

Cost-Oriented Innovation Methods and Education in Developing Countries: Re-engineering Industrial Production Systems

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Abstract: Cost savings can be achieved in a number of ways on the path from good ideas to successful realization. The researchers, practitioners and lecturers can give a huge contribution with focus in Cost Oriented Automation. Hand to hand cooperation between universities and industrial production companies can perfectly integrate cost-oriented approach of researchers, practitioners and lecturers. This paper gives a new model of dealing with cost oriented automation with focus on R&D to solve complex problems of industry in Kosovo, towards “SMART” systems design and implementation

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1. INTRODUCTION (RQS)

The term innovation refers to the introduction of a new idea, method, or device. New demand driven skills as a new approach to competencies development and recruitment is set to revolutionize the education sector. The trend encompasses a wide range of activities, tools and services aiming to directly improve educational outcomes of students and workers. The key differentiator of these innovative methods compared to traditional ones lies in the ability to better align learning materials and content to the industry demand for skills. (European Union, Feb 2015)

The companies who are dealing with manufacturing systems, transportation systems, distributed systems, embedded systems are facing cost constrains. The resources of our earth are not unlimited and therefore the prices of scarce raw materials like various metals are rising continuously. This increases the cost for new products and it gets more interesting to reuse and recycle used products and materials. In less developed regions, these issues brought to novel idea for Reuse, which matches perfect with research in university level education and the state of the arts in mechatronics. (P. Kopacek, June 6-8, 2013) (Muzafer Shala, 24-27 September 2015)

As is shown in Fig. 1, nowadays when it is possible, many of companies are preferring to adopt existing machinery to a new production lines in terms of control processes if the existing machinery is in good mechanical conditions. (Muzafer Shala, 24-27 September 2015)

In another side universities are aiming to be hand to hand cooperation with industry in order to involve staff and students in this operation. Mechatronics as an interdisciplinary subject plays an important role towards “Smart” products whose capabilities in better performance, size, and weight can meet or even can exceed customers’ needs and wants. This paper is focused in cost oriented automation approach in industry, including theories, design methods, architectures and development approaches for automation process or equipment aiming to optimize the long term cost. University students are involved in solving these problems with benefit to gain more industrial problem solving skills. Where the methods to reduce expenses of practical training and education of specialists in automatic control are developed (P. Kopacek, June 6-8, 2013) (Muzafer Shala, 24-27 September 2015)

2. LITERATURE REVIEW

2.1 Cost oriented engineering

The mission of cost oriented engineering is to ensure most optimal cost on materials and state-of-the-arts manufacturing of companies with focus in cost awareness, manufacturing for excellence, operations, cost price, control and budget. (The Association of Cost Engineers, 2016)

2.2 Complexity in food-processing production systems

Following state-of-the-art, many worldwide companies have developed different models of food-processing

production systems which covers a wide range of food products like manufacturing machines for the preparation, marination, further processing, freezing, slicing and packaging of meat, poultry, fish, seafood, cheese and other foods such as sugar-based products, vegetables and beverages. Food production systems consist of inputs, processes, outputs and feedback. There are different scales of food production that require different kinds of equipment. CAD and CAM can be used to design, test, and monitor processes. By cost oriented engineering, standard components can be used to speed up production, lower the cost and increase quality:

Examples:

- monitor temperature
- monitor weight
- check pH
- control conveyor belt speed
- monitor quantities of ingredients

Advantages

- more consistent results
- reduces labour costs
- improves accuracy, reducing waste
- faster for high-volume production
- improved safety and hygiene
- easier monitoring

Disadvantages

- needs skilled designers
- because of physical characteristics of food products requires deep analyses to implement modification for new function of system



Fig 1 New digital control technologies of food processing



Fig 2 Early analogue technologies for food processing

2.3 Mechatronics education in Kosovo

Mechatronics is the synergistic combination of precision mechanical engineering, electronic control and systems thinking in the design of products and manufacturing processes. It relates to the design of systems, devices and products aimed at achieving an optimal balance between basic mechanical structure and its overall control. (Elsevier *Mechatronics, The Science of Intelligent Machines*, 2016)[5]

Mechatronics trends are towards more and more automated and smarter tools and processes. The principles of mechatronics have felt in every aspect of our society, where the cost, quality, and versatility of each new product is directly related to how it was produced.

Emerging economies in the midst of fundamental restructuring of higher education can benefit from radical approaches to engineering education programme design. The authors present the case of the development of a BSc curriculum in Mechatronics Management for one of the new international universities in Kosovo in order to demonstrate that it is possible to develop higher-education programmes in advanced engineering, which have local economic context in an emerging economy. The authors illustrate how it is possible to use theories of engineering and technology professional competence to develop a coherent higher education programme which has the potential to deliver on aggressive economic and educational objectives. (Kopacek, July 6-11, 2008)

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