CURRICULUM ADAPTATION IN ERAS OF TRANSFORMATION BY UTILIZING A CDIO ENABLING PLATFORM

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ABSTRACT

Concerning profession degree programs, this contribution discusses aspects of curriculum design that arguably will become affected by the ongoing digital transformation of the society.

For this purpose, a CDIO Enabling Platform (CEP) is exemplified with hardware representing a modular cargo bicycle under development. Paired with a corresponding scenario tailored to simultaneously support multiple courses with active learning modules, the platform simulates a multi-disciplinary engineering environment during a full semester. On a broader perspective, the way learning activities are organized using the CEP, a less rigid curricula structure is enabled. The paper argues that, for academic programs to stay relevant throughout the period of its execution of up to five years, inevitably a more flexible and adaptable curricula will become necessary as demands from the community rapidly transform under the influence of trends like IoT, AI and Industry 4.0.

Furthermore, the CEP is being evaluated from the faculty perspective, represented by a team of program planners and course examiners, with the specific purpose of assessing its effects on a number of parameters, including motivation, engagement, and examination results.

A key component in the concept of CEP is industry engagement during planning and execution of the curricula. The initial response from the industry is very positive according to results from an interview study during which the platform was introduced and evaluated by SMEs in Sweden. In addition, an in-depth interview with a representative of the industry reveals several interesting issues and potential uses of the CEP regarding the need for life-long learning and re-education due to obsolete core knowledge among the workforce.

Following an in-depth discussion regarding the role of active learning modules of a curriculum, the conclusion is that a learning platform, such as the CEP, could be used to tackle future demands on engineering education institutions, driven by an accelerating pace of transformation within related technical domains.

KEYWORDS

Integrative learning, Course Integration, Curriculum development, CDIO Enabling, Digitalization, Industry 4.0, Standards: 3, 4, 5, 6, 7, 8

1 INTRODUCTION AND MOTIVATION

The very attentive Future of Jobs report from the 2016 World Economic Forum summit concluded that 65 percent of the children that are now in pre-school, will have jobs that today does not exist. Furthermore, it points out the drivers of change stating that “we are today at the beginning of a Fourth Industrial Revolution. Developments in previously disjointed fields such as artificial intelligence and machine learning, robotics, nanotechnology, 3D printing and genetics and biotechnology are all building on and amplifying one another. Smart systems—homes, factories, farms, grids or entire cities—will help tackle problems ranging from supply chain management to climate change. Concurrent to this technological revolution are a set of broader socioeconomic, geopolitical and demographic developments, with nearly equivalent impact to the technological factors.” (Wef. 2018). Needless to say, such rapid transformation of society will affect higher engineering education, what programs are offered, their content and especially the way they are designed and organized.

Furthermore, it should be noted that many aspects of today's higher education system still looks and works the same as hundred years ago, or more. Despite the Bologna process, which successfully managed to align almost all the European higher education systems, higher education in practice still works the same. Students select a program of three to five years, enter it and takes the courses the program consist of. Like a carriageway path to a degree that certifies the achieved knowledge and skills. Alternatively, the students could pick independently selective courses, but then missing out on the credibility that comes with the faculty´s pre-selected “package” of courses, indicating that an authority has been involved in justifying the curriculum.

So more specifically, what are the role and function of higher engineering education in a future, highly digitalized society? In a late 2016 report from Digitaliseringskommissionen, a commission appointed by the Swedish government to investigate the impact of digitalization in Sweden, several conclusions are made that addresses the higher education system in Sweden. For instance, the report states that “in the future, we will most likely have a society where more people than today need to change their professional orientation multiple times during their career. We will probably continuously need to develop, specialize and upgrade our education” (SOU 2016:85, p.504, authors translation). The report, named “The Effects of Digitalization on the Individual and Society”, also remarks on future demands for individual competencies and abilities. Four specific abilities are pointed out

- Ability to lead and collaborate on projects to reach the objectives in a time-efficient, economical and structured manner.
- Group work and group collaboration, because more and more collaboration takes place in groups with other people with completely different knowledge, experiences, working methods and values.
- Creativity, design and innovation to make it possible to think new, thinking "outside the box" and find new solutions.
- Ability to illustrate, communicate and dramatize to create understanding, influence, experiences and influence.

These abilities are also recognized by others, such as the Organisation for Economic Co-operation and Development (OECD, 2003).

With the above reasoning as a starting point, this contribution will argue for the usage of a so-called CDIO Enabling Platform, CEP (Hallberg, 2016) as a tool for managing the effects on higher engineering education, due to the rapid transformation of technological domains and the society in general.

2 APPROACH AND OBJECTIVES

The following section describes the primary objectives of this contribution, given the introduction, as well as an outline and an overview of methods used.

2.1 Method and paper outline

The outline of this paper is illustrated in Figure 1. Following the introduction and basis of motivation, an overview of related work is given. This includes how the contribution connects to general learning theory, as well as the CDIO framework. Next, a declaration of various implementations of the CEP platform follows, along with responses from students, faculty and industry. The discussion section processes these responses but also reflects on potential future short and long-term consequences of the CEP concept, if implemented.

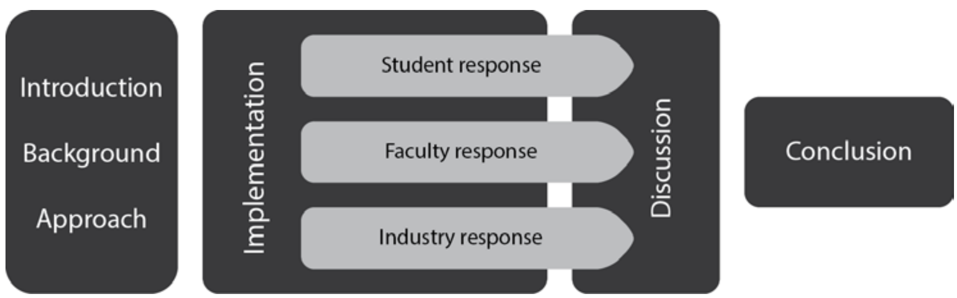

Figure 1 Paper outline.

The research environment is mainly represented by the workplace of the author – the Division of Machine Design at Linköping University. The methods used consist of literature studies together with interview and observation studies. Part of capturing the industry response is based on a combined survey and interview study conducted as part of a faculty funded project aiming at fostering innovation by promoting novel ideas among researchers at Linköping University (Eroglu, 2016). Furthermore, another response of the CEP is based on an interview with a representative of the industry. The interview was conducted with a predetermined framework of themes, corresponding to the research questions specified in 2.2, and was performed in a semi-structured manner (Ayres, 2008).

2.2 Research questions

Given the reasoning above together with research findings presented later in this contribution - this paper addresses the following three questions

Q1. **Ability to change** - Given how higher engineering education is commonly organized today, and considering the large and conservative organizations involved, such as universities – what measures needs to be taken to meet the demands from stakeholders (students, faculty and industry) under the influence of digitalization trends in the society?

Q2. **Identification of new knowledge areas** - Considering a faster phase of demand shifts from the industry, due to digitalization and its effects on industry demands - how to ensure that the knowledge achieved during the freshman year of an outstretched engineering program of three to five years, is perceived as relevant by the student and his or her employer on graduation day?

Q3. **Identification of new skill sets** - Regarding the expected future industry view of employability, are there skills that have not yet been identified that program planners urgently need to consider for implementation on their list of curriculum objectives? And what would be the means of swift, smooth implementation with a minimum of reorganization?

This paper presents and discusses a platform-based educational concept, based on the principals of the CDIO framework. A so-called CDIO enabling platform (CEP) is used to demonstrate and propose how these three questions above could be addressed.

2.3 The CDIO Enabling Platform and integrative learning

The CDIO enabling platform described in this contribution (illustrated in Figure 2) was first presented at the 12th International CDIO Conference in 2016. It currently consits of a physical modular cargo bike paired with a product development scenario. The arrangement is capable of integrating multiple active learning components taking place in courses given in parallel. For example; a lab-session in a fluid dynamics course evaluates the drag of different covers for the cargo bay, implementation of a control strategy as a part of a course in automatic control (the vehicle is steer-by-wire capable), sizing of the brake system within a course in hydraulics and pneumatics, and analytical calculations and experimental verifications within a solid mechanics course. Preliminary observations from implementing the platform has resulted in the following key conclusions (Hallberg, 2016).

- Enabling integrative learning is one of the keys to making the learning environment relevant in the eyes of the students.
- There is a mutual interest in relevancy (regarding the execution of learning activities) among both students, institutions and the industry.
- The platform could serve as a tool for program planners to ensure a multi-disciplinary learning environment.
- In order to create a multi-disciplinary learning environment, the platform is used as an enabler for facilitating integration between different courses.

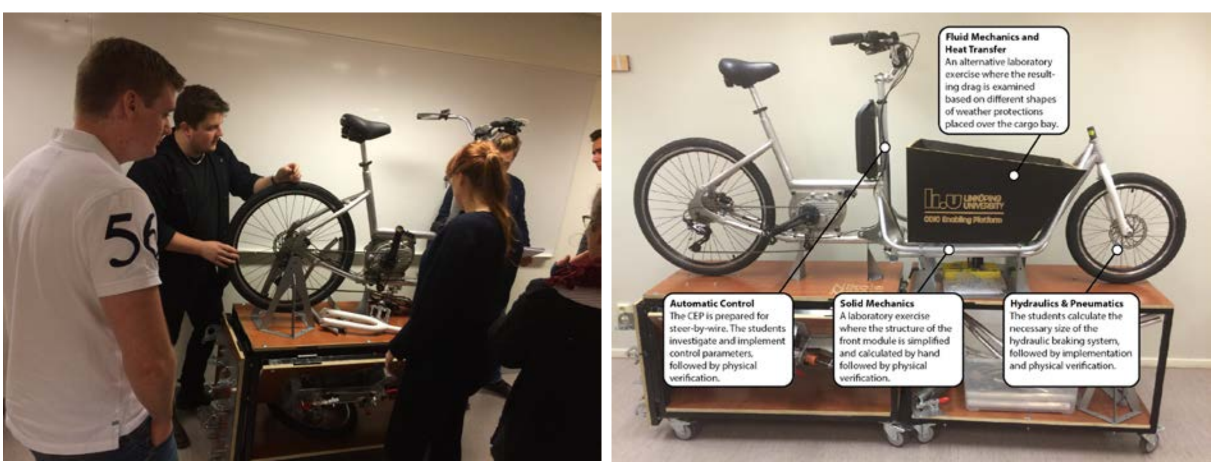

Figure 2 The CDIO Enabling Platform being used in a classroom situation (left) and short descriptions of the currently available integrative interfaces allowing for interaction from different courses (right).

Furthermore, several contributions from the CDIO community addresses and supports the raised issues within this paper. Regarding capturing and integrating industry demands, Edelbro (2017) gives a clarifying example where the mining industry foresees a shift regarding the needed competencies of the engineering labor force, and consequently the academy has to develop a way to adapt to the situation. Chong et al. (2017) provides yet another example where a newly developed curriculum is built specifically on CDIO Standard 3 – Integrated Curriculum. A learning track is organized as a structured internship program during which the students work closely with companies representing the biomedical manufacturing industry. Chong concludes that “industries recognize that our graduates are more industry-ready and confident in facing the complex, highly regulated and challenging biomedical manufacturing industry”.

2.4 Curriculum development and industry relevance

Without going into details, the process under which a curriculum is being updated at Linköping University is the following; After identifying the need for a new or updated part of a curriculum, typically the responsible board of studies is approached with a proposition. If accepted, the change could be implemented twelve to eighteen months later, at the earliest. Relevant for the discussion further on is the extended time scope of this procedure.

Furthermore, any academic program where the graduate receives a professional degree, naturally also has to be relevant for the industry. In order to ensure this relevance, engineering programs are often initiated after a need has been identified. That was also the case with the origin of the CDIO syllabus, when represents of the industry demanded graduates equipped with more knowledge of engineering practice over engineering sciences. The now-famous Boeing-paper serves a good example declaring the “Desired Attributes of an Engineer” (McMasters, 1996).

However, capturing the desires of the industry is ever so relevant. At Linköping University, represents of the industry has a permanent seat in the board of studies for all engineering programs. The board has full responsibility form executing the curricula according to the CDIO framework. Furthermore, on the operative level, each individual course responsible has an implicit responsibility for maintaining the course content relevant and up to date with industry standards.

3 IMPLEMENTATION

This section provides information on various observations made from cases where the CEP has been implemented or presented as a tentative implementation. The section is outlined with the perspectives of the students, the faculty and the industry.

3.1 Student response

At the time of writing the CEP has been used during three years in the course TMKT73 Advanced CAD. The response from the students have been overall positive. Comments from course evaluations speaks about “fun, innovating and interesting”, “Very well organized where we had to think outside the box” and “Great project. Develop further a bit, and it´s smashing!”. The course evaluation score has also showed a significant increase after implementing the CEP. On a scale of five, the average score for the years where the concept has been fully implemented is 3.9, compared to an average score of 3.0 for the years when teaching was conducted in absence of the CEP.

The CEP cargo bike described above has also been successfully used in other courses, both as a subject for development in final year project courses, as well as playing minor roles as part of automatic control and mechatronics lab exercises. Both with well receptions according to course evaluations. In some cases the integrative effect has been notably beneficial although difficult to quantify. The CEP, and its physical representation (the cargo bicycle) is by now a rather familiar inventory of the department where it has been used. As a consequence, discussions with students and colleagues regarding ongoing and future tentative projects are not seldom without reference to the project and courses where the CEP is being used.

3.2 Faculty response

Apart from being continuously presented and discussed on numerous occasions at the authors home department and elsewhere, a workshop, gathering the majority of the examiners and course responsible, some twenty participants, on the mechanical engineering bachelor program at Linköping University. The platform, and how it was used during the preceding fall semester was presented, followed by bee-hive discussions on the CEP concept. The joint discussion summarizing the workshop, as well as handed in protocols of the group-wise discussions reviled an overall positive response of the CDIO Enabling Platform. Some comments in favor of the concept were

- The CEP would encourage collaboration between examiners responsible for parallel courses on the same semester and program.
- The CEP would foster more effective alignment of course content for courses given in parallel on the same program, given increased collaboration among the examiners.
- The CEP could potentially disclose unnecessary overlaps of course content with courses given in parallel.
- Physical representations attract attention among students and faculty members.
- Seemingly, a CEP could be a significant motivator for the student, and a common subject for discussions.
- Utilizing the CEP could give understanding of the importance of compromising and avoiding sub-optimization.

Some of the negative response was

- Project-based courses tend to “steal time and focus” from basic courses if given during the first years of a program, which especially affect students with underdeveloped study technique.
- Development of hardware and scenarios is resource intensive for the course responsible.
- A risk for too much focus on a single product, leading to less “general knowledge” of a technical domain.
- There is also a risk for costly projects.

Furthermore, several suggestions for alternative products manifesting a CEP was given, such as wind turbines and washing machines.

3.3 Industry response

So far, two significant studies have been conducted to investigate the attitude among industry represents towards using the platform-based approach to higher engineering education, as represented by the CDIO Enabling Platform.

3.3.1 Interview study

An interview study was conducted with a representative of the industry during the fourth quarter of 2017. The interview was performed in a semi-structured manner, initially focusing on the origin and incentive to why the subject approached the faculty for further training. The analysis of the study resulted in the following key conclusions.

- Major technology shifts cannot be managed by the industry alone. Involving universities and higher engineering institutions will be necessary. For instance, large-scale implementation and utilization of AI for development and manufacturing is so complicated, yet so promising, that intensified collaboration and research with universities is necessary, including re-education of engineers.

- Given the rapid pace with which new technologies emerge and develops within the engineering domain, one plausible implication is that general skill sets of younger and senior engineers will become much more different in the future. For instance, engineers who received their undergraduate training before computers was fully implemented as an engineering tool, are more familiar working with physical prototyping during product development. On the other hand, today´s new graduates, who basically grew up with 3D computer modeled representations of real (or fictitious) objects, through gaming experiences, and later 3D-CAD tools, naturally possesses much greater familiarity with the digital world, but ever so less with the physical compared to senior engineers.
- One problem with industry organized training is that it is often concentrated in time. From the interview study it was concluded that stretched-out courses – where one spend a couple of hours a week over months - would be preferable over such high intensive courses that may be perceived as knowledge-cramming.
- The interview study also confirmed the challenge for institutions with communicating the relevance of what is being taught during undergraduate training, as the incentives for implementing the CEP for such reasons was said to “correlate very well actually, because sometimes during the education (undergraduate) you really didn’t understand the purpose of the training but made the connection much later after graduation. Here, it seems that it is possible to make the connection while you are in the learning process. For example, some content regarding automatic control has made sense ‘like five years later’ and ‘you couldn’t see all the practical applications.’”

3.3.2 Survey study

To investigate the potential interest from the industry to collaborate with Linköping university using the CDIO Enabling Platform, a more extensive investigation was conducted (Eroglu, 2016). Interviews were made with representatives of twenty-one companies, all small or medium size enterprises. The study excluded large companies since they tend to have already developed collaboration programs with universities. The central questions that were asked were whether the companies conceived the CEP concept as something they could benefit from.

The study concluded that there indeed is an interest among SMEs to collaborate with the university based using the CEP. One aspect of the concept that was pointed out as particularly beneficial was that it does not necessarily have to be resource-intensive from the perspective of the participating companies, primarily regarding time. At the time of the study, all of the participating companies expressed interest in collaborating with the university when a CEP-based learning platform has been fully developed. Notably, 88 percent of the companies stated that such a collaboration is seen as an opportunity for recruitment, although 83 percent states that it would not be the primary incitement, indicating further analysis of the study to find the right balance between expected beneficial outcomes for companies and the faculty. This in order to design an attractive offer for future partners.

4 DISCUSSION

This paper argues that academic institutions involved in engineering education inevitably will have to adapt due to consequences from rapid transformation of society, driven by trends as digitalization and automation. Consequently, this also affects engineering education frameworks as the CDIO syllabus. Ultimately it is a question of employability of graduates from programs adopting the CDIO standards.

The following discussion elaborates on a number of incitements for considering a make-over of how higher engineering is being organized today. The reasoning is a combination of potential outcomes connected to increased pace of transformation of society, as framed in the introduction of this paper, together with beneficial aspects of implementation of a physical learning platform concept such as the CDIO Enabling Platform. The following sections also references the research questions specified in 2.2.

4.1 The problem with long programs (Q1 and Q2)

Given the ongoing digitalization of society and the corresponding accelerating pace of transformation within affected domains, paired with a graduate/industry "supply and demand" viewpoint, institutions may find it difficult to "keep up" and adapt their curriculums in order to match the desires of the industry. At least the way it is done today, considering the relatively slow and rigid process by which curriculums updates are decided on. Add to that the fact that courses given for the first time, rarely meet the expectations neither from the teachers nor the students. "Good courses", in the sense that all involved agree that the learning objectives have been reached with quality and effectiveness, are often the ones well established after several occurrences. Also consider the length of many engineering programs, in Sweden typically requiring three years for a bachelor level degree, and five years for a master level - if finished on time, that is. Given this, let's imagine the extreme scenario where a new capstone course on a five-year program during the first semester is to be updated in order to reflect the profession the program is supposed to lead up to. From identifying updated demands, via decision on the updated syllabus, adding a couple of years of "maturating" of the course execution, to graduation from the program – we are looking at a time-frame of almost a decade. Considering the conclusion of the World Economic Forum summit, that "65 percent of the children that are now in pre-school, will have jobs that today does not exist" – decade-long time-frames must be considered unacceptable in terms of adapting engineering curriculums to support the demands of the industry. This reasoning responds to the first and second question specified in 2.2.

However, implementation of the CDIO Enabling Platform potentially may reduce the down-side effects of long programs. If the very same platform, or a similar, is used throughout the curriculum (fostering continuous collaboration with the industry), it would consequently update the students on the developments within a particular domain. This would especially be the case if the platform is implemented "cross-grades", where senior and junior students cooperate, but towards separate learning objectives. This would be accomplished due to the flexibility and integrative properties of the CEP concept, as exemplified in this paper.

4.2 Managing, and make use of the returning students (Q2 and Q3)

On a future and even more globalized and rapidly shifting labor market, knowledge (Q2) and skills (Q3) of individual engineers will to a much larger extent become obsolete. Consequently, individuals will have to re-educate themselves in order to stay attractive on the labor market throughout their careers. Indications of such trends is an outcome of the interview study presented earlier. Again, the CEP would potentially have the ability to play a vital role in adapting the organization of engineering education institutions regarding curricula design. Today, given the situation at Linköping University, returning students are directed to independent courses that are not part of specific curriculums. Apart from being inefficient, two major opportunities are being missed, both connected with the second and third question specified in section 2.2.

1) A returning student posses much of the knowledge that institutions find very hard to teach. For instance, consider the concept of tacit knowledge, first coined in 1994 by Polanyi

(Polanyi, 2009), i.e. typically skills acquired by someone who has been active in a profession for an extended period. In some cases, the only way of teaching such knowledge is to observe someone who possesses it, while she or he actively makes use of their skills. Therefore, by arranging curriculums so that returning students and undergraduates cooperates on the same platform, with different (or same) learning objectives, would enable a transfer of knowledge otherwise impossible to achieve. Also, note that much of the meaning of the term “employability” refers to tacit knowledge (or lack thereof), and other skills, heuristics and behaviors that are sought-for by the employer, but ever so often absent with the new graduate.

2) Especially in the case of more extended programs, institutions may find it challenging to communicate the relevance of the curricula and the included courses. One may predict, and fear, a sense of being “locked-in” among students, struggling with a fixed curriculum while the “surrounding” labor market is perceived as very flexible, undergoing an increased pace of transformation. By allowing a much higher degree of corporate involvement, elaborated in 2.5 and the suggested outcomes of the interview study in 3.1.2, relevance may be kept throughout the curriculum by letting companies take part in the development of the CDIO Enabling Platform. This would also automatically result in a “reality check” that would otherwise fall on the board of studies and their industry representatives.

4.3 Organization of curricula execution and versatile integration (Q1)

Traditionally, university teaching is organized so that different subject is taught by individuals representing “island of expertise” within a particular domain of technology. In the case with advanced level courses, typically the professor of a division or department covering a few, or perhaps even a single domain of a curriculum, conducts the actual teaching. Collaboration between domains (i.e. departments) may be very active regarding research, but collaboration regarding teaching is more rarely seen. However, implementing the CEP in a way that multiple domains, along with their representatives at the institution, are “forced” to interact with each other as a result of development and operation of the CEP, an enhanced “collegial learning environment” could be achieved. Not only would this foster exchange of basic knowledge between colleagues and their domains, but it would also address some of the issues and concerns raised by members of faculty in section 3.3, such as more efficient alignment of course content, disclosing unnecessary overlaps.

Another apparent beneficial aspect of implementing CEP, as a consequence of “one hand knowing what the other is doing”, would regard staff stand-ins. The problem with islands of expertise taking sole responsibility for parts of the curricula is that the organization becomes vulnerable with personnel absent from illness or change of job. Apart from being a well-known source of stress for the individual lecturer, the absence of a stand-in de-facto means that the responsible lecturer has no one to discuss with regarding development of the field he or she is responsible for.

Furthermore, the reasoning regarding possibilities of integration utilizing the CEP concept should go beyond integrating parallel courses within the same curriculum. An extended thought is to engage different groups of students working in parallel on the CEP. As an example, at Linköping University, discussions have been made to let students on the mechanical engineering bachelor program work together with industrial engineering management students. The idea is to let the latter act as project managers for the design teams of mechanical engineering students, which would potentially resemble a highly likely real-world situation. Potentially this would be an opportunity to address the soft-skills needed to cope with people with a completely different background, something that rarely occurs at the campus, but ever so often after graduation.

The question of how to achieve versatile integration of many parts of the faculty responsible of a curriculum is ultimately a question of the ability of adaptation to a society characterized by rapid transformation. A more integrated organization should be expected to act more flexible in times of rapid or even disruptive change within the domains of technology it is educationally set to cover. This reasoning directly addresses the first question specified in section 2.2.

4.4 Future tentative model of CEP implementation and modes of operation

The central theme that corresponds to the above reasoning is the *integration of knowledge creation activities*. Fundamentally, the prosperity of both industry and academy organizations depends on the success of their *knowledge creation processes*. However, these processes are connected with each other via intellectual properties (possessed by scholars, graduates or industry employees) flowing from one organization to another. The four-field matrix in Figure 3 schematically illustrate this flow as a constant loop (indicated by the circling arrows) where the CDIO Enabling Platform could work as a *knowledge creation hub* for many of the activities that takes place within the industry and academy. Conducting higher engineering education is fundamentally an effort to integrate research with undergraduate education (through state-of-the-art knowledge) and students with the industry (through their degree). Also, through joint research projects, the industry integrates with the academy, which in a sense closes a "loop of knowledge creation".

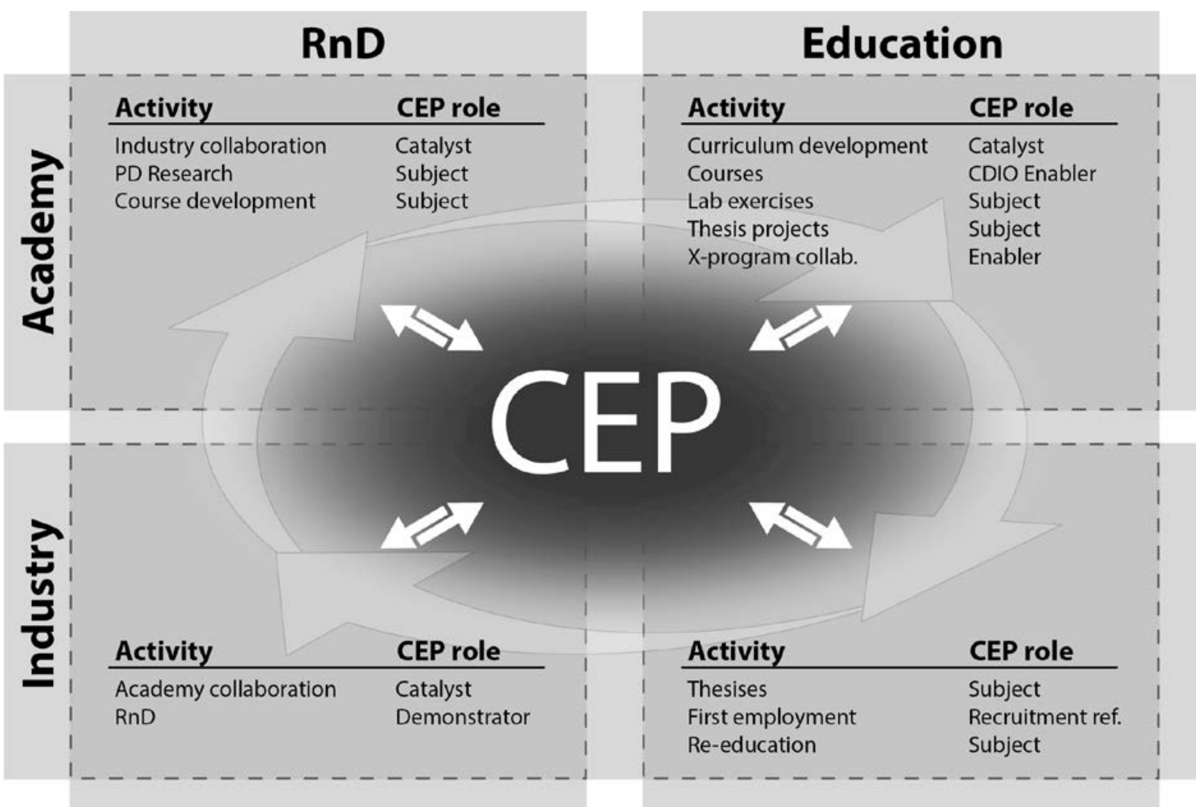

Figure 3 Schematic illustration of the CDIO Enabling Platform, showing examples of potential roles for different activities within the intersections of the academy and industry domains, and the research and education domains. The circling arrows indicates the intellectual properties, or people moving between domains.

The following sections further elaborates the proposed role of the CEP as illustrated in Figure 3. Assuming that the industry and academy both engage in research and development - and knowledge creation processes, such as undergraduate education or re-education of employees - a number of activities may be imagined where the CEP could act as the supporting platform.

4.4.1 Example of CEP roles within the Academy/Research domain

As previously discussed, the CEP could act as a platform for conducting research, perhaps as a joint industry/academy project. Moreover, existing (preferably physical) subjects of research projects could be utilized for developing undergraduate courses, and if cleverly organized simultaneously support the very same research projects. In cases where the CEP resembles a physical product under development, activities of product development research are imaginable.

4.4.2 Example of CEP roles within the Academy/Education domain

The CEP could serve as a catalyst for curriculum development and maintenance, being able to foster overview for both students and faculty members. There is also the apparent potential as the enabler for implementation of CDIO standards, mainly standards 3 to 8. Apart from being the backbone of a curriculum as a whole, there is also the possibility to let the CEP serve as a subject for “stand-alone” lab exercises or thesis projects. Another plausible utilization is to let the CEP act as the collective subject upon which students from different programs collaborate.

4.4.3 Example of CEP roles within the Industry/Education domain

If the CEP has a strong connection to the product development process within a collaborating company (that perhaps even took part in developing the CEP), it would be natural to formulate final year thesis projects for students close to exam. Consequently, such thesis project would serve as a valuable recruitment reference for first employment. Also, as previously discussed, the CEP could be the connector regarding engineers in need of re-education due to effects of rapid transformation on the labor market.

4.4.4 Example of CEP roles within the Industry/Research domain

Apart from being the corresponding industry/academy catalyst for collaboration, a CEP may also be represented in the form of a demonstrator perhaps as a part of research-intensive product development projects. Examples of such demonstrators are common at technical universities but are rarely integrated with undergraduate activities.

While discussing the proposed CEP implementation model, it is important to stress that one should take an open-minded position regarding the actual manifestation of the platform. The CEP could be represented by anything from a small circuit board to a full-scale vehicle, from entirely fictitious to real business cases. The organization around an advanced CEP could be imagined as a stand-alone company, trust, foundation or a company/university joint venture, or as exemplified in this paper – a prototype vehicle connected to a fictitious product development scenario.

5 CONCLUSION

For future engineering students to become relevant for the labor market, they will require access to *future-relevant training*. That has always made sense for all parties involved – students, institutions and the industry – since the advent of academic, professional engineering programs. However, disruptive industry demand shifts, due to rapid transformation of technical domains, put pressure on institutions to revise how curriculums are organized and executed.

Properties that will need more attention are curriculum flexibility, multi-disciplinarity and continuous integration of non-technical domains, such as soft-skills and entrepreneurship. Consequently, apart from maintaining relevancy, execution of curriculums based on the CDIO syllabus will also require means that foster these properties.

As proposed in this paper, a mean for program planners to achieve such properties is by utilizing a CDIO Enabling Platform as a tool for managing program execution. By doing so, the CEP allows for realistic training of several engineering disciplines concurrently through-out the curriculum. Furthermore, by developing and maintaining the CEP in partnership with the industry - not only is sufficient level regarding relevancy continuously monitored and ensured – it also allows for future-necessary collaboration regarding re-education of workforce and joint research projects.

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