Co-creation workshops for work life oriented ICT education

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Abstract. ICT Companies in Finland today are facing problems in recruiting the right skilled workforce to meet their needs [1]. There is particular shortage of application developers, application designers, web professionals and coders in the South Ostrobothia area of Finland [2]. Typical degree courses offered by universities would not work because there is a mismatch between the university degrees offered and the needs of these companies. There is a need to develop a new approach to address this shortage. In response to this, local University of Applied Sciences has developed a new ICT education programme using co-creation methods. The new approach is based on the concepts of co-creation of value from service science. This paper discusses the importance of this new approach in education and how it can be implemented. Empirical data is gathered through observation of and reflection on the development of the ICT programme which follows the principles of co-creation.

Keywords: Co-creation, work life orientation, educational planning

1 Introduction.

Taking care of the quality and know-how of working life will be more challenging in the future and will require more attention. Changes in the micro and macro environments also create new opportunities. Knowledge requirements increase and diversify, challenging both management and employees.

The concept of co-creation is about working co-operatively to produce better results. It has emerged as a management initiative in which different parties (such as a company and their customers) work together. This allows different perspectives and ideas to be contributed and can result in enhanced value for all concerned. The theoretical basis for the concept of co-creation is examined in Section 2. In business terms, the benefits of co-creation are seen in terms of advantage (ultimately financial) to the company and an enhanced, tailored product for the customer. However, co-creation can apply in a similar way in other contexts as well, notably to the creation of knowledge [3] where students and teachers are recognised as contributors to the knowledge creation process. Regardless of context, six elements can be identified in

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the process of co-creation, the contents and roles of which should be defined as part of the process of facilitation [4].

- ○ A role-free community involving both problem-definition and decision-makers. Users and other external actors act as developers and traditional producer-consumer roles are faded in the process. (The platform structure and transparency of the community is emphasised)
- ○ Neutral environment in which to operate. This underlines the openness of the operating environment, ie, in principle, it is not delivered behind one of the closed doors of one company or operator, but serves more operators and in a common space. (The openness and innovativeness of the space are highlighted)
- ○ Co-creation is both problem-solving and solving problems in a collaborative way for all parties involved. Because of this, it is important to identify and define the roles of the client, the problem solver, and other community members; who is involved in the process and in what way, and how are they motivated to participate? (The openness and innovativeness of the community are highlighted)
- ○ Value creation has been thought and recognized in the development process, ie how working together increases the value of the activity and how the different parties benefit from the process. (The innovativeness and originality of the community are highlighted)
- ○ The innovation process has been defined and timed at least to some extent within the framework of the platform, so that the customer can identify it. The beginning of the process, the milestones, the ways of interaction, the end and the form of the end result must be defined. (The innovativeness and platform structure of the community are highlighted)
- ○ Repeatability is a key element of the platform model, ie scalability is possible if demand is sufficient and can be created. Repeatability means that you can continuously or repeatedly bring new problems to the platform. However, the co-creation process itself should also be reproducible in other environments. (Platform structure and openness of the community are highlighted.)

Knowledge creation in the context of a subject such as ICT is more complex than a simple two-party interaction. Universities are involved in developing, accrediting, delivering and assessing courses, providing accredited levels of assurance. A purely teacher-centric model of education is giving way to a more collaborative model in which students are recognized as being part of the knowledge creation process [5]. This is particularly valuable in the case of mature students with knowledge of working in industry. Thirdly, companies themselves have direct knowledge of the challenges of the workplace and the issues they face in a real business context as opposed to a purely academic learning environment. Hence, they are ideally placed to be part of the co-creation process.

So far, there has been little investigation of this type of three-way co-creation of knowledge, or of the impact on the different parties involved (for example, the work-

life balance of the students). This paper consider a practical case study of the implementation of a programme based on the principles of co-creation and reflects on the issues arising and experience gained from the initiative.

2   Theoretical Background of Co-Creation

Taking Co-creation has emerged as a new business management paradigm and is based on value creation in interaction between the company and the customer. The theoretical background of co-creation is largely based on the literature of the service business, although research on innovation management, marketing and consumer behaviour has also provided new insights into the co-creation of value [6]. The discussion of co-creation presented here is largely in the context of business as this is where the majority of current literature is focused.

Co-creation refers to a common, communal, concurrent, equal process that generates new, either tangible or symbolic value [7]. Prahalad and Ramaswamy [8] presented the concept of co-creation in recognizing the change of roles in the market: interaction and co-operation between customers and suppliers increasingly influenced on market mechanisms than the traditional supply-demand relationship.

The changing operating environment of companies and the widening of the service business require a service dominant logic, in which services are playing a key role instead of products and production. The company's entire business aims to create value for its customers and their role is central. Interaction is active both between the company and the customer, and in the relationships between the customers. Co-creation is one of the basic elements of this perspective, which enables the company to develop its service offering. [9][10]. Today, interaction is increasingly taking place through social media channels and the Internet. Product and service advisers are given an ever-increasing value and, for example, when choosing a destination, many are looking for social media channels to support other consumers and industry enthusiasts in their decision-making.

Co-creation offers benefits to both the company and the customer, for example through better consumer and user experience [11][12]. Co-creation can promote product and service innovations [13][14]. In addition, it can also be explored from a cultural perspective in consumer research. Consumption can be regarded as a highly symbolic and culturally related activity where consumers give subjective meaning to products and services. [15][16]. Consumers and the meanings they create have a key role to play in creating value for products and services, as symbolic and cultural-related meanings have a significant impact on the attractiveness of products and services [17]. From the point of view of innovation research, cooperation and open processes of the company and users are central to co-creation [18][19][20][21].

The changing environment in business may be compared to the evolving context in higher education. Institutions which were once regarded as the main creators of knowledge and providers of learning are now recognising the benefits of an approach in which students contribute to the generation of knowledge [22] and external bodies such as industry partner in the development of the curriculum [23]. However, there

has been little evaluation of these approaches. Further, initiatives which embed students' learning in their work practice, such as work-life oriented Masters in Finland [24] and degree apprenticeships in the UK [25], involve a three-way relationship which has received little attention.

3   Case Study

In this paper we report a preliminary study in which empirical data is based on observations of a practical development process of ICT education. The case study was conducted at the University of Applied Sciences, in Finland between May 2018 and October 2018. Following the principles of "value creation" the development of the education was informed by "co-creation workshops" with local industrial partners, combining action research with a case study approach.

3.1   Research Methodology and Data Collection

According to Yin [26], case research is appropriate to answer the questions "how" and "why", which aim to explain causal connections or a series of events that happened during a longer period. It is also appropriate to answer the explorative "what" question and evaluate and describe the research. So, the initial task is to clarify rigorously the nature of the study questions [27].

Susman & Evered [28] describe action research with six properties, as follows. Action research is future oriented and collaborative, implies system development, generates theory grounded in action, is agnostic and situational. The typical action research process has a cyclical nature. Susman [29] distinguishes five phases to be conducted within each research cycle. Initially, a problem is identified and data is collected for a more detailed diagnosis. This is followed by a collective postulation of several possible solutions, from which a single plan of action emerges and is implemented. Data on the results of the intervention are collected and analyzed, and the findings are interpreted in light of how successful the action has been. At this point, the problem is re-assessed and the process begins another cycle. This process continues until the problem is resolved.

The research methodology of this study is an action case study, which is a combination of case specific analysis and action research methods [30]. The main purpose of the case study is to understand and interpret, whereas action research aims to change the object of research.

3.2   Description of the Development Process

The needs of ICT competence of the South Ostrobothnia region have been studied in close cooperation with the local ICT and industrial companies.

The process started with a joint business meeting on the needs of ICT skills (10 companies) in May 2018. The invitation to the starting meeting was sent to key ICT and industrial companies. After this, the ICT competence survey was conducted for

the ICT and industrial companies in the region (49 companies) in June 2018. In the web survey willingness to participate in the development process was asked. The invitations to the workshop were sent to those who were interested to participate. Based on the analysis of the survey, the co-creation workshop was arranged with the local companies (12 companies) in September 2018. This was further elaborated by the companies participating through online connections. In addition, strong company involvement will be continued during the forthcoming implementation phase including the memberships in the advisory board, visiting lectures and real development projects in the companies.

Need Analysis of ICT Competences

In the starting meeting, it was discussed the ICT needs of the region. Companies highlighted the need for ICT education and it was decided to launch a web survey about the needs and education mode. The survey was widely distributed through various regional networks for ICT and industrial companies.

The survey explored the importance of the need for know-how related to information technology and digitalisation as well the preferred way to meet the competence needs. They were identified in the following areas: Software Engineering, Information Networks, Information Security, Information Systems and Server Management, and Embedded Systems and Electronics.

As a result of the survey, 76% of respondents in South Ostrobothnia consider the IT and digital skills shortage to be significant. For most companies, the expertise needs are related to software technology (56%) and to the management of information networks, systems and servers (65%). The need for software engineering is immediate for 64% of companies and 36% of companies say they need more experts within 1-2 years. The need for networking, systems, and server management is an immediate need for 56% of companies and 34% for this competence within 1-2 years. The need for embedded systems is immediate for 43% of companies and 43% say they need this expertise within 1-2 years.

Businesses preferred recruiting new graduates to meet their skill needs. 48% of companies announced they were hiring a newly graduated software engineer. Recruitment of experienced experts was felt to be preferable to embedded systems and electronics.

The e-mail survey carried out in the design workshop and thereafter specified the content of the training, its implementation and the role of the companies in the planning and implementation of the training.

The planned training has been developed in cooperation with the companies and is thus an excellent response to the region's need for expertise in producing software engineering, information networks, systems and server management.

Planning Process of the ICT Education

This section describes the content of the workshop and the implementation of the principles of co-creation. The workshop was planned based on the principles of co-

creation and the preliminary study plan has prepared before the workshop based on web survey.

The co-creation workshop was organized in collaboration with company representatives/ICT professionals from twelve local ICT and industrial companies. Their role was to present the needs of ICT competence and the understanding of working life into the workshop. The teaching staff brought pedagogical skill and knowledge about curriculum development.

In the beginning of the workshop, a preliminary study plan was presented and participants were introduced. In the workshop, participants attended a wide-ranging and in-depth discussion of both today's and future ICT competence needs and contributed to the study plan. They presented ideas about content and approaches of it. As well, ideas about learning styles were considered. Participants highlighted practical perspectives on the quality and need for ICT skills.

After the workshop, the study plan was further elaborated by online workshop, which clarified companies' interest in participating in the implementation phase. New kind of company involvement was developed. Three companies expressed their interest in engaging in a steering group. All companies, except one, were ready to provide teaching in the form of guest lectures. One company was also interested in teaching larger study modules and courses. As well, an option to run some of the courses in the premises of the company was discussed. The companies were willing to offer work life projects, internships and company visits.

4   Discussion

In this section the results of the co-creation method will be described and discussed. At the moment, a deeper analysis only about the development process is possible, because the education programme will be implemented after the publication of this article. In the following sub-chapters, the added value produced by the co-creation methods will be analysed. The analysis is divided to the content and the development process of the ICT education. As well some of the potential features of the implementation are presented.

4.1   Work Life Oriented ICT Education

The name of the programme is The Study Programme of Software Developer and it is a type of conversion/updating education. According the admission criteria students are eligible if they have a higher education degree in the field of engineering or business. Length of the studies is 60 ECTS Credits and it will be implemented in one year (Table 1).

The programme aims to increase student´s ICT competency and it is for those looking for a career in ICT or wishing to improve their professional ability.

Training is carried out in a multidisciplinary way in close cooperation with companies. Multimodal learning methods are used. It includes contact sessions and

online studies. The emphasis of learning is on independent work as well as solving distant learning assignments and studying online. The work life project is an essential part of the studies.

The study programme will be ensured by personal study guidance. At the beginning of the training, students are interviewed and their learning abilities and motivation are surveyed. Individual study plans are prepared for students. Possible learning difficulties are taken into account through structured guidance. In the middle of the training, the progress of the studies is discussed with each student and the necessary steps are taken.

Tab. 1. Study programme (60 cr) of software developer

Pre-assignment and Complementary studies					
Programming Skills (22 cr)					
Basics of programing	Object-oriented programing	Data structures and algorithms	Software engineering	Interfaces	Embedded systems
Data Competence (18 cr)					
Databases	Communication technology and information security	Virtualization methods	Cloud services		Data analytics
Orientation Option 1: Industrial Internet (15 cr)					
Basics of industrial Internet	Web programming	Server programming	Browser programming		Basics of artificial intelligence
Orientation Option 2: Data Analytics (15 cr)					
Data analytics tools	Big data and NoSQL databases	Data analytic tools	Machine learning		Statistical methods
Work Life Project (5 cr)					

4.2 Co-Creation Workshops in the Development of ICT Education

In the development process of ICT education co-creation workshops were arranged. The primary co-creation workshop was organised by face to face and the secondary workshop was organized by online. In each workshop, a preliminary study plan produced on the basis of previous steps was under discussion. (Figure 1).
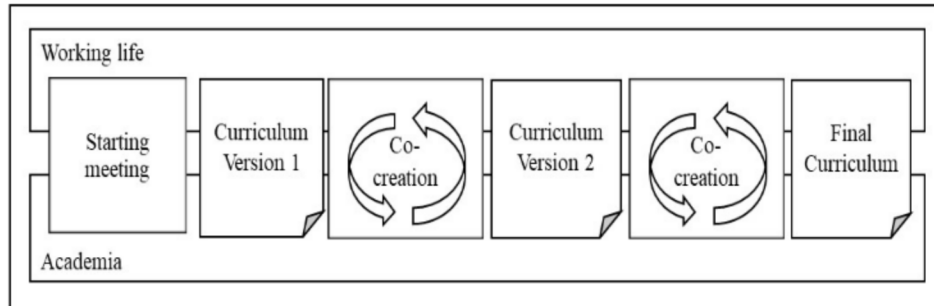
Fig. 1. Co-creation model in ICT education

Next, the implementation of co-creation principles in the primary workshop will be described and analysed according to the following prerequisites for successful co-creation [31].

1. Equal participation
2. Identifying different goals
3. Concrete work
4. Appropriate space and guidance
5. Transparency for new ideas

Co-creation requires equal participation. The company participants were invited by personal invitations and by the web survey. Various representatives of the ICT and industrial companies were included in the workshops. At the beginning of the workshop, the participants presented themselves. Everyone had equal opportunities to participate and all participants were listened to. The benefits of participation were also made visible and the participants' contribution was appreciated. The atmosphere of the workshop was sought to be open and to encourage participation.

The work should identify the different goals of the participants and find a common goal and a shared topic of interest. Participants had their own goals, but the common interest was to find a solution to the shortage of ICT competences in their companies. The co-creation workshops were successful in bringing together different perspectives.

Co-creation should proceed by doing, that is, ideas should proceed quickly to concrete action and everyone should be allowed to experiment and fail and at the same time learn. The curriculum has been developed step by step and participants have contributed to it during the planning process. Communication and transparency play a key role in co-creation, and therefore evaluation data was structured and visualized and dealt with by entrepreneurs after the workshops.

Co-creation needs the right spaces and guidance. The facilities were chosen to provide a good framework for presentations and joint discussions. The aim was to create an environment and atmosphere that supports cooperation as much as possible.

The time was carefully designed and manuscripts were prepared in advance for the workshops.

Collaboration can also create a variety of emotions in the participants. Various emotions are essential in all development work. Thus, it is important to create open and transparent atmosphere where participants feel themselves valued.

4.3 Analysis of Added Value for Different Parties

The benefits of the co-creation, methods can be characterized from three different perspectives: regional business life, students´ learning process and university teaching (Table 2.)

Table 2. Added value of co-creation for different parties

Regional business life	Students´ learning	University teaching
Better recruitment opportunities Outputs of work life project and assignments Professional input from the university faculty Opportunity to influence in content and learning methods	Work life oriented content Authentic learning environment New learning methods Opportunity to get company knowledge, feeback and experience Better opportunities for employment	Genuine cooperation with work life Better employment opportunities for students More diverse teaching resources Well-functioning industrial relations Support from work life

For regional business life the ICT education developed by co-creation methods offers customized expertise and better recruitment opportunities. During the training process companies can get valuable outputs from students´ work life projects and assignments and expertise from professors. In addition, the close co-operation with education can offer teaching opportunities for the staff of ICT companies. In turn, these companies are able to influence the learning content and methods in the university teaching.

For the student´s learning process this model offers work life oriented content and an authentic learning environment in a real company context. Students have good opportunities to gain company knowledge and experience during the training process. This can lead to better opportunities to find employment. New kinds of learning methods are applied and students are able to get genuine feedback from working life and have ICT professionals as teachers.

For the university teaching process, it is valuable to arrange education in genuine cooperation with work life and get more diverse teaching resources. Well-functioning industrial relations lead to better quality of education.

We can conclude that the described co-creation of ICT education can at least partly, solve the shortage of ICT skills in regional companies. The companies start to

get skilful software developers and they can influence the subject knowledge and learning process for their forthcoming work force.

For students, the ICT programme offers genuine, working-based, real life experiences. From the perspective of the university, co-operation with real businesses helps faculty to gain first-hand experience of the needs of the company. This allows faculty to develop research that helps companies to innovate.

5   Conclusions and future work

The case study shows that a co-creation approach to the development and delivery of ICT education has resulted in the successful development of an education programme. Further, the participation of industry from the earliest stages has resulted in a curriculum in which all parties are invested and see themselves as meaningful stakeholders and contributors (rather than just consumers in response to us as providers).

Analysis of the co-creation process shows that the early and continued involvement of industry resulted in a syllabus which met their needs and which they had confidence would foster the graduate skills they need. Students benefit through closer integration of their studies with industry, with greater consideration to the work-life balance.

This paper considers the process of development and outlines important issues for successful co-creation. The next stage is to assess the delivery of the programme, to monitor the on-going co-creation process and to evaluate both students' experience of the course and the feedback from industry assessing the process from their perspective.

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