
Leading Innovation in Universities: From Practice Ahead of Practice

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Abstract

The purpose of this paper is to provide information to support a change in the curriculum and promote the inclusion of new advances in study programs. The resources of this paper come from the shared experiences of the authors working in strategic management at the university, and also from audits from the Slovak Higher Education Institution (HEI) and several projects in the field of education and innovation. The Paper describes a project to develop an advanced general method of improving and innovating study programs according to the expected development of advances in the field. The overall findings have shown study programs required change, it is appropriate to use the Study Program Leading Innovation (SPLI) model and apply it to the creative existing curriculum. The diversity of ideas was and still is limited about the quality benchmark and how to achieve change and improvement.

Keywords

Creativity • Laboratory education • Quality engineering and management • Cloud learning

Introduction

Research and innovation are two of the most important priorities of Europe's 2020 strategy, which puts research and innovation as the pillars of economic growth and development [1]. Organizations evolve and remain competitive only through innovation.

To formulate a sufficiently and specific mobilization concept of innovative education, that will be accepted by the scientific and pedagogical staff of Higher Education Institution (HEI), requires the knowledge of modern trends in the area.

Universities are expected to be a source of new ideas and information. But in reality universities often have trouble keeping pace with evolution their own fields of study. There

could be many reasons why, however let's focus on four main points:

- The slow introduction to new concepts;
- Communication gaps and shifting priorities;
- A lack of funding;
- The verification or validation of new or modified study programs is too slow.

According to Merriam-Webster dictionary: Being an advanced means to be ahead of others in progression or idea and leading means providing direction or guidance [2].

The products of universities are study programs; research projects outcomes and publications as a result of their dual research-educational process [3]. These, however, often lag behind the needs and expectations of the future employers of graduates. Offered study programs are presented in curricula. To create such study programs that prepares students in advance to be innovative requires prognostic and creative thinking, modern behavior and flawless performance.

Therefore the HEI should be ahead of the practice and the practice should constantly innovate (of course within the limits of corporate social responsibility).

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The purpose of this paper is to present factual and generalized information for advancement and curriculum change according to needs, requirements and expectations associated with current and modern practices in the field.

The research methodology is based on key words text mining and clustering. The results are presented in the form of:

- Clouds of most frequently used keywords in four areas: (a) provided study programs, (b) student results—the final theses, (c) the results of academics—publishing’s outputs and projects, (d) the professional requirements of practice and trends of innovations;
- Simplified methodology, which we named ‘Study Program Leading Innovation’ (SPLI).

Social implications of results lie in the increasing of the competitiveness of universities and improving the loyalty of employers of graduates, and other interested parties.

The originality of the solution is in the approach to research and related research methodologies. Critical success factors of the SPLI model are:

- Creating innovative and creative research team, involving all stakeholders (especially future employers)
- Reliable assessment of the current state of knowledge and the development trends in the practice (prospective employers of graduates),
- The creation of the initial idea of the optimum (benchmark) desirable outcome of the current state of the solution, its comparison with the recognized state and factual, resource and chronological planning of the SPLI project.

This paper is intended for HEI executives, academics and professional practitioners who are involved in changing and innovating study programs.

Methodology

The development of a new curriculum and its accreditation often takes several months and with staff and instrumentation preparation, testing, start-up and completion of the first graduates, it could take several years.

HEIs have the opportunity to partly change the curriculum and update content after accreditation, but there is always the question of which way the practice will move and what skills for innovation will graduates need.

Europe’s future economic growth and jobs increasingly will have to come from innovation in products, services and business models. This is why innovation has been placed at the heart of the Europe 2020 strategy for growth and jobs [4].

The EU 2020 strategy sets up a basic research orientation with a detailed creation of curriculum, close monitoring of development trends (technology) and collaboration with the practice is necessary, especially with top experts—innovators in the field.

In the framework of Education, Research and Innovation knowledge triangle universities have a crucial role to play in creating knowledge and translating it into innovative products and services, in cooperation with research centres and businesses [5]. There is a range of mechanisms by which universities can contribute to regional innovation systems [5]. One of the possibilities is that universities and businesses directly cooperate in curricula design and curricula delivery to ensure that graduates has the right skills and transversal competences [5, 6].

Within the research project ESF Technical University of Kosice (TUKE) ITMS 26110230070 ‘Elements package for improvement and innovation in education at Technical University of Kosice’ we have created a general ‘Study Program Leading Innovation’ methodology, which meets the criteria in terms of achieving innovation ahead of the industry:

“– from praxis ahead for praxis –”

The starting point is a collaborative network of teams from Slovak universities and representatives of employers to generate ideas for advance innovation of study programs. The methodology is being tested on the study programs in the field of ‘quality’ on six technical faculties of Slovak universities. The methodology can be suitably generalized and used to advance innovation of courses also in other disciplines.

The research methodology is based on searching keywords and subsequent visualization by tag clouds. The research was conducted in the following steps:

Selection of Electronic Databases for Research on the Subject

- PortalVS of Slovak HEIs [7]: collects information about curricula; teachers and researchers outputs: publications and projects.
- Portal Profesia SK [8] and Profesia CZ [9]: collects information on labour supply and demand home and abroad.

Note: We have also investigated Czech portals because of minimum language barrier and the fact that approx. 10 % of Slovak HEI graduates in the field of ‘quality’ profession are looking for work in the Czech Republic.

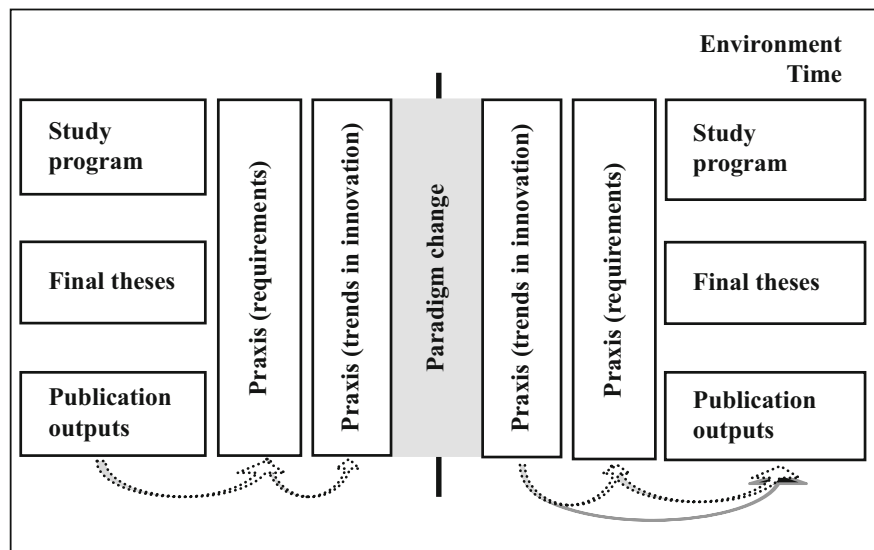
Search Criteria Based on Portals Offer

- The title [corresponding to area of research ‘Engineering and Technology’ (SK classification No 17), study branch ‘quality’ (SK classification No 5.2.57)]; keywords and content according to the study program.
- The title and keywords of final theses (BSc., MSc. (Ing.), and Ph.D. of university study).

Table 3 Presentation of the ten most frequent words in the ‘Profesia SK and CZ’ databases, Slovak and Swedish expert analysis and QIP Journal

Profesia (SK and CZ). Date: November 10, 2013	Expert prediction (SK) 3 Slovak Universities. Date: February 15, 2013	Quality Innovation Prosperity (Scopus) Journal www.qip-journal.eu	Expert prediction Swedish Universities. Date: August, 2012
Process	Leading	Improvement	Development
Product	Creative	Innovation	Customer
Production	Sustainability	6 sigma	Focus
Management	Service	Management	Improvement
Control	Intelligent	Efficiency	Sustainability
Implementation	Measurement	Success	Business
Customer	integrated	Social value	Integrated
Documentation	System	Critical factor	Continuous
Compliance	Self-learning	Process map	Service
Audit	Mobile	Strategy	Network

Fig. 5 Graphic model of paradigm shift of curricula preparation and their content



3. Realization of changes in the existing curriculum or creation of new curriculum.
 - 3.1 The realization of organizational and personnel changes.
 - 3.2 The realization of technical changes and changes in management and implementation of key (research and training) and secondary (administrative) processes.
 - 3.3 Design, start-up and normal process of study program, including the creation of documentation and study aids, laboratory training and interaction with the practice (especially) for students theses.
4. Evaluation knowledge of a new state and monitoring of development trends of the improved or new study program.
 - 4.1 Determination of actual status against the plan in documentation (records).
 - 4.2 Designing and implementing corrections in all monitored areas.
 - 4.3 Summarization of knowledge for SPLI knowledge management.

Conclusion

Whoever innovates in advance wins. Universities that prepare graduates for this trend can win in the competition from other universities and their offers of study programs.

Creativity has an essential role to play in education, whether for the purposes of enhancing technical innovation or for creating well-rounded graduates who can truly contribute to society [17].

From a more detailed comparison of the study program, final theses and publications of academics of TUKE DIM with other study programs in Slovakia in the field of ‘quality engineering and management’ follows that the curriculum content is about the same and differs only in details of the subjects depending on the general technical basis of Faculty to which the program is implemented. For example Slovak University of Technology Bratislava—automotive industry and materials; Slovak Agriculture University—agricultural machinery and information’s systems; Technical University

Table 4 Future research keywords in the field of quality

Leadership
Creativity
Improvement
Innovation
Development
Customer
Quality renaissance
Experience economy
Experience quality

of Kosice—metallurgy, foundry, engineering, automotive industry, and mining.

From comparison of the requirements of practice the knowledge and skills of graduates follows, that HEI provide sufficient background for the positions listed in the Table 1, but according to the prediction of experts, it would be useful to include in a curriculum subject/s on creative thinking and innovative behaviour, to extend the selection of subjects relating to the quality of services and develop the students' ability to think in terms of leadership.

From the Table 3 and thematic topics of scientific conferences in 2013, and planned topics of conferences for the year 2014 we can conclude that the future research can be presented with keywords from the Table 4.

To achieve leading innovation in study programs it is required:

- To design and implement the SPLI project and manage information for leading innovation of study programs in the field of study 'quality engineering and management'.
- To continuously benchmark products i.e. study programs and curricula as well as research-learning processes versus the best domestic and foreign study programs in the field of 'quality engineering and management'.
- Theses should be focused on research projects and innovations in practice.
- To monitor trends of innovation in the field of application of knowledge and skills of students.

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References

1. We Welcome Europe. (2012, December, 10). *Research and innovation in the Europe 2020 Strategy*. [Online]. Available: <http://www.welcomeurope.com>
2. Merriam-Webster.(2013, January, 20). *An Encyclopedia Britannica Company* [Online]. Available: <http://www.merriam-webster.com/dictionary/definition>
3. K. Zgodavova, "Quality Culture and Systems of Quality Management at Universities. From LearnAbility & InnovAbility to SustainAbility". in: *Proceedings of the 11th QMOD '08 Conference*, Helsingborg, Sweden 2008.
4. EU, Innovation Commission (2012, December, 10). *Innovation Union, turning ideas into jobs, green growth and social progress*, [Online]. http://ec.europa.eu/research/innovation-union/index_en.cfm, on-line:
5. D Foray, J. Goddard, X. G. Beldarrain, M. Landabaso, P. McCann, K. Morgan, R.. Ortega-Argilés, *Guide to Research and Innovation*. Luxembourg: Publications Office of the European Union. 2012.
6. K Zgodavova, J Roznik, J Strauszova, *Study of the innovative potential of West Slovakia (Trencin region, Trnava region, Nitra region)*, 2010. [Online]. Available: <http://www.fidibe.eu/outputsandresults>
7. PortalVS, (2013, January 15). *Portal vysokych skol*, [Online]. Available: <http://www.portalvs.sk/en/>
8. Profesia, spol. s r.o., (2013, February 15.). [Online]. Available: <http://www.profesia.sk>
9. Profesia CZ, spol. s r.o. (2013, February 15.). [Online]. Available: <http://www.profesia.cz>
10. International Labour Organization (2013, February 15). *International Standard Classification of Occupation*. [Online]. Available: <http://www.ilo.org/>
11. M. Halvey, M. T. Keane, "An Assessment of Tag Presentation Techniques" in World Wide Web Conference Committee (IW3C2), Alberta: Banff, Alberta, Canada, 2007.
12. B. Lee, N. H. Riche, A. K. Karlson, S. Carpendale, "SparkClouds: Visualizing Trends in Tag Clouds". *IEEE Transactions on Visualization and Computer Graphics*, pp. 1182-1189, 2010.
13. E. R. Tufte. *Beautiful Evidence*. Cockeysville, Maryland 21030: Graphics Pr. 2006.
14. A. M. Hearst, Tag "Clouds: Data Analysis Tool or Social Signaller?", in *Proceedings of the 41st Annual Hawaii International Conference on System Sciences. IEEE Conference Publication*, 2008.
15. SK ISCO-08. *Vyhľadávka Štatistického úradu SR č. 516/2011 Z.z., ktorou sa vydáva Štatistická klasifikácia zamestnaní*. International Standard Classification of Occupation, 2011.
16. B. Bergquist, R. Garvare, H. Eriksson, J. Hallencreutz, J. Langstrand, E. Vanhatalo, T. Zobel, "Alive and Kicking—But Will Quality Management Be Around Tomorrow? A Swedish Academia Perspective". *Quality Innovation Prosperity*, 16(2), pp. 1-9, 2012.
17. T. Brown, *Creativity's Role in Education*. (2013, February 15). [Online]. Available: <http://www.linkedin.com/today/post/article/20130207220042-10842349-creativity-s-role-in-education>.