

# **INTERDISCIPLINARY LEARNING ENVIRONMENTS**

Study on perceived values in HAMK Design Factory



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#### TIIVISTELMÄ

HAMK Design Factory on opetuksen liittyvä konsepti, jossa korkeakoulun opiskelijat opiskelevat monitieteellisyyteen ja projektilähtöiseen oppimiseen rakennetussa ympäristössä. HAMK Design Factory perustettiin 2019, eikä sen kursseihin rakennettua ja opiskelijoiden kokemaa arvoa ole vielä kattavasti HAMKissa tutkittu. Oppimismalli vaatii myös uudenlaista koulutus 4.0 - teemaan liittyvää osaamista sekä taitoja niin osallistuvilta opiskelijoilta kuin henkilökunnaltakin.

Oppimisympäristönä HAMK Design Factory eroaa luentopohjaisesta opetustyylistä, koska opetusta toteutetaan työpajatyylisesti tiimeissä. Tiimejä hallinovat useat eri valmentajat, joka tarkoittaa, että oppimisympäristö voi erota myös kurssille osallistuvien opiskelijoiden kesken.

Tutkimuksen tavoitteena oli rakentaa ymmärrys siitä, kuinka opiskelijat kokevat HAMK Design Factoryn tuottavan arvoa heidän opintoihinsa. Koettua arvoa verrattiin samankaltaisissa olosuhteissa toteutettuihin tutkimuksiin, jotta koettua lisäarvoa voitaisiin joltain osin ymmärtää ja nähdä se, mitkä ominaisuudet koulutuksessa olivat niitä, joita opiskelijat arvottivat.

Palvelua tarkastellaan työssä palvelun tuottamisen näkökulmasta. Palvelu tarkoittaa siis Product Development Project -kurssin aikana tuotettua opetuspalvelua, johon myös palvelun elementit kytketään.

Opinnäytetyön tutkimus toteutettiin Product Development Project -kurssilla. Kurssin tarkoituksena on yhdistää eri koulutusohjelmien opiskelijoita rakentamaan ratkaisuita asiakasyritysten antamiin haasteisiin. Kurssille osallistui opiskelijoita hoitotyöstä sekä muista koulutusohjelmista. Tutkimuksen näkökulmasta hoitotyön opiskelijat olivat oma tutkittava joukkonsa, koska he olivat ainoat kurssille määräytyä opiskelijat. Muiden koulutusohjelmien opiskelijat ilmoittautuivat kurssille

vapaaehtoisesti. Yhteensä kyselyyn vastasi 35 opiskelijaa. Tutkimusmenetelmänä käytettiin määrällistä SERVQUAL-menetelmää, jota käytetään yleisesti palvelun laadun mittaamiseen. Kyselyä muokattiin hieman soveltumaan tutkittavaan kokonaisuuteen.

Tutkimus osoitti hoitotyön ja muiden opiskelijoiden kokemassa arvossa olevan eroavaisuuksia. Kun kokonaistuloksia verrattiin muihin vastaavanlaisiin SERVQUAL-menetelmällä tehtyihin tutkimuksiin, ei voitu todeta monialaisen ympäristön tuoneen tässä tapauksessa lisäarvoa opiskelijoiden kokemaan arvoon. Johtopäätöksenä voidaan todeta, että pedagogista mallia tulisi kehittää vielä opiskelijälähtöisempään suuntaan ja mahdollisesti rakentaa kokonaisuus vielä ekosysteemisen ajattelun suuntaan, jolloin opiskelijat olisivat kurssin toteuttamiseen liittyen vieläkin suuremmassa roolissa.

**Avainsanat** monitieteellisyys, palvelun laatu, kokemus, korkeakoulu

**Sivut** 106 sivua, joista liitteitä 20 sivua

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#### ABSTRACT

HAMK Design Factory is a learning concept in which students from an institute of higher education study in a multidisciplinary and project-based learning environment. HAMK Design Factory was established in 2019, and the perceived value from its courses has not yet been thoroughly researched in HAMK. The learning model requires a new education 4.0. – based skills from both the staff and students participating.

HAMK Design Factory's learning environment differs from lecture-based studies as the learning is done through workshops in teams. Various coaches manage teams. Thus, the learning environment also has its differences between the students participating in the course.

The study aims to understand how students perceive the selected value creation elements of the HAMK Design factory and compare the results to similar studies. The research method to understand the possible added value and the elements that students feel gives them the most value.

Service is looked through the scope of something that a service provider offers. In this case, the selected service was the Product Development Project -course and all the service elements it included.

The study's research was conducted in the Product Development project, a course with students from multiple degree programmes. Students were divided by their respective groups into healthcare and other students. In total, there were 35 students. The research method used was a quantitative SERVQUAL-method that has been widely used to measure the quality of services. The questionnaire was edited for the study to further

A study showed a difference in how healthcare and other students perceived the value created in the course. Compared to other studies that had used SERVQUAL as the method, it could not be shown that the multidisciplinary environment provided additional value in this case. The study's conclusion emphasized that the pedagogical model should be

further developed and implied that even more student-based research, where students are seen as learning ecosystem stakeholders, could be applied in the future.

**Keywords** Interdisciplinary, experience, value, higher education

**Pages** 106 pages including appendices 20 pages

# CONTENTS

1	INTRODUCTION .....	1
1.1	Purpose and scope of the research.....	4
1.2	The objective of the research .....	5
1.3	Research design.....	5
1.4	Key concepts .....	6
2	CONTEXT.....	7
2.1	co-creation .....	8
2.2	Problem-Based learning.....	10
2.3	Flipped Learning.....	11
2.4	Experimental development.....	13
3	EXPERIENCES .....	15
3.1	Customer journey mapping and service blueprint .....	23
4	DESIGN THINKING.....	26
4.1	Design thinking as a methodology .....	27
4.2	Definitions of value .....	31
5	EFFECTUATION AND LEARNING ECOSYSTEMS .....	36
5.1	Effectuation.....	36
5.2	Learning ecosystems .....	38
6	METHODOLOGY.....	47
6.1	Research philosophy .....	48
6.2	Mixed method research .....	51
6.3	Research process and approach .....	52
6.3.1	Selection of the participants .....	53
6.3.2	Survey .....	53
7	RESEARCH .....	57
7.1	Reliability and Validity.....	58
	Cronbach's Alpha .....	59
7.1.1	Content validity .....	60
7.2	Research findings .....	62
7.2.1	Reliability .....	62
7.2.2	Responsiveness.....	64
7.2.3	Assurance .....	66
7.2.4	Empathy.....	68
7.2.5	Knowledge and Communication .....	70
7.2.6	Tangibles.....	72
7.2.7	Interdisciplinary co-creation environment.....	74
8	CONCLUSION .....	77

REFERENCES..... 81

Appendices

Appendix 1 Research questionnaire

Appendix 2 Deviation of the responses

## 1 INTRODUCTION

Häme University of Applied Sciences (HAMK) concludes of over 20-degree programmes in Bachelor and Master levels. Different disciplines also include full- and part-time students, and there is a variety of pedagogical methods and choices the teachers have to make. One of the main principles of universities of applied sciences in Finland was providing a platform for applied research and establishing connections to local organizations to offer areal effectiveness. The effectiveness was also one of the funding criteria. The students in universities of applied sciences should gain a strong connection with both the regional development and the working life and besides have higher education degree that is professionally orientated (Studyinfinland, n.d). Development of the professional practices of the teacher's education and operational models in UAS is one of the continuous processes behind the development of the UAS framework. The approach has been on how to change teaching from being transmitting information to facilitate learning, changing the current classrooms towards learning environments, and focusing on providing collaborative and networked, practice-based learning (Kunnari, 2019 p. 13).

Recent changes in the environment have been the rise of industry 4.0. Marr (2018) defines industrial digitalization as the fourth revolution of manufacturing. The fourth revolution brings vast amounts of autonomous systems and smart functions to industry and alters work-life ideology. The change has also been noted in higher education—smart technologies (Kunnari, 2019 p. 12). Heidi Ahokallio-Leppälä (2016, p.12) sees the changes as a tool that will, when correctly managed in higher education organizations, help renew working life and provide more competent experts to business areas that are frequently in change. Design Factories operate on the brink of the change, as they are highly involved in cooperation with both companies and cities. Having the change as a driver was chosen as a tool to developed studies in 2014 when HAMK reformed the studies to larger modules, where competency-based operations were set as a target. (Kunnari, Jussila, Tuomela & Raitanen, 2019).

Design Factory studies of Aalto University use experimental experimenting and iterative action cycle to create co-creative environments. The learning is allowed to happen when it is due. There is no certainty to process in the Aalto Design Factory model, but a supporting structure that is created around connecting different stakeholders, allowing empowering to happen, embracing the uncertainty, and acting based on experiments (Björklund, Laakso, Kirjavainen & Ekman, 2017. p.30-31). HAMK Design Factory has opted to take on a pedagogical model called co-creation pedagogy. Co-creation pedagogy emphasizes the learning to be based on constructing collaborative knowledge contrary to individual knowledge



building. In co-creation, the students are set to solve challenges and tasks meaningful to them and meet the changing world's requirements (Kunnari et al., 2019).

The environment where co-creation is created is where uncertainty can flourish, and different types of actors can be bound together. Service Design is one tool that can be used as an advantage in fields where complexity and interdisciplinary operations take place. Service design as a method might be challenging for students and teachers to understand, as it is not tangible at the source. Instead, the service design needs to turn into something real with different tangible tools to make it understandable. (Moritz, 2005. p. 3-4). Another method widely used in HAMK Design Factory is an entrepreneurial theory effectuation that allows the students to be empowered in uncertainty and meet the challenges regarding the means they possess and networks they have (Sarasvathy, 2001. p. 4-5). Passera (Björklund et al., 2017. p.38-39) describes the knowledge to be either tacit, where it is included in the personal experiences and practices of an organization and hard to be turned into verbal communication or explicit, where the knowledge is easily accessible as it is written in an exact format. The same ideology also goes to the co-creation process, where both students, lecturers, sponsor organizations, and opting to create a joint solution or a prototype. Bridging the gap between the different stakeholders is essential for the environment to turn into an ecosystem, where all the counterparts create additional value through their actions.

Educational ecosystems are also a thing to look at when discussing inclusive operations, design thinking perspective, and empowering, effectual approach for the student's development. Ecosystems are functional entities inside the higher education institutes that vary depending on the problem they are aiming to solve. Using ecosystem thinking in the context of education, it is vital to count the actor-based, living components such as the students' abilities and the materials and equipment and assess the dynamics they offer in the whole. Ecosystems must resolve the solutions on both the why and how questions regarding the problem statement. In the current times, the classroom, communications, and activities also expand to the digital environment, which creates a demand for more complex solutions to be brought to solve problems in creating co-creational learning experiences levels. By using more resources on developing the environments and managing the living actors, the learning environments become such that the learners have the possibility to create meaningful learning experiences, where both intrinsic and extrinsic motivation can be found (Muller & Toutain, 2015, p. 8-9, 11). Schamer (2019) has also mentioned the importance of shifting the learning environments to such, where students are learning by doing in activating environments. The change in the pedagogical model swaps the formerly set student-teacher relationship. It makes the students owners of their own learning, forcing the different operators in fields where there is a vast amount of uncertainty and high demand for both parties' new

communicative skills. Social ecosystems are not a new thing. Moore (1993) already motioned the need for organizations to have coevolution in order for them to be successful in the changing business environments.

Moore (1993) described the ecosystems needed to have cross-industrial operators to reach the viability for managing the uncertain business environments. The ecosystems are also products of their time and situation: ecosystems collapse when the environments meet too radical changes. Key elements for the business ecosystems to survive could be technological advantages, market leadership, innovations, and the skill to direct the change's operations. The aspects of educational ecosystems differentiate from the business ecosystems. Still, the similarity comes from the fact that the elements should be such that they could be identified and built upon when creating an ecosystem process and organizing the operations so that they can be used to form a community.

In the operational model of HAMK's Design Factory, the demand for new solutions is imminent. The students coming to the courses represent a variety of cultures, operating models, and the learned learning styles of individual degree programs. Adding to the total is also the factor that in the future, the learning experiences must be formed in a way that also fits the co-creational activities and courses of the international Design Factory Global Network. The new operating environment approached the co-creation pedagogy. Still, in this thesis, the subject will be further investigated and studied to form a picture of how the pedagogical practices could be enhanced to both take the students into the planning to create more meaningful learning environments and also empower them during their studies so that they would perceive additional value from the courses proved by the HAMK Design Factory.

The entity of University of Applied Sciences level learning is also looked through the scope of interdisciplinarity. Where definition Marilyn Stember approaches the concept of interdisciplinarity (1990) introduced. Interdisciplinarity is integrating methods and knowledge from various disciplines using techniques and approaches that create a cohesive state. The reliability and understandability of different subjects are developed in teaching situations. (Jensenius, 2012).

Differentiating the multidisciplinary approach from interdisciplinary is crucial for the success of the thesis work to be successful. The interdisciplinary approach aims to create overlapping in the different disciplines. The multidisciplinary approach is people from other disciplines working in a group but approaching the matter from their perspectives, not aiming to create new methods to break the boundaries (Jensenius, 2012).

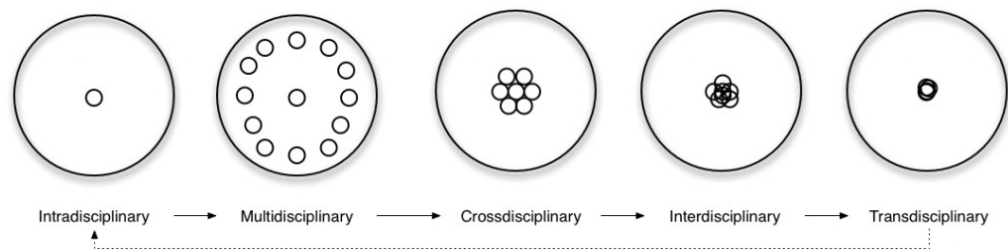


Figure 1. Interdisciplinary Approach (Jensenius, 2012)

Interdisciplinarity in research is also defined as an approach where individuals or teams create new by integrating data and information, different techniques and perspectives, and theories from various disciplines to fundamentally advance understanding or solve problems too broad to be solved in a single discipline. (Szostak. 2015).

The opportunities of building new types of educational ecosystems lie behind larger themes, such as education 4.0, co-creation, and design thinking, but for the students to be able to attach themselves to the educational ecosystem as primary stakeholders. The ecosystem thinking is not something that has yet been thought of in the HAMK Design Factory context. The operational side is also in the development stage, and the operational models are currently investigated. The manifestation of students' values should be identified and the perceived value researched to create the right elements for HAMK's approach. The research is conducted by using the SERVQUAL-method. SERVQUAL method is not made in parallel with design thinking principles, but it captures service elements and is parallel with the elements relating to Design thinking. Elements will be opened up in chapters 3-5.

### 1.1 Purpose and scope of the research

This master's thesis aims to map the learning experience in the interdisciplinary study module of Häme University of Applied Sciences (HAMK) Design Factory. HAMK Design Factory is a platform that creates new interdisciplinary learning modules for all of the students of HAMK. This thesis closes student experience through design thinking, effectuation, service design, and business design methods. Through this study, HAMK Design Factory will learn how students in the modules perceive the added value. The study also allows evaluating the perceived learning experience through different disciplines.

This research population is HAMK Design Factory students who participated in HAMK Design Factory's first larger Product Development Project (PDP) in the 3<sup>rd</sup> module of semester 2019-2020. The focus with the background variables is the student's discipline, their participation in interdisciplinary courses, and the experience they gained from the course. This research does not take into the notion of the pedagogical choices and differences that are applied inside the HAMK Design Factory studies or in

the PDP. Product Development Project is a course that has been adapted to HAMK from Aalto Design Factory, but there are differences in the modules.

## 1.2 The objective of the research

HAMK Design Factory is a part of a global network that strives to achieve co-creation in creating interdisciplinary student experiences. The emphasis on HAMK Design Factory is to create new, multidisciplinary student modules. In the frame of HAMK, Design Factory uses the HAMK cSchool - method, where students, business operators, and teachers act in the joint co-creation methodology. The Design Factory frame in HAMK is new. HAMK Design Factory was established on the 29<sup>th</sup> of August 2019 and has now been forming its pedagogical model, where different methods are being experimented with.

This thesis aims to determine the relevant factors that make HAMK Design Factory studies valuable for students and the factors that make the interdisciplinary approach valuable for students. Other aspects, such as design thinking, effectuation, and service design, are brought to the research because they could further help develop the studies.

The research questions are

Research question 1: How are the current Design Factory studies in HAMK Design Factory perceived?

Research question 2: Are there differences in how students from different disciplines react to HAMK Design Factory studies?

The research's main hypothesis is: Learning is a service process that can be mapped and developed with the tools originated from Design thinking.

## 1.3 Research design

The research methods are explained more in-depth in chapter 6. The research is based on positivism, where the basis is that former human experience is the philosophy the study follows (Dudovskiy, n.d). The researcher operates on the theoretical material, collected data, and the interpretation in an objective manner. The process for this research was established with the theoretical background from literature and further processed to create a theoretical framework out of the findings.

The research questions were based on the established theoretical framework. The research was then conducted so that it would provide information and answers related to the research questions. The theoretical framework also answers the hypothesis that is described later on. The method for the questionnaire was based on SERVQUAL -model.

Services can be researched by using the existing data as a source of development. The research can be conducted by using reviews and ratings as source material. Without mapping the service process, it is challenging to create a holistic understanding of the customer's customer experience. for that reason, it is crucial to collect feedback on the process in question and develop hypotheses or interpretations to explain the customers' emotions. (Kalbach, 2016, p. 108-109). In the higher education learning environment, student feedback is a tool through which the students can give feedback and review the services HAMK's framework provides: the courses such as the Product development project of HAMK Design Factory.

#### 1.4 Key concepts

Effectuation

Design Thinking

Experiences

Learning Ecosystems

## 2 CONTEXT

In HAMK University of Applied Sciences, multiple different methods are used continuously in teaching. Lecturing is done both inside classrooms, but also outside classrooms. This chapter presents some of the methods used in HAMK Design Factory's education currently. It is good to notice that the methods described are not limited to a single discipline. HAMK Design Factory's pedagogical approach and the surrounding learning environments are a combination of multiple pedagogical theories and methods. There are numerous courses with different operational models, which might require the prioritization of specific pedagogical models to operate correctly. HAMK Design Factory uses the following models in the studies to create student-centered activities for the students.

Discipline-based teaching in higher education lacks a take on cross-disciplinary skills and knowledge that has a demand in the working life. The absence of these cross-disciplinary skills may negatively affect the students' success when they have graduated and are entering the working life. Service design techniques, such as service blueprinting, can be of value when higher education turns the scope into the student experience as a tool for creating value-based learning opportunities. (Bitner et al., 2012).

Irma Kunnari, a Principal Lecturer in HAMK Edu, notifies in her doctoral dissertation (2018) that the teachers need to get accustomed to the rapidly changing teaching situations to be continuously more student-centered, learning-focused, and practice-based. The teacher's role is to cultivate the students to achieve their potential. Still, in the process, the teachers must also concentrate on their development and create environments where students and teachers can flourish (Kunnari, 2018, p.12-13). The change in the paradigm also affects learning. As per the new way of teaching, the students are guided into new learning environments. The same notion of the changing of learning has also been called a learner-centered approach. In the learner-centered model, the students are also responsible for their learning. The model also encourages teachers to re-think the way they teach. The learner-centered model requires teachers to design the learning opportunities so that they have both the responsibility and a semi-conducted learning situation inside which their actions and decisions matter. This way, the students also take the initiative and are motivated to learn in a manner suitable for themselves (Weimer, 2013, p. 11-12).

Bitner, Ostrom, and Burkhard (2012) define student experience as a term that concludes the whole higher education experience that has multiple years and institutions affecting the experience; or a particular course or degree program; or the student services that are located in the proximity of the higher education experience. The services surrounding the higher education experience are, for example, the financial aid system, wellness services, or housing services. As seen holistically, the student experience covers all of the interlaced services and the operators offering the services.

Transforming the current situation is inherent with the challenges related to multiple goals, apparent conflicts of incentives, and motives inside the education institute. There is also the complexity of needs the different stakeholders have. The stakeholders are the individual students and their families, funding partners, and other faculties' teachers and staff. The process will fail if the student is not set as the primary beneficiary of the change (Bitner et al., 2012). In the broader scope of co-creation. In practice learning, stakeholders are, even more, local businesses, experts, etc., and that makes the learning experience so diverse.

All the methods described in this chapter aim to give the students meaningful learning tasks that support their development. Where Problem-Based learning and Phenomena-Based learning methods are imbued in the current learning cultures and provide depth to learning tasks, Flipped learning broadens the way learning culture can be sculpted and the altering role of the teacher. Kunnari (2018) looks at the changing role of the teachers in higher education.

Interdisciplinary teams have their advantages when the problems are complex and require knowledge for multiple different subject areas. Various approaches inside the interdisciplinary teams also make it possible to use a broader system to assess the problem. Having people with different skillsets operates when everyone is collectively responsible for the ideation and building up the solution. Interdisciplinary teams combine their skill set to solve something that would be hard to solve using their skillset. Multidisciplinary teams are not as invested in the co-creation but try to approach problems from their perspective, and each member is responsible for the skills and knowledge they bring to help to create the solution (Lewrick, Link & Leifer, 2018, p. 144-145)

## 2.1 co-creation

Co-creation pedagogy allows students to be the leaders of their learning. It turns teachers more towards the learning events' facilitators—all the learning environment stakeholders, whether it be the HAMK Design Factory or cSchool environment. The process relies upon the stakeholder's involvement and presence to reach full potential and realize the potential. The re-structured curricula of HAMK, where the study modules are profiled as competency-based modules, require the pedagogy to have innovative elements to support the student's learning and further improve the interdisciplinary learning to answer complex projects from various partner organizations. One of the created learning environments that rely on the co-creation process is Business Administration degree programmes school. The students are put into a co-creation platform with teachers and various business partners. Each stakeholder has its role in fulfilling for the co-creation process to be successful. The process can also be seen in demand-driven education, where the learners' varying needs and the contacting world interact. Teachers operate as facilitators, holistically approaching

the needs, pedagogical practices, and competencies to support the competence creation and students' responsibility as the operators in the learning process (Kunnari et al., 2019).

Co-creation (Ramaswamy & Gouillart, 2010, p.141-142) is also something that requires the participation of all the key stakeholders for it to operate appropriately, requiring all the participants in the process to understand how the co-creation process proceeds and what are the milestones on it. As courses, co-creation processes provide unique experiences, so they cannot be thoroughly designed but must also be open for adaptation during the process. By creating visual and interactive co-creation platforms, all the stakeholders can gain value from them.

Aalto Design Factory (2018, p. 14-16) understands the meaning of co-creation in learning as the part that makes solving complex possible. In learning environments where complex situations and unclear objectives meet, understanding multiple different knowledge areas is required. Critical thinking and a more holistic understanding of the case, formed by stepping out from the regular discipline limitations, is required. Co-creation also helps different disciplines create a shared experience and language regarding the problem and innovative methods. Co-creation is also a proactive method, where things are planned before operations occur, allowing different scenarios to be tested during the co-creation process.

The co-creation process strives to create value for all the primary stakeholders and serve their interests. In the co-creation process, it is essential to identify the stakeholders involved in the process and understand the interactions and relations. After the identification phase, the process continues to create interaction possibilities for the stakeholders to share their experiences and develop scenarios on improving them. A new co-creation platform for the development can be made. Understanding the value is essential, as stakeholders might not opt to participate in the process if they see the added value for their operations. While running the co-creation process, the operators should create a shared value and experiences for all the stakeholders involved, maintaining the interaction between the stakeholders. Operators that manage the co-creation are also the ones in charge of creating the joint platform for the process, as it is a crucial tool in sharing and developing the co-creation environment (Ramaswamy & Gouillart, 2010, 6-7).

HAMK Design Factory uses the same co-creation framework established and mapped for the HAMK's cSchool module. All the main stakeholders have their roles and responsibilities but are also in relation with the other stakeholders in co-creating new value for everyone. The main stakeholders are teachers, students, and the business partners engaged in the courses (picture 1) (Kunnari et al., 2019).



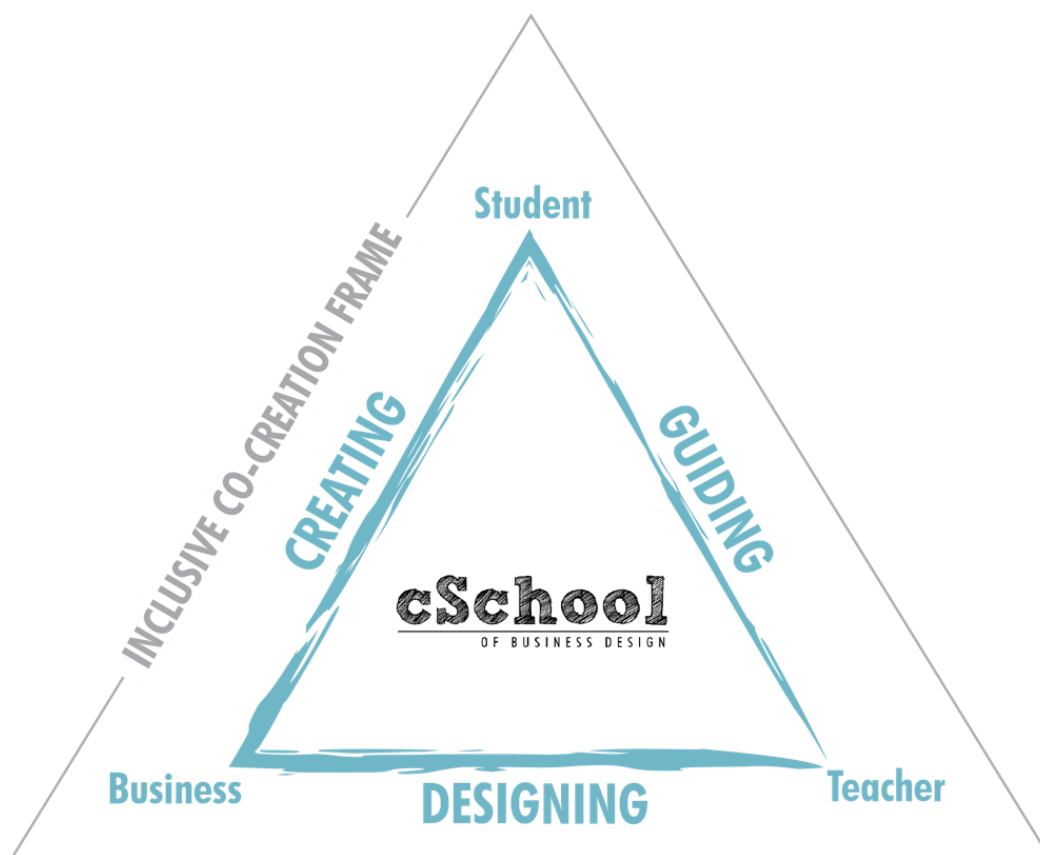


Figure 2. Inclusive Co-creation frame of HAMK cSchool (Kunnari et al., 2019).

## 2.2 Problem-Based learning

Problem-based learning (PBL) is a learning method that uses diverse problems from real life in teaching concepts and principles. PBL can help the students to learn critical thinking skills, abilities to solve problems, and communication.

Problem-based learning can be used widely in group work, and it is also flexible so that almost any subject can be turned to PBL with a small input. PBL problems have some functionalities that make them good. Regarding Duch, Groh, and Allen (2001), good functionalities are:

The problem must motivate students to seek out a deeper understanding of concepts

The problem should require students to make reasoned decisions and defend them

The problem should incorporate the content objectives in such a way as to connect them to previous courses and knowledge

If PBL is used for a group project, the problem needs a level of complexity to ensure that the students must work together to solve it

If used for a multistage, the initial steps of the problem should be open-ended and engaging to draw students into the problem." (Illinois CITL, 2019)

In problem-based learning, students operate with issues and cases that are being brought from the surrounding world. Students perform to find well-constructed and justifiable answers to the problems. They are also encouraged to use their prior knowledge, brainstorm, and think critically to reach a solution. Teachers are aiding the students, but students are the drivers of the process. Problem-based learning can help students create an understanding of classroom concepts on a deeper level. They are helping to connect the course objectives to prior knowledge. Encouraging the students to operate as a group to solve complex issues and engage them in open-ended problem solving and its tasks. (Hun School of Princeton, 2020).

Problem-based learning's background theory implies that the effective acquisition of knowledge derives from the stimulation of their expertise with realistic content. Gaining and elaborating new knowledge is done with peers. Problem-based learning emphasizes the singular student and their abilities to seek, assimilate and create relevant information. The students are given a scenario and an objective that they need to address, but learning is informal and uses to advantage the group working possibilities. Problem-based learning is a challenging, motivating, and enjoyable approach from a student's perspective when appropriately used. Problem-based learning environments can be looked at from the viewpoint of learning results or developing an enhanced learning environment for both students and the faculty (Steiner, Sonntag & Bokonjić, N.D.).

Problem-based learning is based on seven steps (Maurer & Neuhold, 2011):

1. Clarification of terms and concepts
  2. Formulation of the problem statement
  3. Brainstorm
  4. Categorizing and structuring of brainstorm
  5. Formulation of Learning objective
  6. Self-Study
  7. Post-discussion
- + Additionally: Reflection on Learning Process

### 2.3 Flipped Learning

Flipped learning bases on a method where the students act voluntarily and are taught unprompted learning. Flipped learning usually manifests so that the theory is looked at outside of the classroom, and the assignments are done in the classroom. The flipped classroom is a teaching method where the teacher can move away from the lecturing role through different

digital tools. The first publication about the flipped classroom is from 2012 by Jonathan Bergmann and Aron Sams, called *Flip Your Classroom*. The ideology in flipping a classroom can be concentrated into two questions:

1. Why should every student study the same thing at the same time?
2. Should the knowledge of the student be validated before moving to the next subject? (Toivola, Peura & Humaloja, 2017, p. 20-21).

Flipped learning differs from traditional classroom teaching in both the usage of time, activity, and space. Students interact with the course material before a class, having the possibility to allocate their own time and working on the material at their own pace. Having the students familiar with the material frees up space in the classroom to focus on targeted questions and creates a possibility to assimilate the information gathered immediately. Flipped learning thus operates as a twofold learning design tool; what and how users learn. Using flipped learning, the teams' meetings can be spent directly accessing the critical aspects of the learning tasks and possible problems at hand. The teacher's role is to guide and assist the students during the meetings. Still, teachers must also plan the course and activities well beforehand to let the students have a harmonious flow of tasks, information, and progress from the basic level tasks to more advanced ones. Flipped learning also nurtures self-regulation as the students are responsible for approaching each of the themes and the effort they put into their own learning process. As the students are the drivers of their learning and the pace and level they progress, the teachers can be set to gatekeepers or coaches who activate them and adapt to the various learning styles (Talbert & Robert, 2017, p.8-10).

Flipped Learning is based on the ideology that a student must themselves be able to create an atmosphere on which they want to learn. The Finnish education system is advanced, and there are multiple methods designed to support the improvement of the learning culture. On the other hand, the education system has been criticized for the lack of change and the speed that has happened inside the system. Change can be achieved only through a new, collectively accepted new way to create a learning culture. Feedback and assessment are in a key role in flipped learning. Feedback can be given to five different sectors; fundamental knowledge and understanding, practical application, integration between people, ideas and context, human dimensions like learning about oneself, caring feelings, interests, and values. And finally, learning not to know (Toivola, Peura & Humaloja, 2017, p. 12-17).

When mentioning space, activity, and time, the concepts need to be opened up to be understandable in the idea of Flipped learning. Space refers to the individual and group areas in the learning design and the emotional, physical, intellectual, and psychological context connected to the student during the process. Space is divided into individual and group

spaces. In individual space, the student is operating alone and is not in contact with other students. In contrast, in the group space, the student concerns other students either physically or in online sessions. Areas are not limited by group work, as the students might interact with each other, for instance, in large lectures, where the topic is covered, but none or a low amount of group working is conducted. When moving onto the digital learning atmosphere, the concept of time might also vary in the studies as online courses might not be bound to specific times or spaces. Individual students thus dictate how they spend their time. The concept of group space is also different in fully online courses. For instance, situations, where a student is writing a blog to a group platform are considered to be concluded into the group space. The last concept, activity, is divided into direct instruction and active learning. Direct instruction meaning the situations where a teacher is directly in contact with the student, including lectures, pre-recorded video sessions, or group mentoring. On the other hand, active learning represents the instructional methods that promote students' learning processes in the designed learning spaces (Talbert & Robert, 2017, p. 10-12).

#### 2.4 Experimental development

Experimental development can be defined as acquiring, shaping, combining, and using the existing business or other relevant information and skills to create something new. Experimental development might include planning, designing concepts, or prototyping new services or services. Prototyping could also go into the phase where the validated prototypes of services or products are already taken to a commercial developmental state (Ideare, (n.d)).

Experimental development derives from the idea that certain subjects cannot be thoroughly planned before experimenting on them. Experimental development operates well in situations where the final resolution is unclear. The project's environment is involved, or there is no appropriate amount of information regarding the subject at the beginning of the project. The more a development project has moving or uncertain elements, such as considering customer behavior, the more benefits experimental development has. Experimental development also fits into circumstances where the relevant information must be created during the project. In projects, the experimental development can be seen as a beneficiary approach when the tasks have open objectives. The methods for reaching the result are unclear. There is a constant demand for creating meaningful information regarding the project; the project process is iterative. It allows pivotal movements inside it, and the project framework is not thoroughly planned, allowing decisions to be made as situations arise. Experimental development is continuously and purposefully created learning, where the direction is found during the learning process (Hassi, Maila & Paju, 2015).

Knapp, Zeratsky, and Kowitz (2016) Planned an experimental development method called Sprint during their time at Google Ventures. Like the product development project, Sprint aims to solve unclear situations with an experimental development process that requires the problem to be stated and clarified, a solution to be framed and developed to solve the problem, a prototype is built, and finally, a test is conducted. In the Sprint development model, all the development work is done during a single week, which is reserved for all the participants. In contrast, PDP and HAMK Design Factory courses usually take a more extended period to be booked as they have other calendar activities. The customers involved could also have issues taking a whole intensive week out of their ordinary workload.

### 3 EXPERIENCES

In this thesis, the students are seen as customers, and HAMK is seen as a service provider. The interaction between the counterparts is interpreted through the background of customer experience. Students act as customers in the scenario as they can mostly freely choose the PDP course as a part of their studies. With a different operational model, teachers as arbiters in the process, the approach would see teachers as the customers and students as users. This interpretation requires us to take a notion to the values also. Values, per Harland and Pickering (2010, p. 9-10, 42), reflect how we as individuals perceive the surrounding environment. Valuating situations thus differ much and are also connected to the situation where the individuals are. When operating with multidisciplinary and multicultural groups, the values should be in parallel with the course's operations, and they should also be visible in the teachers' functions.

Bringing the concepts of values and experiences into the course context makes it imminent that lecturing should be thought of from the perspectives of what the teachers would like to teach and what and how the students should learn. The learners have little knowledge on how various courses are taught and make only seldomly their study choices based on the methodology and their perception of how they would like to learn (Harland & Pickering, 2010, p. 43-44). HAMK Design Factory has manifested its values connected to the interdisciplinary projects, but the operational model is still being built up as it is a new unit inside HAMK. The situation means the students make their choices on joining the course based on what they might find the suitable addition to their own studies but are limited on the knowledge of how various teachers teach in the HAMK Design Factory. Another approach is when students are forced to join the studies as a part of their degree programmes courses. The style they prefer to learn might not be compliant with the teaching methods and manners in which the teaching is organized in HAMK Design Factory.

Designing experiences has been one of the competitive methods in customer-orientated organizations. Differentiating the customer experience should be accompanied by also collecting data that is relevant regarding the change. When trying to understand the customer lifecycle and improve the customer experience collectively, data can be harnessed by firstly identifying the channels and then choosing how and when to collect the necessary data. The customer journey can be improved and investigated with the data, but it should be decided which crucial touchpoints need to be measured (Lewrick, Link & Leifer, 2018. p. 292-293).

Customer experience helps to create an understanding of the service process and the environment where a service is being produced. The elements on which a service process mapping can be, for instance, physical, behavioral, cognitive, emotional, needs, challenges, context,

culture, events, touchpoints, offering processes, challenges, operations, metrics, evaluation, opportunities, goals, or strategy. All the described elements have deeper levels that should be measured when understanding the process being mapped. (Kalbach, 2016, p. 24). The elements

Customer experience is a psychological construct that is being created subjectively and holistically from the customer and service provider's interactions. The process might include different levels of customer involvement. The actions provide distinct responses that initiate the customer experience related to sensory/physical, emotional/affective, cognitive, pragmatic, lifestyle, and relational. The interactions and customer interactions accumulate the knowledge, value, and perception of the quality of the service in different phases of the service process. Customer experience also affects if a customer is willing to consume a similar service multiple times. (Nasution, Sembada, Miliani, Dwi Resti & Ambar Prawono, 2014, p.6).

User experience encompasses the touchpoints, etc. The human-object interactions are created during the service process between the service provider and the user. User experience metrics are widely used in describing the information technology sector, where the relationships can be turned into researchable data. Turning services into data will guide the service providers in measuring and designing services that meet the customers' requirements and preferences. User experience design can be derived into three different questions: Does our service give the user added value, does our user find our service easy to navigate, and does our user enjoy using our service. Creating a service process requires the designers to understand the different elements inside the service, research and analyze, and spread the findings to other stakeholders in the service creation process (Interaction Design Foundation. 2020, p. 3-5).

Customer experience can be assembled from various elements, but the core is how a customer perceives its brand. Controlling customer experience and the subjects bound to it is one thing, but the customer experience is only measurable from the customer's perspective. As there are multiple elements, a company might be viable in one sector but lacking something in other sectors. All the elements of a customer-related process play a part in how a customer perceives the company and its services. Customer experience can be managed by controlling the customer journey and creating service processes where the quality of products and services, besides the facilities and personnel, are on par with the customer experience a company aims to create. (Morgan, 2017).

Grönroos (2003) describes customer experience differently through the scope of the services that are being built. The experience is always a perception of numerous elements, dimensions, and interactions that create a service. The dimensions are technical and functional. The technological dimension describes what result the service provides, and

the functional dimension looks into how providing a service has been operated. (Grönroos, 2003, p. 100).

Customer experience can and should be analyzed for a service provider to improve its operations. The improvements done to improve the service can be looked into through measurements, and new goals and targets for the future can be created. Measuring also clears the most critical touchpoints in the current service and thus helps remove unnecessary operations. The metrics relating to customer experience can be roughly divided into five categories.

#### Customer satisfaction

Customer satisfaction is done through survey questions regarding the satisfaction or implicit metrics, for example, reviews of products, mystery shopping, or delivery statistics.

#### Customer loyalty, retention, churn

Customer loyalty, retention, and churn metrics are retrospective, for example, the likelihood of customers continuing their customership with the service provider, usage of channels, average orders, or return rates.

#### Advocacy, reputation, brand

Determining what level the customers would be willing to endorse or recommend either the service provider or product/ service.

#### Quality, operations

Quality and operations are hard to measure and be given a set of metrics. The reason a product or service does not meet customer criteria could be based on multiple actors and actions.

#### Employee engagement

Services are provided through the actions of the employees. Measuring and focusing on employee engagement in customer experience delivery was ranked higher by 86 % of the organizations that participated in Gartner's research on customer experience challenges (Moore, 2019).

The experience a customer receives from a service is the core of any service. The experience breaches through the company's whole offering from marketing to the quality of the service, the quantities included in the service, ease of use, and reliability. Customer experience can be divided into three levels: actions, feelings, and meanings. The action level notifies the level on which the service responds to the customer's needs, smoothness of the processes, and accessibility. The emotional level consists of the immediate emotions and personal experiences the customer has regarding the service. These emotions can be as easiness, likeability, mood, or the ability to touch senses. The level regarding meaningfulness feels the suggestive level – cultural codes, personal uniqueness of the experience, and the service's relation to its current lifestyle o (Tuulaniemi, 2013, p. 74-75).



Experiences can also be created and mapped. Garrett (2009) Describes the experiences as emotional, personal, and ephemeral, as the perception of services is associated with certain moments in time. The decisions that result in users' positive experiences are abstract considerations that can either be conscious and intended or unplanned consequences that appear. The considerations can be layered and visualized as planes that are layered. The layers start from the abstract level and move toward concrete considerations towards the top layer (Picture 1) (Lockwood, 2009, p. 252).

Starting from the most concrete plane, surface, the sensory elements of the user experience are touched. These elements are auditory, visual, and tactile stimulation. The surface plane is connected to the skeleton plane, in which the selection and arrangements are brought through the design elements aimed for effectiveness. Underneath the skeleton plane is the structure plane that describes how the experience process and touchpoints are organized. Besides, the structure plane addresses the relationships of the informational and functional service elements. In-the Scope plane, the informative and functional elements are planned and selected to fit the plan. At the strategy level, the service frame, market placement, and business objective are clarified to meet each other. (Lockwood, 2009, p. 252-253).

The skeleton with the different planes also combines a vast amount of design elements in it. In the Surface plane, the sensory design is imminent, whereas the skeleton plane combines interface, navigation, and information design. The structure plane is a combination of interaction design and information architecture.

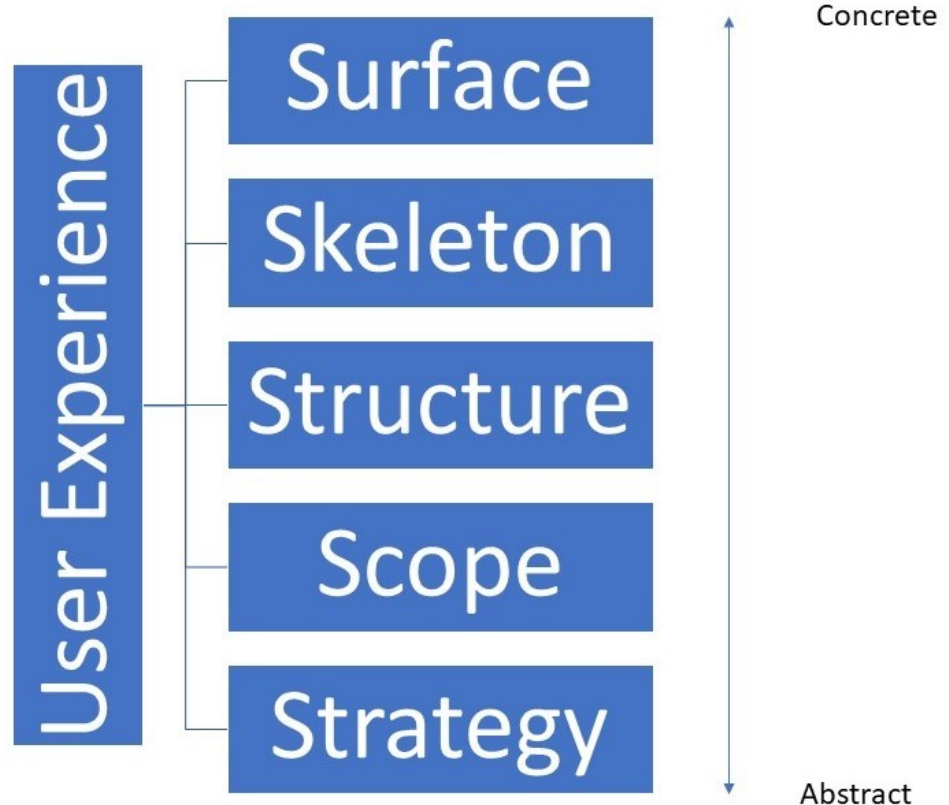


Figure 3. Levels of user experience based on Garrett 2009 (Lockwood, 2009, p. 252)

Customers in the customer experience process think about the value it creates to them, not the channels through which the value and touchpoints are operated. Customer experience process differences regarding the solutions a service provider is offering are: Does the service have a texture, recognizable look, or aesthetic. With materials with a specific surface, the decision-making process aims to fulfill an individual feel about the product. Without customer segmentation and research of the customer's current needs and lifestyles, the customer experience might be hindered. Regarding products and services, the central theme is consistency, and inconsistency is one of the main problems in delivering a sound customer experience (Cook, 2014, p.262-266).

Gartner (2017) has conducted research on where they questioned the main issues regarding customer experience strategies. The challenges were concentrated on the case that the persons whose responsibility is to operate the customer experience through an organization are simultaneously slowing the implementation process. Many participants expect fast results in the process and pressure to drive the customer experience process through and not concentrating on the long-term results. Also, the clarity on what is customer experience might not be

there. If there is nothing to benchmark or give metrics to, the customer experience is a vague task to fulfill (Panetta, 2017).

Oracle conducted research on which they got approximately 350 answers from the customer experience leaders. From these results, the main issues with customer experience strategies were framed. One of the significant challenges was that the data was not connected with all the necessary data to understand the customers and needs. Operating on creating an omnichannel experience was also perceived as a challenge. Driving with the accessibility and controlling the purchase process through digital and traditional channels was seen as a problem. Building unique customer journeys and making personalized experiences, and adapting the process to be tailored to different needs was challenging. In addition to the customer journey problems and finding reliable data, Finding the correct analysis tools and metrics to measure the actions and touchpoints needs development. Lastly, maintaining and investing the level on which customer experience is looked at inside organizations was a challenge amongst the participants. The feeling that companies were lagged on the investments done to improve the customer experience (Ollila, 2018).

The issue of measuring experiences can be derived from the factor of expectations. Users tend to have expectations through which they have assumptions and anticipation of how a specific experience should be. User experiences are defined as responses and perceptions of a person regarding the anticipated use of a service or product. When the depth of feelings is also added to the whole, the user experiences can be more holistically thought of (Kraft, 2012, p. 1-3).

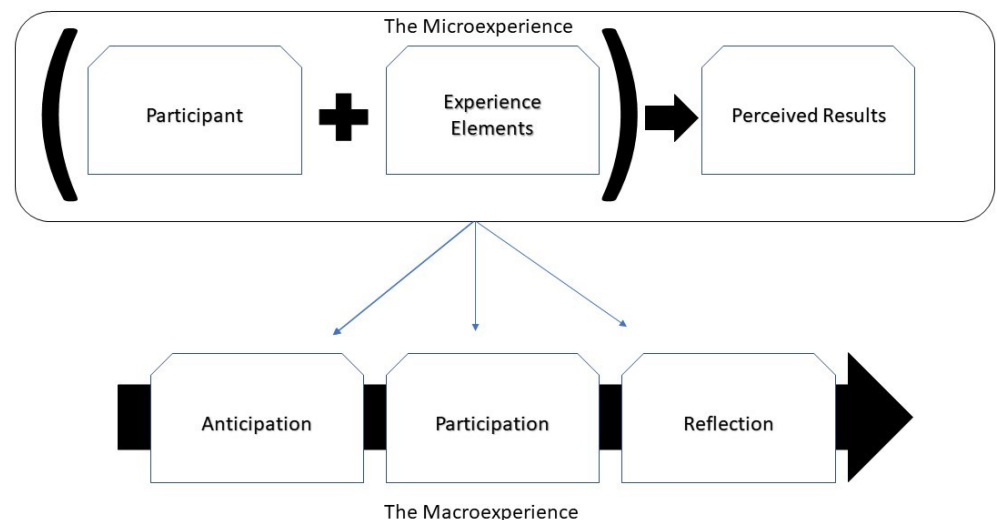


Figure 4. Experience environment (Based on Rossman & Duerden, 2019, p. 10)

Experiences are difficult to define, as they consist of many different elements and have been given various meanings in literature. Rossman and Duerden (2019, p. 8-11) describe experiences both to be related to the context in which the experiences are imminent and the bits of knowledge and skills being brought from cumulative exposure, as defined in the English grammar. Experiences can also be based on personal accomplishments, where the one who is experiencing is doing some activities and thus being an active operation. Experiences in this sense are being created in conscious ongoing interactions. The prerequisite for the experiments is that one must be aware of the surroundings and participating in or contributing to the ongoing activities (picture x). Grönroos & Tillman (2015) have approached experiences through the perception of service quality – the organizational side of creating experiences for customers; They have the notion that services are mainly brought up from two service qualities and that services, such as experiences, are hard to be made to fit everyone as the customers subjectively feel them. Service dimensions are the technical dimension regarding what the customer has received and how the process has been produced and delivered to the customer. From these two main dimensions arises the total quality of service that the customer perceives. Customers highly value what they get from the interaction with the service provider, and usually, companies also assess the result when looking at the quality they provide. Technical quality can also be measured, but companies should also assess the production process of the services, touchpoints, service elements, and customer jobs to be done when looking at the whole quality. The production process, also called the operational process quality, is more challenging to measure than the technical quality. There are multiple variables and assumptions from the customers on how the process should have gone (Grönroos & Tillman, 2015). In the HAMK Design Factory environment, regarding courses such as the PDP, the technical result is the grade a student will gain from the course. On the other hand, the production process has a variable servicescape depending on the students' choices during the course and their chosen project. That is why it is essential to use a method such as SERVQUAL that measures the whole service experience and the elements inside the service process.

The issues in SERVQUAL, when concentrating only on the service element side of the learning environment, come to addressing how a singular student or a student group has developed their knowledge and learned during a course. Lack of measuring the development of learning capability is an approach that must also be noted when looking at the succession of the co-creation environment, as learning is the key objective HAMK Design Factory provides. For this study, the SERVQUAL was modified with elements that were essential building blocks in the book *Passion-Based co-creation* by Aalto Design Factory (Ekman, 2017).

One term to describe experiences is multiphase. Experiences have the anticipation phase, participation phase, and reflection phase. In each of those phases, multiple operations and interactions occur between the

experiencer and the surrounding elements. The elements are similar to Kalbach's (2018, p.28) ideology, where the experiences are bound to the static, interactive, and human dimensions; interactions, touchpoints, and static elements that do not allow interaction. Experiences can be seen as interconnected to the services they are produced from. Services consist mainly of 3 qualities: processes that have operations inside them, being produced and consumed at least partly simultaneously, and being co-produced by the customers. When looking into services, such as the study courses, one should acknowledge the importance of the maintained service process when looking into the total quality of a single service (Grönroos & Tillman, 2015).

Reason, Flu & Løvlie (2015, p. 16-17) Have split the service production process into three sections that define the services. Movement is looking at the service through the service journey process. Movement can also be seen as a more comprehensive measuring tool and measure all the customers moving into a company's service processes. Movement provides an understanding of the quality of the services and customers' flow, pinpointing the possible touchpoints where the service is not performing as wanted. The second service section diverges the different service elements and functions to deeply understand how the services are built to function and how they could be developed further. The third section is behavior, which connects movement into the structure and maps how customers move inside the services and between the service structure elements. The behavior section can then also be used to understand how the personnel operates inside the service production process.

Experiences are unique, but there have been some studies in which the criteria of experiences have been further researched. One way to categorize experience is through the variety of results they produce. The results can be attached to positive emotions, engagement, relationships, meaning, and accomplishment. Even though the criteria are somewhat vague and general, it is advisable to build experiences that meet at least some of the criteria to bring out positively perceived experiences. Great experiences accomplish positive emotions, engaging attention, developing and strengthening relationships, providing meaning, promoting competence, or grant autonomy. Some experiences might meet all the elements listed. Still, those experiences might also be resource-demanding for the organizers also, so every experience does not have to be made to meet all the criteria. Always, they can just focus on one of the elements. The experiences could be seen as holistic, personal, and situational – an experience is also the product of the surrounding, possibly even uncontrollable environment (Kalbach, 2018, p. 20; Rossman & Duerden, 2019, p. 21-22). The issue with setting

### 3.1 Customer journey mapping and service blueprint

The customer journey can be defined as a roadmap that details how the customers become aware of the service providers' service and interactions during the time of buying and using the service and interactions. The customer journey can be described as the whole experience customers have when they are in business with the service provider. In the customer journey, the full experience that a customer has is documented. Customer journey is based on the touchpoints during the customer life cycle (Sorman, 2019).

A customer journey map is a diagram of the touchpoints or steps that the customers have to go through when they engage with the service provider. For example, the steps can be using the product, searching for information online from the Internet, or gaining the retail store outcome. The customer journey maps can also cover a customer's whole life cycle. The journey is drawn as a customer lifecycle circle, where a customer is leaving the cycle when changing the product or service to another supplier. Customer journeys are a tool that aims to create ease for the user by simplifying and visualizing the process from the customer's point-of-view (Richardson, 2010).

The customer journey includes different types of actions, motivations, questions, and barriers that the customers are going through during the interaction with a service provider. The aspects must be met from the provider's side, and they should be researched as in-depth as possible to avoid looking over the details that lie in the unique journeys. The journeys are flexible to change, as should be the organizational view on finding the suitable routes to map the journeys (Richardson, 2010).

The customer journey can also be seen as a five-step process that starts with building the business case, where the customer journey is mapped and opened so that the results will be measurable. When the mapping has been done, the used channels must be identified and look at which channels control the service provider and which are not. From the channels, data can be created, and the effectiveness of each channel can be measured. After identifying the data and channels, the operating team must look at how to track the customers' movements in each channel. When the metrics and analytics have been set, the data needs to be turned into information that will support the business decisions (Rajack, 2017).

Looked into holistically, the aim of the customer journey and customer journey mapping is to gain data on how the users are using the services, improve the experience the customers achieve when using a service, improve the quality of the customer experience, and creating a stable operating process that allows the service provider to develop and maintain unique customer journeys while simultaneously collecting relevant data about the customers. When considering the operations a company or a service provider must do to meet the customer's emotions, expectations,

and activities. The customer journey maps can diverge into service blueprints, where the operations are matched with the prescribed path a customer moves. An example of a grocery store experience made by the service blueprint analogy can be seen in figure 4. The aspect of the customer journey and their path is enriched with the organizational activities. There could also be a row for future development in the experience as there is in this canvas.

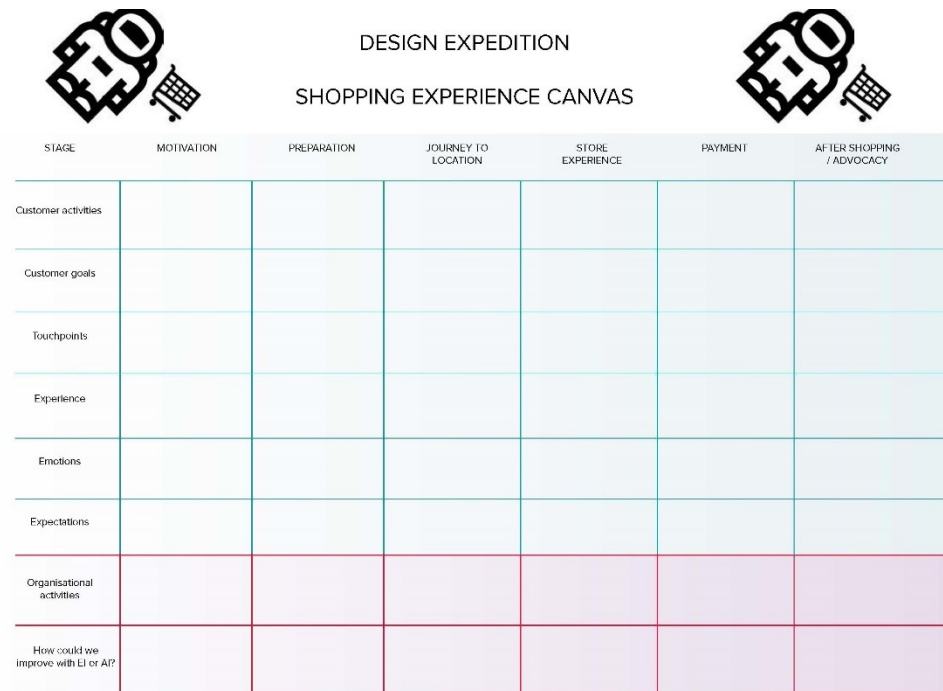


Figure 5. Service blueprint of a grocery store experience

Touchpoints are the segments inside the customer journey. Each of the touchpoints can consist of many interactions between the customer and the service provider. Touchpoints can be, for example, people, environments, objects, and procedures. The variety of touchpoints inside the customer experience creates a challenge in segmenting different activities into touchpoints. Both customers and the service provider employees are amongst the elements that make value in the customer journey by doing actions that have been described in the service blueprint. In a service environment, the service provider builds task that supports the customer in reaching their goal. Services can be made to be created in virtual, digital, or physical environments. Different environments have a fundamental difference in creating experiences, as they both guide the customers' behavior and affect the mood. In virtual environments, it is crucial to concentrate on the usability of the user interphase. (Tuulaniemi, 2013, p. 79-82).

Learning Space Toolkit (2019) describes a service blueprint as an informative framework that specifies employees' actions, physical evidence, and the mandatory infrastructure to produce the service over various channels to the customer. Service blueprint must contain the information of the front-end actions and back-end actions. Each core service should have a blueprint created for them (Learning Space Toolkit 2019).

Service Blueprint gives insight into how the processes and interactions between all the service elements are bound together and connects them with the customer journey's touchpoints. With a service blueprint, the service provider can also associate the external processes to the customer journey. The service blueprint can be built on four different levels:

- Activity (Customers actions)
  - Front Office (Touchpoints & interactions)
  - Back Stage (Internal process)
  - Support (External process [Partners])
- (Sarvas, Nevanlinna & Pesonen, 2017, p.29).

Service blueprints map the customer journey's needs and pain points and add to the personnel and systems in the front and backstage. While the focus is concentrated on the customer journey, the whole process is under evaluation to create the customer's best possible experiences. While the services are created for the customers and users, it is evident that companies must also take a glimpse of their processes and identify if the processes and tools meet the requirements of the customer experience or if there are some needs to add or reduce some elements to be simultaneously effective in creating experiences but also influential on the side of resource allocation. (Dixon, 2018).

Service blueprint gives guidance on how to understand the full service and the processes as visual depiction. By service blueprint, the service system can be simplified. With the simplification and task orientation, managers can learn how the service can be developed towards future challenges. The service blueprint also helps the managers by giving a graphical aspect of how the service system operates and how it can be improved. From a strategical viewpoint, the service blueprint gives organizations insight into allocating resources, evaluating performance, and integrating essential functions. Service blueprinting can also be seen as a viable method for identifying how to improve things where organizations do not operate on full efficiency. With the tool, the inter-organizational interfaces between departments can also be looked at, and a concrete basis for structural efficiency and sourcing can be created. (Accountlearning, 2019).



## 4 DESIGN THINKING

The design thinking process creates an understanding of the user and defines the problems related user's needs. Through empathy, the process gives an understanding of different alternative solutions and a base to find the causes behind the symptoms that create the problems. Design thinking can also be used in creating definitions of problems that have unknown factors in them or are ill-defined. The process has phases where the information is gathered, but experiments and tests are also crucial for experimenting with the hypothesis the service designers have created in the process. (Interaction Design Foundation. 2020a, p. 9-10).

This thesis aims to find the elements that create value in higher education teaching in Häme University of Applied Sciences, thus creating the platform for designing learning experiences. The methods used for the research of the thesis are qualitative and quantitative. The research is conducted mainly by a questionnaire sent to the students and the teachers, and other teaching-related staff of HAMK. The value chart's main building blocks are built up from the questionnaire, and a value chart is built. Design thinking is a human-centered method, where the development is done for the customer.

Design thinking is combining two different thinking approaches, namely inductive and deductive, and as a result, translate them to abductive thinking. Inductive thinking starts from individual cases that are based on generalizing. Deductive thinking starts from models that are then applied in individual cases. Abductive thinking is iterating and combining both approaches. Design thinking is one element in business design. As a concept, Business Design can be described to be an operational and viable activity that draws from various design methodologies, using the mindset and business development measurements to approach complex challenges in a business environment (Faljic, 2019, p. 4-5).

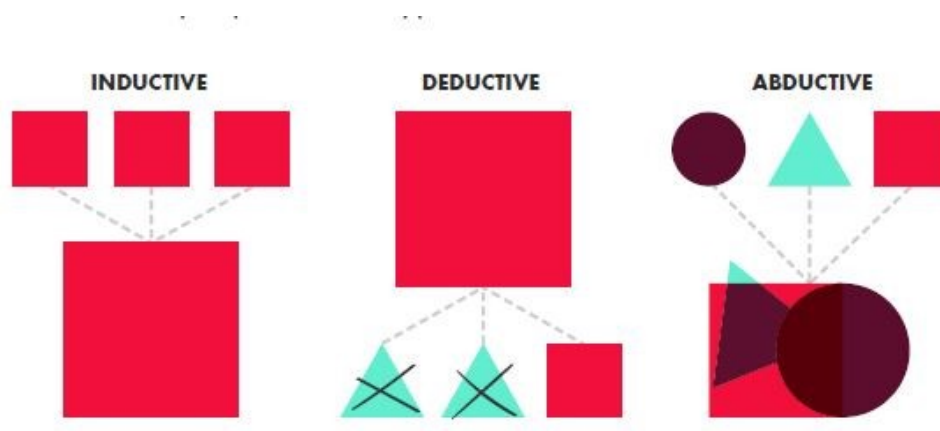


Figure 6. Design thinking approach as an abductive methodology (Faljic, 2019, p. 7)

In the thesis, the educational system and, more so, the teaching is looked like a platform where an educational ecosystem operates. Educational ecosystems have varied operators, and in the thesis, those operators are identified.

#### 4.1 Design thinking as a methodology

One of the methods of emphasizing the usage of design inside an organization is, for instance, the Design Ladder -model created by Danish Design Centre (2001). The model emphasizes the design through different variations it has in different organizations. The organizations are split into four steps regarding how they use design in their product development, planning, and general operations. The first step is non-design, where an organization uses design as an invisible part of their product or service development. There are no designers involved in the design, but rather the solution is based on the ideas of aesthetic and functionality opinions of the development process participants. Users' perspective does not have a role in the development. In the second step, the organizations use design as a form-giving approach, e.g., design as a part of producing the last phase of items and services where it is not embedded in the graphical design or product development. Professional designers seldomly create the design, but often the designer is from another discipline. The third step sees design as a process, where it is the result of planning and used to create new solutions based on the user needs. Multidisciplinary teams are involved in the design process, whether it is related to products or services. Organizations that are in the fourth step have been designed as a part of their strategy. Designers operate with the management level to recreate the business model as a whole or partially. Design is focused on being connected with the organization's vision and the business goals and objectives that have been set for the future (Danish Design Centre, 2015).

Moritz (2005) has created another model to describe the levels of design as circles. The model has been created based on the model from the Spirit of Creation. The circular model splits the design into four circles. The inner-circle sees design as a tool to create qualities, spaces, or elements of products. The meaning of design is to build elements a customer can easily purchase. Designers take part in the creation of visual appearance. In the second circle, the design is used to create an understanding of the customer experience. Design is a mechanism that helps build customer journeys and optimize the services to meet the customer's expectations. Design is embedded in the processes as a function that will create additional value. Designers operate in cooperation with other operators in the service design process. The third circle sees design as a tool to maintain and create processes and connect operations. Designers take part in the service development with interdisciplinary teams. In the most outer circle, the design is strongly imbued in the practices and philosophies,

instructions. The objects that are being designed are intangible objects connected to multiple operations and ecosystems, where design is in contact with multiple different stakeholders.

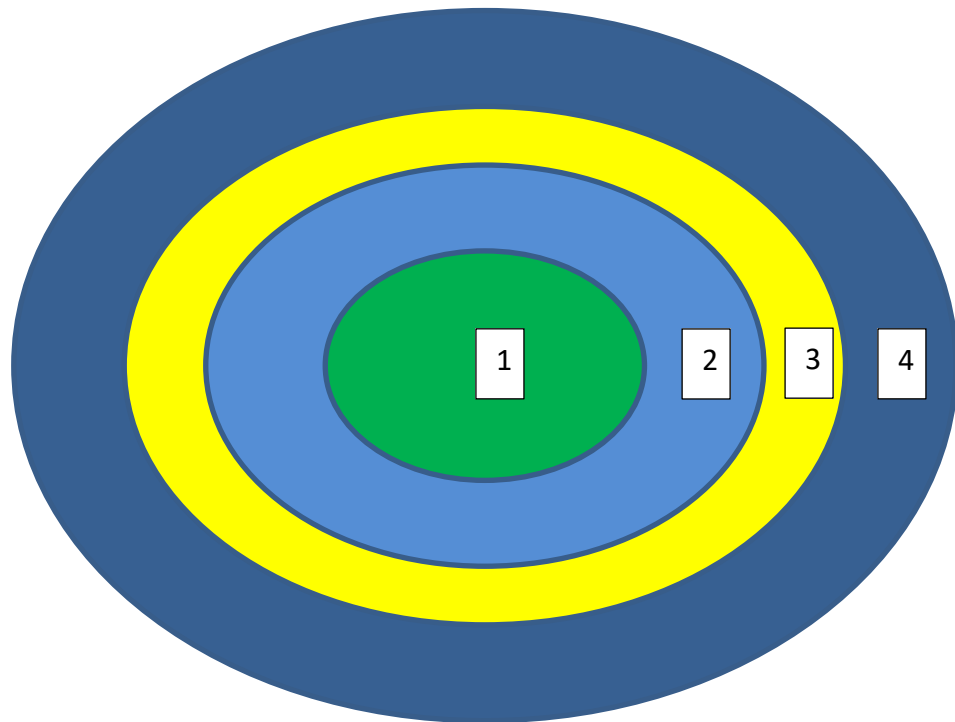


Figure 7. Levels of Design (Moritz, 2006, p. 33)

Levels and the definition

Design of features (product, service, or space)

Design of client experience

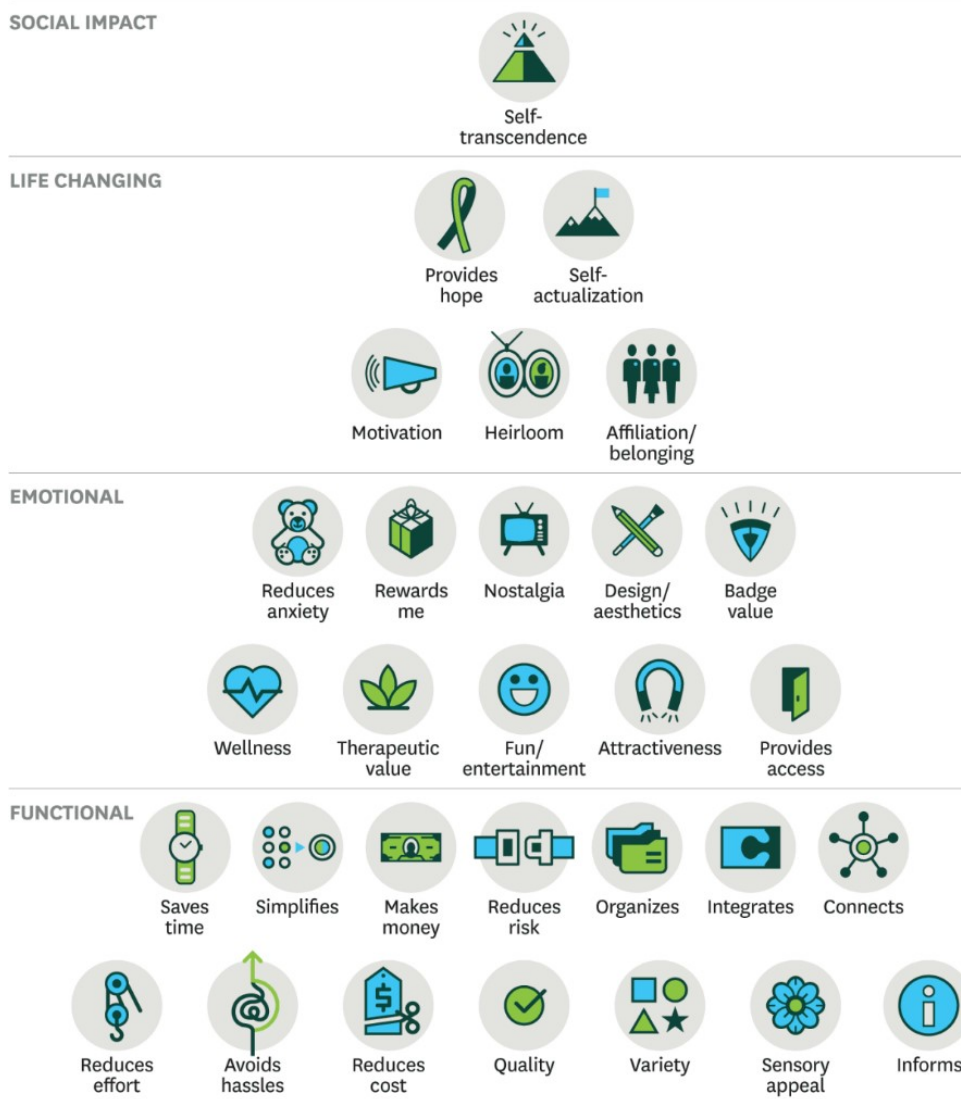
Design of processes and systems

Design of strategy, philosophy, policy, and ideology

(Moritz, 2006, p. 33)

## The Elements of Value Pyramid

Products and services deliver fundamental elements of value that address four kinds of needs: functional, emotional, life changing, and social impact. In general, the more elements provided, the greater customers' loyalty and the higher the company's sustained revenue growth.



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Figure 8. Elements of Value (Almquist, 2016)

One of the platforms build around consumer value perceptions of which different elements create is The Elements of Value Pyramid (Figure 9), visualized by Eric Almquist (Harvard Business Review, 2016) based on analysis from Bain & Company Inc (2015). The value pyramid is based on four types of value categories, where the emotional value is increased when going from the lower levels towards the top.

- Functional
- Emotional
- Life-Changing
- Social Impact

The value pyramid consists of 30 different elements that create value. Not all elements must be represented in every case, but a mix of different value elements creates the unique value mixes that the consumers attach to.

Design thinking is a process that can be used when designing products and services. Design thinking is not limited to any industry or expertise, as the tools are made to function in different circumstances. Design thinking aims to search for a need a designated customer has and operate with different sets of tools to solve the problem most efficiently and accurately to match the need. There are three aspects in design thinking: the method takes account of people, technology, and business success requirements (Turnali K., 2013). When diverging design thinking into the scope of education, business success must be examined. Creating attractive solutions that operate with maintainable resources and answer for the governing officials' requirements needs to be considered. The business success of educational institutes, such as HAMK, operates on given resources based on the results they gain from educational processes' effectiveness. Creating a student-centered solution must be done with the limitations a school has in order to gain traction in the operating system.

Design thinking is a process that can be seen to be divided into five different stages. The stages are based on the Hasso-Plattner Institute of Design approach at Stanford (Dam & Siang, 2019.) HAMK cSchool and HAMK Design Factory have used the Hasso-Plattners' model to create HAMK's descriptive method on how the Design Thinking process could be suited for the usage of student projects. In addition to the five steps that the earlier model had, HAMK has added the Prepare, Assess and Repeat -steps to structure the design thinking process to fit more flexibly into the project work.

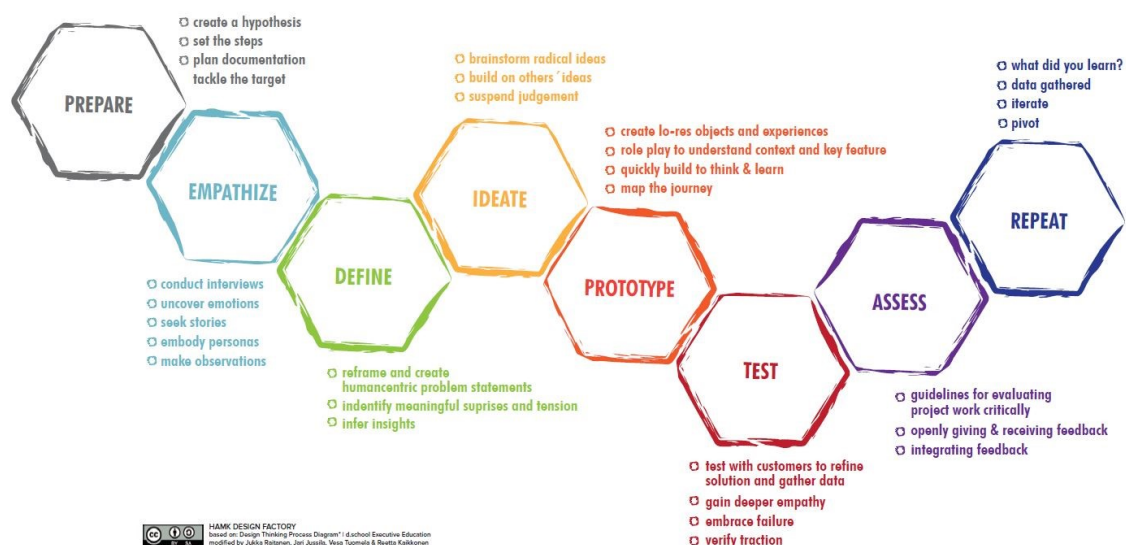


Figure 9. Design Thinking process of HAMK Design Factory (Kunnari et al., 2019)

- Empathize  
Design thinking is based on empathy and understanding the needs and problems of the customers. Empathize aims to understand why people do things, the emotional and physical needs, and what things are meaningful for the customers.
- Define  
In the Define stage, the process focuses on creating clarity around the need and creating a clear context on who the user is and their situation. The problem statement is needed to create a meaningful solution.
- Ideate  
In the ideation stage, the solution is searched through various methods of ideation. During this stage, the need and problems are approached from different perspectives, and ideas are generated to find verifiable solutions to solve the problem.
- Prototype  
Prototyping starts with diverging the ideas into a few. The ideas are narrowed down to meet the real need, and after choosing the idea, the best approach is chosen to take into prototyping. The idea of design thinking is that the solutions need to be created fast and cheaply. When the information is gathered from the prototype, new information is produced in the process.
- Test  
Testing is based on gaining feedback from the targeted test group and framing if the design thinking process was based on a real hypothesis. After the testing stage has been running, the information gathered should guide if the prototype should be taken into production, to a next iterative design thinking process to re-evaluate or stop with the current idea in total. (dSchool. 2010, p. 2-6).

#### 4.2 Definitions of value

Value has multiple definitions, but there is no clear way to calculate the created value. Multiple definitions are partly because the customer evaluates the value perception when using a product or a service. There is also the aspect of desirability – a customer associates the product or service through the lens of their needs. Thus, they value it more highly than the competitors. (Koppi, 2019; Cambridge Dictionary, n.d). den Ouden (2012, p.13-15) has addressed value from a multi-level perspective, with the core level touching the value a user gains. The user is the pinnacle of the value creation model. As they are in, they are the ones that are meant

to consume the created experience. If there is a lack in the usage's longevity, then the creation process must be deemed unsuccessful. After the user, the value creation process reaches the organization. The value creation at the organizational level is different because the organizations are stakeholders that produce, design, and market new services – they are creating services that imbue the user's value and concurrently also for the employees. For organizations to be effective in value creation, they must have adaptational, integrative, and value maintenance operations.

In its fundamental essence, when looking from an organizational point-of-view, value creation is the difference between the resources being put into an organization and the products or services it produces. If the procurement process's value is weighted larger than the tangibles and help put in, value has been created (Dubois, Jolibert & Muhlbacher, 2007, p.4-5). From the HAMK Design factory's perspective, the resources are quite clear, as spaces, time, and financial resources are measurable. Comparing the process and outputs to a single discipline course or without a project is harder to evaluate. There are no criteria to build the value creation assessment on from the organizational standpoint.

Peter Thiel (2014) defines the value in business as something created through the formula where monetary value is created for the World. The company also creates revenue from the value created. The ideology also goes into that a company should be able to provide specific unique value that is not yet offered in the markets. The doctrine of value creation does not fit directly into higher education, but there is a need to stand out from the different service providers to cope in the surrounding markets. Harland & Pickering (2010) describe the values created in higher education to be reflected through the values that a teacher makes when planning their courses, teaching methods, research, and activities. The values in higher education also skip to the individual preferences of each customer.

Five unique values drive customer choice. The values that drive the choices are functional, social, emotional, epistemic, and conditional. Using this criterion to meet the customers' unique needs will give a company a customer-centric core on the business model (Nasution et al., 2014, p.5). On the contrary, at the organizational level, the values can and should be explored so that they can be quickly developed. How the service process can be built to meet the customer's value criteria can be divided into four different structural models. The models can be present in the service process chronologically, spatially, hierarchically, or through network structure (Kalbach, 2016. p.24-25).

The customers give outstanding value on what they receive as a service. The technical solution for a problem can also be often measured. The route from the customer's problem to a solution is not as simple, as it has multiple interactions between the customer and the service provider. Other elements that affect the quality of the service and the experience the customer gets are the tasks a customer has to do autonomously, other

customers and the service personnel, and other interphases in the service journey. The process a customer has to go through, how the service is being produced and consumed, creates the productional dimension of how the service has been produced. In addition to the provided service, the customer's expectations regarding the service provider also affect the result of the service provided. Both of the dimensions need to meet and preferably exceed the customer's expectations for the customer to feel a positive experience from the service. (Grönroos, 2003, p.101-104).

The customer value is based on the situations where a customer is in contact with a service provider. Altering the situation to fit the educational system is possible, as the higher schools as HAMK are easily monitored, and the services can be divided into different categories. Education and the learning experience exist both in the teaching done in classrooms and the individual and group tasks outside classrooms. The value can also be seen as something that is created during the learning process. This aspect allows looking into the elements that are creating value on different levels.

The value creation process in higher education thus differs from the business. As the process is different, the goals are different, and the stakeholders expect additional value in the two separate cases. The value creation process is still similar – value is created in a process. The operating organizations and their employees act both as contributors and gain the added value from the created possibilities. The role of the users is to use the additional value while consuming a service.

Touchpoints in customer experience creation are the encounter, physical or digital, where a customer or user interacts with the organization. Touchpoints are operating using different channels, which the organization does not always control, but they can be, for example, social media platforms (Interaction Design, 2020). Kalbach (2016) suggests that there can be three types of touchpoints:

#### Static

Static touchpoints are ones a user cannot interact with, such as banners, advertisements, and newsletters

#### Interactive

Interactive touchpoints are usually digital solutions where the users can interact with them. Examples are the likes of applications, chats, and websites.

#### Human

The human touchpoints are ones where there is human-to-human interaction.



Education for		
	High value	Low value
Knowledge values	Knowledge Critical thinking Evaluation Originality Application Problem-based learning	Information Repetition Rote learning
Academic values	Honesty Integrity Fairness Truth Solidity Evidence	Cheating Plagiarism Leeching
Attitudinal values	Caring for others Respecting others Co-creation Co-design	Selfishness Individualism
Public service values	Equality	Inequality

Figure 10. Teaching values. Based on Harland and Pickering (2010)

Value can also be looked at from the aspect of quality. Organizations have multiple different stakeholders. The primary group is the customers as a service provider cannot successfully operate if it does not fulfill its needs. Organizations are also dependable on other parties that provide sufficient resources to manage and the operations' parties. Still, they are not seen as customers as they do not receive the service. Stakeholders have the open possibility to either provide or withdraw resources from the organizations. They see value as something created in the process (Hoyle, 2007. p. 4-5).

The customer perception of gained values can be met by specific criteria imbued in the value proposition an organization offers. Essential questions regarding the value proposition are what type of value we provide for our customers, what needs we are satisfying, and what types of customer segments we are serving. It is essential to notice that value can be either qualitative or quantitative. Quantitative values are the likes of amount, price, or the speed service was produced. Qualitative values can be ones that are connected to design, experience, etc. Attributes that can be derived to create value are, e.g., newness, performance, accessibility, and usability (Osterwalder & Pigneur, 2010. p.24-25).

Values can also be how an individual operation or service guides and encourages people to join and commit when they see the value it provides for them or their environment. This notion of value is also one to which the business aspect of value is attributed in business operations. Defining value is not simple, as the value might be created in the exchange or use of goods, depending on the value in question. Besides, the value might have two sides: The side where value means that something provides added pleasure or benefit to a single person or a community. Value can also be a base, such as the overall quality of an absolute service that similar services are compared to. In education, the traditional operational model in teaching might be the base to which new methods like the co-creational

and Problem-Based learning models are compared (Jalonen, Helander & Mäkelä, 2020, p.36-39)

## 5 EFFECTUATION AND LEARNING ECOSYSTEMS

Effectuation – a theoretical approach to developing students' entrepreneurial skills in higher education and ecosystems is partly intertwined, as both operate on creating new possibilities for students' development. The core idea is also quite similar; even though the approach has differences, they see the students as the primary key ingredients of the plot, ecosystems as one leading stakeholder group, and effectuation as the operators of creating new. Both ideologies fit into the HAMK Design factory's co-creation environment, where the goal is to allow students to take the initiative and create new solutions in unknown circumstances.

### 5.1 Effectuation

Effectuation is an entrepreneurial theory that approaches entrepreneurial actions through an effectuation process, where individuals who take on entrepreneurial activities use the resources in their immediate proximity. A clear objective for the process is not set at the beginning of the process but clarifies the individuals' steps during their path. As an objective or the operative approach towards it has not been framed, the process remains flexible. It allows the operators to use the advantages the environmental contingencies provide as they appear. Relevancy of Effectuation regarding entrepreneurial teaching and research is valid because it contests the models based on causation (Perry, Chandler & Markova, 2011. p. 837-838). Causal reasoning approaches pre-defined goals through a given mean, through which the operators opt to find an optimal solution.

Creative causal thinking is also thought to include additional goals without set means, inspiring the stakeholders to think strategically on reaching the goals. In comparison, the effectuation process starts with given standards but has not yet defined a set of goals. The goals will be formed when the stakeholders create new and communicate with their peers. It is important to note that even though effectuation is based around uncertainty and creating new, it requires skills and training related to the domain. The three main differences between causal and effectual reasoning are, per Sarasvathy (2001):

- Causal reasoning focuses on the expected return, and effectual reasoning operates through the affordable loss
- Causal reasoning relies upon competitive reports and analyses, whereas effectual reasoning has its basis in strategic partnerships
- Causal reasoning aims to exploit the pre-existing resources and knowledge, whereas effectual reasoning operates by leveraging contingencies (Sarasvathy, 2001. p.2-5; Sarasvathy 2008, p. 16-18).

Effectuation is divided into different principles, that each has its unique characteristics, which will support students' entrepreneurial development

and create an environment where co-creation pedagogy can flourish. HAMK Design Factory's model is created similar to Sarasvathy's original theory with the exception that the Effectual principles are called phases. Effectuation was chosen as one of the core building blocks of co-creation pedagogy. It challenges the sequential progression, where ideas forward first to the research phase and then sequentially to business plan, financial projections, and, if viable, then to prototyping (Sarasvathy, 2001. p.3). Teaching students that pivoting is crucial and not just deviating from the correct journey will empower them (Kunnari et al., 2019.)

Principle 1: Bird-In-Hand. The entrepreneurs are encouraged to start with the resources they have in their proximity, the knowledge of themselves, understanding their capabilities, and forming the picture of their network. The operations are often related to creating a basic understanding of the situation and defining the current situation

Principle 2: Affordable loss. Setting the scene for deciding which of the goals as such, they should be further looked into and invested in. The goals that should be contested have the characteristics of the combination of equitable risk and the possibility of failing cheap.

Principle 3: Sparkling lemonade. Embracing unexpected events, information, and situations. The sparkling lemonade phase commonly includes activities that are related to the customers, such as segmentation

Principle 4: Crazy quilt. Forming bonds with like-minded people, creating standard networks, and involving committed stakeholders to join the operations. During this phase, actions affect different operators, like ideation, brainstorming, and developing concepts. Stakeholders that are committed enrich the process by proposing new ideas, solutions and enlarging the network with their contacts. In the crazy quilt phase, the potential customers and users are also engaged in the process.

Principle 5: Pilot-on-the-plane. Actions taken should be in line with the recognized risks and simultaneously embracing the potent surprises. Entrepreneurial operators have both understanding and control of the surrounding environment, even though there are uncertainties (Sarasvathy 2009).

As the five different principles are connected, they create the logical approach of effectuation. Useful is controversial to the logic of causation as causal models expect the effect to be completed and seek options to either fulfill or create new means to react to the set goals. Effectual reasoning can be described as more inductive. The reasoning starts with a selected set of means and moves towards understanding the situation and creating new with non-predictive methods (Sarasvathy, 2008. p. 16-17).

Effectuation has been used in higher education to increase the entrepreneurial skills and capability to handle uncertainty. Entrepreneurial

education is not just a single pedagogical choice but also a mix of different pedagogical approaches and methods. Effectual decision-making is related to entrepreneurial studies, but the method can help students make decisions and operate with different scenarios that require effectual decision-making. Scenarios can be extensively used in practice-based learning environments. Effectuation can be divided into choosing how to use the available resources and the building of scenarios on what might come when resources are optimized in different ways (Carr, 2014).

Effectuation originates from the logic of entrepreneurial expertise. The logic has consistency in the way ideas are set to form a basis that makes it possible to take actions upon the world. Causal logic has its definitions in premise assumptions: only by predicting the world can we control it. Effectual logic, on the other, has a premise connected to the future: If we control some parts related to the future, we do not need to predict it. Effectors can be described as someone who sees the world open and sees a possibility to operate with their means. Organizations and markets are seen as changeable artifacts rather than social constructs, and by that approach, more easily changeable. Effectuators also see their possibilities to lie in an environment where they can create change, and that is in their control and fabricate new opportunities. Organizations are seen as instruments that can create additional value, and markets are seen as something that can be made rather than found. Effectuators operate on the ideology that by their actions, they can create positive outcomes and success. Failures and success are both outcomes of the different experiments that entrepreneurs or other active operators do, and they can also be researched as such (Sarasvathy, 2008. p.18-19).

## 5.2 Learning ecosystems

When assessing the possible scenarios and ways to develop the student experiences even further, the future scenarios for further improving the student experiences could be looked from turning the HAMK Design Factory and Product Development Project -course towards educational ecosystems that both encompass the co-creation ideology and shared value creation. The main stakeholders are the organizations involved in the courses, the students, and the staff of HAMK. Kola, Koivukoski, Koponen & Heino (2020, p 8-11) have split the constructed ecosystems into elements that should be taken into account when creating ecosystem journeys. The elements include the purpose, rationale path, and emotional path. Emphasizing the elements, the purpose consists of the ecosystem's boundaries and framework, describing why the ecosystem is relevant. The rational path describes the ecosystem's logic, the participating stakeholders' roles, and the ecosystem's impact and objectives. The emotional path includes the understanding and tools to maintain and develop the diverse group of people working in the projects, focusing on reflecting the actions taken in the ecosystem journey. Muller and Toutain (2015, p.10-11). Bring up the need for the motivation of the stakeholders

as one crucial factor. Motivation regarding educational ecosystems can be divided into intrinsic motivation coming from inside and not needing external simulation and extrinsic motivation based on the actions, constructs, elements, and the framework of the ecosystem. Creating intrinsic value comes from the benefits the stakeholders, in this case, students, teachers, and partner organizations gain from the ecosystem. Suppose the value and benefits the stakeholders see are not perceived as something that will get them additional value regarding other options or solutions. In that case, it will not spark intrinsic motivation. It is crucial to create the operations and tasks inside the ecosystem so that they can be seen as valuable and their consequences are transparent for the stakeholders to feel the value of the work.

Schamer (2019) also addresses education 4.0 as an essential tool for higher education institutes, as education 4.0 has embedded within the idea of a learning ecosystem that allows the institutes to provide vertical literature and create and lead the transformative social change. The education 4.0 ideology also consists of changing the organizations towards ecosystems; here, learning can be distributed to the participants. Creating these co-creational learning ecosystems allows the learning to become deeper whilst simultaneously affecting the students' capabilities to aim for the awareness-based collective action. One of Schamer notes as the factors in education 4.0 is action learning: students become learners and learn new skills by doing, changing the paradigm of teaching towards entrepreneurship centric initiative taking on the part of students and fading the teachers to counsel and coach the process. The initiative also requires the students, and the staff, to focus more on the community development approach instead of just developing their skills. Embedding real-world laboratories and ecosystems to the higher education institutes' operational playing field turns campuses into factories where all the stakeholders participate and learn from the experiences created in experiments.

Design Factory environment offers the possibilities to encompass the different elements. The co-creational frame (picture x) already has the stakeholders in the co-creative operations that revolve around the courses. The courses can also represent their own individual project ecosystem in the whole construct. If the HAMK Design Factory environment would be turned into an ecosystem, it might also help relieve the entire entity and help nominate the different stakeholders' responsibilities. Furthermore, they are alleviating the students' situation from users' perspective on the design thinking method, where the burden of succeeding is only dependent on one single stakeholder.

Further, it challenges the coaches and other HAMK Design Factory staff to implement the courses' effectual actions. The students can also be empowered to face the uncertainty mentioned in design thinking and ecosystem thinking. Therefore, the three different approaches could be seen as one whole picture that could holistically, but not in the perspective

of pedagogical operations, meet the complex and interdisciplinary environment where the PDP studies are performed.

Ouden (2012, p. 148-149) also weighs the networks' challenges to the single stakeholders. The complexity of the networks creates challenges to the management of the network. The stakeholders have their own perspectives with both limited and subjective approaches regarding the ecosystem. Creating a common understanding of the drivers, challenges, and views helps clarify the stakeholders' differences and sets a thriving platform for the ecosystem. Organizations involved in the ecosystems are also both influencers, having a say in how operations are being managed and in counterparts being influenced, affected by other organizations' decisions and actions. The relations also make it relatively hard for any one of the operators to control the ecosystems fully.

Educational ecosystem framework can be split into two primary levels (Muller & Toutain, 2015, p. 12-13, 15), where the teacher level represents the set learning framework, new ways to facilitate the learning for the teachers and the learner level that takes in notion the set objectives and tasks given to the students. The learners' level the actions can be set to meet the development of business ideas towards creating social or economic value or developing the skillset consisting of the entrepreneurial operations. The idea generation can be made either inside the educational unit or together with different actors both inside and outside the educational institution. Connecting the ideation process to the local operators and organizations helps alleviate the cooperation obstacles and increases the school's impact and benefits regarding the local networks. The actions that aim to develop the entrepreneurial mindset can be done through a project or a start-up initiative. Activities are meant to encourage the students to take the initiative and actively search for the means to create something new, whether inside or outside the school environment. Through entrepreneurial activities, the students can enable themselves to learn styles and capabilities and control their learning process. The educational ecosystem also takes into the notion of the spaces that are used for the learning activities. The spaces can be fully integrated and managed by the school, outside of the campuses, and managed by the learners or a hybrid model that best suits them in different situations. In HAMK, the spaces and environment currently have the digital aspect. There the digital platforms play an essential part in the learning process and affect the learning experience.

The ecosystem thinking is also a new perspective to approach the learning environments. In service design and business design, the students are taken as the targets of the development. In co-creation and ecosystems, all the stakeholders join in to create new on the same level. The ecosystems also fit into the uncertain and complex challenges and take into the notion the difference of the actors and assess the common purpose, capabilities, and objectives. Also, it should be noted that interdisciplinary co-working might connect actors operating in various

ways. The complex environment also affects the actors, their behaviors, and actions. Political, social, and cultural differences also affect the ecosystem's operational model (Kola et al., 2020, p.11; Muller & Toutain, 2015, p. 8). Building ecosystems thus includes the co-creational element, where the necessity of adjusting the process per different teams should be met when opting to create interdisciplinary student experiences.

When establishing an ecosystem, it should be based on the need and understatement of how the value could be created by creating meaningful innovations that would advance the participating stakeholders' capabilities. Designs should be created through collaborative manners, and they must meet the customers and users and the needs they have. Inspecting the ecosystems through this perspective allows it to have a more profound impact on its environment. (Ouden, 2012, p. 148-149).

Kola et al. (2020, p. 15) have divided an ecosystem from different operators' perspectives and abilities (Table 1). In the other table (table 2), there is a short description of how the operators could be seen in HAMK Design Factory's ecosystem, emphasizing the actions and roles concerning project courses such as PDP. Moore (1993) also noted that (Ouden, 2012, p. 143-144)

Ecosystem Partner	Rational Motivation	Emotional Consideration	Collaboration impact
Research Institutions	World-class research	“They do not know enough about real-life business.”	More practical approach and collaborative mindset could help benefit more from research
Public Players	Regional support: <ul style="list-style-type: none"> <li>• Facilities and funding</li> <li>• Funding instruments</li> <li>• Piloting facilities and infra</li> </ul>	“Big talks, less action.” “What is their decision-making logic.” “Election is coming- so there is vote fishing.”	Public funding, partnering, or piloting opportunities are essential for solving grand challenges and wicked problems
SMEs	<ul style="list-style-type: none"> <li>• New markets and customers</li> <li>• Faster growth</li> <li>• Speed and scale</li> </ul>	“All they talk about is their product/solution.” Limited ability to think big/ long term	Limited ability to “think big” might limit their opportunities to grow together with others
Orchestrators	<ul style="list-style-type: none"> <li>• New business development</li> <li>• Speed and agility</li> <li>• Leadership</li> </ul>	“They are just facilitating and waving hands.”	Orchestrators can add a lot of value – and manage both rational and emotional aspects – not competing with other partners

Table 1. Ecosystem perspectives (Kola et al. 2015, p. 15)



There are some differences regarding the business ecosystem when looking into the described partners or stakeholders in the HAMK Design Factory ecosystem.

Ecosystem Partner	Rational Motivation	Emotional Consideration	Collaboration impact
Partner Organizations	New solutions and insight for their problems  Speed of development	“They are only interested in the product and service development.”	Usually limited R&D  Limited ability to take part in the daily actions
Students	New skills and knowledge  Connection to real-life projects  Study credits	“They do not want to work too much as the course is only one part of their studies.”	Uncertainty about the whole course  The core of the development actions
Teaching staff	New educational perspectives for students  Using different pedagogy that requires the company projects to operate	“They are limited by their resources and not interested in the whole development.”	Guidance and communication with all the different stakeholders
Other staff	Organizational development  Gaining new knowledge on using equipment and spaces	“They are just operating behind the scenes and not adding value to solving the problems.”	Connecting the other operators to the equipment and spaces of HAMK Design Factory

Table 2. Ecosystem perspectives of HAMK Design Factory

The differences also come in the form that in educational ecosystems, such as the HAMK Design Factory, the value might not be as economical as it is in the business ecosystems. Still, it could be in a different form. That is the reason why it is essential to look into the purpose of the educational ecosystem. The purpose defines why the ecosystem exists, what problems the ecosystem is solving, and sets the work's milestones and objectives. While the purpose is set initially, it is open for the stakeholders to change if necessary (Kola et al. 2020, p. 17). The possibility to change objectives and purpose during the course is crucial for the PDP as in design thinking, the progress starts from uncertainty, and there are no clear objectives in the starting phase of the projects.

Ecosystem culture could be split into three parts that support each other: strategic purpose, ability to maintain and attract new suitable partners, and impact. The culture is essential as ecosystems seldomly clarify the milestones and goals initially, but the target is formulated during the ecosystem process. Strategic purpose amplifies the purpose and helps the partners form their role in the ecosystem. It also helps the ecosystem individuals to form a picture of the whole and align themselves with it. Without the alignment of the goals and interests, there is a risk of losing the capabilities, motivation, and commitment of both the operating organizations and individuals involved in the operations. Purpose also acts as something that can be measured during the process and used to develop or adapt the ecosystem work (Kola et al. 2020, p. 21, 23-24). For HAMK Design Factory, the purpose can be seen as a multi-level variant: HAMK and partner organizations operate both on the partnership and individual levels, whereas the students are set to focus on the personal level courses for them to develop their skillsets. When building up the ecosystem culture, it should be noted that organizations might have multiple ecosystems their connected to as stakeholders (Moore, 1993). Multiple stakeholders are also the HAMK Design Factory case, as the unit has various projects, cooperations, and development sprints with different actors. The cultures in different environments have their own characteristics and the motivations of the stakeholders involved. One operator cannot dictate how the culture of an ecosystem is being built.

Iansiti and Levien (2004, p. 148-151) have found that one of the success factors when building operational ecosystems is the platforms they are built on. The platforms should be both operational and a tool to be used to share the value created. Platforms can be thought of as the ecosystem software's application programming interfaces; they connect the stakeholders to a more extensive network and share important information. Ecosystems need the functional operations on which the stakeholders can create their own value creation mechanism. When looking more in-depth, ecosystems consist of two different types of platforms. Implementation platforms are the tools built to solve the underlying problem the ecosystems are built for. Interface platforms provide the stakeholder's access points to operate in the ecosystem. Platforms offer a technological structure and an operational one as through them, the operational rules of ecosystems can be formed. When turning the scope to HAMK Design Factory, the platforms that can be identified are the ones through which learning is provided and where all the stakeholders can be simultaneously present: Microsoft Teams, ZOOM, Miro, and Learn.

Mueller and Toutain (2015, p. 17-18) approach the entrepreneurial school culture by the values and meanings that the primary stakeholders have set. Through the common goals and interests comes the schools' internal and external actors' common language and allows them to operate on standard rules. Each school should establish its own culture, values, and activities to enhance the wanted culture's construction. The culture should

provide social or societal value for those that belong to the ecosystem or community. Entrepreneurship is also seen as something where the stakeholders take the initiative and act, so the culture should be operational and locally relevant.

Purpose itself does not maintain an ecosystem, but it must also meet the objectives to fulfill its existence requirements. The objectives can be split into rational, where the value creation, impact, and financial aspects are considered, and emotional, which comprises the individual benefits, succeeding together, well-being, and excitement. (Kola et al. 2020, p. 27). Purpose can also be derived from the ecosystem process and its stages: Business ecosystems thrive on conquering new areas and broadening their operational field. Common purpose helps the ecosystems bypass their rivals in situations where there is a highly competitive market, as there is a national scale with higher education schools in Finland. The purpose can also be seen through the scope of value: ecosystems must have stakeholders that see the joint value and customers that value the ecosystems' operations and have the potential to scale up the functions of the ecosystem for broader markets. In this case, the broader markets could be seen as scaling the local ecosystem viable globally with the Design Factory international network partners (Moore, 1993).

Education ecosystems, design thinking, and effectuation all make it possible to use co-creation and involve stakeholders other than teachers in the course planning process. For that reason, it is good to acknowledge that there are still quite many restrictions that might hinder the process. Rossman and Duerden (2019, p. 59) connect the various elements to an experiencescape, where people, place, related objects, relationships, and blocking are being planned. The theoretical environment then must be brought to a realistic level; What are the surroundings in which the courses are being created, and what the enablers and disablers in those environments are. Boutillier (2016, p.44, 48) notifies that ecosystems will not strive independently, but besides, they must have supporting features as financial, governmental, technological, social, and technological support. The supportive mechanisms allow the ecosystem, as in this case, the educational ecosystem, to reach the functional sphere. Unlike natural ecosystems, innovative and economic ecosystems have a target to which they aim to achieve. The primary objective or objectives then operate as the educational ecosystem's motivator to be meaningful to its participants.

When designing ecosystems, the crucial steps for the innovation process to successfully identify and understand user needs and future core task development. If the customers are not identified and their needs mapped, the ecosystems lack the core. When the customer need is assessed, ecosystem functional stakeholders and elements must be clarified and chosen. When the elements are clear, it sets the path onwards to start focusing on the core tasks and possible pain points that might hinder or even disrupt the ecosystem work. If the prerequisites are correctly done, the elements and stakeholders will support the ideation in the new ecosystem purposefully (Kraft, 2012, p. 125-128)

Kola et al., Moore, and Ouden (2020, p. 57; 1993; 2012 p. 150-151) Also note that ecosystems must have the skills to adapt based on the market needs. A lot of the viability of the ecosystems comes down to the leadership of the ecosystem. Even though the ecosystems' hierarchical structures are loose, the leaders still direct the way of the ecosystem and are also constructing the rules and guidelines for the operational model. Business ecosystems have seen larger players such as Apple or IBM rule their own ecosystems and high demand the goals rigorously. When turning the scope to educational ecosystems, the leader's role is naturally attained by the school of higher education, in this case, HAMK. The leader's role in facilitating the relationships in the ecosystem and managing the actions, and helping the whole ecosystem reach the set goal or goals.

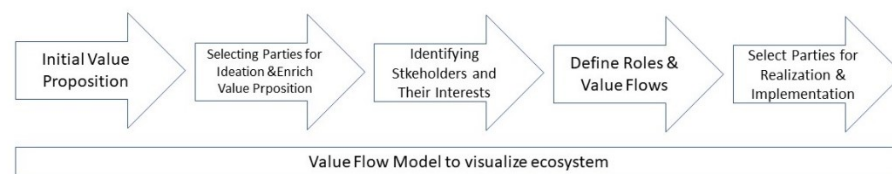


Figure 11. Value Flow Model (Modified from Ouden, 2012 p. 154)

Ecosystems can be honed to value the customers and simultaneously capture and add value to the complex network operators. The choices made in ecosystems must answer claims such as our offerings, what value we add to the customer and other ecosystem operators, and what value we seek from the ecosystem. A regular value chain that can be made to map a singular organization's value flow is not flexible enough to be used in the ecosystem. The value chain model requires more thought on the relations between the stakeholders to be adequate. Ouden (2012, p. 154-156) has created a value flow model where the interactions between the stakeholders and the value-creation perspective are brought to be the central point of the development process. The value flow model links the understanding of customer needs to the network's offering and creates an account of how the value could be made. The value flow model also addresses that certain elements affect value creation. They can be, for example:

- Actors: such as Individuals, small companies, universities, large communities. Actors can present customers, service providers or both
- Motivations: Interests and intentions related to the actors. It is defining why they are present in the ecosystem. Also, mapping the shared drivers that create sustainability and stability to the ecosystem. Motivation operates as selection criteria when selecting actors into the ecosystem
- Compatibility and influence: Compatibility of the partners regarding the core value proposition and motivation. The compatibility is based on both motivation and behavior of each actor. The behavior per value flow can be either negative or positive. If the equalization is negative, the value flow

cannot be produced. That is why the leaders of the ecosystem need to look into how each partner behaves

- Core value proposition: Without the Core Value proposition and the prerequisites it provides, the ecosystems lack the primary value created for the end-customers or users. In addition to the proposition itself, the value must also be presented to the customer or user in a positive manner (van Ouden, 2012, p. 154-159).

## 6 METHODOLOGY

The objective is to understand which of the factors create added value to the students and what are the main differences, if any, between the students for different disciplines. Furthermore, the thesis and the methodological sources help create a new, research induced co-creation learning environment under both the cSchool and Design Factory of HAMK. This thesis is one of the many different tools in creating the platform. Thus it has been decided to only concentrate on the whole from the scope that has been framed to learning design through design thinking, service design, business design, and effectuation.

Björklund et al. (2017) have defined the methodologies and practices of Aalto Design Factory in a book called a passion for co-creation. The methodologies are entwined design thinking that is enhanced with different actions relating to the learning environment. The guiding idea is that the design thinking ideology operates the environment. In HAMK, the selected tools in addition to the Design Factory courses effectuation, phenomena-based learning, and project-based learning. Additional to the program's selections, the learning environment has affected education 4.0, intertwined continuously with the universities' applied sciences' operational model.

Service quality has been a widely researched topic, as its quality is directly connected with customer satisfaction. Customers evaluate the service through different parameters when deciding if they are satisfied or dissatisfied with it. Assessing the service quality is a process that requires various parameters to determine if the customer has felt that the service has been adequate. (Emerald Insight Staff, 2003, p.1162-1163).

## 6.1 Research philosophy

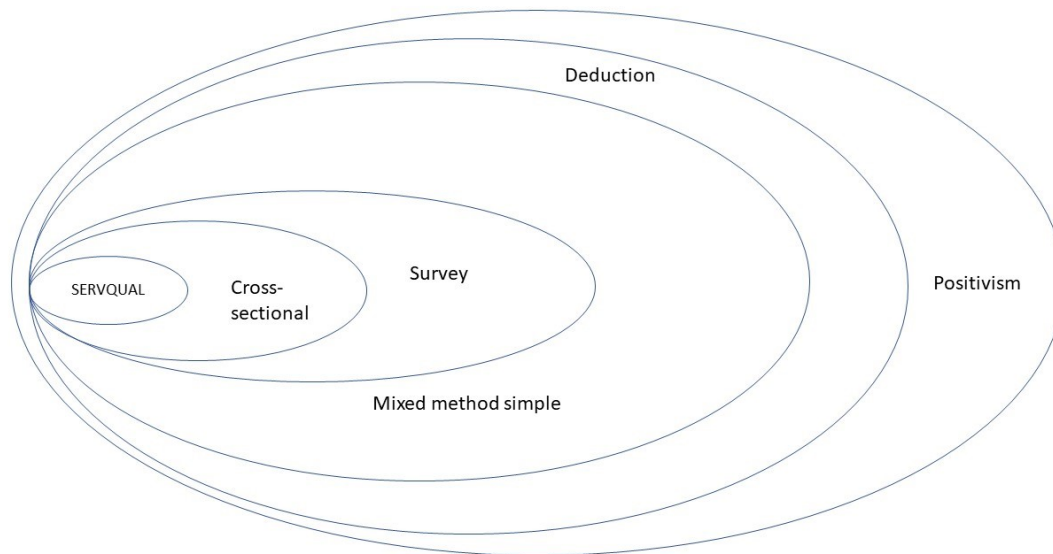


Figure 12. The research design of the study

Positivism can be based on five principles that frame the research philosophy:

- There are no differences between different sciences regarding the logic of inquiry
- The research should be created to explain and predict
- Research should be such that it could be observed empirically with human senses. The hypotheses should be created through inductive reasoning that is tested during the research process
- Science and common sense differ. Common sense should be excluded from the research, and the bias should be taken note of
- Science needs to be value-free and only judged by the basis of logic (Dudovskiy, n.d.).

Research philosophy describes the operational model of assumptions and beliefs that are related to the development of knowledge. The research aims to create new knowledge in specific fields, whether creating new theories or just focusing on a single specific problem. Philosophical choices determine how a researcher approaches the research and includes the decisions on what type of strategies, procedures, theory development, and time horizon could be used when conducting research. Saunders, Lewis, and Thornhill (2018) have created a research onion to describe the whole research philosophy in one picture (Saunders et al., 2019. p.147).

The thesis is conducted with deductive reasoning, using theory to create the framework to understand the theoretical proposition and then doing empirical research to understand how the theory is on par with the findings. Deductive research can be divided into five sequential stages:

1. Defining the research questions from the theory

2. operationalizing the questions in such a manner that they are in a format where they should be answered. The way to do it could be done, for instance, with a form where there is a hypothesis or multiple hypotheses
3. Collecting the data to answer the formulated hypothesis of operationalized questions
4. Analyzing the collected data to create understanding on if the data supports the relevant general theory or if there is a need for a new modification to the theory
5. Confirming that the general theory fits the findings or if the situation is different, modifying a new theory to fit into the findings

Deductive reasoning aims to explain the causal relationships that are between variables primarily. The deductive reasoning stages create platforms where the researchers can be structured in a manner where they can be replicated. The methodical possibility of replicating the research is crucial because it can gain reliability (Saunders & Lewis, 2018. p 112-113.) Deductive thinking is also stated to be from the top-to-bottom approach as the theory is thought of as both the starting point and the highest information point in the process. The idea operates as the basis for the hypotheses that are already subjects that can be experimented with. Where inductive reasoning operates from a broader approach during the research phase, deductive reasoning has a narrower viewpoint, and it is scoped on only validating the set hypotheses. The hypothesis phase leads to the observation phase, where data is gathered regarding the set hypothesis. The hypothesis can either be confirmed or re-assessed with the collected data set, and thus, the theory is validated or modified to fit into the resolution (Trochim, M.K., 2020).

Bradford (2017) describes deductive reasoning as a form of a valid reason that starts with a statement and examines the plausibility of getting to a specific and logical conclusion. Theory creates a platform from which predictions of actions and consequences can be made from. The approach is from the general standpoint to more in-depth and precise observations. In the standard deductive reasoning format of syllogism, major premise and minor premises reach a logical conclusion. Syllogism operates by defining different factors and searching causal and valid arguments from them. Syllogism also operates from the perspective that for deductive reasoning to be valid, the hypothesis must also be valid.

Positivism uses theoretical knowledge as the philosophical standing point when observing reality and creating results that can be generalized. Positivism sees the social entities, such as organizations, as objects and phenomena that can be looked into and researched. The discovered matters are observable and measurable regularities and facts. When researching matters, they will provide meaningful, authentic, and credible data. When the data is created, it provides insight into the causal relationships and helps create the generalizations that help explain,



predict, and develop models for behaviors and events that occur. Challenges in positivism are the researcher's biases, as the researcher should look at the research from a neutral perspective. They are choosing an objective perspective (Saunders et al., 2019. p.144-147).

The research conducted in this thesis focuses on the core elements of design thinking. It aims to understand the casualization between effectuation and service design in higher education organizations' environments. The positivism paradigm creates structures in where certain elements are looked into and derived from the larger phenomenon. The thesis phenomenon is the ones of design thinking methodologies and effectuation—one crucial factor in positivism. Positivism needs large sample sizes. Thus, quantitative research is the preferred method of analysis to be used, but besides, the study can choose other supporting research data collection methods to support the research (Saunders et al., 2019. p.147.)

Qualitative and descriptive research methods are well fitted to research education and have also been increasingly used when researching learning. Qualitative research acknowledges the complexity of knowledge. Both qualitative and descriptive research have in common the fact that they use real data as the source. The descriptive study aims to understand phenomena and particular characteristics. Typical tools in descriptive research are surveys, where both qualitative and quantitative can be collected simultaneously. Qualitative data can be brought in to enrich the quantitative survey data in order to gain a more in-depth understanding of the phenomena in question (Nassaji, 2015. p.1-2). McCombes (2020) defines descriptive research as something that pursues to precisely and organizes describe situations, populations, or phenomena. The questions related to descriptive study tend to answer the questions of what, where, how, and when. Experimental research is needed to determine the cause and effect—definitive research suits in the study that are meant to identify specific characteristics or trends. Conclusive research is not as good when the problem or topic in question is still somewhat uncertain or unknown. Both qualitative and quantitative research methods are suitable for descriptive study, so approaching the research through mixed-methods analysis is plausible.

Saunders and Lewis (2018. p. 115-117) conclude that both the research approach and research purpose define the research process and its methods. Focusing the research both based on the theory available and the framework's context will persuade the researcher's direction. The research purpose then helps identify the exact role and format of the hypothesis and clarify which methodologies are correct to be used in each research. Descriptive studies must explain why a phenomenon occurs immensely more difficult than just describing the situation in which the is imminent.

The research in this question is descriptive as the research topic is quite limited and is related to finding definitive factors around a single phenomenon. Research methodologies have been chosen to meet the descriptive research requirements, which allows and supports both the usage of qualitative and quantitative research methods.

## 6.2 Mixed method research

Research can be conducted either by using qualitative or quantitative methods. These methods can also be used together. When using qualitative and quantitative methods together, the research design is quoted to be mixed. Qualitative data is usually understood to be non-numerical, where the data is gathered by data collection techniques or by using data analysis from where the numerical data is collected. On the contrary, quantitative data is non-numerical data that is gathered by using techniques such as interviews. Research conducted with mixed methods can be a questionnaire that mainly has closed questions that can be used as numerical data but simultaneously has open questions where the participants can give open responses using a text box. Quantitative research is used primarily when using a deductive research approach as the data is used to gather the necessary data to validate the hypothesis. However, the quantitative methods can still also be used (Saunders et al., 2019. p.175-178).

Mixed methods research is the philosophical research design where methods from multiple research branches are combined. Researchers that use mixed methods as their approach are usually pluralist in their view of research methodology and see flexibility as an option to broaden the research scope and still keep the research legitimate. In single or straightforward mixed method research, the qualitative and quantitative methods are used concurrently. Concurrent triangulation design is set on the ideology that the two different data sets can support each other regarding the hypothesis. The mixed methods approach lets the researcher decide if the quantitative and qualitative methods are used equally or unequally. (Saunders et al., 2019. p.181-184).

Qualitative research data is gathered from verbal data, textual data, and Visual data. Collecting verbal data is done through figurative speech, as spoken words. Oral data can also be transcribed into written text, but it will still be classified as verbal data if the structural integrity is kept. Textual data is collected from interviews or observations or as derivations from documents, whereas visual data can be gained from images, videos, and other visualizations. A vast amount of qualitative data is acquired directly from the participants. For the basis of qualitative analysis, it is essential to look at the results through social construction. In social constructionism, social reality is constructed of social actors that produce multiple social realities created by different assumptions and interpretations. Through

the scope of interpretive research, the research follows the flow of the data. (Saunders et al., 2019, 638 - 639).

Kalbach (2016. p.108-109,127) Has created a practical approach to applying service design research. As the research subject in the approach of experience design involves the development of practical processes, the study can be done in a spray of multiple methods. The methods include both research material and questionnaires with all or selected groups of stakeholders. The methods include direct feedback, media sources, reviews and ratings, market research, and user testing. When researchers are using quantitative and qualitative methods in designing an alignment diagram, a survey is one method that can be used. A survey will make it possible to measure the whole process that includes the different touchpoints and phases of service. Scales should be created so that they are consistent with the scale used in the closed questions. The safest way to combine constant research is by using a standardized survey platform, likes Net Promoter Score or SERVQUAL. When possible, also the usage of benchmarking possibilities could be used when assessing the surveys.

### **6.3 Research process and approach**

Research for this thesis was conducted as a digital survey with the participating students of the Product Development course, sprint 1 2020 of HAMK Design Factory. The research target was to gain feedback on the learning environment and its elements from an interdisciplinary group of students.

Research ethics guide the research process. Saunders & Lewis (2018, p. 75-77) deem that matters such as informing the potential participants clearly in advance about the research, freedom of participation, and opportunity to give their consent should be taken into a notion. Besides, if the participants were guaranteed anonymity, the researcher must maintain anonymity throughout the whole process. This research was done as a part of the HAMK Design Factory studies, and the students were informed about the possibility of taking part in the survey. The survey was not compulsory for the participants, and it was put as a part of neither the course description nor the grading. The anonymity is maintained throughout the whole research, and there are no questions that will risk the loss of anonymity. Consent is seen to be given by the participants when they return a filled form. Consent is something that should not be given under pressure, so the researcher mustn't apply pressure for cooperation. The consent was not pressured in the research question, but the willing participants participated in a raffle. The consent and additional motivation were seen as the students' prominent ways of being motivated and simultaneously giving their consent.

### 6.3.1 Selection of the participants

The participants were all part of the HAMK Design Factory Product Development Project, sprint 1, that was operational during the 3rd module of the spring semester 2020. The course was the first interdisciplinary course that was being created by the procedure from Aalto University Design Factory.

The difference between HAMK and Aalto University is that Aalto had the course done mainly as an additional course in the degree programme of mechanical engineering in which all the students could apply freely. In HAMK Design Factory, the course was also open for all the students to choose from. Besides, the course was mandatory for a group of healthcare students. The difference in the limitations of degree programmes' possibilities of joining was the main difference between the PDP courses. PDP in Aalto is the main project course provided by the Aalto Design Factory.

The PDP of the HAMK Design factory was split into two different sprints. The course had to be divided per the operational model of periodical module work in the degree programmes of HAMK. Splitting the course also meant that there was a need to open the course to be done as a whole or just partly. The research was done on the students who participated in the first half of the PDP that lasted for period 3 in the 2019-2020 semester of HAMK.

### 6.3.2 Survey

Surveys are research tools where the information is mined with structured data collection methods from a pre-defined population. Data can be collected in the form of questionnaires or structured interviews. Survey strategies support research where the questions linger around the questions of what, where, and how. The questions also fit well into the descriptive research, where the details are looked into. One method inside the surveying entity is a questionnaire. Questionnaires are comprised of a pre-defined set of questions, and they can also be done via online tools. It is essential to look into the survey also in the part of the respondents. The sample should be representative and the data collection instrument for ensuring both the quality and a reasonable response rate. One plausible issue with questionnaires and surveys as a strategy is that the data's depth and quality might not be as good compared to other data collection tools (Saunders & Lewis, 2018. p. 120-121).

Questionnaires (Ponto, J. 2015) can be delivered to the recipients either in a physical form, digital channels, or using both methods. Using both methods, when possible, might help the researcher gain a better sample coverage. In the questionnaire done for this study, only the digital channels were used, as the recipient's addresses were not known, and the situation

was such that the recipients were all in the same place. The questionnaire could be delivered to them simultaneously.

Ponto (2015) has described the survey as a research approach to collecting samples from individuals through responses regarding a set of questions. A research survey allows the research to use various methods when using the quantitative and qualitative research strategies together, for instance, using questionnaires with numerically rated items and more open questions that create the possibility to use the qualitative questions. Surveys are generally used in social research when trying to explore human behavior. Surveys have been used to collect data and obtain information for both behavioral factors and preferences. In addition, they have been used as a part of even more constructed research strategies. Feedback surveys are one example where the method has been used to acquire information that reflects the respondents' characteristics and form knowledge based on the data collected. Historically the sample sizes have been quite large. Still, the approach to using surveys has also turned in building smaller, detailing samples that bring up more representative data from the data. Surveys also have some biased aspects that need to be considered when conducting research using the survey method.

Type of error	Source of error	Strategies to reduce error
<i>Coverage error</i>	Unknown or zero chance of individuals in the population being included in the same sample	Multimode Design
<i>Sampling error</i>	Individuals included in the sample do not represent the characteristics of the population	Clearly identified population of interest Diverse participant recruitment strategies
<i>Measurement error</i>	Questions do not accurately reflect the topic of interest: questionnaires do not evoke truthful answers	Valid, reliable instruments: pretest questions, visual characteristics
<i>Nonresponse error</i>	Lack of response from all individuals in the sample	User-friendly survey design; follow-up procedures for nonresponders

Figure 13. Sources of Error in Survey Research (Based on Ponto, J. 2015)

Sampling is an integral part of planning the survey as a sufficient and representative sample from the population should be found to be exploited. The sample should be identified, and the individuals in the sample should be ones that reflect the sought characteristics of the research population. Sample selection is important because it might not be meaningful to collect data from the whole population. It is also case-dependent if collecting data from the whole population brings additional value to the research compared to the selected sample's data. Selecting a

reasonable sample will assist the research as it saves resources for the analysis. Samples can be built on sampling frames of the relevant sample and the participants' information in the sample. (Ponto, J. 2015; Saunders & Lewis, 2018. p. 138-140).

The survey will be conducted as a digital questionnaire form. The tool's selection was moderated by the possibility to collect the results in a defined situation and in a limited time frame. The questionnaire was built on the SERVQUAL model and enhanced with the questions derived from HAMK and Aalto Design factories' operational model. The whole population is here seen as all the students that have prior attended the HAMK Design Factory studies with a similar operational model as the PDP had. The questionnaire sample was selected as they had the most recent experience in the HAMK Design Factory environment, and in the sample, there were participants from various degree programmes. The participant list of students will be used as the sampling frame to do the research on.

Parasuraman, Zeithaml, and Berry created SERVQUAL Model in 1985 to understand service gaps that affect the perceived service quality. The gaps were further examined, and the service provider's qualities affected the quality perception from the customer's side. The quality gaps were defined to be:

- difference between customers' expectations and management perceptions of customer expectations
- Difference between managements perception of customer expectations and service quality specifications
- Difference between service quality specifications and the service quality of the delivered service
- Difference between the service delivery and the customer communication regarding the service
- Difference between service expectations and the perceived service quality (UK Essays, 2018).

Furthermore, the gaps are turned into dimensions that in the SERVQUAL model are reliability, responsiveness, tangibles, assurance, and sympathy/empathy (Arlen, 2008.) Reliability consists of the ability to provide the service accurately and credibly. Fulfilling the reliability dimension, the service must be consistent in the way it is implemented and delivered to the customer. Responsiveness measures the ability to solve the customers' problems swiftly and deal with possible complaints quickly and effectively. The criterion of tangibles measures the qualities that consist of facilities, machines, equipment, materials, and staff attitudes; the effect of tangible materials and surroundings in contact with the customer is also sometimes referred to as servicescape, influencing both the customers and employees of the company. Assurance relates to the elements of credibility and trust, which are based on the technical knowledge, professional services, courtesy, and communication skills that create an environment where the

customer believes and trusts the quality of the company's service quality. The sympathy criterion is about consideration, care, and the best preparation. Sympathy can also be turned into empathy and used to create a profiled service process to meet the customer's specific expectations even beforehand the service process has even started (UK Essays, 2018; Arlen, 2008).

Both Wong, Ong & Kuek (2012) and Gregory (2019) have researched the use of SERVQUAL in the research on finding out the relevant factors and improving the service quality in the educational organization field. Both of these papers are considered when doing the survey and analysis of this thesis. Wong et al. do their research also on a modified version of SERVQUAL, where some aspects of the questionnaire were re-fitted to suit the purpose of the research.

Service quality is not as easy to measure as product quality, as services are consumed simultaneously as they are produced and have intangible elements in them. Service quality is thus always a perceived quality related to the expectations of the customer. Tools such as SERVQUAL and SERVPERF compare the received quality to the expected quality and, from that perspective, try to create a value chart for the services. Perceived service quality and customer satisfaction are intertwined as customer satisfaction results from the customer's pre-purchase or post-purchase expectations. Service quality can be felt satisfactory when the customers do not feel that services are of high quality – creating a difference between the service quality and customer satisfaction, which is essential to note when measuring service quality. (UK Essays, 2018.)

## 7 RESEARCH

The research was conducted after the Product Development project (later referred to as PDP) -course. The course had 51 enrolled students, out of which 35 answered the questionnaire, which in percentage means 68,6 %. The students who participated in the course can be roughly divided by their form of participation: The course was a mandatory part of their course for the healthcare students. For the other students, it was volitional.

The questionnaire used in the research is based on a SERVQUAL model used in a research conducted by Wong, Ong, and Kuek (2012) when researching how to collect data on business academics' service quality. Concerning the mentioned questionnaire, some of the questions were changed. Some themes added to empathize further the scope of meaningfulness of the interdisciplinary operations and HAMK Design Factory's operational model.

Comparing the results to other studies the students have done in HAMK is impossible as the data relating to their studies has been collected differently. The only comparison can be established with similar research methods. Thus, there is also no knowledge on how the students of HAMK perceive their recent studies, so a hypothesis cannot be made regarding if they value the HAMK Design Factory studies more than their respective degree program studies. The research was based on the hypothesis that the interdisciplinary environment produced added value for the students. For more in-depth results, the group has further diverged into the healthcare students obligated to participate and the other students who had been voluntarily participated. The results will be shown per the whole group and the difference between the two groups that were chosen by their participation situation.

The questionnaire was mainly done with a five-point Likert-scale with the same arguments in all cases. The structure had 36 variables that were placed under seven different themes based on the SERVQUAL model. Compared to the questionnaire of Wong et al., the Design Factory version had both tangibles, and an interdisciplinary co-creation environment added, as the scope of the research sees the environment and the process additional elements in the value chain that provides a service to the students.

- Reliability – Ability to perform the promised service dependably and accurately
- Responsiveness – the willingness to help and provide prompt service
- Assurance – Knowledge, and courtesy of employees and their ability to inspire confidence
- Empathy – caring, individualized attention the organization provides its customers



- Knowledge and Communication -
- Tangibles – The surrounding environment supporting the production of a service
- Interdisciplinary co-creation environment

The questionnaire that has been used should meet three criteria for it to be seen as an excellent measuring instrument. The criteria are reliability, sensibility, and validity. To meet the sensibility requirements, the questionnaire has to measure the answers' variability accurately, which the simple yes/no -questions do not do. The Likert scale provides information about the respondents' perceptions and attitudes and is easy to administrate and analyze. The scale provides variability for the answers and provides the sensibility aspect. A five-point Likert Scale was chosen for the questionnaire, as it provides sufficient data and variability regarding the themes. For the reliability criteria to be met, the questionnaire must be done to collect data that can produce consistent results. The questionnaire can be seen as reliable when most respondents give almost similar answers to the statements. In this research, the reliability is by using an adopted questionnaire form that has already been used in similar research. Factor analysis and Cronbach's alpha. (Won et al., 2012, p. 213-217). In order to gain more detailed information on how the course was perceived, additional open questions I wish, and I like to have been added after each SERVQUAL dimension. The I wish, and I like questions are open questions where the students can give the details on which of the matters they felt were correctly done and what matters they would like HAMK Design Factory to use resources to improve. The scale for the questionnaire was:

- 1 – Strongly disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

## 7.1 Reliability and Validity

Validity can be divided into internal and external validity. External validity implies if the research can be generalized to fit into other situations. Evaluating the external validity is concerning the whole research design. Data collection in qualitative studies is blamed for being subjective and harder to establish external validity. Internal validity measures the questionnaire and its' fit regarding the purpose of the research. Internal validity can be further derived into three subcategories of content validity, construct validity, and criterion-related validity. Validity correlates directly with the credibility of the research, the conclusion, and research findings. Research validity and reliability need to be taken into consideration when creating the research design. Validity is crucial as multiple factors can affect the research and the results, rendering the findings invalid.

The factors are:

Subject selection – the biases regarding the research subject that might be unrepresented in the research population

History – Events that have occurred in the history of the study that might affect the findings

Testing – Are there any effects of the data collection process regarding the subject

Mortality – Are there any loss of subjects during the research

Ambiguity about causal direction – Inability to locate the flow of the cause and effect. Is poor performance deriving from poor rating or vice versa

Reliability has factors that are threatening the reliability of the conclusion and findings

- subject error – Measurements that are affected by the research situation
- Subject bias – Research subjects are giving unreliable information because they think the information given might affect them somehow
- Observer error – The way the questions are formatted so that they might affect the results and findings

Observer bias – The way different researchers analyze the data (Wong et al., 2005, p.216; Saunders & Lewis, 2012, p. 133–134).

For the research to be reliable, the results should be looked at through a critical approach and analyzed, if possible, by comparing them to other similar studies. For this study to be reliable, the research questionnaire was filled anonymously so that the single respondents could not be targeted from the results. The one question that hinders the anonymity was the question regarding the degree program. Still, it was a compulsory question as the results needed to be analyzed so that the degree programs and their differences would have been pointed out if there had been any.

### Cronbach's Alpha

Cronbach's Alpha is a measure used when analyzing the consistency of responses regarding a certain data set of questions defined to measure a pre-decided concept. Cronbach's Alpha consists of an alpha coefficient that has a value from 0 to 1. Values that are above 0,7 are seen as consistent (Saunders et al., 2019, p. 518, 800-801).

Cronbach's alpha is developed in 1951 for measuring the reliability or internal consistency of a specific data set. Reliability meaning that the test is measuring the statistics it should. Cronbach's Alpha is used together with the Likert scale. The questions put on to Likert scale measure the latent variables that a hard to measure in reality. The reliability and internal consistency have directive order relating to the internal consistency. In

Likert scale questionnaires, the internal consistency is met with the following criteria (Statistics How To, N.D):

Cronbach's Alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Table 3. Internal consistency scale of Cronbach's alpha (Statistics How To, n.d.)

Cronbach's Alpha per dimension:

Dimension	Cronbach's Alpha	Internal consistency
Reliability	0,9171	Excellent
Responsiveness	0,8989	Good
Assurance	0,9596	Excellent
Empathy	0,8968	Good
Knowledge and communication	0,9476	Excellent
Tangibles	0,9455	Excellent
Interdisciplinary Co-creation environment	0,9554	Excellent

### 7.1.1 Content validity

Content validity refers to the ability to perform the promised service dependably and accurately. The content validity was measured with four different statements. The statements are adopted from the research by Wong et al. (2012). The results are thus comparable, the only change being the change of term teacher to coach as there are multiple other staff members than just teachers involved in the HAMK Design Factory courses. Content validity also notes if the research is done so that the results represent the domain that is being studied (Salkind, 2010). The content was measured from a group with 35 responses from a total group of 50 students, meaning 70 % representation of the whole group. One factor in the content validity is the research questions used and their suitability for the study. In this study, the research questions were derived from a study by Wong et al. that also studied the service quality in higher education. Part 7 that researched the interdisciplinary environment has been adapted from the material regarding Design factory studies' value from Aalto University Design Factory material. The material has been taken from a study covering a similar subject. The themes of similar studies and the

service quality aspect have also been covered; thus, content validity can be seen as good.

Dimensions (This study, 2020)	Factors (Sahney et al., 2003)	Mean Score (Wong et al., 2005)	Mean Score (Sahney et al., 2003)	Mean Score (This study, 2020)
Tangibles	Tangibles	N/A	3,49	3,76
Assurance & Empathy	Attitude	3,22	3,70	3,77
Responsiveness & Reliability	Delivery	3,46	3,82	3,70
Knowledge & Communications	Competence	3,41	3,74	3,65
Interdisciplinary Co-creation Environment	N/A	N/A	N/A	3,62

Table 4. Comparison of similar studies

Compared to other studies using similar methodology, this study's results are similar to the comparable results. The studies of Wong et al. and Sahney et al. give an understanding of what could be the scale regarding how students reflect their study environments and thus provide crucial information regarding later development in HAMK Design Factory. Other studies did not have the dimension of interdisciplinary co-creation environment, but the dimension does not stand out as a significant dimension in the students' responses.

For further examination, the students were divided into two groups: healthcare students with the Product development project course as a compulsory part of their curricula and other students who chose the course as mandatory. In the research analysis, it is also good to notice that a hypothetical target SERVQUAL value of 4,00 has been set. The value is set for the research to provide the aspect regarding the perceived added value. If the value is higher than 4,00, it means the students have seen the additional value in the statement. The set value can also be given meaning when differentiating the given responses of the different groups. The target value is also being done in reflection to the other studies (Sahney et al., 2003; Wong et al., 2005) and their results. I wish/ like questions have not been used in the analyzing phase as there were only a few answers to them.

## 7.2 Research findings

### 7.2.1 Reliability

The statements were based on a prior study by Wong (2005) but altered so that they would meet the dimensions that are seen as important in the multidisciplinary product development and ideation courses.

	1.1	1.2	1.3	1.4
<i>Target value</i>	4,00	4,00	4,00	4,00
<i>Mean</i>	3,66	3,37	3,23	3,89
<i>Median</i>	4,00	3,00	3,00	4,00
<i>Standard deviation</i>	0,91	0,94	1,04	0,96
<i>SERVQUAL GAP for all students (From Target value 4)</i>	-0,34	-0,63	-0,74	-0,11
<i>Mean for other students</i>	4,00	3,80	3,73	4,07
<i>SERVQUAL GAP (From Target value 4)</i>	0,00	-0,20	-0,27	0,07
<i>Mean for Healthcare students</i>	3,40	3,05	2,90	3,75
<i>SERVQUAL GAP (From Target value 4)</i>	-0,60	-0,95	-1,10	-0,25

Table 5. Reliability

On dimension 1, the students had to reply to four different statements that were described earlier. The material will be assessed looking into the whole dimension and the single statements to clarify how the Design of studies could be improved. In addition to the closed questions, also I like/ I wish method was used, where the students could further describe the tangible areas in which they seemed to be most important.

When looking into the research results, they can only be assessed relating to the Product development project -course, as there has not been similar data collected from other courses. Thus, the target for succeeding the students' expectations has been put to 4,0. Most of the students feel like the study has surpassed their expectations and provided additional value for them. The limit is hypothetical but is just set to give a perspective on how the results line up regarding the target value.

The mean helps understand the difference between the two different subgroups in the research. In the reliability part, the healthcare students' responses are generally lower than those of the other students.

- 1.1. My coaches provide their services at the time they promise. The mean for all students was 3,66. For healthcare students, the mean was 3,40, and for other students 4,00. The difference between the

different student groups is 0,60. Compared to the set SERVQUAL value of 4,00, the value perceived for other students is on par with the target, but the perceived value for healthcare students is significantly lower. The students were divided into multidisciplinary groups, so students have perceived reachability and service quality in this aspect quite differently.

- 1.2. My coaches tell me exactly when services will be performed. The mean for all students was 3,37. For healthcare students, the mean was 3,05, and for other students, it was 3,80. Compared to the set SERVQUAL target value of 4, there is a small difference of -0,20 for other students and -0,95 for healthcare students. The difference is more considerable compared to claim 1.1, so there have been some issues that have hindered the perceived experience. The coaches' ability to be clear and clarify their message can be seen as a part of development.
- 1.3. My coaches perform service right the first time. Measuring coaches' ability to impact the first try is essential to create trust between the coach and the team. The mean for all students was 3,23 that was also the lowest in theme 1. Mean for other students was 3,73 and for healthcare students, 2,90, that was also the only sub 3,00 mean in the whole theme. The ability to create an environment where students perceive things going fluently is essential and should be elaborated.
- 1.4. When my coaches promise to do something by a specific time, they do so. This question reflects the reaction capabilities of the coaches. When discussing the different responsibilities, the coaches also carry the tasks they're assigned. The mean for the whole group was 3,89, where the mean for other students was 4,07 and for healthcare students 3,75. Part 1.4 is the only one in the theme where some additional value can be seen created from the students' perspective.

As a whole, the statements in dimension one did not reach the set SERVQUAL value. They thus can seem as parts that need to be further developed in order for the studies to fully meet the criterion of added value in the perspective of the students. Unique actions need to be added in the planning, designing, and implementation phases. In addition to the closed SERVQUAL questions, the students were asked to give open feedback on each of the dimensions. Open feedback was divided into I wish – parts where the students wished for improvement to be made and I like – parts where the students felt the course had fulfilled their expectations.

## 7.2.2 Responsiveness

	2.1	2.2	2.3	2.4
<i>Target value</i>	4	4	4	4
<i>Mean</i>	3,63	3,80	3,97	4,06
<i>Median</i>	4,00	4,00	4,00	4,00
<i>Deviation</i>	1,03	0,90	0,89	0,87
<i>SERVQUAL GAP (From Target value 4)</i>	-0,37	-0,20	-0,03	0,06
<i>Mean for other students</i>	3,87	3,93	4,07	4,20
<i>SERVQUAL GAP (From Target value 4)</i>	-0,13	-0,07	0,07	0,20
<i>Mean for Healthcare students</i>	3,45	3,70	3,90	3,95
<i>SERVQUAL GAP (From Target value 4)</i>	-0,55	-0,30	-0,10	-0,05

Table 6. Responsiveness

On dimension 2, the students had to reply to four different statements that were described earlier. The material will be assessed looking into the whole dimension and the single statements to clarify how the design of studies could be improved. In addition to the closed questions, I also like/ I wish method used, where the students could further describe the tangible areas in which they seemed to be most important.

When looking into the research results, they can only be assessed relating to the Product development project -course, as there has not been similar data collected from other courses. Thus, the target for succeeding the students' expectations has been put to 4,0, where most of the students feel like the study has surpassed their expectations and provided additional value for them. The limit is hypothetical but is just set to give a perspective on how the results line up regarding the target value.

- 2.1 My coaches are never too busy to respond to my requests. The question relates to the responsiveness and availability of the coaches. For all students, the mean is 3,63, for healthcare students, the mean was 3,45, and for other students 3,87. SERVQUAL gap for both groups is negative, but the median response for the statement is 4, but the deviation is 1,03, indicating relatively high variation in the responses.
- 2.2 When I have a problem, my coaches show a sincere interest in solving it. This statement also relates to the coaches' presence and interest in the problems that arise during the courses. Mean for all students is 3,80, healthcare students 3,70, and for other students 3,93. The responses are -0,20 compared to the set SERVQUAL target value of 4,00.

- 2.3 My coaches give me prompt service. When in doubt, the reliability of the teachers needs to be realized. When coaches are available for the students and offer their services when needed, the students feel that the service has been provided just in time. The mean for all students was 3,97, with a deviation of 0,89. The median response for the statement was 4, so the majority of students felt that the service provided additional value for their learning experience. The median for other students was 4,07, and for healthcare students, 3,90. The responses being so near to the set SERVQUAL target value of 4, it can be said that PDP was able to perform relatively well regarding this statement.
  
- 2.4 My coaches are always willing to help my team and me. In addition to the availability, presence and goodwill are also necessary traits for the coaches in the PDP environment. The coaches should be present, if not physically but at least mentally, and provide their assistance. The mean for all students was 4,06 and the deviation 0,87. Mean for other students was 4,20 and for healthcare students 3,95. The statement was 0,06 over the SERVQUAL target value. For this statement, it can be seen that the course provided additional value for the students.

Based on the results of the dimension of responsiveness, the students saw some added value for the coaches' responsiveness factors, and that reflected in their responses. Compared to dimension 1 of the significant notes, in dimension 2, the median response on the Likert scale was 4 in all of the statements, signaling that a majority of the students felt value being created in the co-creational environment. One continuing factor is that healthcare students' responses are generally slightly lower than the other students' responses. As there is more healthcare than other student respondents, they weigh more when analyzing the results. Responsiveness can still be seen as something the coaches were generally successful on the course. The future development could be done with slight improvements based on the aspects brought up in the open questions.



## 7.2.3 Assurance

	3.1	3.2	3.3	3.4
<i>Target value</i>	4,00	4,00	4,00	4,00
<i>Mean</i>	3,97	3,71	4,03	3,83
<i>Median</i>	4,00	4,00	4,00	4,00
<i>Deviation</i>	0,82	0,93	0,79	0,89
<i>SERVQUAL GAP (From Target value 4)</i>	-0,03	-0,29	0,03	-0,17
<i>Group median</i>				
<i>Mean for other students</i>	4,07	4,07	4,07	4,07
<i>SERVQUAL GAP (From Target value 4)</i>	0,07	0,07	0,07	0,07
<i>Mean for Healthcare students</i>	3,90	3,45	4,00	3,65
<i>SERVQUAL GAP (From Target value 4)</i>	-0,10	-0,55	0,00	-0,35

Table 7. Assurance

Dimension 3 is based on the courtesy and inspirational abilities of the coaches. The students had to reply to four different statements that were described earlier. The material will be assessed looking into the whole dimension and the single statements to clarify how the design of studies could be improved. In addition to the closed questions, there was also, and I like/ I wish method used, where the students could further describe the tangible areas in which they seemed to be most important.

When looking into the research results, they can only be assessed relating to the Product development project -course, as there has not been similar data collected from other courses. Thus, the target for succeeding the students' expectations has been put to 4,0, where most of the students feel like the study has surpassed their expectations and provided additional value for them. The limit is hypothetical but is just set to give a perspective on how the results line up regarding the target value.

- 3.1 My coaches are constantly courteous with me. Being courteous can be seen as something the students expect from the coaches in order for them to feel welcomed and accepted to the co-creational environment. Courteous actions were done both in the physical and digital environments, where interactions took place. The mean for all students was 3,97, and the median was 4. The deviation for the statement was 0,82. The mean for healthcare students was 3,90 and for other students 4,07. The mean implied that the course provided some perceived additional value, but the SERVQUAL target value of 4 was not reached.

- 3.2 My coaches instill confidence in me. Instilling confidence in the students is crucial in the co-creational environment as the students must cope both with the insecurity of trying to solve unknown problems and cope with new, unfamiliar team members. This statement also refers to the coaches' effectual expertise: can they provide opportunities for entrepreneurial actions by the students. The mean for all students was 3,71, with the deviation being 0,93. The median response was 4,00. Compared to the prior statements in the dimension, there can be a severe difference in the healthcare students' responses, mean 3,45, and with the other students with the mean of 4,07. Compared to the SERVQUAL target value of 4,00, the healthcare students were experiencing the coaching staff more negatively than the other students, which is a communicational topic that needs to be explored and developed further.
- 3.3 My coaches conduct themselves professionally. Professional actions take place in digital communication, workshops, and lectures, and meetings with the groups. The mean for all students was 4,03, and the deviation was 0,79. The median response for all students was 4. For healthcare students, the mean was 4,00, and for other students, the mean was 4,07. When comparing the mean for all of the groups to the set SERVQUAL target value of 4, it can be seen that the students perceived additional value from the course regarding their studies in the environment.
- 3.4 My coaches have the knowledge to answer my questions or willingness to seek information that will help me. Willingness to help students succeed is vital as they are in an unfamiliar situation with the project and with their team. The coach can either be helping the student or hindering their progress. The mean for all students was 3,83, and the deviation was 0,89. The median for all students was 4. The mean for healthcare students was 3,65 and 4,07 for other students, creating a gap of 0,42. The mean of other students reached the SERVQUAL target of 4,00, but for healthcare students, the gap was -0,35 on the Likert scale—the perceptions per the knowledge and willingness to aid students varied between the two different groups.

Comparing the results in this dimension shows two different curves: the mean for other students per all the statements is 4,07 but the means of healthcare students' variate from 4,00 to 3,45. The approach and perception of additional value are fluctuating between the two different groups. When approached on the aspect of comparing groups per the whole data set, the other students have given more positive responses, and the healthcare students have given more negative responses. The median response for all of the statements in the dimension was still 4, which gives perspective on how the students have perceived the coaching

staff's actions, reactions, and presence. More in-depth knowledge could be harnessed from the open questions so that the operations could be further developed to meet healthcare students' needs. The dimension also responds to the effectual development – could the coaches help students evolve and be empowered in their own perspective.

#### 7.2.4 Empathy

	4.1	4.2	4.3	4.4
<i>Target value</i>	4,00	4,00	4,00	4,00
<i>Mean</i>	3,37	3,77	4,00	3,46
<i>Median</i>	3,00	4,00	4,00	3,00
<i>Standard deviation</i>	1,14	0,97	0,91	1,04
<i>SERVQUAL GAP (From Target value 4)</i>	-0,63	-0,23	0,00	-0,54
<i>Mean for other students</i>	3,73	4,00	4,07	3,67
<i>SERVQUAL GAP (From Target value 4)</i>	-0,27	0,00	0,07	-0,33
<i>Mean for Healthcare students</i>	3,10	3,60	3,95	3,30
<i>SERVQUAL GAP (From Target value 4)</i>	-0,90	-0,40	-0,05	-0,70

Table 8. Empathy

Dimension 4 defines the caring and individualized attention the students perceived during the course. The students responded to four different statements regarding the dimensions. The different aspects can then be derived from how the PDP course created services for the students both in the different themes and the scope of the dimension. In addition to the closed questions, I also like/ I wish method used, where the students could further describe the tangible areas in which they felt be most important.

- 4.1 My coaches give me personal attention. Attention refers to the activities that seem to be targeted to a single student and the discussive manner when interacting with students. The mean for all groups was 3,37 and the median 3,00. The SERVQUAL gap was -0,67. For healthcare students, the mean was 3,10, and for other students, 3,73. None of the measurements met the SERVQUAL target of 4,00. The healthcare students were more negative towards the attention they received compared to other students, with a 0,63 margin between the mean of the groups.
- 4.2 My coaches give my team sufficient attention. Sufficient attention is comparable to personal attention but also measures the quality and quantity of attention given. Attention is present in the communication and actions of the staff. The mean for all students was 3,77 that was -0,23 from the target SERVQUAL value. For

healthcare students, the mean was 3,60, and for other students 4,00. For other students, the mean reached the set SERVQUAL target value of 4,00. Still, for healthcare students, the target value was -0,40 below the set value, meaning the different groups saw the qualities of the attention give somewhat differently.

- 4.3 My coaches have my and my team's best interests at heart. Students perceive the teachers' actions and communication, and goodwill as a part of their learning experience. The mean for all students was 4,00, and the median was 4,00. The mean for all students reached the set SERVQUAL target value. For healthcare students, the mean was 3,95, and for other students 4,07. The other students perceived the additional value greater than the set SERVQUAL target value. Per the results, the students felt that coaches had good intent and a positive approach to the projects and their projects.
- 4.4 My coaches understand my and my team's specific needs. The understanding and comprising the coaching and helping actions per the situation are reflective and reactive skills the coaches should have in a co-creational environment for them to be helping the students achieve the set goals. For all students, the mean was 3,46 and the median 3,00. The mean was 3,00. For healthcare students, the mean was 3,30, and for other students 3,67. The mean for all students was -0,54 regarding the set SERVQUAL target value of 4,00.

The students felt they did not receive enough personal attention to give additional value for themselves, but the quantity and quality of attention given were met more positively. The students felt that the coaches had their interests in mind, which created additional value for them. Based on the results, only the feeling of goodwill regarding the team's interest was something that brought measurable added value for the students. Still, other aspects of individualized care and attention were felt not providing additional value for the results to meet the set SERVQUAL target value.

## 7.2.5 Knowledge and Communication

	5.1	5.2	5.3	5.4	5.5	5.6	5.7
<i>Target value</i>	4,00	4,00	4,00	4,00	4,00	4,00	4,00
<i>Mean</i>	3,59	3,51	3,54	3,69	3,71	3,77	3,74
<i>Median</i>	4,00	3,00	4,00	4,00	4,00	4,00	4,00
<i>Deviation</i>	1,02	1,12	1,09	0,93	0,83	0,97	1,04
<i>SERVQUAL GAP (From Target value 4)</i>	-0,41	-0,49	-0,46	-0,31	-0,29	-0,23	-0,26
<i>Group median</i>							
<i>Mean for other students</i>	3,73	3,60	3,67	3,67	3,80	3,67	3,67
<i>SERVQUAL GAP (From Target value 4)</i>	-0,27	-0,40	-0,33	-0,33	-0,20	-0,33	-0,33
<i>Mean for Healthcare students</i>	3,47	3,45	3,45	3,70	3,65	3,85	3,80
<i>SERVQUAL GAP (From Target value 4)</i>	-0,53	-0,55	-0,55	-0,30	-0,35	-0,15	-0,20

Table 9. Knowledge and Communication

Dimension 5 measures coaches' up-to-date knowledge in the topics they teach and their ability to relate theory to practical cases. It also measures the coach's communicational capabilities regarding communication to single students, student teams, and the whole class. Dimension 5 also assesses the coach's ability to give constructive feedback that will help the student team thrive.

- 5.1 My coaches have good knowledge about the teaching areas refers to the themes and topics were taught during the course. The mean for all students was 3,59, and the median was 4. For all students, the mean was -0,41 from the set SERVQUAL target value of 4. For healthcare students, the mean was 3,47, and for other students, it was 3,73 meaning each of the set groups did not meet the SERVQUAL target value. The deviation was 1,02.
- 5.2 My coaches are involved in researching the topics at hand. The statement implies that coaches should have empirical and theoretical knowledge of the topics being taught and verified for their professionalism. For all students, the mean was 3,51, and the median was 3. For healthcare students, the mean was 3,45, and for other students 3,60. All means were below the set SERVQUAL target value

of 4,00, meaning that there was a gap between the set target and the responses. The deviation for the statement waws 1,12. mean

- 5.3 My coaches are able to provide real-world examples in their lectures. Using empirical material is thought to support the process of the student's understanding of how different methods are used in the course. For all students, the mean was 3,54, the median was 4, and the deviation was 1,09. For other students, the mean was 3,67, and for healthcare students, it was 3,45. The mean for all students was -0,46 under the SERVQUAL target.
- 5.4 My coaches communicate well with me. Individual communication between the coach and the student had a response mean of 3,69 for all students, 3,70 from healthcare students, and 3,67 for other students. The mean for all students was -0,31 from the set SERVQUAL target value of 4. The statement was the only one in this dimension where the healthcare student's response was higher rated than other students' responses. The deviation for the statement was 0,93.
- 5.5 My coaches communicate well with my project team. The course was majorly done to communicate with the teams either in person or using digital channels, such as Microsoft Teams. The mean for all students was 3,71, -0,29 from the SERVQUAL target value, and the deviation was 0,83. The Median for all students was 4. For healthcare students, the mean was 3,65, and for the other students 3,80. The difference between the means for the different segments was 0,15.
- 5.6 My coaches communicate well in class. The statement regarding the communicative skills when the whole class was present had the mean of 3,77 in all student's segment, 3,67 for other students, and 3,85 for healthcare students. The mean for healthcare students was slightly higher than the one for other students, making an exemption to multiple other statements in the dimension. The median for all students was 4,00 and the deviation 0,97.
- 5.7 My coaches are able to provide feedback about my and my teams' progress. The statement reflects on the whole course and the coaches' ability to provide constructive feedback for the teams. The mean for all students was 3,74, and the median was 4. For healthcare students, the mean was 3,80, and for other students, it was 3,67.

The results of the dimension had quite a small variance in the means that were between the values of 3,51 to 3,77. The means were all under the set SERVQUAL target value. The difference between the healthcare students' and other students' perception of the additional value was quite similar, with the statements 5.4 and 5.6 being the only statement where healthcare students had a more positive mean. All the statements need

to be further improved for the perception of additional value will be increased sufficiently.

### 7.2.6 Tangibles

	6.1	6.2	6.3	6.4	6.5	6.6
<i>Target value</i>	4	4	4	4	4	4
<i>Mean</i>	3,97	3,82	3,74	3,76	3,47	3,79
<i>Median</i>	4,00	4,00	4,00	4,00	4,00	4,00
<i>Deviation</i>	1,03	0,83	0,90	0,99	0,93	0,95
<i>SERVQUAL GAP (From Target value 4)</i>	-0,03	-0,18	-0,27	-0,24	-0,53	-0,21
<i>Mean for other students</i>	3,71	3,86	3,50	3,93	3,57	3,79
<i>SERVQUAL GAP (From Target value 4)</i>	-0,29	-0,14	-0,50	-0,07	-0,43	-0,21
<i>Mean for Healthcare students</i>	4,15	3,8	3,9	3,65	3,4	3,8
<i>SERVQUAL GAP (From Target value 4)</i>	0,15	-0,20	-0,10	-0,35	-0,60	-0,20

Table 10. Tangibles

- 6.1 My coaches provide sufficient equipment for the course and projects. As the PDP is based on building prototypes and bringing ideas to have a physical presence, the equipment is an essential part of the process. For all students, the mean was 3,97, and the median was 4,00. The mean is approaching the set SERVQUAL target value of 4,00. For healthcare students, the mean was 4,15, which was 0,15 higher than the set value so that an additional value can be seen as perceived when compared to the set SERVQUAL value. For other students, the mean was 3,71. The quality of sufficient equipment has been met quite differently by the two groups.
- 6.2 My coaches provide visually appealing facilities. The HAMK Design Factory is a bit older facility with its' own limitations both regarding the visual and operational aspects. Thus, it is crucial to know how students felt the environment felt. For all students, the mean was 3,82, for healthcare students 3,80, and other students 3,86. The responses are slightly below the set SERVQUAL target value of 4,00. The perceived value of the two different groups in the statement is quite similar.
- 6.3 My coaches provide visually appealing and functional materials that provide added value to learning objectives. Materials are prepped before the course and regarding the students' discussions, meaning the students can affect the course materials. The mean for

all students was 3,74 that was 0,26 under the set SERVQUAL target value of 4,00. For other students, the mean was 3,50 and for healthcare students 3,90. There was a gap of 0,40 points between the two different groups.

- 6.4 I feel that the environment supports my team's co-creation process. The environment in question consists of all the communicational, digital, and physical elements. The mean for all students was 3,76, and the median was 4,00. Regarding the set SERVQUAL gap of 4,00, the mean for all students was -0,26. For other students, the mean was 3,93, and for healthcare students, it was 3,65. For other students, the mean was just 0,07 under the target SERVQUAL gap.
- 6.5 I feel that the environment made it easier to reach the goal we set for our project as individuals and as a team. The PDP target is to meet the set project goal and form a team that will be the tool to conquer the challenges given. For all students, the mean was 3,47, -0,53 from the set SERVQUAL target value of 4,00. The mean for healthcare students was 3,57 and for other students 3,40.
- 6.6 I feel the digital tools used are meaningful for my progress. Meaningfulness is something that cannot be administered to fit the students. Still, in the perspective of PDP, it should be a result of a meaningful and supportive environment in total. The mean for all students was 3,79, for healthcare students 3,80 and 3,79 for other students. The mean for other students was -0,21 from the set SERVQUAL value of 4,00. The different groups were all almost on par in the perceived value they gained regarding the statement.

In dimension 6, there were no statements that met the set SERVQUAL target value for all students. Although in statement 6.1, the mean of healthcare students was over the value of 4,00. Most of the means of statements were over 3,5, with 6.5 being the only one that did not meet the 3,5. The median answer for all of the claims was 4,00, which could be seen as something that supports the course's perceived added value. Most improvement must be made in the environmental support for the individuals and teams, and the most added value was felt gained from the equipment that the coaches provided.



## 7.2.7 Interdisciplinary co-creation environment

	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8
<i>Target value</i>	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
<i>Mean</i>	3,82	3,35	3,50	3,65	3,68	3,49	3,62	3,85
<i>Median</i>	4,00	3,00	4,00	4,00	4,00	3,00	4,00	4,00
<i>Deviation</i>	1,11	1,28	1,11	1,01	1,07	1,06	1,33	1,16
<i>SERVQUAL GAP (From Target value 4)</i>	-0,18	-0,65	-0,50	-0,35	-0,32	-0,52	-0,38	-0,15
<i>Mean for other students</i>	3,93	3,57	3,71	3,64	3,93	4,00	3,79	4,29
<i>SERVQUAL GAP (From Target value 4)</i>	-0,07	-0,43	-0,29	-0,36	-0,07	0,00	-0,21	0,29
<i>Mean for Healthcare students</i>	3,75	3,20	3,35	3,65	3,50	3,11	3,50	3,55
<i>SERVQUAL GAP (From Target value 4)</i>	-0,25	-0,80	-0,65	-0,35	-0,50	-0,90	-0,50	-0,45

Dimension 7 is based on different elements regarding the HAMK Design Factory's Product development project's pedagogic process. The claims are derived from the design thinking pedagogics, multidisciplinary approach, team working, and real-life customer problem as the course's principal content.

- 7.1 My team was able to create new even though there was uncertainty in the beginning. There is a lot of uncertainty at the beginning of the PDP as the teams are just forming, the team must choose a project manager to lead the team, and they are uncertain of the challenge and the process the team will face. Uncertainty could be described as the driving factor at the beginning of the course. The mean for all students was 3.82 with a deviation of 1,11. The mean for healthcare students was 3,75 and 3,75 for other students. The mean for all students was -0,18 points from the SERVQUAL target value of 4,00.
- 7.2 My team was able to understand the working method. The PDP course is done with the design thinking theory and process from Stanford as the platform and consists of weekly sprints where teams have to develop their project work with different given teams. For this question, the mean for all students was 3,35, and the median was 3,00. For other students, the mean was 3,57, and for healthcare students, 3,20. The mean for all students was -0,65 points from the set SERVQUAL target value of 4,00.
- 7.3 My team used the different disciplines and knowledge of the different disciplines as an advantage. As the program is based on

multidisciplinary teams, working with different disciplines is basic. Different disciplines operate differently and, for that reason, also approach certain aspects from various perspectives. The mean for all students was 3,50, for healthcare students 3,35 and other students 3,71. The mean for all students was -0,50 points from the set SERVQUAL target value of 4,00. The median was 4,00.

- 7.4 I found working in the interdisciplinary team more meaningful than just with my discipline. Comparing how students feel about working with different disciplines is also measuring the meaningfulness they create in the PDP course. For all students and healthcare students, the mean was 3,65, and the median was 4,00. For other students, the mean was 3,64. The mean was 0,35 below the set SERVQUAL target value of 4,00.
- 7.5 My coaches created an environment where my team was able to succeed. In addition to the pedagogical aspect and team's operational capabilities, the coaches also have a large part in making the team perform at a high level. The coaches should operate as enablers. The mean for all students was 3,68, and the median was 4,00. For other students, the mean was 3,93 and 3,50 for healthcare students. The mean for all students was -0,32 from the set SERVQUAL target value of 4,00.
- 7.6 My team was open to work even though the achievable result was unknown. The co-creational environment in the course was established so that the students had to adapt their approach and operations as the sprints and different themes were introduced to them. The mean for all students was 3,49, which was -0,51 points from the set SERVQUAL target value of 4,00. For healthcare students, the mean was 3,11, -0,89 from the set SERVQUAL target value, but for other students, the mean met the SERVQUAL target value of 4,00. Thus, the difference between the two different groups being 0,89 points. The median for all students was 3,00.
- 7.7 I felt the design thinking method was useful in the co-creation process. Design thinking was the driving development method in the course. PDP was also the first course where the new HAMK Design thinking process was explored. The mean for healthcare students was 3,50, for other students 3,79 and all students 3,62. The median for all students was 4,00. The mean for all students was 0,50 below the set SERVQUAL target value of 4,00.
- 7.8 My team felt meaningful to work with a real working life problem. In PDP, all the work done is done related to the real customer problems given by the so-called sponsor organizations. the mean for other students was 3,85, and the median was 4,00. For all students, the mean was -0,15 from the set SERVQUAL target value of 4,00. The

mean for healthcare students was 3,55, and for other students, it was 4,29, which was 0,29 points over the set SERVQUAL target value of 4,00. The difference between the healthcare and other students' responses was 0,74.

In general, the dimension and added value from the co-creational environment were better perceived by the other student's group, with the only statement valued better being 7.4. The most considerable disparity between the two groups was in statement 7.6. The difference between the mean of the two groups' responses was 0,90 in favor of the other student's group. Statements 7.6 and 7.8 were also the only ones where the set SERVQUAL target value of 4,00 was reached by the mean of the other student's group. For the healthcare students' groups, none of the statements reached the set SERVQUAL target value. Neither did the mean for all students.

## 8 CONCLUSION

Based on the results of the study and comparison with other studies using the SERVQUAL method as a tool, it can be said that the HAMK Design Factory learning environment did not provide additional visible value for the whole study group of the Product development project. When the student groups were divided, the group that had chosen the course as a mandatory project felt the studies more negative compared to other students, who had chosen the studies as preliminary. As the other students were from various degree programs, an analysis of the differences between the perceived value per different degree programs could not be assessed.

The research questions were:

Research question 1: How are the current Design Factory studies in HAMK Design Factory perceived?

The results of the study show that HAMK Design Factory studies are felt to be of decent value. Still, the results did not show that the whole course or the interdisciplinary aspect would be something that would significantly create value if compared to other studies using a similar scale.

Research question 2: Are there differences in how students from different disciplines react to HAMK Design Factory studies?

There was a similarity between the responses of other students compared to students from the healthcare degree programme. The results show that other students perceived the studies, in general, more positively. The reasons for the added value could not be stated from the research.

The research's main hypothesis is: Learning is a service process that can be mapped and developed with the tools originated from Design thinking.

The results indicated that the hypothesis was plausible, but the Design Thinking approach, in this case, was not enough to create additional value for the students. It might require additional pedagogical tools and a more student-centered approach to support.

The ideology of student-centric operations derived from Aalto Design Factory, the environment should be developed further to meet the students' added value criteria. Hence service design methodology could be implemented to improve the environment as mentioned. For the environment to improve the students' character regarding development operations, the aspects of effectuation should be implemented in the course to encourage students to get more out of the studies. The development should then be planned as active (planning the operations through the themes of effectuation) and passive (courses should be

planned with service design tools to give the students elements that would add value to the course's perception).

Looking at the results from the ecosystem thinking level, where the stakeholders are at the same level, it could be noted that the students felt limitations in the course, and they did not perceive additional value. The benefits can be initiated that the amount of intrinsic and extrinsic motivation can be further looked into also on the level of the different operations, communication, and actions in the course. From this idea, we can derive a new method for further improving the student experiences in the course, rather than using only the design thinking and co-creation methodologies in the planning, combining the different operations of the so-called teacher and student levels into one layer as per the paper from Mueller and Toutain (2015, p. 12). As the course also has an external partner level, it should also be connected to the whole course already in the planning phase. By taking the external partners in the process early, they can also join in the co-evolution process that brings value for all the stakeholders.

Ecosystems bound to particular courses also have minimal time to form the focus, rules, and shared value understanding the ecosystems demand to be viable. The process should thus be already something that can be experimented with and iterated. One possible scenario for the process is to base it off of the value flow model by Ouden (2012, p. 155). This process could be applied further to the HAMK Design Factory model's ecosystem learning model to clarify the model for students, teaching staff, and external partners alike. Without a stable process and with the limited resources regarding the courses, there are risks in adopting the ecosystem perspective with design thinking and effectuation. Without the ecosystem thinking, the process would lack the strategical point-of-view and also the perspective where all the primary stakeholders would be seen as equal parties.

They combine the different elements and create a learning journey that would embed elements from all theories. The process can be seen as a learners' journey in the sense that all the stakeholders should be thought of as active learners during the process and embrace the process through which the process can be seen as transparent. Embracing the process might also cause issues regarding the problems and troubles that might appear during it – the stakeholders should be realistic about the situation and openly solve each problem to gain traction between the operational model in theory and practice.

Proposal for Design Factory ecosystem learning model (based on Mueller & Toutain, 2015, p. 15):

1. Creating the course and setting the learning objective for the course. Clarifying the approach (ecosystem thinking, design thinking)

2. Including the students in the co-creation work, choosing the learning method, spaces and defining the physical and digital learning environment, creating a course-specific education ecosystem (design thinking, ecosystem thinking, effectuation)
3. Including a suitable partner organization that meets the criteria for development project and has an active approach for the ecosystem work (design thinking, ecosystem thinking, effectuation)
4. Execution of the course (design thinking ecosystem thinking, effectuation)
5. Reflection on the course with all the stakeholders, operational model, and development for further iterations

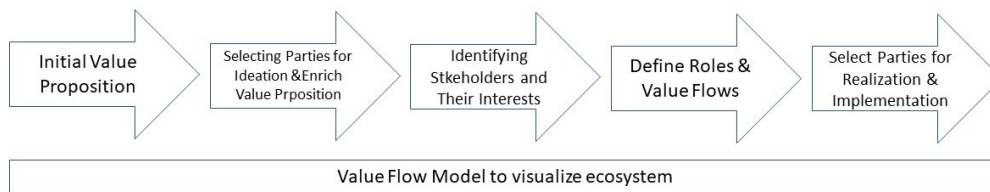


Figure 14. Value Flow Model in Learning (Modified from Ouden, 2012)

Another plausible scenario is to approach the value creation process through the value flow model by Ouden (2012, p. 154). The existing value flow model can be seen such, where the teacher or coaches as other staff members plan the activities and operate as the main organizer of the ecosystem.

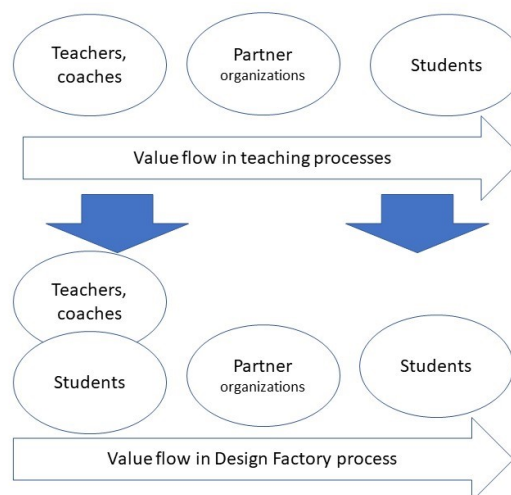


Figure 15. Future Design Factory ecosystem scenario (Raitanen, 2021)

In the Design Factory ecosystem map's future operational model, the students are stakeholders at the beginning of the process as the next

course's planning begins. The students can then assess their course's negative and positive aspects, and coaches can improve the course based on those development ideas. Even though the process is drawn as linear, it is more like circular; when the old courses end, the planning process should start. The planning process should take into account the touchpoints; static, human, and digital so that the planning process has a holistic development view on the course. The touchpoints also require the individual experience to be thought from various perspectives regarding, for example, the tools, digital platforms, communications, goals and outcomes, and processes that create the students' whole perceived experience. (Kalbach, 2018, p. 24, 27-28).

When building the new experiences, it is also essential to understand the criteria (Rossman & Duerden, 2019, p. 21-22) and assess the key approach on creating the experience so that the efforts in creating student experiences could be built with both the appropriate resources and correctly fitted approach. In HAMK Design Factory studies, this might require having a proper discussion on the approach – how and what type of value should we bring to the students that aim to benefit and succeed in the chosen courses. The goals of the students should then be matched with the touchpoints and environments mentioned above.

As experience and value perception are individual, participants are from multiple backgrounds, degree programs, cultures, and unique. Even the highest efforts to create meaningful courses might not achieve the added value perception of each student. There should still be some methods for gaining the students' information to improve the courses continuously. The overall quality would be such where most of the students perceive the value of some sort gained during the course. The value perception is also connected to the situation in which a student is when entering the course. They might willingly opt to join the courses that suit their perception of how they wish to learn in higher education, or the courses might be mandatory from them, even though they might be neutral, or even dislike the way learning is offered by the teachers (Harland & Pickering, 2010, p. 44).

Good experiences also require teachers who empower, activate, engage, and give the students the initiative. Learning has the elements of discovery and invention inside them. Teachers operating as coaches should also be facilitators that have empathy and understand their own dynamical role of either a “pusher” or “puller,” regarding which one a teaching situation requires (Weimer, 2013, p. 61-62). The analog suits also the situation of HAMK Design Factory. When operating in a multicultural and multidisciplinary field, the empathy to tone the learning environment to fit into the students' experiencescape will allow insightful learning experiences to be created. But in order for the teacher to be comfortable, a learning value process must be conducted to give the primary approach for each course.

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## Research questionnaire

## Student experiences in interdisciplinary learning environment Opiskelijakokemus poikkialaisessa oppimisympäristössä

This survey is conducted as a part of MBA thesis regarding the multi-/interdisciplinary courses and the perceived experience of the participating students. The thesis looks into the courses and the value they create through design thinking scope that is broadly used in HAMK Design Factory studies.

In the survey, the term coach refers to the staff of HAMK that are either teachers or other teaching staff.

The closed questions are on a five point likert scale described below. Students that have not participated in Interdisciplinary courses should answer the parts 1-5 on the behalf of their current study modules and leave part 6 unanswered.

- 1 - Strongly Disagree
- 2 - Disagree
- 3 - Neutral
- 4 - Agree
- 5 - Strongly Agree

Regarding the part you are answering to, please reply on what you felt was done properly and what could be improved in the future. The open questions are in a format of

I wish - The matters that could be improved in the future

I like - The matters that you felt were aiding you on your studies

Additional information about the survey:

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Tämä kysely on osa ylemmän AMK:n opinnäytetyötä, joka liittyy monialaisiin kursseihin ja niissä syntyvän opiskelijakokemukseen. Opinnäytetyössä opiskelijakokemusta tulkitaan muotoiluajattelun ja metodista syntyvän lisäarvon näkökulmasta. Muotoiluajattelu on malli, jota käytetään laajasti HAMK Design Factoryn opinnoissa.

Kyselyssä käytettävä termi valmentaja viittaa tässä kontekstissa opettajiin tai muihin opetustehtävissä oleviin henkilöihin

suljetut kysymykset ovat viisiportaisella Likertin asteikolla. Opiskelijat, jotka eivät ole osallistuneet monitieteelliselle kurssille voivat vastata kyselyn osioihin 1-5 nykyisen moduulinsa näkökulmasta ja jättää osion 6 tyhjäksi.

- 1 - Vahvasti eri mieltä
- 2 - Eri mieltä

- 3 - Neutraali
- 4 - Samaa mieltä
- 5 - Vahvasti samaa mieltä

Jokaiseen osioon liittyen on myös kaksi avointa kysymystä. Avointen kysymysten kautta pyritään ymmärtämään niitä asioita, jotka opiskelijat kokivat moduuleissa toteutuneen hyvin sekä niitä asioita, joita opiskelijat mahdollisesti haluaisivat kehittää moduuleissa. Avoimet kysymykset ovat muodossa

I wish - Mitä asioita haluaisin parannettavan tulevaisuudessa

I like - mitkä asiat olivat toteutettu niin, että ne auttoivat opiskeluani.

Lisätietoja:

Jukka Raitanen, jukka.raitanen@hamk.fi, 0505712340

Kyselyn lopussa sinulla on mahdollisuus osallistua arvontaan, jossa on palkintona 2 kappaletta 40 € lahjakortteja. At the end of the questionnaire you will have the possibility to participate a raffle that has 2 pieces of 40 € gift vouchers to S-group

Background information

Taustatiedot

1. Sex/ sukupuoli

- Female/ nainen
- Male/ mies
- Other or do not want to say/ Muu tai en halua kertoa
-

## 2. Degree programme/ koulutusohjelma

- Bioeconomy engineer
- Bio- ja elintarviketekniikka
- Computer Applications
- Construction Engineering
- Electrical and automation Engineering
- Hoitotyö/ Terveystenhoitaja
- Insinööri, Biotalous
- International Business
- Kestävä kehitys
- Konetekniikka
- Liikenneala
- Liiketalous
- Liiketalous, Hevosala
- Maaseutuelinkeinot
- Maisemasuunnittelu/Rakennettu ympäristö
- Mechanical Engineering and production Technology
- Mediatekniikka
- Metsätalous
- Puutarhatalous
- Rakennettu ympäristö
- Rakennusmestari.
- Rakennus- ja yhdyskuntatekniikka.
- Sairaanhoidaja
- Smart and Sustainable Design
- Sosionomi
- Sähkö- ja automaatiotekniikka
- Terveystenhoitaja
- Tieto- ja viestintättekniikka
- Tietojenkäsittely
- Älykäs ja kestävä muotoilu
- YAMK/MBA



3. Study year/ Opiskeluvuosi

- 1
- 2
- 3
- 4 or more

4. Have you participated in HAMK Design Factory courses/ Oletko osallistunut HAMK Design Factoryn kursseille?

- Yes/ Kyllä
- No/ Ei

## 5. Language/ Kieli

- English
- Suomi

## 6. PART 1 Reliability – ability to perform the promised service dependably and accurately

	1	2	3	4	5
My coaches provide their services at the time they promise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches tell me exactly when services will be performed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches perform service right the first time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When my coaches promise to do something by a certain time, they do so	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 7. PART 1: Reliability – I wish


8. PART 1: Reliability – I like


9. PART 2: Responsiveness – willingness to help and provide prompt service

	1	2	3	4	5
My coaches are never too busy to respond to my requests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I have a problem, my coaches show a sincere interest in solving it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches give me prompt service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches are always willing to help me and my team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. PART 2: Responsiveness – I Wish


11. PART 2: Responsiveness – I Like


12. PART 3: Assurance – knowledge and courtesy of employees and their ability to inspire confidence

	1	2	3	4	5
My coaches are consistently courteous with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches instill confidence in me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches conduct themselves professionally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches have the knowledge to answer my questions or willingness to seek information that will help me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. PART 3: Assurance – I wish


14. Part 3: Assurance – I like


15. PART 4: Empathy – caring, individualized attention the organisation provides to its customers

	1	2	3	4	5
My coaches give me personal attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches give my team sufficient attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches have mine and my teams best interests at heart	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches understand mine and my teams specific needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. PART 4: Empathy – I wish


17. PART 4: Empathy – I like


## 18. PART 5: Knowledge and Communication

	1	2	3	4	5
My coaches have good knowledge about the teaching areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches are involved in researching the topics at hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches are able to provide real world examples in their lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches communicate well with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches communicate well with my project team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches communicate well in class	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches are able to provide feedback about mine and my teams progress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 19. PART 5: Knowledge and Communication – I wish


## 20. PART 5: Knowledge and Communication – I like


21. PART 6: Tangibles – The surrounding environment supporting the production of a service

	1	2	3	4	5
My coaches provide sufficient equipment for the course and projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches provide visually appealing facilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches provide visually appealing and functional materials, that provide added value to learning objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that the environment supports my teams co-creation process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that the environment made it easier to reach the goal we set for our project as individuals and as a team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel the digital tools used are meaningful for my progress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22. Part 6: Tangibles – I wish


23. PART 6: Tangibles – I like


24. PART 7: Interdisciplinary co-creation environment

	1	2	3	4	5
My team was able to create new even though there was uncertainty in the beginning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My team was able to understand the working method	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My team was able to use the different disciplines and knowledge of different participants as an advantage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found working in interdisciplinary team more meaningful than just with my discipline	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coaches created an environment where my team was able to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt the design thinking method was useful in co-creation process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My team was open to work even though the achievable result was unknown	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My team felt meaningful to work with a real working life problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. PART 7: Interdisciplinary co-creation environment: Tangibles – I wish


26. PART 7: Interdisciplinary co-creation environment – I like


## 27. Osio 1: Luotettavuus – Kyky tuottaa luvattua palvelua luotettavasti ja oikea-aikaisesti

	1	2	3	4	5
Valmentajani tuottavat palveluita silloin, kun ovat luvanneet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani kertovat minulle tarkasti koska palveluita tuotetaan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani tuottavat palvelut ensimmäisellä kerralla oikeaan aikaan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kun valmentajani lupaavat tehdä jotain määritellyllä tavalla, he myös tekevät niin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 28. OSIO 1: Luotettavuus – Haluaisin


## 29. OSIO 1: Luotettavuus – Pidän




## 30. OSIO 2: Herkkyys – Halukkuus auttaa ja tarjota täsmällistä palvelua

	1	2	3	4	5
Valmentajani eivät olleet koskaan liian kiireisiä vastatakseni pyyntöihini	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kun minulla on ongelma, valmentajani osoittavat aitoa kiinnostusta sen ratkaisemiseksi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani palvelevat minua ripeästi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani ovat aina halukkaita auttamaan minua ja tiimiäni	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 31. OSIO 2: Herkkyys – I wish


## 32. OSIO 2: Herkkyys – I like


33. OSIO 3: Varmuus – Henkilökunnan osaaminen ja huomaavaisuus ja heidän kykynsä inspiroida varmuutta

	1	2	3	4	5
Valmentajani ovat jatkuvasti kohteliaita minulle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani tukevat itsevarmuuteni kehittymistä	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani käyttäytyvät asianmukaisesti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani osaavat vastata kysymyksiini tai heillä on halukkuus etsiä minua auttavaa tietoa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

34. OSIO 3: Varmuus – I wish


35. OSIO 3: Varmuus – I like


## 36. OSIO 4: Empatia – Välittäminen, organisaation asiakkailleen tarjoama yksilöllinen huomio

	1	2	3	4	5
Valmentajani antavat minulle yksilöllistä huomiota	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajat antavat tiimilleni riittävästi huomiota	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajat ajattelevat minun ja tiimini parasta etua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani ymmärtävät minun ja tiimini erityistarpeet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 37. OSIO 4: Empatia – I wish


## 38. OSIO 4: Empatia – I like


## 39. OSIO 5: Taidot ja viestintä

	1	2	3	4	5
Valmentajillani on hyvät taidot opettamistaan asioista	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajillani on käytännön kokemusta käsiteltävistä asioista	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani pystyvät tarjoamaan aitoja esimerkkejä luennoillaan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani viestivät kanssani hyvin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani viestivät projektitiimini kanssa hyvin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani viestivät hyvin tunneilla	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajillani on kyky antaa palautetta minun ja tiimini projektin edistymisestä	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 40. OSIO: Taidot ja viestintä – I wish


## 41. OSIO 5: Taidot ja viestintä – I like


## 42. OSIO 6: Muuttajat – Palvelun tuottamisen välineet ja tuottamiseen liittyvät muuttajat

	1	2	3	4	5
Valmentajani pystyvät tuottamaan minulle tarvittavat varusteet kurssin ja projektien toteuttamiseksi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani pystyvät tuottamaan visuaalisesti houkuttelevat tilat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani tuottavat visuaaliset ja toiminnallisesti hyvät materiaalit, jotka tuottavat opintojen tavoitteiden suhteen lisäarvoa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Koen, että ympäristö tukee yhteiskehittämisen prosessia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Koen, että ympäristö helpottaa minua yhteisten ja omien tavoitteiden saavuttamisessa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
koen, että digitaaliset työkalut olivat prosessin kannalta merkityksellisiä	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 43. OSIO 6: Ympäristö – I wish


## 44. OSIO 6: Ympäristö – I like


## 45. OSIO 7: Poikkialainen yhteisluomisen ympäristö

	1	2	3	4	5
Tiimini kykeni luomaan uutta, vaikka toiminnan alkuvaiheessa oli epävarmuutta	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tiimini kykeni ymmärtämään työskentelymetodit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tiimini kykeni hyödyntämään eri koulutusalojen tietoutta ja taitoja hyödykseen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Koin poikkitieteellisessä tiimissä toimimisen merkityksellisemmäksi kuin vain oman koulutusohjelmani parissa toimimisen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valmentajani loivat ympäristön, jossa minun ja tiimini oli mahdollista onnistua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
koin, että muotoiluajattelun menetelmät toimivat hyvin yhteiskehittämisen prosessissa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tiimini oli avoin työskentelylle vaikka emme tiedäneet projektin lopputulosta etukäteen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Koin hyödylliseksi toimia yrityslähtöisen ongelman ratkaisemiseksi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## 46. OSIO 7: Poikkialainen yhteisluomisen ympäristö – I wish


## 47. OSIO 7: Poikkialainen yhteisluomisen ympäristö – I like


Deviation of the responses

