PAIRWISE COLLABORATIVE QUALITY ENHANCEMENT: EXPERIENCE OF TWO ENGINEERING PROGRAMMES IN ICELAND AND FRANCE

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ABSTRACT

Quality in higher educational programmes is acquired over a long period. Depending on their location, history, tradition, management style or culture, institutions have their own strengths, but also constraints and priorities for quality enhancement. Analysing or even just seeing how programme leaders and developers are managing educational quality in partner countries may provide an opportunity to learn from them and transfer some of their good practices to one´s own context. As a constructivist complement to accreditation to foster quality, a 2015 pilot study showed the strong potential of a large self-evaluation model including maturity scale to shed light on priorities.

The focus of this paper is to critically examine the self-evaluation model and a cross-sparring process, and to assess which parts of the process proved beneficial. Even if very valuable, via short but prepared visits to learn from each other, it shows that (i) the number of criteria in focus should be limited to ensure a deep collaborative analysis and actionable plans, and that (ii) the forms used to report must remain simple and flexible so as to be delivered under time constraints. Thanks to the cross-sparring process, the study validated a flexible and non-competitive approach to stimulate thought and discussion about collaborative quality enhancement at international levels, even without dedicated quality referents in the institutions or a formal quality assurance framework in place. Given the large numbers and nature of higher educational institutions, this practical model reveals an excellent approach to institutions in need of continuous improvement.

KEYWORDS

QAEMP, Internationalization, Program Evaluation, Accreditation, Best Practices, Framework Implementation, Quality Enhancement, CDIO Standard 12.

INTRODUCTION

In order to learn from the experience of others, Telecom Bretagne (TB) in France and Reykjavik University (RU) in Iceland have chosen to engage in a pilot study for collaborative quality enhancement in engineering education by sharing institutional best practices. A collaborative quality enhancement experience took place in the fall of 2015 between two institutions, including a self-evaluation (SE) and cross-sparring model (CS). The pilot study was a part of a European Erasmus+ project. The QAEMP project (Quality Assurance and Enhancement Market-Place for HEIs) proposes a continuous enhancement model and processes for educational programmes in engineering. For their programmes to be enhanced, based on targeted self-evaluations, including criteria and a rubric reference model (Clark et al., 2015), institutions identify and prioritize the criteria they want to improve for a specific programme (Bennedsen et al, 2015). In the pilot study, each institution chose criteria on which it wanted to improve (from a pool of 28 criteria), and visited the other to learn best practices and seek advice from the other. RU wanted to learn and improve on integrated curricula including design projects, different learning styles, and technology to engage students. TB wanted to learn and improve on workspaces and equipment, learner assessment and formative feedback, student progression monitoring, and communication with students.

For each criterion, a clear final statement and rationale is set in order to ensure consistent understanding and a measurement rubric has been developed. The rubrics are based on a hierarchical maturity model as found in the ISO 33020 standard on Measurement Framework for assessment of process capability and organizational maturity (Rouvrais & Lassudrie, 2014), see Table 1.

Table 1. Maturity model for educational programmes in QAEMP.

Level	QAEMP Description
5	Continuous improvement and development is evident
4	Evidence of implementation and measurement of effectiveness are available
3	Implementation is underway
2	A plan to implement change has been produced
1	There is an awareness of the need to implement change
0	No intention to change

Educational program transformation plays a recurrent and key role in the future of an institution (Rouvrais and Landrac, 2012). For quality in engineering education, there is a need for a model that brings together assurance and enhancement and that can be used across institutions, across disciplines and across countries (Bennedsen et al., 2015). At the heart of the process proposed here is a cross-sparring collaborative model, whereby two institutions are matched as critical friends based on the criteria they have prioritized (PC) and their maturity levels for those specific criteria. A reciprocal visit model permits the two institutions to learn from each other. Both institutions engage in such a cross-sparring process over a semester, with the aim of enhancing the quality of their educational programmes in engineering.

Cross-sparring Process in QAEMP

In QAEMP, cross-sparring is to be understood as a process to make analysis and feedback more collaborative, thanks to reflective sessions where strategies but also difficulties can be

informally discussed and a critical but supportive external view obtained. This approach is beneficial both for the institution analysed, which will get a more objective view on its strengths and potential improvements, and for the sparring partner which may identify best practices that can be useful for his own institution. In the QAEMP project, the collaborative model is symmetric, i.e. one institution helps to analyse the other, and vice-versa. The approach is not about competing but about supporting, sharing and complementing. In its actual form, the CS process is composed of four macro activities (once two institutions have been paired):

1. **MA1: Initialization** (e.g. to agree on the selected PC, focus, perimeter, roles and responsibilities and composition of the CS team). This activity is conducted only once in coordination, for the two visits;
2. **MA2: Organization** (e.g. team preparation, SE consultation, agenda, production and validation of the CS plan). This activity is conducted twice, i.e. one instance in each institution, it includes however a coordination between the two institutions;
3. **MA3: Sparring** (e.g. identify evidence related to the PC, enable identification of good practices, challenges and potential improvement actions at the cross-sparring institution). This activity is conducted twice (i.e. two visits, one in each institution);
4. **MA4: Capitalisation** (memo reporting, updates or uploads in a so-called Marketplace of good practices, sponsor notification, follow-ups). This activity is conducted only once, in coordination.

At the end of the CS process, documents are to be delivered, focusing on (i) findings, impressive experiences and strengths, challenges, open questions, and (ii) action plans for quality enhancement. Based on what was observed and collaboratively analysed, actions to develop one's own programme/institution are defined (and hopefully executed).

To meet the main goals of the cross-sparring model, the specific criteria that an institution would like to enhance are chosen from a pool of 28 criteria. Eight institutions participated in this pilot project and each identified 3 – 5 criteria which they wanted to enhance in their chosen programme. The institutions were then paired for cross-sparring i.e. RU and TB were one of four pairs. Ideally, a chosen sparring partner should have a higher maturity level for the criteria on which an institution wants to improve and thus be able to show best practices which the other can learn from. In this experience, RU, with a BSc programme in Biomedical engineering, wanted to learn more on integrated curricula including design projects, different learning styles, and technology to engage students. TB, with a MSc programme in ICT, wanted to learn more on workspaces and equipment, learner assessment and formative feedback, student progression monitoring, and communication with students.

Scope of the Paper

This paper describes a case study of the QAEMP CS process at RU and TB. It focuses on the activities in the above described CS process and reports on the outcomes. This analysis of experience of the QAEMP model and process, and the lessons learned, will give advice to programme leaders interested in a more constructive and collaborative continuous improvement approach, based on an agile iterative cycle to complement cyclic accreditation requirements or broaden the scope of quality assurance standards.

REYKJAVIK UNIVESITY AND TELECOM BRETAGNE AT A GLANCE

Facts and Figure

Reykjavík University is the second largest university in Iceland with about 3,200 students and 250 employees. It is owned by the Chamber of Commerce, the Federation of Icelandic Industries, and the Confederation of Icelandic Employers. The university is "semi-private" in the sense that approx. 75% of the funding comes from the state. RU consists of four academic schools: School of Law, School of Business, School of Computer Science and the School of Science and Engineering.

Telecom Bretagne is one of the flagships of European institutes of higher education in Telecommunications and Computer Science. Affiliated with many networks of alliances in France and abroad, it is also a pole for high-level research activities. In 1878, the high School of Telegraphy was created in Paris, France. It becames *Ecole Nationale Supérieure des Telecommunications* in 1942 (now called Telecom ParisTech). Then the National School of Telecommunications of Brittany was created in 1977, now called Telecom Bretagne. A summary of the two institutions is given in Table 2.

Table 2. Facts and Figures on RU and TB.

	RU	TB
Year founded	1998	1977
Status	Semi-private, under the aegis of the Ministry of Education	Public, under the aegis of Ministry of Industry
Latest buildings	2009	1977 (including some extensions)
Schools	School of Science and Engineering, School of Computer Science, School of Business, School of Law	School of ICT Engineering
Eng. Accreditations and Labels	Authorized by the Quality Board for Icelandic Higher Education, under the Ministry of Education, and validated by the Association of Chartered Engineers in Iceland (VFI).	French CTI (*Commission des Titres d'Ingénieur*,) and HCERES, European EUR-Ace and QuesteSI
Type of curriculum for Eng. degrees after K12 studies	3+2 (Bologna LMD, ECTS)	(2)+3 2 years of preparatory schools with a national selective *concours* (Bologna MD, ECTS)
Nb of BSc Eng. Programmes	9	0
Nb of MSc Eng. Programmes	7	2
Programme under study for QAEMP	BSc in Biomedical Eng	MSc in ICT Eng
Nb of engineering students in 1st year for the programme analysed	40	160
Nb of engineering students overall	800	750
Nb of full time faculty in School of Engineering	50	147
CDIO membership	Since 2012	Since 2008

Both institutions are or have been engaged in mergers with other institutions. Reykjavík University merged with the Technical University of Iceland (THI) in 2005. Following the merger, the School of Science and Engineering was established, partly built upon the foundation of a 40 year old institution (THI) but with the addition of new engineering programmes. TB and Ecole des Mines de Nantes made the decision to merge in 2015. The merger will lead to the creation of a new Mines Telecom Atlantic School in France, positioned

at the heart of digital transformations, energy, environment and societal impacts. The full administrative merger will be finalized in January 2017 and the first students will be enrolled in September 2018, with a single integrated educational programme between three physical sites in Brittany.

THE CROSS-SPARRING VISITS

Two faculty members from RU visited TB in November 2015, two faculty members from TB visited RU in December 2015, and the agenda for each visit was two full days. RU´s cross-sparring visit to TB Brest was both interesting and rewarding. The French system for higher education is very different from Icelandic universities. The institutions were so different that the orientation process and programme architectures, i.e. getting to know each others system, took more time than had been anticipated in the agenda. Table 3 shows the improvement criteria chosen by the paired institutions, including the maturity levels as graded by their programme leaders in the self-evaluations.

Table 3. Priority criteria for improvement (PC), chosen by RU and TB in 2015, including declared maturity level (bolded values are for enhancement purposes).

	RU	TB
QUALITY ASSURANCE AND ENHANCEMENT MARKETPLACE FOR HIGHER EDUCATION INSTITUTIONS		
The 4 items chosen by RU		
QAEMP criteria 3, An integrated curriculum: "The teaching of personal, interpersonal, and professional skills should not be considered an addition to an already full curriculum, but an integral part of it. Faculty play an active role in designing the integrated curriculum by suggesting appropriate disciplinary linkages, as well as opportunities to address specific skills in their respective teaching areas".	**2**	*3*
QAEMP criteria 22, Integrated design projects: "The ability to design is valued in graduate employment; hence, projects where students design and create artefacts of the profession are integrated into the programme".	**1**	*5*
QAEMP criteria 27, Different learning styles: "It is well understood that students prefer to learn in different ways. In order to encourage effective student learning, different student learning styles need to be taken account of in the development and delivery of learning opportunities."	**1**	*3*
QAEMP criteria 14, Technology to engage students: "Technology is a valuable resource when considering the design of engaging learning experiences. It is important that technology is used throughout a programme in a thoughtful way that adds value to learning. The modern world is technology rich and today's students are often very tech-savvy. Incorporating technology into learning and teaching".	**1**	*5*
The 5 items chosen by TB		
QAEMP criteria 6, Appropriate workspaces and equipment: "Learning environments, artefacts and resources that support and encourage engaging professional learning are needed to bring the discipline alive and ensure meaning is being made. The building of disciplinary knowledge and skills is best achieved in workspaces that are student-centred, user-friendly, accessible, and interactive".	*3*	**3**
QAEMP criteria 9, Learner assessment: "Assessment of student learning is aligned with the learning outcomes and the learning experiences and consideration is given to the type, level and amount of assessment employed. This ensures that there is no over-assessment of students and that the assessment used promotes learning. Using a variety of assessment methods accommodates a broader range of learning styles, and increases the reliability and validity of the assessment data".	*1*	**2**
QAEMP criteria 15, Feedback to students: "An important feature of the assessment process is the provision of feedback to students on their work. If the feedback is timely, appropriate and formative it allows students the opportunity to learn more deeply and develop effective skills in addressing the assessment tasks they are set".	*4*	**2**

QAEMP criteria 19, Student retention and progression: "The retention and progression of students is continuously monitored and acted upon to ensure the health of the programme".	*3*	**2**
QAEMP criteria 26, Effective communication with students: "In order to create a positive learning environment, effective communication with students is essential. To achieve this dialogue with students concerning their experiences as students needs to take place formally and informally (Student newsletters, social media, focus groups, drop ins etc.)".	*2*	**3**

RU had, in its self-evaluation, chosen four criteria for improvement but focused in the end on three of these criteria; An integrated curriculum, Integrated design projects, and Technology to engage students. The fourth, Different learning styles, was more or less put aside. This was simply because TB had so many inspiring examples to show regarding integrated curriculum, including integrated design projects, and technology in teaching and learning, that the time did not allow for more.

TB had, in its self-evaluation, chosen five criteria for improvement but focused in the end on feedback to students and effective communication criteria due to a change of priority in the context of its merger. TB is an interesting educational institution, it is highly selective in the intake of students and extremely prestigious. TB students are on the average younger and in some ways not as mature as the average RU students, mainly regarding their future professional identity (Rouvrais & Chelin, 2010). RU has fewer problems to manage on professional identity and misconceptions or stereotypes about engineers. TB aims to make each student aware of his/her competences upon graduation, by personally monitoring each student's progression. The two visitors from France finally learned a lot on success factors and student motivation and retention after their exchanges with stakeholders at RU, including open discussions with students. This provided an opportunity for extensive reflection on Project-based Learning, Work-based Learning, Active and Experiential Pedagogies (Rouvrais & Landrac 2012, Rouvrais et al. 2004). RU offers, in most respects, a more comfortable student working environment and, and teachers at RU have much more flexibility to manage their pedagogical style and learning outcomes. This environment is perfect for pedagogical innovators.

QAEMP PROCESS – LESSONS LEARNED FROM THE TWO PILOT VISITS

"A key objective of the QAEMP project is to ensure that the approach to quality assurance and enhancement has impact but is not overly demanding in terms of time or paperwork. In other words that it is focused on action and value added to staff, students and the programmes being considered" (Bennedsen et al. 2015). Even if such flexibility and reactive properties were anticipated, the experience showed that both organizers and visitors have to be more pro-active in order to meet all the process outcomes.

The Grasp All - Lose All - Effect
Nine criteria, which the institutions had prioritized for improvements, were investigated during the two cross-sparring visits. These had been identified by the institutions through self-evaluations conducted in the spring of 2015, six months earlier. A strong effort was made by each institution to show their good to best practices, as reflected in the agendas of both visits. At TB, there was a total of 15 items on the agenda and a total of 14 people made presentations or had discussions with the visitors from RU. At RU, the corresponding numbers were 11 items on the agenda and 22 persons that interacted with the visitors from TB. On both sides, it was forgotten to address the maturity levels on the criteria, the focus was more on the results than the processes in place for monitoring continuous improvement.

With only two days, a hectic learn and inspire agenda, and nine criteria to focus on, it clearly emerged that the scope was too broad. The mass of information received was hard to follow and align with, and thus generated disperse reporting. Each time you meet someone, you forget the focus of analysis. But many constructive exchanges took place during the two visits, including first discussions about exchange agreements with international services. Research in engineering and technical science was also under the scope. Many topics that were outside the focus of the visit were discussed, e.g. gender and intercultural issues, students living facilities, faculty training and academic career paths, research labs, economic issues such as tuition, national budget, incomes, etc. During the visit to RU, other programmes than the one under consideration were also discussed, i.e. a large part of the discussion was at an institutional level rather than at programme level.

Visitors were, mostly due to their curiosity, rapidly submerged by many ideas, even though the agendas were concise and well prepared. The visitors were becoming acquainted with an institution and becoming friends, discovering possibilities for potential future collaboration. This was fruitful but left less time for focusing on QAEMP enhancement plans based on sound validated good practices, to be transferred and activated formally. Thus, there were too many criteria prioritized. Both institutions found it quite easy to capitalize on the others good practices for their own context, but much harder to report or give good advice on their obstacles or difficulties. Even if all partners were open-minded, visitors were not expert counsellors and cultural dimensions are to be taken into account. Finally, right after the two visits, memos were not really filled out and no actionable and written action plan for each institution was developed.

Ideas for adjusting the Visit Agenda

A timespan of 2 days for a visit in each institution seems to be perfect. The distance between the countries involved is over 2000 km, so 2 days were required for travel, a total of 4 workdays for each visit. It is thus possible to prepare a visit on the incoming plane and/or and work on a visit report on the way back. The four days for a visit should be used as effectively as possible such that the reporting is more or less completed during the visit. Therefore, having 1 hour to reflect and 1 hour to report, each day of the visit, is a must in the agenda, with already prepared templates. The templates should also accommodate some flexibility that may be spurred by the agenda of the visit. In this CS instance, both participants suffered from not reporting immediately after the visits. As a pilot study, quality enhancement based on the chosen criteria was of interest but did not turn out to have a great strategic importance.

The pairing of unlike institutions and unlike programs proved interesting and we are definitely of the opinion that it should be seen as a benefit, not a shortcoming. But in the case of such a "mismatch" in pairing, it will take time for each visitor to familiarize themselves with the educational system of the other institution and therefore there will not be as much time for focused analysis of things that are part of the defined improvement criteria. If the paired institutions/programs are very unlike then it would make sense to focus on fewer criteria for improvement and thus have more time to go deeper into each of them. Also, one should have some leverage in the agenda to be able to incorporate unexpected interest or curiosity on a specific topic that is not on the initial agenda.

Recognized by both participants, having the opportunity to meet students during the visits was more than instructive. Such meetings without the presence of local faculty, allowed the visitors to know much more and get insight into the student perception and implications regarding feedback and course evaluation. The students comments were more than valuable

for transfer to the partner institution, due to a more open and reflective discussion with external visitors.

CONCLUSIONS

In this paper, the authors have analyzed the strengths and weaknesses of the cross-sparring model and process, but not the strengths and weaknesses of each institution, which remains more internal for quality enhancement development plans. Thanks to prior self-evaluation of one of their educational programme, it was clear that reflective self-evaluation is a powerful and objective tool. The overall cross-sparring principles of the QAEMP project were met: to get to know each other, to learn and inspire each other, to be "critical friends", to openly evaluate and analyse rather than audit. Learning from others, and sharing good to best practices, showed that it is also a medium to improve educational quality, and thus performance, considerably. Given the large number and nature of higher educational institutions, this practical model reveals an excellent approach to institutions in need of continuous improvement. But even if the collaborative model and expected outcomes are attractive, the cross-sparring experience was also a pilot study in order to calibrate models, tools, and kits for future public dissemination of the European project results. The visit process, including initialization, organization and capitalization phases, shows some complexity and limits on its practicability for busy programme leaders. Only two criteria per institution or two per visit day may be more realistic to provide clear and beneficial capitalization.

Finally, as a complement to accreditation to foster quality, this pilot study shows the strong potential of a large self-evaluation model, including maturity scale. This pilot study of the cross-sparring process validated a flexible and non-competitive approach to stimulate thought and discussion in the domain of collaborative quality enhancement at international level. As an example, now with more than one hundred collaborating institutions worldwide, the CDIO network can help programme leaders to learn from practice elsewhere, exchange ideas and experiences, review developments, and inspire others (Kontio, 2016).

Although this cross sparring is less formal than audit visits for accreditation or ranking for accountability (Gray et al. 2009, van Vught and Ziegele, 2012), both participants have clearly identified the needs for (i) clearly focused criteria and (ii) a well-defined agenda prior to the visits. In fact, in order to focus on targeted criteria, limit waiting time for visitors and presenters, and allocate enough time to reflect and organize notes, a well-organized agenda is necessary. Although some just in time planning adjustments were necessary during the two visits, e.g. due to more details required or workspace curiosity, it is to be noticed that outside risks were to be taken into account. For the visit to France, worker strikes (e.g. traffic controllers, buses) were monitored, but the 2015 terrorist attack in Paris 10 days before the visit was a surprise. For the visit to Iceland, volcano eruptions were taken into consideration (e.g. several air traffic constraints in 2010), but the snowstorm the day before the trip was of an unexpected severity. Such events perhaps recall the importance of some societal criteria for higher education and future engineers, e.g. thinking in a global context and in the long term, fostering sustainability, social responsibility and resilience related skills. Some student project learning activities place more and more emphasis on such skills in both institutional programmes (e.g. Saemundsdottir et al, 2012) and are part of the national or regional culture and heritage of both TB (Brittany Asterix blend) and RU (Iceland's geography and isolation).

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