survey of the companies in Niš and surrounding cities has been done.

Questionnaire concerning mentioned topics has been sent to the companies: 110 questionnaires to the 62 companies. However, only 44 filled questionnaires' have been returned back. The significant number of eminent foreign companies working in Niš and the region - BENETTON-Niš, JURA-Leskovac, LEONI-Prokuplje, FIAT AUTOMOBILI SRBIJA-Kragujevac, TIGAR TYERS - Pirot, working in last years with the support of the Government of the Republic of Serbia, as well as the domestic companies: KABLOVI – Jagodina, GOŠA-Smederevska Palanka, RTB – Bor, haven't respond to our survey.

I. Product development and innovative management knowledge as well as the consciousness/needs about/of innovations within the company

Enterprises/companies had a question „Do you think that the following factors are important for the work-creativity growth?“ and as the most important they selected „Internal communication“ (63.6% have pointed as “very important”, and 25% as “important”) as well as „Company’s management policy“ (59.1% – “very important”, and 29.5% - “important”). As the least important they pointed “Personal interest” and “Time table pressure” (52.3% – “important”, 25% – “not so important”). There are differences between grades given by persons from the large/medium enterprises and small/micro companies. Large and medium enterprises consider that creativity growth at work is influenced by the “Personality of employees” and “Cultural background” while people from small and micro companies consider “Time table pressure” as the most influencing.

For question concerning about improvements made within the company in the past 3 years, people have answered that significant improvement were made in products (54.5%), organization of the business (44.5%), technologies (40.9%) and at least in services (15.9%).

Almost all of the people have answered that employees do have trainings, where 31.8% of people answered that all employees have adequate trainings, while 56.8% answered that only some of the people have trainings.

Percentage of 28.6% answered that they had no training. The largest number of training programs (36.4%) is based on development of the staff, innovative management (20.4%) and the least trainings is concerning about administrative issues (only one person).

Question “If you had a chance to have creativity development training, which tool would you like to learn?” had highest grade (4.59) for workshops/conferences/seminars and the least grade (3.6) for the CD and (3.75) e-learning platform. People from small and micro companies gave higher grade (4.73) for workshops/conferences/seminars and the least grade than people from large and medium enterprises.

For question if company is performing innovative activities, 38.6% of people gave answer that they do it by themselves, 31.8% of people answered that they cooperate with scientific-expert institutions and 27.4% cooperate other companies.

As the results show, 22.7% of people is having connections with academic institutions, while 18.2% of the rest answered that they have some minor connections with some institutions, 40.9% have contacts with local universities and 11.4% that have contacts with local higher education schools.

II. Strategy of the product development (marketing, concurrence, orientation of the company to the customer etc.)

The highest number of people (43.2%) answered that their company has some certain ideas about the future, but have no precise planning. 27.3% of people considers that their company has plans to develop a vision of the company in a form of a business plan for at least midterm time period. If some considers only manufacturing companies, percentages are even higher: 53.1% i 28.1%.

That projects, that will be done in the company, are selected on the operative basis in connection with the market opportunities, 48.8% consider to be true, and 6.9% consider opposite.

Almost quarter of people (24.4%) consider that market activities of the company are not planned and all people are coming from the manufacturing oriented companies. On the other hand, 44.4%

considers that companies try to keep up the track with the global market development and prepare themselves for such situation.

In total 46.5% of people claim that situation at the market is systematically investigated and that percentage is 54.8% if we consider only manufacturing oriented companies. Significant difference between answers come for the question about the concurrence at the market: 30.2% think that they do not check their concurrence, while the percentage within manufacturing companies is only, 12.9%. People who answered yes on a question „Company does not evaluate its market position versus concurrence” (13.9%) and „The market is monitored only when some issues appear” (9.3%) exclusively come from manufacturing companies. This implies that manufacturing companies have bad market concurrence assessment.

Significant percentage of the people (34.1%) is considering that customer’s requests and needs are defined before the new product is developed. Only 6.8% of people answered that they do not pay attention on customer's needs.

Only 11.4% people answered that they do not have innovation strategy but 34.1% is certain that innovations have to become a part of the company’s strategy.

Overall of 47.7% is certain that company tries to find resources for development, but they are not sufficient, 31.8% has opinion that development of the company is useful but they can not afford it, and only 15.9% has a stabile budget planned for the development.

III. New technologies, planning, organization and human resources

The most of the people (64.3%) consider that there are some of the people in company interested in development and application of new technologies in the industry.

About 58.1% is certain that their company has a progressing technology improvement, while 23.3% thinks that technological changes and efficiency improvement is only planned. Scheduled changes without evaluation of results are done in 2.3% of companies.

Annual plans are done in 53.7% companies, while 12.2% do not have such plans and their answer is the “they do not have time for it”.

25-30% considers that employees in their company accept organization jobs as a part of their work.

Half of people consider formal and informal communication between employees as good manner, while team work is modestly and when needed applied. A quarter of people considers team work as efficient, while 13.6% has an opinion that communication is insufficient and team work is not useful.

56% of people consider that information system of the company has easy usable information for operative and strategic management, while 9.8% thinks that these information are hidden.

36.4% is certain that responsibility for the product development is a matter of higher management, while 27.3% considers general manager responsible for the product development process. 15.9% has no clear picture about the hierarchy in the product development process.

42.8% of people thinks that team gather only at the startup of the project and organized meetings, 19% thinks that teams are always assembled wrongly. Only 11.9% of people thinks that their company has a high-tech approach in team management.

IV. Quality – standards - ecology

48.8% thinks that praxis and quality procedures of the company are as in the standards while 6.7% thinks that quality controlling exists only in the manufacturing.

60.5 % of people tries to follow up standards, regulations etc. while implementing novel product/procedures in their companies, while 18.6% thinks that changes and trends in quality regulations are systematically followed and analyzed.

One half of the people think that their companies plan external quality revisions. 17.5% think that external partners do not require explicit quality certificates.

58.1% has knowledge about the ecological regulations, and think that company is obeying them. 11.6% have no knowledge about ecological regulations and their company pays no attention about ecology.

50% of people think that their company continuously follow up regulations and standards, 11.4% claims that their company has no budget to follow up the changes.

V. Which knowledge product development engineers need to have (basic knowledge and time dependent knowledge)?

The results of the questionnaire concerning knowledge about the product development are statistically processed and given in the Table 1.

Based on the answers of the people, expert technical knowledge have the highest grades: and product development (4.62), mechanical design (4.33), information systems (4.28), technological analysis and production planning (4.21) and testing of products (4.07). The lowest grade has mechatronics (3.65).

Methodological knowledge is ranked as the second highest after technical knowledge. The grades are: project management (4.02), quality management (4.0), product development methods (3.95), innovation management (3.79), simulation (3.71), while human resources management has a grade of 3.6.

Skills and specific knowledge, such creative potential and elaboration skills got 4.02 while foreign languages got 3.84.

The lowest grades are for economic and legal knowledge: profitability analysis (3,63), marketing (3,51), patent right and protection (3,49), business finances (3,24), basics of economy (3,21) and economic law (3,19).

There is a significant difference in grading between large/medium and small/micro companies. The highest difference is in simulation and human resources management: large/medium companies higher grade give to simulation (3.72) versus small/micro companies (3.18). Human resources management is graded as 3.74 vs. 3.27, profitability analysis is 3.58 vs. 3.27, mechatronics 3.67 vs. 3.4, information systems 4.33 vs. 4.09 and foreign languages 3.89 vs. 3.64.

Small and micro companies gave higher grade for economic and legal knowledge: marketing 3.45 vs. 3.26, business finances and economic law 3,27 vs. 3,08.

Table 1. Average values of grades considering the types of knowledge needed by the product development engineers, grades given by questioned persons

No	No from the Questionnaire	Type of knowledge	Total grade	Medium-sized enterprises and above	Micro-entities and small companies
1.	2.	Product development (Morphology and conceptual elaboration, Development of product variants, Analysis of the structure and selection of the solution)	4.619	4.61	4.55
2.	1.	Mechanical Design	4.333	4.28	4.18
3.	8.	Information systems (information basics, geometrical modeling, virtual engineering)	4.286	4.33	4.09
4.	3.	Technological analysis and planning of the manufacture	4.209	4.16	4
5.	6.	Testing of the product	4.07	4.05	4.18
6.	13.	Creative potential and the elaboration skills	4.024	3.89	4
7.	10.	Project management	4.023	3.84	3.91
8.	7.	Quality management	4.0	4.05	4.18
9.	4.	Product development methods	3.953	3.89	3.91
10.	20.	Foreign languages	3.837	3.89	3.64
11.	11.	Innovative management	3.791	3.74	3.64
12.	9.	Simulation (finite elements method, visualization and evaluation, multi-body simulation)	3.714	3.72	3.18
13.	5.	Mechatronics	3.65	3.67	3.4
14.	17.	Profitability analysis	3.628	3.58	3.27
15.	12.	Human resources management	3.605	3.74	3.27
16.	16.	Marketing	3.512	3.26	3.45
17.	18.	Patent rights and protection of intellectual property	3.488	3.63	3.45
18.	15.	Business finances	3.238	3.06	3.27
19.	14.	Basics of economy	3.209	3.11	3.18
20.	19.	Economic Law	3.19	3.06	3.27