ENHANCING QUALITY TOGETHER WITH CDIO COMMUNITY

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ABSTRACT

The CDIO self-evaluation is a valuable tool for any program to enhance quality. The self-evaluation provides information on your progress in continuous development, it shows your strengths and your weaknesses too. This information has traditionally used within the program although it could provide interesting and remarkable observations and possibilities to other programs too. Too often this information is hidden in the program itself and seldom is it opened to other universities for benchmarking and critical observations. CDIO community shares the ideology to continuously improve engineering education and is thus an obvious possibility for sharing information and learning from others. Based on this idea a series of externally funded projects have been established introducing self-evaluation, cross-evaluation and critical friendship. Two first projects operated in Scandinavia and in the Baltic Sea region. The latest project is European wide and number of partners have doubled since the first project. Projects have aimed at improving existing quality assurance tools and at developing new tools for quality enhancement. The projects introduced new programmes to each other and programmes have identified new areas of development as well as common development areas. These projects have shown that the strength of CDIO community in enhancing quality is clear and it should be utilized much more.

KEYWORDS

Quality enhancement, Program development, International collaboration, Self-evaluation, Cross-evaluation, Cross-sparring, ENQA, Standards: 12

INTRODUCTION

A report of the European Commission places high expectations to the quality assurance in higher education by stating that it is at the heart of efforts to build a coherent, compatible and attractive European Higher Education Area (EHEA) (European Commission, 2009). Quality assurance in higher education is based on the responsibility of the institutions for the quality of their programmes (ENQA, 2015). In Europe the standards and guidelines for quality assurance in higher education are defined by European Association for Quality Assurance in Higher Education (ENQA). Their guidelines divide quality assurance in three parts (ENQA, 2015): 1) Internal quality assurance 2) External quality assurance and 3) Quality assurance agencies. In the CDIO initiative quality assurance and quality enhancement is supported with the Standard 12 – Program evaluation. This standard presents a system that evaluates programs against twelve CDIO standards, and provides feedback for students, faculty, and other stakeholders for the purposes of continuous improvement. The CDIO program evaluation

and ENQA internal quality assurance can be seen focusing on similar aspects of higher education. In CDIO, a key function of program evaluation is to determine the program's effectiveness and efficiency in reaching its intended goals thus serving as the basis for continuous program improvement.

The CDIO program evaluation – self-evaluation – is done for analyzing the program's development and for targeting the continuous improvement goals. It is a tool for your program's quality enhancement. However, the program evaluations could provide fruitful information and help other programs too. There is a possibility that other programs could learn from the self-evaluations and identify good practices for their development. In addition, others might also act as critical friends to the other program by providing different viewpoints and aspects to the self-evaluation and program development. Although one of the strengths of the CDIO initiative is the broad community of engineering educators from around the world of higher education institutes, we have not used this power of CDIO community much. However, there are also successful examples of using this power of CDIO community and critical friends. First example started in 2009 with four collaborators, second example started in 2011 with six collaborators and the third example started autumn 2014 with eight collaborators and continues until September 2016. All these efforts have been externally funded projects. One of the ideas in these efforts was to complement internal quality assurance with external quality assurance including an external assessment with a site visit and a report resulting from the external assessment.

The first project focused on self-evaluation and cross-sparring within Scandinavia. It was very strongly based on CDIO standards and a one-day site visit activity was included. Four programs from four different universities participated. The second project had partners from Finland, Sweden, Denmark, Estonia and Lithuania. Four new programs from the participating universities worked on their quality enhancement during this project. The project had three main phases: workshops, self-evaluation, and cross-evaluation. The workshops were supporting pedagogical development, quality assurance and evaluation phases in partner universities. The latest project is an European-wide project and has higher ambitions.

This paper reflects the projects and their influence on quality enhancement. It looks back to the external quality assurance recommendations and reflects them at CDIO too. The paper also discusses the various possibilities within CDIO community to enhance quality together.

CDIO AND ENHANCEMENT OF QUALITY

The European Commission report (European Commission, 2014) underlines the importance of developing quality culture in higher education institutions and points to the value of institutional evaluation which it states "empowers academics and HEIs to build curricula and to ensure their quality, avoiding the need for the formal, external accreditation of each individual programme". The CDIO approach uses standard-based program evaluation model to describe how well a program is implementing CDIO and is building the culture of continuous improvement (Crawley, Malmqvist, Östlund, Brodeur, & Edström, 2014). The CDIO approach answers quite well to the internal quality guidelines of ENQA as shown in table 1. ENQA has 10 different guidelines for internal quality assurance.

Table 1. ENQA guidelines and CDIO approach.

ENQA Internal Quality Guideline	The CDIO Approach
Policy for quality assurance	CDIO does not focus on policy, but CDIO implementation does support implemention of the policy for QA too.
Design and approval of programmes	CDIO standards 2 (Learning Outcomes), 3 (Integrated Curriculum) and 7 (Integrated Learning Experiences) cover part of topics described in this ENQA guideline, but CDIO does not go as deep, it does not look programmes as thoroughly and as widely.
Student-centred learning, teaching and assessment	Standards 8 (Active Learning) and 11 (Learning Assessment) focus exactly same topics as this ENQA guideline.
Student admission, progression, recognition and certification	CDIO approach does not focus on student admission, progression, recognition and certification, but it surely aims at better progression of the student.
Teaching staff	Standards 9 (Enhancement of Faculty Competence) and 10 (Enhancement of Faculty Teaching Competence) focus on staff development similarly as this ENQA guideline.
Learning resources and student support	Standard 6 (Engineering workspaces) is about physical learning resources, but is does not deal with teacher resources and student support.
Information management	This is not present in CDIO model.
Public information	This is not present in CDIO model.
On-going monitoring and periodic review of programmes	Standard 12 (Program Evaluation) emphasizes continuous periodic review of programmes.
Cyclical external quality assurance	CDIO does not encourage to external quality assurance, but standard 12 (Program Evaluation) defines reports from external evaluations as one of the possible sources to be used in programme evaluation.

The second part of quality assurance guidelines by ENQA emphasizes external quality assurance. According to the guidelines external quality assurance processes should be reliable, useful, pre-defined, implemented consistently and published (ENQA, 2015). As mentioned already in table 1, the CDIO approach does not emphasize external quality assurance. The projects described in this paper aimed at producing methods and tools for this external process. ENQA defines the following processes for implementing external quality assurance (ENQA, 2015):

- a self-assessment or equivalent
- an external assessment normally including a site visit
- a report resulting from the external assessment
- a consistent follow-up.

EXAMPLES TO ENHANCE QUALITY TOGETHER WITH CDIO COMMUNITY

CDIO community is built on the common vision on improving engineering education. It is typical that CDIO community shares experiences during the international CDIO conference, Fall

meeting and regional meetings. However, it is not typical that CDIO programmes work closely together on sharing information on their self-evaluation and on their development challenges not to mention site-visit focusing on quality enhancement. This possibility exists and it has been tested in three European projects since 2009. Based on the idea of sharing best practices and learning from other members of CDIO community a series of externally funded projects have been established introducing self-evaluation, cross-evaluation and critical friendship. Two first projects operated in Scandinavia and in the Baltic Sea region. The latest still running project is European wide and number of partners have doubled since the first project. All these projects have aimed at improving existing quality assurance tools and at developing new tools for quality enhancement. These three projects are listed in table 2 and they are introduced shortly in next sections.

Table 2. Quality enhancement project examples.

Project name	Project period	Number of partners	Funded by
Quality assurance in higher education 1	Oct. 2009 – Oct. 2011	4	Nordplus
Quality assurance in higher education 2	Aug. 2011 – Sep. 2012	6	Nordplus
Quality assurance and enhancement marketplace for higher education institutes	Sep. 2014 – Aug. 2016	8	Erasmus+

QA in HEI 1

The first project – Quality Assurance in Higher Education - focused especially on self-evaluation, but cross-sparring element was introduced too. The main goal was to develop and implement a self-evaluation model in the participating Higher Education Institutes (HEIs) to support their quality assurance work and continuous curriculum development. The self-evaluation model was strongly based on the CDIO standards. The project had four partners: the Turku University of Applied Sciences (TUAS) (Finland) as the coordinator, and the Swedish Royal Institute of Technology (KTH), the Technical University of Denmark (DTU), and Helsinki Metropolia University of Applied Sciences (Metropolia) (Finland) as other partners. Each partner had one pilot degree programme that participated into the project.

The project defined an external quality assurance process with five steps:
1. Create the program description
2. Make the self-evaluation
3. Time for improvement and development
4. Preparing for cross-wise evaluations
5. Cross-evaluations.

The program description was a maximum 10 pages providing key understanding about the programme. This description was supposed to be specific enough to enable the assessment of the programme (Step 2). The self-evaluation was based on programme description. It was supposed to contain the actual CDIO ratings of the programme and recommendations for improvements. Furthermore the three best practices were expected to be presented. Preparations for the cross-wise evaluations consisted the description of actions taken after self-evaluation and selection of five theses. The final step was cross-wise evaluations which

included a site-visit. After the visit, a cross-wise evaluation report was expected as well as the evaluation of the actual process. The project is described in more detail in (Kontio et al., 2011; Kontio, Roslöf, et al., 2012).

QA in HEI 2

The second project continued the themes and ideas of the first project including self-evaluation and cross-evaluation but it also introduced a new phase in the project: workshops. Workshops were supporting pedagogical development, quality assurance and evaluation phases in partner universities. This second project had the same partners as the first one and two new partners from Baltic countries: the University of Tartu from Estonia and the Vilnius University of Applied Sciences from Lithuania. During the project four new programs worked on their quality enhancement during this project. The main goal of the project was to disseminate the quality assurance methods and tools developed in Quality Assurance in Higher Education Institutes project (2010-2011) to new partner universities from Baltic countries and to new programmes on the old partners. In this follow-on project the Nordic partners acted as mentors by guiding new partners through the quality assurance process and familiarizing them with CDIO framework which provides the methodological basis for educational quality assurance.

The project organized three workshops in pedagogical development and quality assurance:
- Pedagogical CDIO workshop I
- Self-evaluation and QA workshop
- Pedagogical CDIO workshop II.

The workshops were defined to provide support for the pedagogical development and quality assurance work. The workshops were delivered by representatives of two project partners: the Turku University of Applied Sciences and the Royal Institute of Technology. Each workshop had around 15-20 participants.

Besides the workshops, this second project had the same self-evaluation and cross-evaluation phases. This project is described in (Kontio, Granholm, et al., 2012).

QAEMP

The latest project is an European-wide project and has higher ambitions. The tools and processes developed in the preceding projects functioned quite well, but the partners wanted to do more to support continuous quality enhancement. The first two projects provided valuable input and experiences when Erasmus+ funded was created. The partners identified a need for more flexible evaluation models and processes with peers compared with the inertia of heavy accreditations/evaluations in HEIs. The aim was to create more practical level quality assurance model that sustains continuous reform between accreditation rounds. The Quality Assurance and Enhancement Marketplace for Higher Education Institutes (QAEMarketPlace4HEI) –project (Figure 1) proposes a flexible and constructive/collaborative methods, processes and tools for program evaluation, as a complement to weighty/ponderous accreditations.

QUALITY ASSURANCE AND ENHANCEMENT MARKETPLACE FOR HIGHER EDUCATION INSTITUTIONS

Figure 1. QAEMP project logo.

QAEMP-project has eight partners of which only the Finnish partners have participated in both preceding projects too. The project partners are Turku University of Applied Sciences (Finland), Reykjavik University (Iceland), Aarhus University (Denmark), Helsinki Metropolia University of Applied Sciences (Finland), Umeå University (Sweden), Telecom Bretagne (France), Aston University (United Kingdom) and Queens University Belfast (Northern Ireland, UK). The project is coordinated by Reykjavik University.

One of the key results of this project is the Marketplace. The Marketplace is a web-based tool where programmes can enter their self-evaluation results and based on these the system will pair programmes with the best match for cross-sparring. The idea is that programmes can learn from each other's strengths and weaknesses. Thus programmes are paired together to support their continuous development.

In addition, this project did a lot of improvements to the self-evaluation and cross-sparring methods. As noticed, this project uses term cross-sparring instead of cross-evaluation to emphasize the ideology of learning and supporting in the process. Furthermore, this project has arranged a number of workshops introducing the developed processes and to activate collaboration between HEIs. This project will end in August 2016. A general presentation of the project can be found in (Kontio et al., 2015) and descriptions of the cross-sparring activities between project partners as shown below:

- Turku University of Applied Sciences (Finland) and Aston University (UK) (Clark, Kontio, Roslöf, Steinby, & Thomson, 2016)
- Queens University Belfast (Northern Ireland, UK) and Umeå University (Sweden) (McCartan, Hermon, Georgsson, Björklund, & Pettersson, 2016)
- Aarhus University (Denmark) and Helsinki Metropolia University of Applied Sciences (Finland) (Bennedsen & Schrey-Niemenmaa, 2016)
- Reykjavik University (Iceland) and Telecom Bretagne (France) (Rouvrais, Auðunsson, Sæmundsdóttir, Landrac, & Lassudrie, 2016).

DISCUSSION

The presented projects aimed at the external quality assurance although they had strong focus at the beginning in internal state of the programme with the self-evaluations model and guidelines. In these projects 16 very thorough self-evaluations have been done and 32 cross-evaluation/cross-sparring sessions have been held.

Table 3 compares the ENQA processes proposed in external quality assurance with the processes in these three projects. The first two projects focused on the same things with different programmes while QAEMP took bigger step towards real collaboration in quality enhancement together with other universities.

The developed models worked well, but they all had some very time consuming elements. On the other hand, putting more effort on the quality assurance and enhancement activities it rewards one with better and deeper understanding about the programme. Therefore we could say that it is valuable to be forced to look closer at one's own programme.

The cross-evaluations and cross-sparrings required commitment and willingness to succeed, but they proved to be the most rewarding parts of these projects. Even a short site-visit gives you much better understanding of the other programme than only going through the self-evaluation documentation.

The workshops in QA in HEI 2 and QAEMP projects proved necessary. In QA in HEI 2 they served as training sessions for people who were not so familiar with the self-evaluation and CDIO. Similarly QAEMP workshops have given valuable input to the functionality of the developed tools and at the same time they have shown us that there is a need for the marketplace to pair and connect CDIO programmes with quality enhancement.

Table 3. ENQA external guidelines and QA project activities.

ENQA guideline	QA in HEI 1	QA in HEI 2	QAEMP
Self-assessment or equivalent	Self-evaluation toolkit produced and tested/used	Self-evaluation toolkit improved and tested/used	Used existing self-evaluation tools, but created a list of parameters to be checked after self-evaluation
An external assessment normally including a site visit	Included a one-day site visit; focus on finding additional development areas and identifying best practices; Emphasis on evaluating the partner and providing feedback for their development (Cross-evaluation)	Included a one-day site visit; focus on finding additional development areas and identifying best practices; Emphasis on evaluating the partner and providing feedback for their development (Cross-evaluation)	Included a two-days site visit; focus on finding additional development areas and identifying best practices; Emphasis on sparring the partner programme (Cross-sparring)
A report resulting from the external assessment	Short A4 summary report produced	Short A4 summary report produced	Broader report written together with the evaluators and evaluated produced.
A consistent follow-up	Each program responsible of their own follow-up	Each program responsible of their own follow-up	Each program responsible of their own follow-up; Encourages common development activities with the sparring partner

CONCLUSION

This paper has introduced three examples from CDIO community where CDIO programmes enhance quality together. The CDIO universities have developed tools and methods for self-evaluation, cross-evaluation and cross-sparring. These tools are then tested and used in pilot programs. Based on the CDIO community activities these programs have undergone thorough self-evaluation process and they have joined cross-evaluation/cross-sparring activities. These projects have proven the strength of collaborating and since universities in CDIO community already share a common approach to education development a common language can easily be found. During these activities, 16 programmes around Europe have visited another university usually in another country. They have learnt from the other programmes but this has also been a good journey for them to learn about themselves. The projects introduced new programmes to each other and programmes identified new areas of development as well as common development areas.

These projects have shown that the strength of CDIO community in enhancing quality is clear and it should be utilized much more. To summarize the possibilities to enhance quality and support continuous development together with the other CDIO programmes could be:
1. Increase the awareness of CDIO self-evaluation
2. Support newcomers on the usage of CDIO self-evaluation
3. Joint pedagogical workshops
4. Participation in cross-sparring and visiting other programmes
5. Identify common development themes and initiate common development actions.

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