Industry-oriented Education in eHealth

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Abstract: Technology, or more specifically digitalization, has had a profound effect on industry regardless of the field of business. It has changed the way individuals interact, work and go about their everyday businesses. This, still ongoing change, calls for new kind of professionals who can meet the challenges placed by the changing industry. Health care is one of the areas where digitalization has the most profound effect. It does not only change the way people work, but it also changes the underlying balance of power between different actors. The domain is also an inherently hybrid one as the professionals need to understand what is in the crux of technology and care, between the patient and the professional. In the following, a pilot focused on educating professionals in the field of eHealth in industry-oriented fashion is described focusing on the process and people; stages leading to actual lectures. The result of the examination is a process that can be used in developing industry-oriented education in a domain where expectations are currently high around the globe, and challenges placed on the educators are in a constant flux.

1 INTRODUCTION

Advanced digitalization, the ongoing industrial paradigm shift (Lasi et al., 2014) is changing the world in new and often unanticipated ways. It changes our behavior, the ways we interact with each other - how we learn and how we teach - and it even has an impact on the fundamental notion of what means to be a human.

Digitalization has already created benefits for many, and it will continue to do so in the upcoming years. However, even if it may seem so, digitalization is not axiomatic nor can be taken for granted; talented people are needed to see the ongoing shift to come through.

Universities, especially Humboldtian science universities, are often blamed for stagnation. They are regarded as slow to react to the economic developments in the surrounding worlds (Fathi and Wilson, 2009; Lozano et al., 2013), and establishing new courses and degree programs often takes years (Gerson, 2015). To counter these arguments, and to develop a sustainable and networked approach for industry-oriented education, a project called "Working Life Oriented Open University Education" was established. In the project, polytechnics, universities, and industrial partners collaborated in three distinct fields of 1) health and social services, 2) bio-based economy, and 3) Information and Communication Technologies (ICT).

The project, funded by the European Social Fund (2015-2018) consisted of three pilots, one in each of the three fields. The pilots were stand-alone pilots. In other words, they were implemented autonomously in order to take the distinct characteristics of each field into account, and to create different practices to be investigated by an external evaluator later on in the project. Each pilot was charged with specific tasks of a) developing a method for industry-oriented education, and b) testing the method in practice.

In the pilots, the development took the form of "inspect and adapt" cycles and in concurrent implementations with a specific focus (Figure 1), in the spirit of Agile approach (Cohn, 2005). Due to the differences in the fields, and autonomy of the pilots, the length and amount of cycles was not predefined or limited. In some pilots, the most practical solution was to emphasize the dialogue with the organizations, focus on business priorities, and to implement a single cycle in which the defined method was tested.

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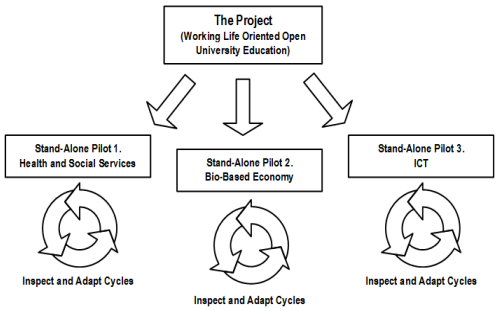

Figure 1: Overall project and pilots.

In the following, the focus is on the ICT pilot (Figure 1, stand-alone pilot 3), and more specifically on one of its implementations that was carried out during the first half of the 2016 in the field of health and wellbeing technologies (eHealth). In the following, this implementation is referred as the eHealth pilot. The examination focuses on the process and the experiences – the way or organizing education in an industry-oriented fashion. It follows from this that the end-user experiences, such as statistical analysis of the student feedback, is omitted from the findings.

2 eHEALTH PILOT

Health care is one of the fields most influences by digitalization. It does not only change the way of working in the field, but it also has a tremendous impact on how responsibilities and duties, even power, is delegated in the field (Koskinen and Knaapi-Junnila, 2014; Lahtiranta et al., 2015). eHealth is also one of the most promising fields in terms of business growth in Finland. While other fields have been in decline during the last years, eHealth has been on the increase. For example, in 2014 health technology export grew to €1.8 billion with a surplus of €829 million (Kauppalehti, 2015). By the end of 2014, eHealth alone covered more than half of the overall high technology export in Finland, more than telecommunications which has been a strong field in Finland for a long time (Kauppalehti, 2015).

eHealth is not a new field or a sudden 'booming star' in Finland. The field has been on the rise for the last eight years and there is no indication that the situation will change in the near future. One indicator of this is a survey conducted in the late 2015 amongst health technology companies in Finland by the Finnish Health Technology Association (FiHTA) and Saranen Consulting. According to the survey, majority of the companies working in the field were to hire new personnel in 2016 (Saranen Consulting, 2015).

Another indicator of relevance is the changing health care infrastructure in Finland. At the moment there are four major health care digitalization projects in Finland. In two of them, focus on implementing a new Electronic Health Record (EHR). First one of the EHR projects, Apotti, focuses on the public health service providers operating in the metropolitan area (i.e. greater Capital Region). Apotti is currently in the early stages of implementation and in early May, 2016 the project recruited approximately 150 health technology professionals. The latter EHR project, Una, focuses on providers operating outside the metropolitan area. The project is currently (September, 2017) in the early stages of implementation and it is estimated that the acquisition of the core components will begin in the fall 2017.

The remaining two health care digitalization projects, Virtual Hospital and Digital Self-care Services (ODA), focus on implementing new electronic services, such as virtual clinics (cd. Krausz, et al., 2016) in basic health care (ODA), and in specialized health care (Virtual Hospital). While the actual costs associated with the projects is still unclear, it is estimated that the costs of the EHR projects alone will be in the neighborhood of €1 billion (Helsingin Sanomat, 2015) of which Apotti alone will cover €575 million (over the timeframe of 10 years) (Apotti, 2017).

The ongoing development in the field has created an acute demand for technology professionals who possess a) a domain-specific skill-set from the field of ICT, and b) at least basic understanding on how the field of health care operates. In order to understand what these skills are, and what kind of 'hybrid professionals' the field needs, the first implementation of the ICT pilot focused on eHealth.

Digitalization does not only create new opportunities to the field of health care, but to the field of education as well, as different digital devices, modalities, and ways of reaching students have become available (cf. Gárcia-Peñalvo et al., 2014). However, new tools and 'gadgets' alone do not inspire learning; it is important to focus on the content and incorporate real-life elements into education. One well-employed approach is to combine online courses (El-Bishouty et al., 2014), and mix the course contents with the challenges emerging in the domain of application. In this, a constant dialogue with the domain-experts from the industry-side is of the essence.

2.1 The Framework

On the level of the overall project, the work was organized in stand-alone pilots focusing on a specific field. Within the pilot focusing on the field of ICT, the work was further organized as "inspect and adapt" cycles and concurrent implementations with a more refined focus (Figure 1). In the ICT pilot, one of the implementations focusing on eHealth (i.e. the eHealth pilot) organized the work even further by employing a more specific methodological framework.

The employed framework based on the works of Stewart and Hyysalo (2008), and previous work by Stewart (2000) on the roles of cybercafés in the 1990s. Their work on intermediary roles in the development and appropriation of new technologies, defines intermediaries as individuals who a) facilitate user innovation, and b) link user innovation into supply side activities, such as marketing, branding or product development (Stewart and Hyysalo, 2008).

Using a more down-to-earth, or even a bland definition, intermediaries can be seen as 'go-betweens'; individuals who bring different people together, and help them in appropriation and generation of new technologies (or related innovations). As such, intermediary is not a fixed concept or a profession, and there are different intermediaries in different fields of business, and their alignment in the supply-use axis may wary (Lahtiranta, 2014.).

The three-tiered framework used by Stewart and Hyysalo (2008) to categorize primary roles of intermediaries, consists of the following: 1) facilitating, 2) configuring, and 3) brokering. In their framework, facilitating represents providing opportunities to other, and as such it covers aspects such as education, setting rules, influencing regulations, and gathering and distributing resources. (Stewart and Hyysalo, 2008)

Configuring does not only represent technology-related configuring (actually technical aspect of configuring is often present only in a minor way), but also creation of space that facilitates appropriation. Configuring also represents influencing individual's perceptions and goals (Stewart and Hyysalo, 2008). A cybercafé is a prime example of configuring; the space (café) existed before function, and the clientele brought in their own ideas on how and for what it is used (Stewart, 2000).

Brokering, as the name suggests, refers to negotiating on the behalf of represented organizations and individuals, for example when features of a new product are discussed. Brokering is one of the most direct ways of interacting within the framework, as the intermediaries are often involved with direct negotiations with different parties, such as sponsors, suppliers or end-users. (Stewart and Hyysalo, 2008)

2.2 The Framework and the eHealth Pilot

In the eHealth pilot, the three-tiered framework was used in a) outlining the needed skill-set, b) organizing the lectures, and c) setting up the platform used in education. As such, the role of the intermediary (Stewart and Hyysalo, 2008) became intertwined with the concept of a product owner; a key stakeholder in project implemented in according to the Agile approach (Cohn, 2005).

Definition of the skill-set, and gaining understanding on what kind of professionals are needed in the field, was done personally – brokered by a domain-specialist. Instead of formal questionnaires, public seminars or workshops, representatives working in the organizations were met face-to-face (when possible). These meetings were flexible and informal, there was no written agenda or minutes, and they were organized on the terms of the representatives (time and place).

The free-spirited meetings gave room for exploring additional topics in addition to the skill-set and the expert profile. These included ongoing projects, potential avenues for future collaboration, and the organizations themselves. It followed from this that the meetings were also about facilitating and brokering, linking organizations together, and not just about the project.

In relation to the goals of the eHealth pilot, the primary result of these 18 meetings was a collection of topics the organizations considered to be of the relevance in the field (Figure 2).

The topics covered the field of eHealth in a wide scale. While some of the topics were extremely specific, related to a single technology or standard, others were vaguer by nature, reflecting concerns of the potential employers.

Example: "*We have this problem that is not really related to technology. When a person starts working in the company, he or she is rather young, typically in late twenties. Most of them have never been seriously ill, neither have their parents. A consequence of this is that they [new employees] do not know how the field [of health care] works, or how it is organized. They can't separate a health center from a university hospital."* [Lahtiranta, personal communication, translated]

The topics were also prioritized using a simple and straightforward method; if the organizations

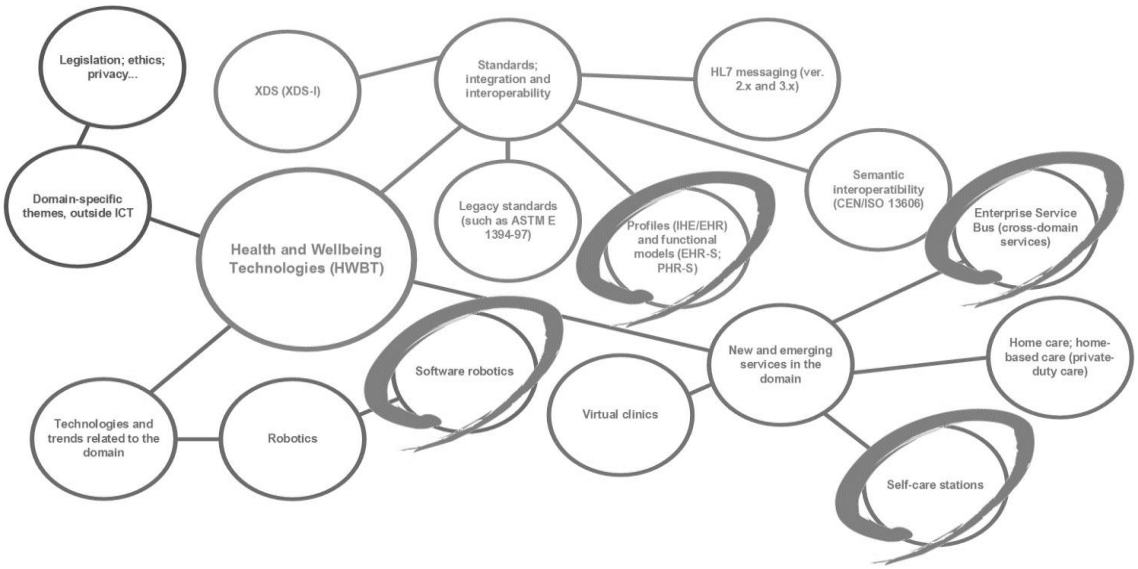

Figure 2: Topics (a sample).

specifically pointed out that certain topic is of the essence for their business, or if a topic was repeatedly mentioned in other meetings, it was considered to be of the essence (indicated by circles in the Figure 2). Altogether 55 topics of different degrees of specificity were found out. In order to analyze the topics in a more detail, they were grouped using the following categories: a) standards; integration and interoperability, b) new and emerging services in the domain, c) technologies and trends related to the domain, and d) domain-specific themes outside ICT. Individual topics were distributed according to the following table (Table 1).

Table 1: Categories and topics.

Category	Distribution
Standards; integration and interoperability	18
New and emerging services in the domain	10
Technologies and trends related to the domain	18
Domain-specific themes, outside ICT	9
Total	**55**

In the next phase, the topics were re-grouped into more concrete groups on the basis of their thematic and contextual similarities (if there was any). For example, certain European Union directives (93/42/EEC, 90/385/EEC and 98/79/EC) formed a group related to validation and verification. In the case of messaging, certain standards (ASTM E 1394-97 and HL7 ver. 2.x) formed a group of their own due to the similarities in structure and function. These groups were called thematic groups.

On a more abstract level, thematic groups took the shape of two distinct collections; introductory and advanced. The topics that were regarded as introductory were related to the nature and organization of health care and social services (e.g. legislation, funding, etc.). The remaining topics, the advanced ones, were related to a specific function or standard, such as the Cross Enterprise Document Sharing (XDS) standards (Table 2).

As the Table 2 indicates, thematic groups formed the backbone for the actual lectures. Content and learning outcomes were defined for each of the formed group on the basis of literature, domain knowledge, and earlier discussions with the companies. In addition, thematic 'arcs' were discussed; how the themes are linked with each other, what is the actual scope, and how much the themes overlap (for example, in the case of legislation and EU directives).

Table 2: Thematic groups (a sample).

Thematic Group	Content Description	Learning Outcomes
Coding, classification and ontologies	Coding, classification and ontologies have a long history in the field of health care. They are essential part of service provisioning today, and they are embedded into most communication standards in the field.	During the lecture(s), an introduction to ontologies is provided, and some of the most common coding and classification systems (such as SNOMED CT and ICD-10) are briefly introduced.

Table 2: Thematic groups (a sample) (cont.).

Thematic Group	Content Description	Learning Outcomes
Messaging	In the health care domain, information is commonly exchanged in (asynchronous) messages. Some of these messages base on "legacy standards" were developed in the 1990s but are still in use.	Starting with ASTM E 1394-97, continuing to HL7 2.x messaging, and later on to the up-to-date HL7 v3 messaging, the lecture(s) outline the used standards and provides practical examples on their use.
Profiles and functional models	Profiles and functional models provide a summary of envisioned functions for specific information systems, such as EHR. Furthermore, profiles (such as IHE integration profiles) define conformance criteria for such systems.	The lecture(s) depict the most relevant functional models today (such as PHR-S and EHR-S), and (localized) integration profiles used in the field. In addition the lecture provides a cursory glance to IHE Scheduled Workflow (SWF), and an introduction to IHE organization (focusing on the national special interest group).

There were no funds reserved for outsourced services, such as marketing or lectures, in the eHealth pilot. One consequence of this was that the lecturers had to be recruited from the industry, domain organizations, standards development organizations, universities, and government. All in all, 49 different organizations were contacted.

As the language of the lectures was English, it was possible to recruit lecturers internationally. The recruitment process was also used for collecting feedback on the original topics, thematic groups, and on the planned 'arcs'. As such, the process itself formed a reflective inspect-and-adapt cycle of its own, executed in the spirit of Agile development (Cohn, 2005).

The recruitment process further defined the thematic groups into actual lectures. While the original topics (Figure 2) were considered as an accurate representation of the industry, and needs of the organizations, the availability and expertise of the lecturers defined the final content and amount of lectures (per thematic group). For example, in addition to giving a generic lecture on trends related to the field, the lecturers insisted on delving deeper into specific trends, such as corporate wellness; a trend that was considered to be of particular importance.

As the lectures were held in English, and the recruitment for lecturers was global, the most practical way of offering lectures was online. Some of the lectures were webinars with a live audience and lecturer, while others were recordings made particularly for the project. The lectures were recorded using Adobe Connect web conferencing software service, and they were offered via open-source learning platform and course management system known as Moodle.

Employing the taxonomies of the used methodological framework (Stewart and Hyysalo, 2008), these two (Adobe Connect and Moodle) were the technical parts of the 'space' that was configured for the purposes of the eHealth pilot, and used for facilitating expertise and knowledge on eHealth.

In order to summarize the process from definition to implementation, or from collecting topics to giving actual lectures, there were 5 steps (Figure 3). First, the topics were collected in free-form meetings with 1-2 representatives from organizations operating in the field of eHealth. These included companies, standards development organizations, universities and research organizations, and government. The meetings were held face-to-face when possible. The collected topics were prioritized and grouped into thematic groups; assemblages of topics that had similarities, or were close to each other (context-wise).

The thematic groups formed the backbone for the actual lectures, and they were used in recruitment. At that time, the groups were also subjected for feedback from potential lectures. The actual lectures were formed on the basis of the thematic groups and lecturers' feedback; their expertise and interests.

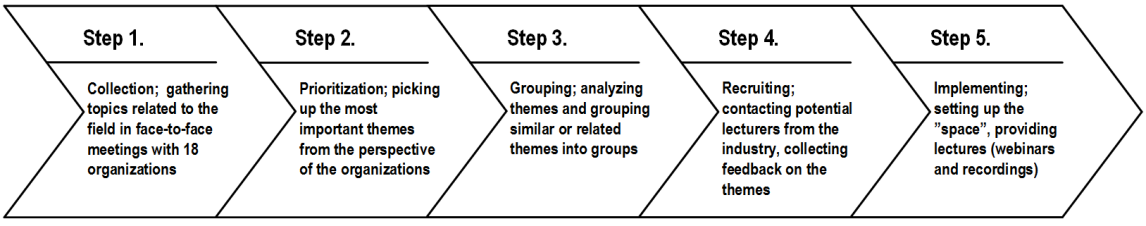

Figure 3: Steps 1-5; from definition to implementation.

Finally, the lectures were provided via an electronic teaching platform, or the 'space'.

Even though the process is depicted as a linear one in the figure 3, certain steps were repeated. For example, the composition of thematic groups changed during the recruitment process, resulting in regrouping.

The figure 3 can also be used in depicting how different intermediary roles were aligned during the overall process. While the content was brokered by a domain-specialist (steps 1-3) the practical arrangements (steps 4-5) were primarily – if not always solely – brokered and configured by the academic officers. In the following, the challenges related to the work of the academic officers are discussed in more detail.

2.3 Practical Arrangement of the Lectures

Organizing a novel course; especially on a new domain with tight coupling to industry can be quite demanding for academic officers working in the Open University. The practicalities require a lot of planning, scheduling, brokering, and marketing; significantly more than in the case of a more typical or 'academic' course.

The lectures and the related materials (handouts, assignments, etc.) were agreed directly with the lecturers. During the course of the arranging these practicalities, it was discovered that sometimes the language used in the course was a challenge for some of the lecturers as they were not used to giving lectures in English. This was considered as too demanding for some, and in few cases the lecturers lost their interest.

Another motivational aspect was the compensation. Some of the lectures refused due to the small compensations. As discussed earlier, the eHealth pilot did not have any funding to cover the lecturing costs. One of the findings of the eHealth pilot is that investments are needed if experienced industry specialists are planned to be incorporated into the education.

Organizing the actual lectures with the potential lecturers caused some challenges to the Open University's academic officers; the lecturers asked for detailed instructions, for example on the domain-specific technical aspects of their topic. Understandably, the officers were not able to answer to these kinds of questions as they did not possess sufficient technical know-how on the domain.

It was also identified as a challenge for the Open University's academic officers to contact the industry specialists as they did not have the needed network or shared the same "language" with them. The academic officers felt it was quite demanding to call to the potential lectures and discuss about the practicalities in-depth.

During the eHealth pilot, four types of challenges were identified from the perspective of the academic officers. 1) Scheduling of the lecturers (brokering). Sometimes it was a challenge to reach lecturers from the industry-side in order to arrange the schedule of the lectures. Commonly, the lecturers answered after the schedule was set. Naturally, this caused changes to the course setup and structure –eventually, the effects were evident to the students as well.

As an example, some of the lectures were originally planned to be available online prior to assignments, and it was intended that the assignments base on the contribution. However, the lectures and the assignments were "out of sync" and this caused fundamental problems to the organizers, and to the students.

2) Scheduling of the academic officers (facilitating). Some of the scheduling problems originated from the officers, which were a direct consequence of the somewhat "stop-go" nature of the course. Planning and practical arrangements (figure 3, steps 4-5) required significantly more time than was originally estimated – even a partial restructuring of the timetable required whole working days from the academic officers. The officers were not solely assigned to the course, and they had other duties to attend to.

3) Setting up the online course (configuring). The original idea was to organize the course as a series of online lectures, or webinars, into which everyone interested could attend to. The focus group was not limited as the course was intended as a low-threshold introduction to the field, and to the relevant actors (organizations, companies, researchers, etc.). However, due to the practical challenges and problems in scheduling, a decision was made to implement (to 'reconfigure') the course as an online course with limited access in the Moodle learning environment. Even though the course was organized as a closed one (for example, in contrast to a MOOC, c.f. Baggaley, 2013), the course was successful in facilitating; in bringing together students from health care and from the technology side.

4) Student recruitment (brokering). This eHealth-focused course was a new addition to the course curricula of the Open University. As such, it needed new marketing approach. It was not enough just to add the course to the list of available ones. At first, the course was marketed using traditional methods,

such as via university's web pages and email distribution lists. Soon it was realized that in order to reach the intended audience, potential students interested in operating in a field that is a mix of technology and health care, social media channels had to be utilized as well. In this LinkedIn, Facebook and Twitter were used as primary channels. In addition, an interview that focused on the overall project was published in one of the Finland's leading newspapers. This was a real boost in terms of marketing.

Despite of the practical challenges described above, the course was successfully carried-out with a very strong industry connection.

3 RECOMMENDATIONS

Looking back to the eHealth pilot, more precisely into the 5 steps depicted in the figure 3, the following recommendations can be made. The recommendations are not intended as domain or project specific, and as such they can be applied to the field of industry-oriented education as a whole.

Use a domain expert as an intermediary (Step 1). Regardless of the domain, planning industry-oriented education requires understanding about the industry. Without a solid understanding about the domain in question, eliciting information from different sources (stakeholders, literature, media, etc.) is a challenge.

The domain in itself; its processes, terminology, hierarchy, etc. may pose a challenge for the uninitiated. More so if the domain is a hybrid one, as it is in the case of eHealth. In the case of eHealth, domain understanding is not just about technology. Depending on the emphasis, it is also about health care, social services, and wellbeing.

Domain expertise is related to another important requirement; networks. Without them, there is a risk that a certain stakeholder group will go unnoticed, of its views are not appropriately incorporated in the planning. For example, in the field of eHealth, different standards development organizations, such as the HL7, are of particular importance.

Prefer face-to-face meetings (Step 1). Personal touch matters. In the eHealth pilot, the representatives of different organizations appreciated doing things 'on their terms' (time, place, etc.). A direct result of this way of working was a more laid-back atmosphere, and a possibility to act as an intermediary. In other words, to bring issues on the table that would have been otherwise ignored, or left outside the official agenda.

Meeting face-to-face was also a matter of efficiency. Instead of communication via email or phone, in personal meetings it was easier to control the flow of the meetings; to ensure that everyone was engaged and participated, and contributed to the eHealth pilot.

Prioritize! (Step 2). Collecting singular themes was not enough in the eHealth pilot; they needed further work and thinning out. Prioritization of the individual themes on the basis of the corporate needs was the first step in the right direction. A simple method that based on the number of occurrences a theme was brought up, combined with emphasis brought up in the meetings, was enough.

However, in an afterthought this analysis could have been strengthened by analyzing future trends provided by organizations such as Gartner or Forbes (cf. Forbes, 2017). This kind of analysis would have given more to the organizations, and even challenged them to reconsider their current position and future avenues in the field. The analysis could have even helped in brokering (Stewart and Hyysalo, 2008), if a common ground had been found in the fields of expertise and interest.

Sharpen up and clarify (Step 3). As the process of planning industry-oriented education moves towards more practical issues, such as organizing lectures, structuring content into manageable content is of the essence. More so, if the lectures are provided by more than a one person, or with external professionals. In this, defining content, learning outcomes, and creating thematic arcs that linked themes together was a valuable tool in the eHealth pilot.

I&A (Step 4). Inspect and adapt. Reflecting the current state of the project and comparing the results on the goals is a basic practice employed in most project management paradigms. Instead of performing analysis retrospectively after the project, iterative and incremental inspect and adapt cycles were performed during the eHealth pilot in the spirit of Agile approach (Cohn, 2005).

Each meeting with a company provided a point of reflection on the themes gathered until that point. The most natural point of reflection where the 'whole' (i.e. thematic groups) could be evaluated for the first time instead of the 'parts' (individual themes) was during the recruitment. At that point, the actual lectures, and the emphasis of the whole education, started to take shape.

Resource adequately (Step 4). Another recommendation that originates from the generic project management paradigms is related to adequate resourcing. There was a single step in the eHealth pilot during which the resourcing was found

insufficient; recruiting. Professional lecturers rarely come cheaply, or for free, especially if the topic of the lecture is a current one.

In the eHealth pilot, the whole field is a current one, especially in Finland, and certain themes even more so (such as the Fast Healthcare Interoperability Resource, or FHIR). The lack of resources made recruiting potential lecturers a challenge.

Another aspect, related to resources and recruiting, which had an impact on the content of the lectures was the HL7 membership. Even though the national organization collaborated and contributed, the international HL7 organization was understandably reluctant to contribute as the organization responsible for the education was not a member at that time.

Advocate (Step 5). Another old best practice originating from project management is advocating. A well-managed project needs a 'champion' (Cash. and Fox, 1992); an unfeigned and authoritative character who carries the weight of the project. In the eHealth pilot, this practice should have been put into a proper use as the project stumbled at a critical point, during the handover from planning the course to making the webinars and recordings.

Revalidate (overall process). Industry-oriented education needs periodic revalidation (unless it is intended as non-recurring education). More so of the domain is a rapidly evolving one, as in the case of eHealth. During the eHealth pilot two basic types of revalidation were discussed: 1) a calendar-based revalidation, and 2) a trigger-based revalidation.

A calendar-based revalidation could occur yearly or bi-yearly depending on the field. During the process, the education as a whole could be put under scrutiny. Depending on the implementation of the education, this could be done at the same time when the practicalities are organized (time, place, lectures, etc.), or within a specific frame of time.

A trigger-based revalidation was seen as a more narrow process. Instead of looking into education as a whole, single topics or thematic groups could be put under scrutiny. The trigger, a real-world event, could be a release of a new standard, law or directive, or announcement of a project in need of a specific expertise (such as the Apotti (2017) project discussed earlier).

While these mechanisms were never put into actual use due to the nature of the ICT pilot (figure 1), they were considered as mechanisms that could be used in maintaining the original connection with the industry.

4 CONCLUSIONS

Industry-oriented education is a 'different animal' when compared to the education Humboldtian science universities commonly offer. Unlike courses like 'discrete mathematics', where the underlying paradigms may remain the same for decades, industry-oriented education may change with every course iteration.

This difference does not make offering industry-oriented education impossibility for the science universities; it just needs a different mind-set and different practices. Such as the one's discussed earlier. As the competition among universities has become intense and international, and the demand for research funding has increased globally, industry-oriented education should be regarded as an opening and an opportunity for closer cooperation with the industry. In this, the intermediary roles (Stewart and Hyysalo, 2008; Lahtiranta, 2014) can be of the essence.

Understanding a) how universities align on the supply-use axis from the perspective of the industry, b) what the expected skill-set and the profile of a specific domain expert are, and c) how intermediary roles can be used in interaction with the industry are steps in the right direction on a grander scheme of things that is the balance between education and industry demand.

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