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Improvement of Product Development Studies in Serbia and Bosnia and Herzegovina

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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 purposes 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 East Sarajevo and surrounding cities has been done.

Questionnaires have been sent to the 6 companies and 27 filled questionnaires have returned back. Companies mentioned above are:

No.	Name of the company	Established	Type	Total number of employees	Number of persons who filled questionnaires
1	**FAMOS** East Sarajevo	1950.	State enterprise	>250	5
2	**ALPRO** Vlasenica	1979.	Private company	50-249	5
3	**ORAO** Bijeljina	1944.	State enterprise	>250	12
4	**SEVITEC** Goraǵde	2012.	Private company	<9	1
5	**SARAJEVO-GAS** East Sarajevo	1994.	State enterprise	10-49	3
6	**MAHAGONI** East Sarajevo	1988.	Private company	10-49	1
				In total	27

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

Companies had a question ĂDo you think that the following factors are important for the work-creativity growth?ñ and as the most important they selected ĂInternal communicationñ (44.4% have pointed as ñvery importantò, and 44% as ñimportantò) as well as ĂCompanyôs management policyñ (51.8% ï ñvery importantò, and 35% - ñimportantò). As the least important they pointed "Cultural background" (29.6% - "not so important") and "Time table pressure" (14.8% - "not so important" and 10% - "not important at all").

Regarding the question concerning improvements made within the company in the past 3 years, respondents have answered that significant improvement were made in products (52%), technologies (48%), organization of the business (45%) and at least in the services (22%) - as expected because of nature of questioned companies.

Almost all of the people have answered that employees do have trainings, where 22.2% of people answered that all employees have adequate trainings, while 59.3% answered that only some of the people have trainings.

33.4% of respondents answered that their employees doesnôt have organized internal trainings (organized within enterprise), while 66.6% answered that their companies regularly organize trainings for employees - especially about the new equipment. The largest number of training programs (22.2%) is related to the organizacion issues.

Question ñIf you had a chance to have creativity development training, which tool would you like to learn?ò had highest grade (4.82) for workshops/conferences/seminars and the least grade (3.68) e-learning platform and (3.32) for the CD.

For question if company is performing innovative activities, 48.6% of people gave answer that they do it by themselves, 27% of people answered that they cooperate with other companies and 24.3% cooperate with scientific-expert institutions.

As the results show, 26.4% of people not having connections with academic institutions, while 26.4% of the rest answered that they have some minor connections with some institutions, 52.9% have contacts with local universities and 8.8% 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 (38%) answered that their company has some certain ideas about the future, but have no precise planning. 14.8% 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.

That projects, that will be done in the company, are selected on the operative basis in connection with the market opportunities, 48.1% consider to be true, and 7.4% consider opposite.

14.8% consider that market activities of the company are not planned and 70% considers that companies try to keep up the track with the global market development and prepare themselves for such situation. 11.1% of respondents consider that their companies donôt possess relevant informations about the latest trends in marketing planning,

Only 20% of respondents claims that situation at the market is considered only when problems appears and 40% said that their companies do perform concurrence monitoring but not continuously, while 28% systematically investigate market position versus concurrence.

Significant percentage of respondents (55.5%) is considering that everything about customer's requests and needs is already predefined by relevant technical legislation and existing documentation. Only 7.4% of respondents said that they permanently analyses wide spectrum of customer needs and that they continuously monitor customer satisfaction level.

33.3% of respondents answered that their companies already possess innovation strategies. Only 11.1% people answered that they do not have innovation strategy but 44.4% is certain that innovations have to become a part of the companyôs strategy.

Overall of 64% is certain that company tries to find resources for development, but they are not sufficient. 28% has opinion that development of the company is useful but they can not afford it, and only 4% has a stabile budget planned for the development.

III. New technologies, planning, organization and human resources

42.3% of the respondents consider that some of the employees in their companies continuously follow the latest trends in product development area and that they report to the management on everyday basis.

About 51.8 % is certain that their company has a progressing technology improvement, while 7.4% thinks that technological changes and efficiency improvement is only planned. Scheduled changes without evaluation of results are done in 3.7% of companies.

Annual strategic plans are done in 75% companies, while 17.8% has plans that take into account trends for the following 2-3 years.

35% considers that employees in their company accept organization jobs as a part of their work. About 44.4% of respondents consider formal and informal communication between employees as good manner, while team work is modestly and when needed applied. 22.2% think that team work as efficient, while 25.9% has an opinion that communication is insufficient and team work is not useful.

28% of the respondents consider that information system of the company has easy usable information for operative and strategic management, while 64% thinks that this information are gathered but not efficiently used. Only 8% thinks that these information are hidden.

59.2% is certain that responsibility for the product development is a matter of higher management, while 11.1% considers general manager responsible for the product development process. 14.8% has no clear picture about the hierarchy in the product development process.

70.3% of people thinks that team gather only at the startup of the project and organized meetings, 14.8% thinks that teams are always assembled wrongly.

IV. Quality – standards - ecology

55.5% of respondents thinks that praxis and quality procedures of the company are as in the standards, 14.8% thinks that there are some restrictions in their companies quality procedures, 3.7% thinks that quality control exists only in the manufacturing process and 25.9% claims that their companies have implemented TQM (Total Quality Management) system.

62.9% of people tries to follow up standards, regulations etc. while implementing novel product/procedures in their companies. Only18.5% thinks that changes and trends in quality regulations are systematically followed and analyzed.

62.9% think that their companies plan external quality revisions, while 22.2% claim that their companies periodically and systematically organize external controls in cooperation with customers and providers. Only 14.8% think that external partners do not require explicit quality certificates.

74% has knowledge about the ecological regulations, and think that company is obeying them, and 14.8% claim that their companies possess ISO-14000 certificate. 7.4% have no knowledge about ecological regulations and their company pays no attention about ecology.

40.7% of people think that their company continuously follow up regulations and standards, 11.1% 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 concerning knowledge about the product development are statistically processed and shown at the Table 1.

Based on the answers of the respondents, expert technical knowledge is the most important skill necessary for successful product development. Offered choices are assessed as follows: product development (4.56), mechanical design (4.27), information systems (4,19), technological analysis and production planning (4.15), and testing of products (4.11). The lowest grade has mechatronics (3,72).

Methodological knowledge is ranked as the second highest after technical knowledge. The grades are: product development methods (4.27), project management (4.15), simulation (4.07), quality management (4.03), innovation management (3.88), while human resources management has a grade of (3.8).

Skills and specific knowledge, such creative potential and elaboration skills got (3.96) while foreign languages got (3.88).

The lowest grades are for economic and legal knowledge: profitability analysis (3.81), patent right and protection (3.42), marketing (3.4), business finances (3,24), basics of economy (3.24) and economic law (3.18).

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
1.	2.	**Product development** (Morphology and conceptual elaboration, Development of product variants, Analysis of the structure and selection of the solution)	4.56
2.	1.	**Mechanical Design**	4.27
3.	4.	**Product development methods**	4.27
4.	8.	**Information systems** (information basics, geometrical modeling, virtual engineering)	4.19
5.	3.	**Technological analysis and planning of the manufacture**	4.15
6.	10.	**Project management**	4.15
7.	6.	**Testing of the product**	4.11
8.	9.	**Simulation** (finite elements method, visualization and evaluation, multy-body simulation)	4.07
9.	7.	**Quality management**	4.03
10.	13.	**Creative potential and the elaboration skills**	3.96
11.	11.	**Innovative management**	3.88
12.	20.	**Foreign languages**	3.88
13.	17.	**Profitability analysis**	3.81
14.	12.	**Human resources management**	3.80
15.	5.	**Mechatronics**	3.72
16.	18.	**Patent rights and protection of intellectual property**	3.42
17.	16.	**Marketing**	3.40
18.	15.	**Business finances**	3.24
19.	14.	**Basics of economy**	3.24
20.	19.	**Economic Law**	3.18