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Modern approach to standardization of higher education of engineers

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Abstract

This paper treats topic of standardization of higher education of engineers.

Main goal is to find analogy between process of higher education of engineers and protocols which can lead to standardization of process of higher education of engineers.

Defining protocols of higher education is key to standardize the whole process. Modern approach of standardizing the process is kept in idea of modern approach of process of higher education itself.

Key words

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1. Standardization of educational process

1.1. What is standardization and how it can be benchmarked

There are a lot of definition of standardization [1] [2] but one we will use to establish main goal on this topic can be interpreted as:

„Standardization is the process of creating protocols to guide the creation of a good or service based on the consensus of all the relevant parties in the industry.“ [2]

According to [3] [4] [5] we can benchmark process of education and business process, further more business to industry and then the definition can be stated as:

„Standardization is the process of creating protocols to guide the creation of a educational service based on the consensus of all the relevant parties in the education.

Also, according to [3] [4] [5] definitions:

“The standards ensure that goods or services produced in a specific industry come with consistent quality and are equivalent to other comparable products or services in the same industry.“ [2] can be modified to statement:

„The standards ensure that educational services produced in an education process (specific education) come with consistent quality and are equivalent to other comparable education in the same category.“

1.2. Standardization in certanibility, interoperability, and compatibility of educational service

If we continue in benchmarking, stated for standards:

„Standardization also helps in ensuring the safety, interoperability, and compatibility of goods produced. Some of the parties involved in the standardization processes include users, interest groups, governments, corporations, and standards organizations.“ [2]

can be transformed [3] [4] [5] to:

„Standardization also helps in ensuring the certanibility, interoperability, and compatibility of educational service provided and engineers educated. Some of the parties involved in the standardization processes include students, universities and faculties (interest groups),

governments, corporations, and standards organizations."

1.3. Goal of standardization in educational process

According to definition of Goal of Standardization:

„The goal of standardization is to ensure uniformity to certain practices within the industry. Standardization focuses on the product creation process, operations of businesses, technology in use, and how specific compulsory processes are instituted or carried out." [2]

we can benchmark it to, according to [3] [4] [5]:

„The goal of standardization is to ensure uniformity to certain practices within the education. Standardization focuses on the product creation process, operations of education, Technical culture, thesaurus and empiria in use, and how specific compulsory processes are instituted or carried out." [2]

and, according to [3] [4] [5]:

Standardization of Business Processes: „The most common form of standardization is in the area of business processes. Typically, companies with a global presence or operate franchises utilize detailed process documentation to ensure that the quality of their product or service is the same regardless of the geographical location that a customer visits." [2]

we can transform this definition to:

„Standardization of Educational Processes: „The most common form of standardization will be in the area of educational processes. Typically, universities with a global presence or which operate franchises utilize detailed educational process documentation to ensure that the quality of their educational service is the same regardless of the geographical location that a student (engineer) attends."

also applicable on:

„Standardization among manufacturing businesses ensures that customers get similar products regardless of the manufacturer or geographical location of the store where customers buy from." [2]

to [3] [4] [5]:

„Standardization among educational processes ensures that companies (recruiters) get similar educated engineer regardless of the university/faculty or geographical location of the university/faculty where student was educated."

1.4. Marketing in education

In product marketing we can find:

„Standardizing products that are available in various states, countries, or continents ensures that customers receive the same product or service regardless of where they buy it. This applies to big brands that customers are already very familiar with, where any change in the product would likely be noticed immediately. One example of a company that uses this form of standardization is Coca-Cola." [2]

Companies that operate globally also standardize their advertising, maintaining a uniform design theme across the different markets as a way of reinforcing its brand image among its global audience. The same design theme and color scheme are applied even when the product packaging is presented in a different language. [2]

Same can be said for education. [3] [4] [5]

Universities that operate globally also standardize their advertising, maintaining a uniform education across the different states and continents as a way of reinforcing its brand image among its global audience. The same education and programs of education can be applied even when the educational programs are presented in a different language.

2. Effects of Standardization

Some of the effects of standardization include the following:

2.1. Firms/Faculties

When competing firms standardize their products and services, the competition shifts from integrated systems to individual components. This means that companies whose main selling point is the integrated system must change strategy to focus on the individual components of the system. [2]

Companies can create a competitive advantage by selling components or subsystems of the integrated system to other businesses that are compatible with their business model. [2]

Benchmarked to universities [3] [4] [5] [6] [7] [8]:

When competing universities/faculties standardize their programs and topics/courses, the competition shifts from integrated education programs to topics/courses. This means that faculties whose main producing point (educated engineers) is the integrated system must change strategy to focus on the individual components of the system.

Universities/Faculties can create a competitive advantage by producing engineers or qualified staff of the integrated system to other businesses that are compatible with their educational model.

2.2. Consumers

One of the benefits that consumers reap from standardization is increased compatibility and interoperability between products. For example, when communication gadgets and services are standardized, consumers can share information across a large number of people who are not limited by a specific service or product. [2]

Also, consumers can match up the components of a system in a way that fits their specific preferences. However, standardization can also adversely affect consumers. For one, it means that options will be limited for consumers. Also, standardization may limit producers from providing more value to consumers than their competitors, because they are constrained by the standards. [2]

In consideration of [6] [7] [8] Consumers of educated engineers are businesses and enterprises across the globe.

3. Impact of standardization on technology

The effect of standardization on technology is mixed, and it may yield both positive and negative outcomes. The positive effect of standardization is that it can help weed out incompatible technologies in the market that slow the growth of technology. There will be an increased uptake of standardized technology, which will spur the growth of the technology industry. A familiar example of standardized technology is that of software programs that are compatible with the Windows operating system. [2]

On the downside, standardizing technology restricts the innovative quality of new and existing technologies and may reduce competition. [2]

In our comparisation technology can be benchmarked with knowledge in education or technology of education.

Since education is live process and therefore is affected by various types of impact and education is very innovative, standardization has to be implemented very carefully.

4. The social effect of standardization of education of engineer

To become competent to implement and develop engineering activities, engineer must have several areas of education. With certificates and degrees, the engineer can demonstrate his abilities in a quick and simple way. There are currently many different ways to get a engineer degree throughout the Globe.

The guaranteed standard of higher education is maintained through national systems of legal regulations and quality certificates. Guaranteed European co-operation, as written in the Bologna Declaration, promotes a quality certificate for the company with the purpose of developing comparable criteria and methods.

There are standards like one that already exists and has been issued by EFNMS Vzw., and accepted by CEN in the Technical Report 2006- CEN/TR 15628- Maintenance Personnel Qualifications. [9] [10]

5. Conclusion

The major purpose of this paper was to analyze and compare process of standardization in business and engineering with process of higher education of an engineer.

The benchmarking used in the process was established on facts [3] [4] [5] [6] [7] [8] that:

- education is a system,
- education is process which has inputs and outputs,
- education is process which produce engineers as one of outputs, among other higher educated

This analysis shows great potential of benchmarking business processes with educational processes. Great analogy is discoverable and conclusions can be made:

1. **conclusion:** Higher educational of engineer can be standardized (and in some way it has shape of it in Bologna declaration already)
2. **conclusion:** Same principles of standardization can be used in educational process as in standardization of business process.
3. **conclusion:** Same positive and negative outcomes of standardization of education can be expected in standardization of education as in standardization of business process, as benchmark was properly conducted
4. **conclusion:** Education protocols has to be carefully benchmarked as business procedures in order to standardize educational process

And last but not least, we can standardize educational processes in higher education of an engineer using same principles of standardization as in business process, taking special care of innovation in educational process and standardization routine, as downside effect of standardization.

6. References

[1] iso.org

[2] https://corporatefinanceinstitute.com/resources/knowledge/economics/standardization/

[3] Moriarty, J. and Smallman, C. (2009) En route to a theory of benchmarking, Benchmarking: An International Journal, Vol. 16 No. 4, pp. 484-503. DOI 10.1108/14635770910972423

[4] Moriarty, J. (2011), A theory of benchmarking, Benchmarking: An International Journal, Vol. 18 No. 4, pp. 588-611. DOI 10.1108/14635771111147650

[5] Yasin, M. (2002), The theory and practice of benchmarking: then and now, Benchmarking: An International Journal, Vol. 9 No. 3, pp. 217-243. DOI 10.1108/14635770210428992

[6] Biggs, J.B. (2006) From Theory to Practice: A Cognitive Systems Approach, Journal Higher Education Research & Development, Pages 73-85 | Published online: 01 Nov 2006 DOI 10.1080/0729436930120107

[7] Zhang, Li-Fang (2010) University Students' Learning Approaches in Three Cultures: An Investigation of Biggs's 3P Model, The Journal of Psychology Interdisciplinary and Applied sciences, Pages 37-55 | Received 24 Sep 1998, Published online: 01 Apr 2010 DOI 10.1080/00223980009600847

[8] Van de Werfhorst, Herman G. (2011) Skill and education effects on earnings in 18 Countries: The role of national educational institutions Social Science Research Volume 40, Issue 4, July 2011, Pages 1078-1090

[9] Wilson A., de Bruin A., Eweg E., (2008) Guide to Maintenance Management, Hogeschool Utrecht, University of Aplied Sciences, ISBN 978-90-813466-1-0

[10] EN 15628:2014, CEN, Maintenance – Qualification of maintenance personnel