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Implementation of university- industry collaborations

An abductive case-study on the challenges faced
by course coordinators in Norwegian higher
education

Master's thesis in NTNU School of Entrepreneurship

Supervisor: Dag Håkon Haneberg

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Abstract

Increasingly more attention is given to the importance of implementing practice and real-life experiences as part of the curriculum in higher education technology degrees. That is due to the need for complex problem-solving skills to remain competitive in a global work environment. Also, these competencies are crucial to developing solutions for the growing number of societal problems. Through collaborations between higher educational institutions and the industry, students are exposed to such wicked problems, which in turn increase their employability upon graduation. However, these collaborations have several challenges when it comes to implementation and conduction, especially for the course coordinators. Quality assurance of the learning outcome, lack of knowledge in certain fields of expertise, and manual labour are some of the main struggles. Therefore, this study seeks to investigate the challenges of course coordinators trying to implement university-industry collaborations (UICs).

The contribution to the literature is a thorough understanding of the many tasks and following challenges of a course coordinator in charge of a UIC. Additionally, concrete propositions on how to ease these challenges serve as a recommendation for practical implications in the higher education sector.

To answer the research question, an abductive research approach has been used. The data were acquired and analysed by iteratively connecting existing literature to real-life observations, mainly in the form of semi-structured interviews and a cross-case analysis.

The findings suggest that the main challenge of a course coordinator is ensuring high-quality learning outcomes, due to bad communication routines between the stakeholders. Further, the lack of legal expertise, especially with regards to IPR, poses a challenge crucial enough to cause negative well-being. Also, time-consuming, manual tasks affect all other processes and further increase the number of challenges for a course coordinator. Additionally, the findings argue that the current public funding opportunities available to the higher education sector are ineffective due to their complexity and too narrow focuses. Hence, it is suggested that there is a need for streamlined processes and solutions, and cross-institutional collaborations to provide experiential learning to students through UICs.

Sammendrag

Et stadig økende fokus er rettet mot viktigheten av å implementere praksis og reell erfaring som del av studieplanen i teknologiske studier ved høyere utdanning. Dette grunnet et økende behov for ferdigheter tilknyttet kompleks problemløsning for å videre kunne forbli konkurransedyktig i et globalt arbeidsmarked. I tillegg er slik kompetanse essensiell for å utvikle løsninger til de stadig økende samfunnsproblemene. Gjennom samarbeid mellom høyere utdanningsinstitusjoner og industrien blir studenter utsatt for slike umedgjørliche problemer, som videre øker deres attraktivitet på arbeidsmarkedet ved ferdige studier. Likevel har disse samarbeidene mange utfordringer når det gjelder implementering og gjennomføring, spesielt for emnekoordinatorer. Kvalitetssikring av læringsutbyttet, mangel på kunnskap innen visse områder og manuelle arbeidsoppgaver er noen av hovedutfordringene. Derfor søker denne studien etter å undersøke utfordringene som oppleves av emneansvarlige når universitet-industrisamarbeid skal implementeres.

Bidraget til litteraturen er en grundig forståelse av de mange oppgavene og medfølgende utfordringer tilhørende en emnekoordinator som har ansvar for universitet-industrisamarbeid. I tillegg bidrar konkrete forslag til hvordan å lette på disse utfordringene til forslag om praktiske implikasjoner i høyere utdanningssektor.

For å svare på forskningsspørsmålet har en abduktiv forskningsmetode blitt brukt. Dataene ble innhentet og analysert gjennom iterativ koblinger mellom eksisterende litteratur og reelle observasjoner, hovedsakelig i form av semistrukturerte intervjuer og kryss-case analyse.

Funnene viser at hovedutfordringen til emnekoordinatorer omhandler å forsikre høy kvalitet på læringsutbyttet grunnet dårlige kommunikasjonsrutiner mellom partene. Videre er mangelen på ekspertise, spesielt knyttet til IPR, grunnlag for negativ påvirkning hos den enkeltes mentale velvære. I tillegg blir utfordringene ytterligere påvirket av tidkrevende, manuelle oppgaver som også gjennomføres av emnekoordinatorer. Videre argumenterer funnene for at dagens offentlige finansieringsordninger for den høyere utdanningssektoren er ineffektiv grunnet kompleksitet og for snevert fokus. Basert på disse funnene understrekes det et behov for mer strømlinjeformede prosesser og løsninger, samt samarbeid på tvers av utdanningsinstitusjoner for å kunne tilby erfaringsbasert læring til studenter gjennom universitet-industrisamarbeid.

Preface

This thesis is written by Carla Birgithe Kielland as part of a master's degree at the NTNU School of Entrepreneurship in the Department of Industrial Economics and Technology Management. The goal of this thesis has been to investigate the challenges a course coordinator, implementing a UIC, experiences. The inspiration for looking into UICs comes from the pedagogical methods used at the NTNU School of Entrepreneurship, where learning through practice fosters not only great entrepreneurs, but also skilled industry workers, and academics. Further, the great need for innovative solutions and mindsets to solve the current and future global challenges can be acquired through industrial experience along the course of study. Therefore, this thesis seeks to provide propositions on measures that can aid decision-makers in higher education in the process of implementing UICs.

I want to thank my supervisor Dag Håkon Haneberg for his guidance and engagement through the fall of 2021 and spring of 2022. His engagement, knowledge, and expertise in the field of UICs, and not least the process of conducting a study, have led to interesting discussions and helpful guidelines. Also, I want to thank all the interviewees and informants for providing interesting and important insight, and for sharing their genuine engagement with UICs.

Trondheim, June 10th, 2022.

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List of Abbreviations

COO	Chief Operating Officer
UIC	University-Industry Collaboration
HEI	Higher Educational Institution
IPR	Internal Property Rights
TTO	Technology Transfer Office

Introduction

Today, the Norwegian higher educational structure and -goals are in the process of change (Kunnskapsdepartementet, 2021). The increase in global societal challenges, like limited access to water or pandemics, entails a need for creative problem-solvers and innovative graduates (Voogt & Roblin, 2012). The ability to memorise theory and find one correct solution is not sufficient to deal with the complex tasks in work-life. Therefore, pedagogical approaches in higher education, especially in science and technology studies, must change (Kunnskapsdepartementet, 2021; Lönngren, 2019). By collaborating with the industry throughout a course of study, students are exposed to real challenges, and reflective practice (Cooper et al., 2004; Kubberød & Pettersen, 2017; Paisey & Paisey, 2010). These are important competencies wanted by employers globally, that one does not learn sufficiently through classroom teaching (Dorland et al., 2020; Mason et al., 2009; Plewa et al., 2015).

Experiential learning is a pedagogical method for practising theory through trying and failing and experiencing the reality of problem-solving. A way of facilitating such learning is through university-industry collaborations (UIC), which can be structured differently depending on the student's course of study (Cooper et al., 2004). By establishing a connection to the industry, businesses get access to new knowledge and potential candidates to recruit upon graduation (Etzkowitz et al., 2010). However, the many governmental- and institutional processes constitute an obstacle (Borah et al., 2019; Kolmos, 2006). That is despite scholars emphasising how UICs have a positive impact on the institution's contribution to society (Davey et al., 2018; Green & Farazmand, 2012; World Economic Forum, 2020).

The obstacles to implementing a UIC are most demanding for the course coordinator structuring it all. Not only is one in charge of ensuring high-quality learning outcomes for the students (Gibbs, 2006), but other aspects such as legal rights and ownership, and clear communication with all stakeholders are also the course coordinator's responsibility (Williams et al., 2022). Further, due to a lack of decision-making power (Ladyshevsky & Jones, 2007), streamlined processes, and available resources (Hall et al., 2000; Kubberød & Pettersen, 2017; Paisey & Paisey, 2010), these tasks become demanding and ultimately affect one's well-being (Murphy, 2003). However, for an increased number of UICs to be implemented, there is a need for change agents, namely motivated course coordinators (Williams et al., 2022).

For the coming technology degree graduates to be ready for work-life, there is a need for change in the pedagogical approaches in higher education towards experiential learning and UICs. Literature states the many positive outcomes of UICs, however, there are still a limited number of higher educational institutions (HEI) incorporating it in courses. Therefore, the challenges of a course coordinator implementing UICs should be investigated as they are the individuals responsible for the course curriculum. Hence, the following research question will guide this thesis and its associated study.

“What are a course coordinator’s challenges when implementing a university-industry collaboration for technology courses in higher educational institutions?”

The research question will be investigated through an abductive approach, beginning with the author’s phronesis and real-life observations to then be matched with existing literature (Kovács & Specs, 2005; Lukka & Modell, 2010; Taylor et al., 2002). Phronesis is the author’s preconception and knowledge of a certain topic (Lukka & Modell, 2010), as for this thesis is the author’s experience with UICs. The abductive process is iterative, and thus the findings from real-life observations are analysed continuously to guide the search for new literature. Ultimately, the discussion based on the analysis of the study concludes with a proposition on how to deal with the uncovered challenges, in line with the last step in the abductive research methodology (Kovács & Specs, 2005).

This thesis offers the following contributions: First, it adds to research by yet again emphasising the importance and positive outcomes of UICs (e.g. Dorland et al., 2020; Green & Farazmand, 2012; Smith et al., 2015). Further, it adds to the literature about possible limitations of UICs, more specifically to the challenges faced by the course coordinator (Hall et al., 2000; Kubberød & Pettersen, 2017; Paisey & Paisey, 2010). Lastly, the findings suggest that a more streamlined and automated process should be established for UICs to discharge the few available resources of the course coordinator. In that way, document handling, communication, and feedback are simplified, which ultimately improves the students' learning outcomes.

2. Guiding Literature

As the methodology for this thesis is abductive, which is further explained in *Chapter 3*, the theoretical framework is closely associated with the analysis in *Chapter 4* and discussion in *Chapter 5*. As the research question seeks to investigate the role of a course coordinator and UICs, the following thematics will be introduced as guiding literature for the following study. First, the nature of UICs in HEIs will be presented, followed by the process of change in HEIs. Then, the learning outcomes for students and further societal impact will be briefly introduced. Lastly, a narrowing of the research gap will be presented to summarise the most important takings from the literature.

2.1 University-Industry Collaborations

Collaboration between HEIs and the industry is increasingly perceived as a vehicle for knowledge exchange and further enhanced innovation in society (Ankrah & Al-Tabbaa, 2015). It is defined by scholars to be an important interaction between higher education systems and the industry, to encourage knowledge and technology exchange (Bekkers & Freitas, 2008; Siegel et al., 2004).

2.1.1 Motivation in the Educational System and Industry

It is commonly agreed that HEIs have other missions than high-quality teaching, with the two others being research and providing social impact (Zomer & Benneworth, 2011). Regardless of the third mission being a relatively new addition, it is the one that has led to a shift in policy makers' focus (Bellucci & Pennacchio, 2016). A driving motivation from the governmental organ is the need for technology transfer to secure economic growth and thus competitiveness with other countries (Barnes et al., 2002; Etzkowitz et al., 2000; World Economic Forum, 2021). Further, UICs are a means to attract financial resources, as rising costs and fighting for limited funding is an enormous challenge for most HEIs (Hagen, 2002). Having a look at another aspect of resources, HEIs and businesses would be mutually beneficial in terms of expertise. Businesses get extensive access to research expertise on one hand, while the industry further provides HEIs with great experience in product development and commercialisation (Sherwood et al. 2004), and not least employment opportunities for graduates (Dorland et al., 2020; Plewa et al., 2015).

2.1.2 Decision Making in Higher Educational Institutions

Research has found that there are several factors impacting the decision making of HEIs, such as the size of the institution, variety of disciplines, quality, status, academic research, and industrial network (Perkmann et al., 2013). Also, the role of leadership is decisive as a change in curriculum is often dependent on eventual change agents (Kolmos, 2006). Through motivated employees, there is a chance for new visions and concrete plans to be fulfilled. However, a change in curriculum impacts the wider student community which unfortunately leads to low willingness for implementing new pedagogical approaches in most HEIs (Borah et al., 2019; Kolmos, 2006; Mulder et al., 2009). Therefore, external factors such as location, government policies, and support mechanisms available to the institution play an important role in the fight for UICs (Borah et al., 2021; Kolmos, 2006).

It is argued that the lack of UICs might be due to them not being compulsory (Mandilaras, 2004). Nevertheless, internships and live cases, which are the most common methods of implementing UICs, are proven to be the most effective educational techniques (Green & Farazmand, 2012). However, it demands a change in the current government measures for evaluating education, which often include GPA at graduation, salary after a certain number of years in work-life, or other parameters developed to measure so-called “success” (Kantar, 2019). On the contrary, the assessment of new teaching methods should have a softer approach as the impact on both students’ learning outcomes and further socioeconomic impact is complex and hence takes time (Cooper et al., 2004).

2.1.3 Pedagogical Strategies

For wicked problems to be solved in the future, a change in pedagogical strategies toward experiential learning and UICs is needed (Green & Farazmand, 2012; Mulder et al., 2010). Consistent with Kolb’s (1984) learning cycle, skills and knowledge must be *experienced* through real cases and problems, and hence prepare students for future work situations (Dorland et al., 2020; Smith & Gibson, 2016). Further, high proximity to a business representative leads to deeper learning (Cooper et al., 2004) and implies that industrial collaborations lead to good teaching performance. Accordingly, scholars argue that formal training offered by HEIs on its own is of little use unless there is apprenticeship training (Brown et al., 1989). Therefore, it is argued that the pedagogical strategies should be expanded to include methods that enhance the transformative learning experience for students (Dorland, et al., 2020; Smith & Gibson, 2016). With an increase in exposure to real cases,

graduates are better equipped to deal with complex problem-solving processes and hence be better prepared for the transition from academia to work-life (Smith et al., 2015).

With the business representative providing valuable questions and learning (Cooper et al., 2004), the student can “see, touch and feel” the ways of solving tasks, employee personalities, and the contingent business (Kubberød & Pettersen, 2018; Kubberød & Pettersen, 2017). However, it is argued that the complexity of social practice is easily ignored in such settings and must therefore have an increased focus on how the educator and a business representative can co-participate in a more relational learning process (Higgins et al., 2013). Another social aspect is how one learns best from sharing theories and experiences with peers (Schön, 1983). Therefore, the aspect of reflection should be expanded in a pedagogical strategy to ensure knowledge sharing within- and across groups of students (Raelin, 1997). At the same time, educators must be aware of interpersonal and social aspects, both in terms of facilitating UICs, and potential impending factors which could influence the students’ learning trajectories (Kubberød & Pettersen, 2018).

2.1.4 Course Coordinators

A key leadership player in the establishment of UICs is the course coordinator, as they are in charge of managing, developing, and running HEI courses (Ladyshevsky & Jones, 2007). This role can be taken up minimally, however, coordinators also have the potential to serve as change agents (Williams et al., 2022)

Despite course coordinators’ academic anchoring and knowledge, these individuals often lack other competencies which are important when managing leadership tasks and change processes. They are often uncertain about the scope of their role (Briggs, 2001) and HEIs usually do not acknowledge their broad variety of tasks and hence need to make decisions on their own (Ladyshevsky & Jones, 2007). Due to the limited leadership experience and authority, combined with tasks that are complex and demanding, many course coordinators experience stress and a lack of personal well-being (Murphy, 2003). It is therefore no surprise that the expectations for a course coordinator from the HEI administration and the actual tasks of implementing a UIC do not combine well. Another highlighted reason for putting more emphasis on the role of the course coordinator compared to what is done today is the effect on student learning outcomes (Gibbs, 2006). Therefore, these positions should be given

greater attention, as the promotion system and allocation of resources today are heavily biased towards research and teaching (Ladyshevsky & Jones, 2007).

Figure 1 from Williams et al. (2022, p. 125) gives an overview of the many tasks a course coordinator must handle. For instance, does not the communication with the department follow a consistent pattern (Apkarian & Rasmussen, 2020). However, it is emphasised how this connection is important due to the potential further dissemination of UICs to the larger HEI administration, and grant of power to the respective course coordinator (Williams et al., 2022). For UICs, where industry representatives serve as external instructors (Mulder et al., 2009), the instructor role in Figure 1 of a coordinated course could therefore refer to the industrial party. The inner arrows of the call-out box illustrate how the interaction between course coordinators and industry representatives should be aligned with the course content. The risk of limited interaction between these three is that students might feel isolated and remote from the university (Hall et al., 2000). Further, the interaction within a student group is important for reflection and sharing of knowledge (Cooper et al., 2004; Raelin, 1997; Schön, 1983). In fact, scholars argue that course coordinators have the potential to influence the different types of interaction through facilitation and support (Williams et al., 2022).

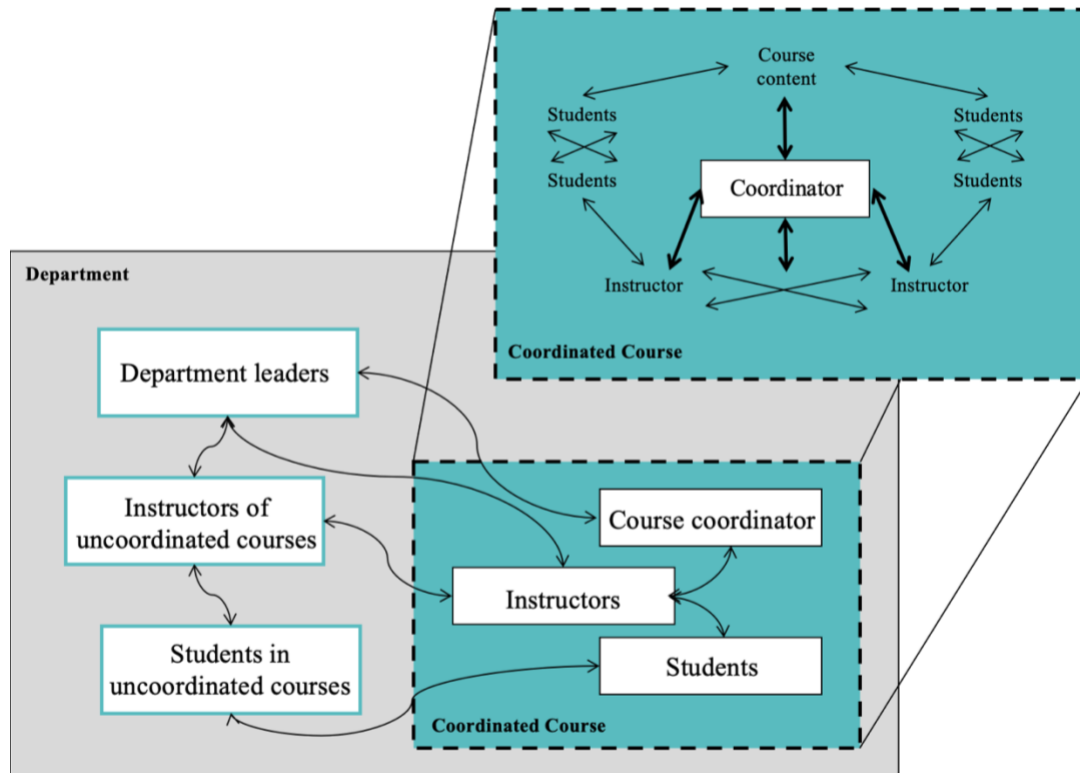


Figure 1: The interaction between an HEI department and a coordinated course, and the interactions within a coordinated course from Williams et al. (2022, p. 125).

2.2 Value Provided by University-Industry Collaborations

2.2.1 Experiential Learning and In-Company Projects

It is commonly agreed by scholars that the curriculum in higher education should have an increased focus on personal transferable skills, meaning a wider set of both skills and knowledge needed by employers (Bothelo et al., 2016; Paisey & Paisey, 2010).

Entrepreneurial skills are especially crucial for students to learn in order to develop the so-called “21st-century competencies” (Voogt & Roblin, 2012). Such skills include managing the turbulent labour market (World Economic Forum, 2020), coming up with innovative solutions, dealing with uncertainty in small firms, and ultimately contributing to the competitiveness of European firms in the rapidly changing world (Davey & Merman, 2018). An entrepreneurial mindset is not only important for developing new firms (Cooper et al., 2004) but has also proven significant for developing intrapreneurial self-efficacy (Deperez et al., 2021). However, such competencies cannot be acquired solemnly through classroom lectures.

Learning is a continuous process that happens in four phases, according to Kolb (1984) and his *learning cycle*, which has become a key theoretical model to explain the nature of experiential learning (Cunningham, 2017). The learning cycle substantiates the importance of UICs, as it provides an accessible way of expressing both the importance of experiential knowledge and the link between theory and practice (Vince, 1998). The holistic process begins with (a) experience, leading to (b) observation, and (c) reflection, and results in (d) experimentation, to then continue with (a) experience, and so on (Kolb, 1984). UICs can be seen as built upon the structure presented in the learning cycle.

The *experiential learning continuum* further emphasises the value of UICs on students’ learning outcomes. Cooper et al. (2004) have developed the model based on Kolb’s (1984) learning cycle and describe that deeper learning occurs as the student’s level of involvement increases. The continuum is adapted to today’s educational techniques and describes the level of learning students experience through different methods. However, it must be acknowledged that not all types of learning should happen through pedagogical approaches that include experiential learning (Paisey & Paisey, 2010). Further, the maturity of students impacts their ability to solve complex problems due to the increase in confidence and investment in the courses later (Cope, 2003; Kubberød & Pettersen, 2018). Therefore, one

could argue that the amount of experiential learning should be adjusted to the course of study (Pittaway & Cope, 2007). *Figure 2* illustrates that the level of wickedness in problems (x-axis), and hence the different types of UICs, should follow the students' course of study (y-axis). In that way, the students can apply the theory learned and get value from experiential learning (Stevens et al., 2008).

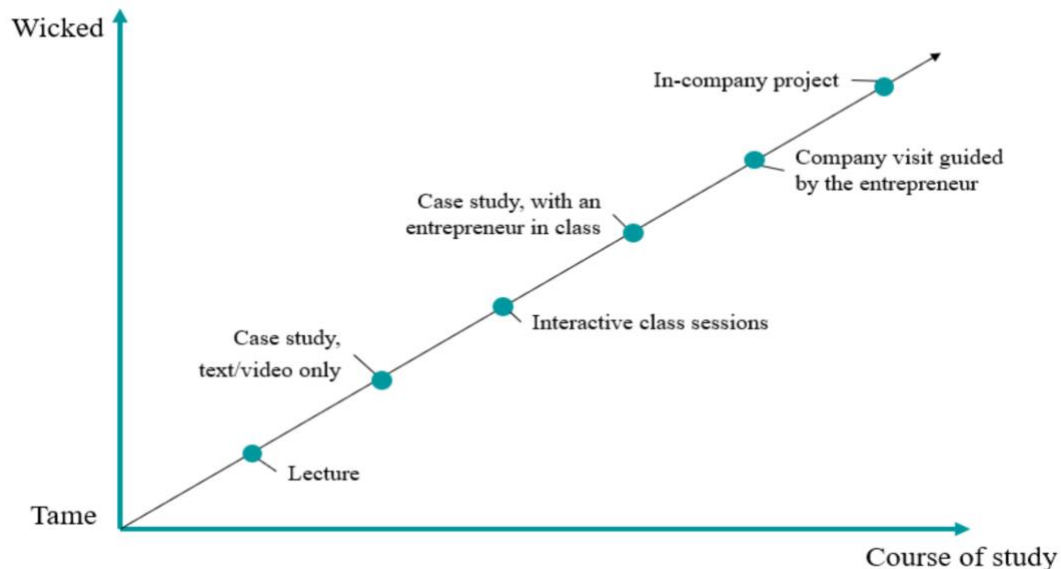


Figure 2: When to introduce different types of problems during the course of study, based on the experiential learning continuum by Cooper et al., (2004).

2.2.2 Students' Learning Outcome from UICs

By taking part in UICs, research shows that students not only learn what is part of the curriculum. As one gets more responsibility in such projects, studies have found that students are more capable of finding the correct materials needed to solve tasks (Stevens et al., 2008). This further leads to students being better at justifying and arguing for their decisions, as they understand the underlying mechanisms and reasons for the different solutions. Other than the ability to reflect, other "social" knowledge is learned, such as adapting to new settings and dealing with people different from oneself (Kubberød & Pettersen, 2017; Paisey & Paisey, 2010).

The aspect of employability is important for most students, and through UICs, one acquires several competencies wanted by employers other than being able to apply theory to practice (Dorland et al., 2020; Plewa et al., 2015; Smith & Gibson, 2016). Through working with

other people on real cases, graduates can integrate themselves into new jobs more rapidly as they have already understood the importance of teamwork and processes behind complex problem solving with others (Cooper et al., 2004). Research even shows that, apart from having a positive impact on labour market performance in terms of skills wanted by employers (Mason et al., 2009), experiential learning significantly enhances the chance of achieving top-level grades (Mandilaras, 2004). Lastly, studies have found UICs to positively impact the students' understanding of the socioeconomic environment and hence a holistic picture of how different mechanisms affect one another (Borah et al., 2021; Paisey & Paisey, 2010; Pittaway & Cope, 2007). Experiential learning makes students better equipped for a variety of work settings (Mulder et al., 2010), and hence improves organisational performance which in turn has a positive impact on the society and economy (Green & Farazmand, 2012).

2.3 Narrowing the Research Gap

Most research focuses on the effects of UICs, while little focus has been devoted to the process of implementing collaborations. Research further emphasises how the bottleneck of institutional regulations complicates the establishment of new UICs without having come up with a framework or suggestion on how to simplify or solve these struggles. Due to the complexity and great need for resources, few Norwegian technological degrees have courses including the industry or practice as a compulsory part of their curriculum (NOKUT, 2022). Additionally, scholars and the initial interviewees in this study point to the cumbersome processes before, during, and after such projects. Also, the course coordinator serves as an important change agent for change in the curriculum. Therefore, this study investigates specific challenges and tasks to, hopefully, provide a suggestion on how to implement new structures so that more UICs can be initiated. Scholars highlight the need for an empirical understanding of the circumstances that promote and restrict UICs, instead of testing existing theories (Ankrah & Al-Tabbaa, 2015).

3. Study Context and Methodology

3.1 Study Context

The preliminary publications on wicked problems by Lönngren (2019) highlight the importance of experiential learning in engineering education. This thesis further contributes to research in a slightly overlapping field of study, namely how UICs are a means to include experiential learning in Norwegian HEIs' technology courses. The choice of focus towards technology studies is partly based on the high demand for such competence in the coming years, presented in i.e. the Future of Jobs Survey 2020 (World Economic Forum, 2020). The nature of these roles reflects the trajectory towards areas of innovation and growth across multiple industries. Similarly, Lönngren (2019) highlights the importance of developing creative mindsets and soft skills in engineering and technical disciplines. Yet, as of today, these fields of study are taught through "tame" problem solving, involving tasks with one correct solution and no wickedness (NOKUT, 2022).

The importance of UICs was highlighted by the Norwegian Ministry of Education in their 16th deposit report (Kunnskapsdepartementet, 2021). It states that "*This publication is an encouragement to the higher education sector and industry to collaborate more and better than what is done today, to increase the relevance in education and make the students better suited to meet a society and work-life in conversion and change*" (translated from Norwegian, Kunnskapsdepartementet, p 5, 2021). A coherent fundamental priority, which the goal of more experiential learning is built upon, is a strengthened culture for innovation and entrepreneurship. Further, the Norwegian Government states that they will work towards student active learning- and educational methods, and more and better practice (Kunnskapsdepartementet, 2021).

3.2 Methodology

3.2.1 Research Design

For this study, an explorative design is chosen, as it seeks to map out and explore an established phenomenon in a context that has not yet been comprehensively investigated (Askheim & Grennes, 2008). This study follows an abductive qualitative research design, which starts from empirical findings to then be seen in the context of current literature (Lukka & Modell, 2010). This methodology is combined with a multiple case study and the

goal of building new theory on experience. Thomas (2010) highlights that “*the case study seems the ideal vehicle for this kind of insight to occur, as long as it is enabled by a spirit of inquisitiveness and not extinguished in a search for generality*” (Thomas, 2010, p. 579). Even though behavioural sciences often use statistical methods in data analysis, qualitative methods can also be used to detect phenomena (Strauss, 1987). Further, qualitative research allows for “*deep and rich theoretical descriptions of the contexts within which organisational phenomena occur*” (Gioia et al., 2013, p.16). However, to capture the essence of the interviewees the researcher must be curious, open-minded, handle conflicting information, listen, and act understandable (Robson, 2002).

Abductive Research Methodology

Researchers agree that an abductive approach enables one to move back and forth between theory and data to develop a new theory or modify an existing theory (Blakikie, 2009; Dubois & Gadde, 2002; Saunders et al., 2012). Lukka and Modell (2010) distinguish deduction and abduction observing that abduction “*starts from the empirical findings, not from theory*”, but that this “*does not deny the role of prior theoretical knowledge in providing a background to the search for the most plausible explanation for empirical observations*” (Lukka & Modell, 2010, p. 467). One can use existing theory as a starting point in an abductive analysis, but in contrast to the deductive approach where theory is to be tested, it is rather used to facilitate exploration of phenomena through close examination of cases (Sætre & Van de Ven; 2021; Thomas, 2010). Through such a reflective dialogue between the researcher, data, and theory (Haig, 2005), one allows for novel and unanticipated themes to emerge (Conaty, 2021). Abduction is in fact compared with detective work, as one starts with limited information, to then continue the work along with the appearance of new information (Åsvoll, 2014).

A key aspect of abduction is the researcher’s role in terms of prior knowledge, experience, and understanding of the topic (Haig, 2005; Sætre & Van de Ven; 2021). For this study, the author’s phronesis is based on work with developing and implementing UICs at three different HEIs in both studies and part-time jobs during the past year. Hence, an abductive approach allows for interpretation through creativity and intuition, which in turn facilitates a critical analysis (Conaty, 2021; Sætre & Van de Ven; 2021; Taylor et al., 2002; Thomas, 2010). Similarly to inductive research, abduction begins with empirical observations before any theoretical framework. Then, the data collection happens as an iterative process (Taylor et al., 2002) together with theory development and -matching (Dubois & Gadde, 2002). The

abductive research process is illustrated by Kovács and Spens (2005, p. 139), of which a revised version is shown in *Figure 3*. The different steps will be referred to throughout the continuation of this thesis.

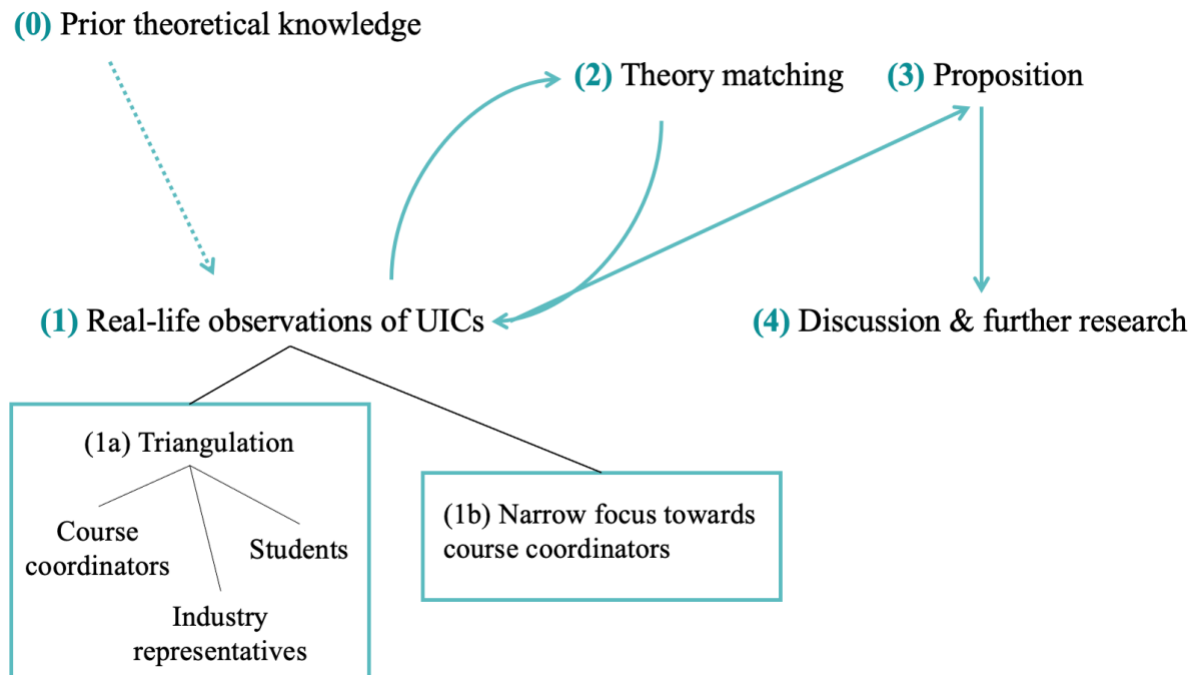


Figure 3: The abductive research process for this study, revised from Kovács & Spens (2005, p.139)

For this study, the author’s phronesis served as the starting point (0) with the notion that course coordinators are the driving force when establishing UICs. Then, an interview guide was formed, to begin with, the real-life observations (1) of UICs. A triangular data collection with students, course coordinators, and business representatives, was then begun (1a). Alongside the initial data collection, literature guided the continuation of the study (2). Both findings and literature directed the focus towards the course coordinators, and so the data collection was somewhat narrowed (1b). Step 1b and 2 was continued until a better understanding of the phenomena was formed and allowed for the initial formation of a proposition (3), which can also be described as the analysis in *Chapter 4*. The last step (4) illustrated in *Figure 3* is argued to be a deductive process, and thus the abductive reasoning ends with hypotheses or propositions (Kovács & Spens, 2005). For this study, the last step was partly completed by briefly presenting the proposition to the interviewees and is therefore outlined as a suggestion to further research.

Triangulation - Step (1a)

In qualitative research, it is common to use multiple methods and/or data sources to understand the phenomena in their entirety (Patton, 1999). The goal of this method is to increase confidence in the findings with the use of two or more independent measures, in addition to providing a more comprehensive understanding than either approach could do alone (Heale & Forbes, 2013). This study makes use of *data triangulation*, which involves collecting data from different types of people (Wilson, 2014), such as step (1a), illustrated in *Figure 3*, which compares data from students, course coordinators and industry representatives. By combining several perspectives, the individual weaknesses and strengths can be uncovered and point to bias or stronger validity of the results (Campbell & Fiske, 1959; Denzin, 1978; Stake, 1995). For this study, the data triangulation in step (1a) led to the understanding of the course coordinator's important role and struggles that forms a bottleneck for UICs, hence the adjustment to step (1b). However, triangulation should not be used as a solely technological solution to ensure validity, but rather to understand a phenomenon in a holistic manner (Ashour, 2018). Therefore, the abductive process with theory matching and case studies was continued.

Case-studies - Step (1a) and (1b)

A case study was chosen as this study seeks to understand the processes of UICs, and hence *how* a phenomenon occurs from a holistic point of view (Awuzie & McDermott, 2017; Benbasat et al., 1987; Jick, 1979). With explanatory research questions, one investigates operational links which must be traced over time (Bhattacharya, 2009). In comparison to *what* questions, where the prevalence is studied and surveys can be used to find some answers, case studies enable the researcher to understand the phenomenon (Stake, 2005; Yin, 2014). Further, this study explores current and recently happening events, which is in line with case studies as methodology and contrary to investigating historical, "dead" data (Yin, 2014). Due to the nature of abduction as a methodology, where the phronesis and hence the researcher's role in investigating a phenomenon (Haig, 2005), the case study approach developed by Stake (2005) is used. He expresses that "*Case study is not a methodological choice but a choice of what is to be studied*" (Stake, 2005, p. 443). Hence, his constructivist approach allows for discovery and interpretation to happen concurrently (Boblin et al., 2013), aligned with steps (1) and (2) in the abductive process (Kovács & Specs, 2005).

The rationale for choosing a multiple-case study research design for this study is that it is proven highly effective when investigating complex phenomena that include social-, real-life, - and organisational aspects (Ellram, 1996; Eisenhardt, 1989; Ferreira & Merchant, 1992). Multiple instead of one single case increases the robustness and generalisability of the study's findings (Eisenhardt & Graebner, 2007). Also, multiple cases can help investigate similarities and differences as well as the emergence of patterns (Glaser & Strauss, 1970; Eisenhardt, 1991). The immersive nature of abduction facilitates such enquiry (Conaty, 2021). Additionally, reflection is a central aspect of the abductive approach, and case studies facilitate interaction between the researcher, field, and people of interest, and establish a contemplative space (Irvine & Gaffkin, 2006).

3.2.2 Study Sampling

According to George and Bennett (2006), the most crucial aspect of deciding on a study sample is that the respondents are relevant to the research question and methodology. As this study seeks to understand the phenomena of a course coordinator's role in UICs, which consist of three stakeholders, it is natural to include all perspectives through data triangulation. That way, divergence in the experiences can be detected (Stake, 1995).

As the author's phronesis formed the initial beginning of this study, the immediate network was utilised to access potential course coordinators and their belonging students, and industry representatives. The following requirements formed the selection of cases:

- The course in which the UIC is implemented must be part of a technical study.
- The UIC must be an in-company project, meaning a work placement.
- The UIC must consist of a Norwegian HEI and a Norwegian-based company.
- The UIC must be completed at the time of the interview but may well be recent.
- The same interviewee(s) cannot be used for several UICs in this study.

Further, the following requirements were set for the selection of course coordinators and industry representatives:

- The course coordinator/industry representative must have been responsible for the implementation of the UIC in their respective place of work.

From the selection criteria and immediate network of the author, three-course coordinators were approached. They each suggested one student and one business representative with which they had completed a UIC together. The process, therefore, resulted in three-course coordinators, three students, and three business representatives, that together accounted for three different UICs. After having performed 6 interviews with two UICs and their respective stakeholders, the abductive process allowed for the author’s phronesis to impact the area of focus due to emergent challenges. These findings appeared to be a more pressing matter for the implementation of more UICs, and hence the author chose to narrow the investigation to course coordinators (step 2b) to further investigate the phenomenon in detail. Therefore, the interviews with the industry representative and student from UIC 3 were cancelled. Also, additional interviewees were selected, once again from the author’s immediate network. The final study sample, with changed names for the sake of anonymity, is illustrated in *Table 1*.

Table 1: The final sample for the study.

	Course Coordinator	Industry representative	Student	Norwegian Ministry of Education
UIC 1	Chris	Irvin	Susan	
UIC 2	Colin	Isac	Steven	
UIC 3	Charlotte	Cancelled	Cancelled	
Additional interviewees	Cameron			Nyla

3.2.3 Data Collection

The abductive approach is rather unstructured in terms of starting with an interest in finding out more about a phenomenon (Conaty, 2021; Haig, 2005). Therefore, the process of collecting data can be considered highly engaging for both the researcher and the interviewee (Gioia et al., 2013). Semi-structured interviews were therefore chosen as the data collection method, as it allows for changes according to the interviewees' responses (Johannesen et al., 2017).

Semi-Structured Interviews

In-depth interviews are appropriate when the researcher needs substantial and detailed information about how other people analyse their situation, points of view, and perspectives on the specific topic (Thagaard, 2013). It allows for complete focus on the individual, in contrast to group interviews (Askeheim & Grennes, 2008), however, could be very resource-intensive (Jacobsen, 2015). Further, it could prove challenging to compile, interpret, and analyse the data, as the interviews could end up quite different (Askheim & Grennes, 2008).

For semi-structured interviews, an interview guide is formed before the interviews, for which this study is attached in the *Appendix*. These types of interviews have questions varying from specific and well-formulated questions to overarching, thematic bullet points. Such a format allows for improvisation and the possibility to dig deeper into the information the respondent gives (Ringdal, 2013). A semi-structured interview is well suited for this study due to the overarching topic being set, while the formulation and order of the questions can be adjusted throughout the interview (Johannesen et al., 2017). During the interview, it is essential to be observant of alternative topics, experiences, and points of view, and then be able to ask follow-up questions if relevant (Klenke, 2016).

The interviews were started in an informal tone to create a comfortable and safe environment for the interviewee. The introductory question was therefore asked openly about the respondent's role in UICs to create a sense of familiarity and prevent any form of distress. Scholars highlight the importance of establishing a natural environment so that the interviewee feels comfortable and hence share their true experiences, thoughts, and reactions (Silverman, 2014; Tjora, 2017). As the interviews were performed digitally due to COVID, it was difficult to capture reactions and other non-verbal expressions. However, as the interviews were recorded with a tape recorder, the author could note down interesting points, and the limited non-verbal observations (Jacobsen, 2015).

While conducting interviews, Gioia et al. (2013) emphasise that one should “*get in there and get your hands dirty*” (Gioia et al., 2013, p. 19). Therefore, the researcher should try using the terms of the interviewee to make them more comfortable and understand the subject from their point of view. However, by becoming “native” in terms of the topic, the risk is that one becomes naïve and should hence strive to continuously remind oneself to stay objective. On the other hand, taking such an approach of putting oneself in the shoes of the “problem-owner”, could emerge surprising facts, in line with the process of abduction. In the case of a

new focus, it is crucial to further change the interview questions. Gioia et al. (2013) stress that the rigourness of many researchers, who are fixated on the initial interview guide, is the reason why traditional research fails to uncover new concepts to develop.

3.2.4 Analysing the Data

Researchers using qualitative methods have noted that the interviewing and analyses are intertwined, and so it often becomes artificial to parse the two (Langley, 1999; Lincoln & Guba, 1985). Further, it is difficult to follow a strict coding process as the abductive method is iterative and requires a process that allows for the creativity and intuition of the researcher. However, there are certain structures to follow so that the process, and hence findings, can be replicated by other researchers. This study partly uses the Gioia method (2013) to analyse the data, due to it being constructed to allow for creativity and simultaneously retain the “qualitative rigour”. Additionally, the steps of Bazeley (2013); *read, reflect, play, and explore*, are used throughout the process to allow for the phronesis of the author to inform the analysis (Conaty, 2021).

First-Order Coding; Read and Reflect

After transcribing the first 6 interviews of the initial thought research scope, the initial data analysis began with the so-called “first-order coding”, which sought to adhere to informant terms and not distil categories (Gioia et al., 2013). The analysis software for qualitative data, NVIVO, was used at this stage. Initially, almost 100 references were marked with first-order codes, which were very narrow and specific. After some rounds of processing the data, these codes were broadened to include a number of these initial reference markings, as it is recommended that between 50 and 100 codes should emerge from the first 10 interviews (Gioia et al., 2013). However, it is crucial to not create overly abstract codes at this time, as that is the goal of the second-order coding.

According to Bazaley (2013), the process of *reading* is central to the entire analysis, commencing with the reading of literature, and the reading and re-reading of the transcripts. It facilitates understanding, nuance, and *reflection*. In addition to being reflective in terms of the data collected, the abductive process also allows for “external” reflection (Conaty, 2021). The author discussed emergent codes with the supervisor and other people relevant to UICs. It was at this stage that the author understood how the focus should change to a narrower focus for the course coordinators. Topics such as “governmental challenges”, “limited

resources”, and “task management” emerged more often than what was sought after - namely the learning outcomes and societal impact of UICs. Therefore, the study sample somewhat changed to include several HEI representatives, and one informant from the Norwegian Ministry of Education. Then, the additional interviews were transcribed to further be analysed in first-order codes. At this point, the author tried to not be biased by the first round of coding to allow for potential new codes to emerge.

What was interesting in this process is that the focus of the study changed from investigating the different stakeholder’s experiences of the course coordinator’s role, to understanding the negative and challenging aspects lying with the course coordinator. That further forced the author to conduct a broader literature search to look for previous research done on the HEI perspective of UICs. What was then found was the lack of propositions on how to enlighten the course coordinator’s tasks. Literature indeed states that governmental and institutional regulations serve as obstacles to implementing UICs. However, the question of the specifics of the daily struggles related to a course coordinator’s role in implementing UICs, and how one might solve those is lacking. *Figure 4* illustrates the structure of HEIs in UICs, together with the bottleneck of limited resources and many tasks of the course coordinator. *Figure 4* illustrates the complex structure and hence the change of focus towards the “problem owner”, namely the course coordinator. Following the abductive process with a narrower focus at hand, the coding process continued and ended up with 56 first-order codes.

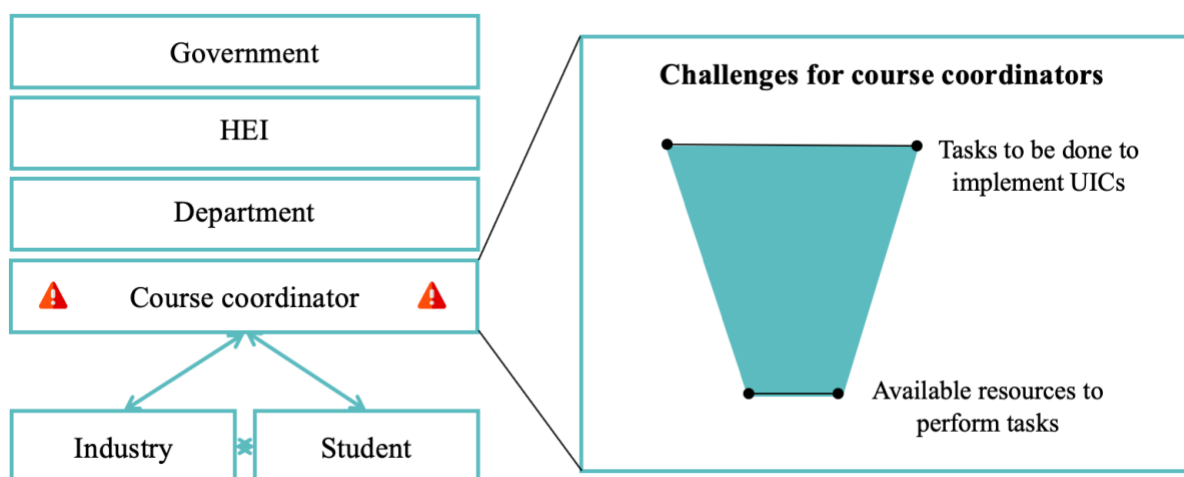


Figure 4: The structure of UICs with a narrower focus on the structure in HEIs, and the bottleneck of combining limited resources and many tasks for the course coordinator.

Second-Order Themes; Play and Explore

For the first order codes to be more manageable, differences and similarities among the many codes are sought (Gioia et al., 2013). These new categories are labelled, preferably with informant terms, to understand the larger narrative. One could argue that this process was somewhat done earlier in this study, as the course coordinator's role and challenges were discovered in the process of coding first-order categories. Therefore, after having performed first-order theme coding of the Gioia method, the author decided to use creativity to further analyse the data. That is in line with Bazeley (2013), as the abductive process at this stage should be focused on *playfulness*. By that, it is meant to use different ways of describing and viewing the emergent themes. The first-order codes were therefore put into a mind map, which allowed for new questions to be asked, to then go back to the transcripts and discover new findings. An excerpt of the mind map is illustrated in *Figure 5*. The map further allowed for the data to be seen in the context of the literature, hence the filtering of themes.

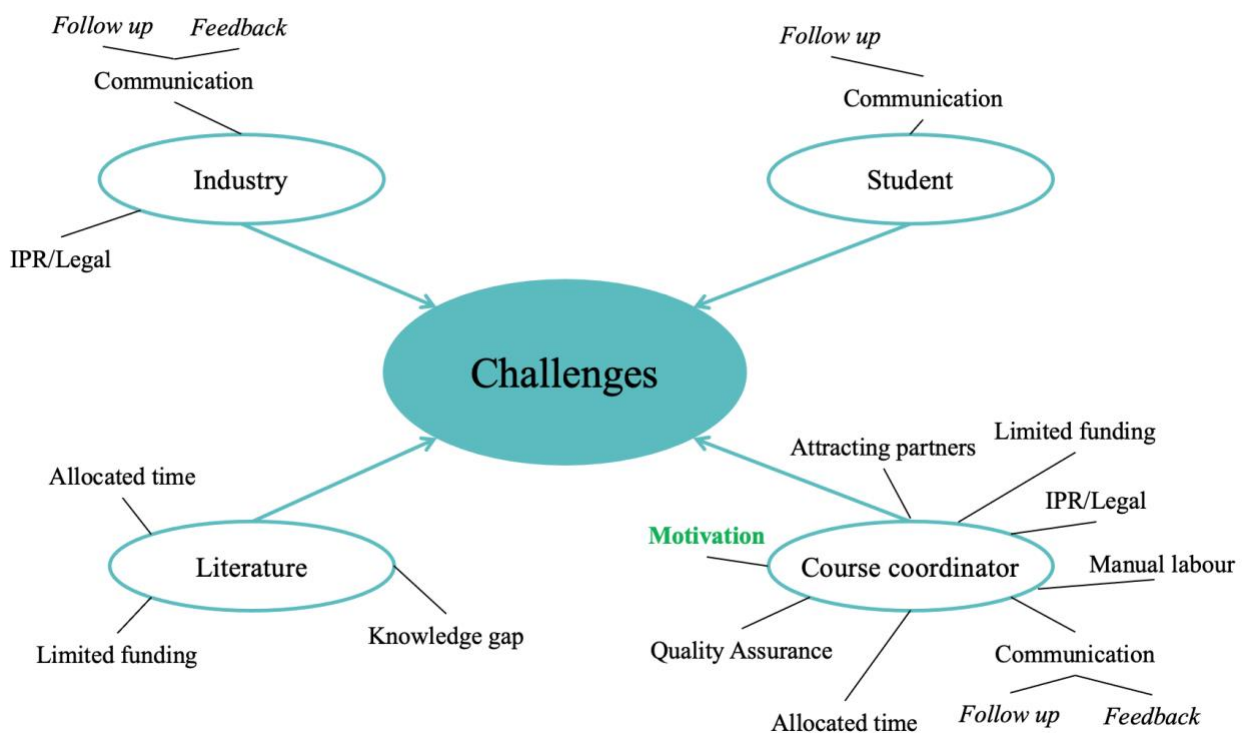


Figure 5: An excerpt of the creative analysis process with the use of mind maps.

As highlighted by Bazaley (2013, p. 113), the “analysis is as much about identifying the larger significance and meaning of objects and events for a participant, about finding the connections - the interdependencies - within and across data”. Therefore, the larger “second-order” codes illustrated in the mind map were further organised into overarching themes that

are distinct from one another (Braun & Clarke, 2006). A complete data structure is a key component of demonstrating qualitative rigour (Pratt, 2008) and allows for a better understanding of the larger picture. Thus, one can continue the abductive process of connecting the findings to existing theory or figure out that one must come up with new propositions (Alvesson & Kärreman, 2007). Hence, the *exploration* stage led to new propositions, which will be presented in the following chapter of the analysis.

3.3 Limitations and Reflection

This section briefly highlights some of the limitations and reflections done by the author concerning the methodology chosen for this study. As abduction is highly reliant on the phronesis of the author, and hence poses a large risk for confirmation bias, a reflection of the phronesis' impact is presented first. Then, a more general reflection on different aspects of the methodology is given.

3.3.1 Phronesis and Confirmation Bias

Abduction, where the phronesis plays an important role in the iterative process of finding literature and observing real-life experiences (Lukka & Modell, 2010), could pose a risk of confirmation bias for the Gioia method. It clearly states that “*knowing the literature intimately too early puts blinders on and leads to prior hypothesis bias (confirmation bias)*” (Gioia et al., 2013, p. 21). However, the coding process did not strictly follow the Gioia-method, and rather combined it with the recommendations of analysing data from Bazeley (2013). Further, the goal of the study is not to generate theory but rather to understand the challenges of a course coordinator implementing UICs and suggest propositions for further research.

The risk of confirmation bias could also have affected both the generation of interview guides and the conduct of interviews. That is not only due to the phronesis of the author, but also the a priori knowledge of the interviewees. Further, with the recruitment being from the immediate network of the author, another limitation of this study could be the selection of interviewees. However, the internal validity of a study is strengthened if one can ensure that the respondents of a study can contribute to a better understanding, and enlighten the problems thoroughly (Jacobsen, 2000a), which is the case for this study's respondents. Further, it is argued that a prolonged relationship with interviewees increases the credibility

of a paper (Bryman, 2016), which speaks for the positive impact of the author's a priori knowledge.

If the study would have been conducted by more than one author, the risk of confirmation bias could have diminished. That is due to the increase in reliability of an analysis with the use of inter-coder reliability (Jacobsen, 2000b). With more than one author, one can also serve as one another's "devil's advocate" throughout the coding process (Gioia et al., 2013). Further, the use of several investigators impacts the validity of a study for two reasons; it increases the creative potential of the study, and increases the confidence in findings (Eisenhardt, 1989).

Lastly, somewhat relevant to confirmation bias is the limitation posed by confirmability. It refers to the interviewee or author's risk of shaping findings due to underlying motivations, preconceptions, and other subjective factors (Bryman, 2016). By assuring all interviewees that they would be anonymised, and hence unable to trace, before agreeing to an interview, the potential of confirmability was reduced. Also, as all course coordinators in this study are actively working toward more UICs being established, one could argue that their motivation, to tell the truth, was high. In fact, six of the individuals interviewed asked for a copy of this thesis to use for the future work of convincing HEI administrations that a change is needed.

3.3.2 Other Methodological Limitations and Reflections

According to Thomas (2010), case studies are unable to offer generalisable findings. However, the goal of this study is not to generalise, but rather to investigate phenomena to understand their complexity and propose areas of improvement and potential solutions and future research. Therefore, this study investigated several cases with different stakeholders, allowing for triangulation of the perception of a course coordinator's role. Thus, a multiple case study proves a valuable method due to the nature of this study's goal. It is further argued that the use of multiple data sources, such as this study's triangulation, increases the credibility of a study (Bryman, 2016). One could argue that there are six different data sources used for this study: students, industry representatives, course coordinators, a governmental perspective, guiding literature, and the author's phronesis.

Taking a closer look at the conduction of interviews, a potential limitation is that they were all conducted virtually over zoom. That is conflicting with the recommendation of scholars who argue that face to face interviews is the most effective way to capture the most value

from the interviewees (Jacobsen, 2016; Tjora, 2017). Then, the body language and eventual other non-verbal utterances are difficult, and in some cases impossible to detect. However, with the COVID-pandemic having lasted for several years, all respondents were highly comfortable and used to talking over zoom. Therefore, one could argue that the effect of not being in the same room physically had limited negative consequences for the interviews. In fact, it contributed to lowering the barrier of interviewees saying yes due to the digital meetings demanding less time compared to finding a time and place to meet physically.

With lots of information gathered from multiple sources, as briefly mentioned above, the aspect of dependability is important to highlight. It refers to whether the collected data is consistent and can be replicated over time (Bryman, 2016). With the use of abduction, which moves iteratively between observations and literature (Lukka & Modell, 2010), most of the process heavily relies on the author's preferences in structuring data. Even though the Gioia method was followed, and NVIVO was used to code in the beginning, most of the coding and analysis did not follow a strict process. Therefore, it is difficult for an external party to replicate the exact process, which decreases the dependability. Yet, by thoroughly elaborating on the research process with the use of figures and enclosing appendices, the author has sought to increase the dependability.

4. Case Descriptions

For the analysis in Chapter 5 to be better understood, a brief description of the different cases and interviewees in *Table 1* will be presented. The focus of this chapter is on the respective course coordinator and his or her affiliated HEI, as the study seeks to understand the role and challenges of the course coordinator.

4.1 UIC 1

Course coordinator: Chris is the coordinator for an IT course at the bachelor's level. The number of participants in the course has grown exponentially in the past years, with over 100 students this semester. The course is offered at a Norwegian university located in one of the largest cities, however, the exact location will not be disclosed due to the anonymity of the interviewee. Chris has been an active change agent ever since he was employed, and he has worked for different HEIs in several countries. He is strongly motivated for implementing experiential learning in all technical degrees and hence does so in the courses he is responsible for. UIC 1 is a project that is part of the largest cohort Chris has ever managed. The course is structured as a semester-long project drawn up by the industry representatives. Then, the students can apply for the projects they find interesting, and the businesses conduct interviews to decide who they want to take in. During the project period, Chris and two other mentors from the HEI are available for the students once every second week if they have questions. The assessment of the course is through a group folder submission where the students are to explain the processes and tools used throughout the project, in addition to an individual reflection paper. The grade is not based on the finished product in terms of code produced or a finished technical function, but rather the choice of techniques to ensure progress.

Industry representative: Irvin is the industry representative for UIC 1. He is the COO of a newly established technology start-up based in the same city as Chris' affiliated HEI. Irvin has worked many years in the industry before co-founding his start-up together with two other men. They have previously taken part in a handful of UICs with different HEIs, with several students being employed after the end of their respective projects. However, this project is the most comprehensive with 15 students from Chris' course working on different IT projects. Except for the mentoring during the project, Irvin does not take part in the assessment of any students.

Student: Susan is one of the students working for Irvin's start-up as part of her bachelor's degree in IT. She has never taken part in any UICs before and chose Chris' course due to her believing it to be valuable for her resumé and future job hunting. The course can be chosen as an elective, either in Susan's second or third year. The project for Irvin's start-up is conducted together with two other students she did not know before the UIC.

4.2 UIC 2

Course coordinator: Colin is the coordinator for technical design subjects, on both bachelor's and master's levels. The respective course for UIC 2 is mandatory for all second-year students taking the design degree. The HEI where Colin is employed is in a rather small Norwegian city and is considered a division of a larger Norwegian university. For years, Colin has worked towards establishing UICs across the different cities where the divisions of the larger university are located, however without much luck. Hence, he considers himself a change agent working upstreams. Nevertheless, UIC 2 is one of the many collaborations Colin oversees, with a dozen students taking the course this semester. The course is structured as a semester-long project that is drafted by the industry stakeholder together with the student. Due to the course being a design subject, this close collaboration from the beginning is important. Therefore, it is mostly the students' job to find interesting businesses and projects on their own. The grading is done through an individual folder submission focusing on the iterative processes of design thinking, from an idea to a proposition of a finished product or service.

Industry Representative: Isac is the co-founder and CEO of a Norwegian software start-up and the industry representative for UIC 2. This project is the first UIC he has taken part in, however, the company has had several student interns in the past years. The main motivation for Isac to take in students is the cheap (or even free) labour, in addition to the new ideas and impulses. UIC 2 was initiated after a student contacted Isac and asked about the possibility of a design-driven development project. During the collaboration period, the student was invited to the company's office several times to "feel the pulse" and hence be better suited to deliver proper value through the project. Isac proved as a mentor for the student throughout the period and provided a reflection letter about the project as part of the student's assessment. Isac was also invited to the final presentation of the project for Colin's course.

Student: Steven is a second-year industrial design student. As part of his degree, real cases and wicked problem solving have been an important focus from day one, as designers seek to find better solutions for today’s challenges. Therefore, Steven has taken part in UICs before, however, this one is the most comprehensive so far. The course is mandatory for all students and Steven works alone on the project for Isac’s start-up.

4.3 Other interviewees

As shown in *Figure 6*, a triangulation of several UICs was the initial plan of the real-life observations, step (1a). However, the abduction led to findings that drew the attention more specifically towards course coordinators, step (1b). Therefore, Charlotte and Cameron are interviewed without their belonging industry representative and student in this study. Also, Nyla serves as an additional informant with the perspective of a governmental stakeholder. These three individuals will be introduced in the following section.

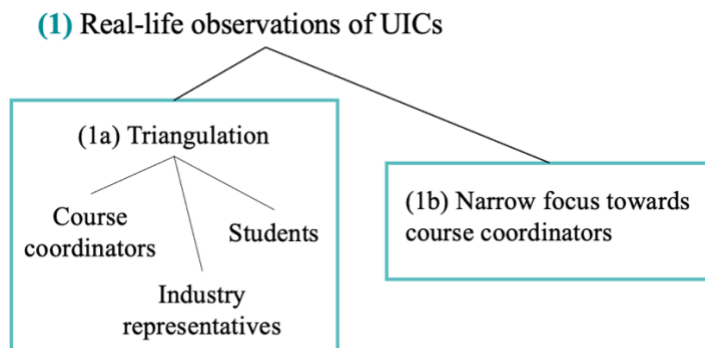


Figure 6: The two different narratives taken in the abductive process.

Course coordinator: Charlotte is a course coordinator in a private HEI located in one of the largest Norwegian cities. She is responsible for several technical courses where UICs are a core factor in the pedagogical strategy. The HEI Charlotte is affiliated with is where she studied herself, and it is known as an innovative HEI with a large focus on learning through practice. Therefore, the need and interest for implementing UICs are grounded in most of the employees and stated as an important part of the HEIs mission. The specific UIC Charlotte was interviewed about was structured as a nine weeklong internship. During the semester the students are therefore placed in a business two to three full workdays a week. After a period of work, they have a so-called “study week” where they go back to having lectures to reflect and share experiences with their classmates. After the nine work placement weeks, the students submit a reflection paper and an assignment of their own choice relevant to the

business they have worked for, which is the basis for grading. Also, the business has a concluding chat about the student's experience and sends a short feedback summary to the HEI.

Course coordinator: Cameron is a course coordinator at one of Norway's largest universities, which is the same university where Colin is employed, but in another city. Cameron has been in charge of courses where UICs are an important part of the pedagogical strategy for many years. Therefore, he has established a wide network with relevant and interested businesses, in addition to having good routines. He is convinced that students must work on real projects to truly understand the theory and has thus made it mandatory to participate in UICs several times during the technical engineering program he is working with. However, he is frustrated that just a few other study programs at the same university understand the value of UICs. Therefore, he is actively working to promote UICs to other course coordinators and considers himself a change agent.

External informant: Nyla should be considered an informant for this study as she is neither part of any UICs, nor a course coordinator. Her role in this study is to supplement with an understanding of the governmental policies and structures, and how they can serve as contributors or obstacles to the implementation of UICs in Norwegian HEIs. Nyla is employed by the Norwegian Ministry of Higher Education, where she works with grants connected to the 16th deposit report (Kunnskapsdepartementet, 2021). She has previously been employed at the university where both Cameron and Colin are currently working, and so she has experienced the struggle of previous colleagues who were course coordinators. Nyla is convinced that there is a need for change in Norwegian HEIs for both students, educators, and businesses to be competitive in global education and work life. She further emphasises how other countries, like Germany, are far beyond Norway when it comes to UICs and that we should learn from others to improve ourselves. However, she highlights the aspect of culture being a difficult aspect to change, and that might be the reason for the implementation of UICs to be a struggling and time-consuming process.

5. Analysis

As abduction is an iterative process between real-life observations and examination of existing literature (Kovács & Specs, 2005; Taylor et al., 2002), the analysis will be presented together with literature from *Chapter 2*. The findings presented are mainly from the course coordinator's perspective, however, other stakeholders' perceptions and experiences will be presented to show differences and emphasise important findings where relevant. The different sections in this analysis follow the nature of developing a UIC, beginning with findings linked to how one *constructs a UIC*, followed by *quality assurance*. These two main themes include several subtopics, however, most topics are intertwined and so some findings will be presented in several places. Lastly, a summary of the analysis will be given.

5.2 Constructing a UIC

The process of implementing a UIC begins by finding the correct partners, and so findings relevant to the establishment of relations to the industry are presented initially. Then, the importance of the course coordinator's personal motivation to drive the establishment of UICs is analysed before a presentation of the findings linked to human resources - and funding allocation.

5.1.1 Establishing relations with the industry

In the initiating phase of a UIC, the attraction of industrial partners is somewhat time-consuming for the course coordinator, reliant on the coordinator's network and eventual successfully finished UICs. It appears that if a business is happy with the students having done a project, they come back for more. Also, business representatives reported, in line with the literature, that it is a great way of meeting potential candidates to recruit (Mason et al., 2009; Mulder et al., 2010), in addition to being fed with the newest knowledge within the respective field (Sherwood et al., 2004). Therefore, one could say that well-executed projects simplify the initiation phase of new UICs.

“We’ve had 3 student-projects [UICs] the past two years, and this semester we’ve taken in 15 students on one project because we’re so satisfied. They might not provide the highest quality of work, but the new insight, interest of learning, and not least aspect of employability outweigh the time it takes.”

- Irvin (Industry Representative, UIC 1)

“Every year, we see companies coming back for more! They often expand their capacity as well, so I guess that means they are very happy. And that makes me happy, which is one of the reasons I keep doing this.”

- Charlotte (Course Coordinator, UIC 3)

In addition to successful UICs being a generator for new ones, the positive feedback is a major reason why the course coordinator continues the work despite a lack of resources. As Charlotte expresses in the quote above, she gets motivated when the businesses come back for more. However, as of today, there are no customised processes for gathering interested businesses. That means if a business reports interest in a UIC to the course coordinator sometime during the semester, it is up to the course coordinator to keep the information until the beginning of a new UIC course. One could say that it is a luxury problem due to it being a good thing to have businesses lined up, however, it demands a clear structure with information about who to contact, which course to include them in, and at what time.

“I get some emails once in a while from businesses wanting to take part in projects [UICs]. So I have to save that information in an excel sheet and remember to take a look at it once a new semester approaches. But I have to admit that there are times when I forget that it [the excel sheet] exists.”

- Colin (Course Coordinator, UIC 2)

“When we get interest from companies I just flag the emails in my inbox and hope that I remember to contact them when the new semester begins”

- Charlotte (Course Coordinator, UIC 3)

Due to the current challenges of automation, several of the course coordinators expressed how their affiliated HEI is trying to develop a platform for solving some of the problems. They explained how they have experienced several struggles and ill-structured processes and therefore want to do something to solve the problem. However, once again, the challenge is the lack of both time and financial resources. Also, it was stated how it might not be the solution to the problem to develop one platform each.

“One of my colleagues is actually in the process of developing a platform to handle some of the challenges, mostly in terms of the manual labour of sending messages back and forth. The only problem is that he is doing it as a part-time project, so I have no idea when it will be done..”

- Charlotte (Industry representative, UIC 3)

“We have done this [UICs] for several years now and see the need for automation of the slow and repetitive work. So we did manage to get some funding from our department for developing a prototype of what we need.”

- Cameron (Industry representative, Additional)

“I think one of the challenges with incorporating collaborations [UICs] in the Norwegian education system is the lack of a common platform for all universities. If we look at other countries they are much more mature in terms of working together for the sake of students’ learning outcomes. I guess Norway has some way to go, and maybe it has to do with culture?”

- Nyla (Norwegian Ministry of Education, Additional)

It does seem like the different HEIs, or at least the motivated course coordinators, are trying to do something about the problem they experience. The question is whether they are making a solution that only works for their specific course or department, or if it will be sufficient for all of the respective HEI courses. Further, as hypothesised by Nyla, is the aspect of culture. It may not be enough with a well-functioning platform to convince the HEI administration to allocate resources towards UIC initiatives, as the change might need to be founded in the Norwegian HEI culture first. Nevertheless, with motivated change agents such as both Charlotte and Cameron, one might be on the right track (Kolmos, 2006).

5.1.2 Personal motivation as the driving force

Taking a closer look at motivation as a driving force, which was briefly mentioned in the previous section, it is apparent that UICs would not exist without motivation from the course coordinator. All the interviewed course coordinators emphasised how the positive feedback from both students and businesses is the driving force for continuing to implement UICs.

“It’s really fun because the students get a lot out of it. I really see the value of it, so I continue doing it because I believe in it.”

- Chris (Course Coordinator, UIC 1)

“All the happy students and start-ups [industry representatives] are an important motivating factor. Like, if the students’d bitch about it, I’d probably put less effort in, or I would have dropped this a long time ago.”

- Cameron (Course Coordinator, Additional)

It appears that the experience of the positive learning outcomes students have from UIC is crucial in the process of implementing UICs. Another aspect mentioned by one of the course coordinators is how his own experience of having taken part in a UIC during his degree is triggering.

“During my own studies, I had a so-called “sandwich year”, where I worked for a company for an entire year. It was then I understood how much more you learn through experience. That is something I want my students to experience as well.”

- Chris (Course Coordinator, UIC 1)

5.1.3 Funding and human resource allocation

Even though personal motivation and positive experiences are a driving force, it all comes down to how many hours an HEI employee has left of the day. Willingness to do something is of course important, but without a salary and enough hours left in the day, it becomes impossible to continue. All four-course coordinators from different HEIs expressed how the financial situation impacts the implementation of UICs.

“If I was being strict about it, I don’t get compensated enough. The number of hours I get on my work plan does not match the hours I spend on this. Not by a long stretch. I think it’s like half as much as what I should get.”

- Colin (Course Coordinator, UIC 2)

A lot of manual processes were highlighted as one of the reasons for UIC implementation to be so time-consuming, hence the need for financial support to cover salaries. Once again, the lack of streamlined processes and customised systems appeared to be a bottleneck for all of the course coordinators.

“I send out copies of contracts to every student, and this semester we had over 100 [students]. Then I have to get them in return with a signature to then forward it to the industry representative. And in some cases, people don’t have the correct Adobe program or whatever to sign, and so they have to scan it as a new pdf, which makes it very complicated. And then I am the one who has to keep everything in a file until the end of the project, so my computer is stacked.”

- Chris (Course Coordinator, UIC 1)

“ We need someone to do the donkey work, or don't get me wrong, but the repetitive work (...) I have to copy and paste any text from one forum to another, and I have to do that manually myself. And that's 37 documents that I have to do..” -

Colin (Course Coordinator, UIC 2)

“It involves lots of manual work, (...) my colleague has to upload everything himself. Just to mention some of it, he matches the students with the business, enters information about all parties, and sends out contracts.”

- Charlotte (Course Coordinator, UIC 3)

Literature states that UICs are a means to attract governmental grants (Hagen, 2002). However, according to the course coordinators interviewed for this study, there was little financial support to be found. Therefore, an informant from the Norwegian Ministry of Education was contacted to understand why there is still a gap. The informant is partly responsible for the larger grants provided by the Norwegian Government to promote the mandate published in the 16th deposit report about implementing more UICs (Kunnskapsdepartementet, 2021). Even though there are numerous programs, with millions of Norwegian NOK, one can apply for it seems to not be sufficient. The informant explained how the system is not customised for smaller projects, and that it is a gap between what the Ministry of Education wants and what they can provide.

“We have lots of grants you can apply for when establishing UICs, however, the problem is that they are highly specific and comprehensive. Usually, you have to put down a group of researchers for the project, it should be within a specific industry, it must last for quite some time, and so on. So I guess it is not for anybody. And I see how that is bad for the individual course coordinator trying to do something good.”

- Nyla (Norwegian Ministry of Education, Additional)

It appears that there is a disparity between the vision for Norwegian HEIs coming from the Government (Kunnskapsdepartementet, 2021), and the missions of each HEI (Belluci & Pennacchio, 2016; Zomer & Benneworth, 2011), and the course coordinator's experienced reality. Therefore, in the case of a course coordinator wanting to try something new like implementing a UIC, it goes at the expense of his or her spare time. However, Williams et al. (2022) suggest that through close communication with the HEI administration about the positive impacts of UICs, a course coordinator could be successful in implementing change.

5.2 Quality Assurance

For course coordinators to ensure that a UIC aligns with what a student is supposed to learn and experience within a course, close communication is important. Therefore, the findings linked to communication will be presented first. Then, legal aspects, and especially IPR due to this study focusing on technical courses, will be presented as it proved to be a large challenge impacting the quality assurance of a course.

5.2.1 Communication

As highlighted by scholars, the roles and tasks of a course coordinator are many, with the most important probably being the quality assurance of the course content (Ladyshevsky & Jones, 2007; Williams et al., 2022). In the case of UICs, this process is strongly associated with the industry representatives as they play the role of an instructor (Mulder et al., 2009). However, in this study, communication was highlighted as lacking at all times of the collaborations from all stakeholders. In the making of a UIC, several processes involve communication between all parties, such as handling of contracts, clarification of expectations, project outlines, and so on (Ankrah & Al-Tabbaa, 2015). Unfortunately, this process is not automated and so one uses a handful of different platforms to get in touch with the respective stakeholder. Ultimately, this is the job of a course coordinator due to him or her being the contact point for both students and industry representatives. As Irvin from UIC 1 expressed, the many channels to deal with complicate everything and make it highly time-consuming:

“I think we used like five different communication tools. I talked to the uni’s legal department for contract handling, but I also had to send the contracts to the student and lecturer by email. We were asked to send a text about ourselves to Canva, which I think is the student platform, and then I had to call the lecturer to clarify some stuff. And internally we use Slack, so I had to talk to my colleagues about the project there simultaneously.”

- Irvin (Industry, UIC 1)

As one understands, the lack of a streamlined process frustrates the involved stakeholders, and not least generates a high probability of mistakes and delays. It appeared that the students did not experience the process as painful, however, their job initially was just to do whatever their course coordinator told them to do. That further emphasises how conveying messages is an important task of the course coordinator to ensure communication flow.

“Hmm, I don’t think it [managing the many communication platforms] was that difficult. He [the course coordinator] just posted what to do on Canva and then I did it. But I guess I could have done it a bit faster, hehe.”

- Susan, (Student, UIC 1)

When having initiated the UIC and all preliminary communication was completed, the beginning of the project period presented new challenges. Once again, the lack of one common platform between all stakeholders proved to be a problem. Most importantly, the communication between students and the industry representative did not always go smoothly.

“We didn’t have any contact with him [the course coordinator] throughout the project. Suddenly one student just disappeared for weeks and I didn’t really know what to do or who to contact. I had no way of reaching him [the student]”

- Isac (Industry, UIC 2)

Williams et al. (2022) highlight how the interactive role of a course coordinator is important to facilitate interaction between fellow students, and between students and industry representatives. However, as highlighted by Isac in the quote above, it appeared that the course coordinator was absent and so the interaction was up to the other parties to initiate themselves.

Correspondingly, the course coordinators expressed frustration about the communication and how it affects the quality assurance of the course content. Without a common platform for all involved parties, the process of communicating becomes time-consuming and serves as a potential risk for misunderstanding. In the end, that could affect the learning outcome of a student.

“ Communication is a major problem because I have so many students taking this course, together with all the different industry partners. I have to set up like FAQs, digital forums, etc. And, you know, sometimes I use teams, slack, email, phone, seeing them physically. That becomes annoying and hard.”

- Chris (Course Coordinator, UIC 1)

“We have had incidents where the clarification of expectations was not communicated well enough to the company and the student ended up doing secretary work, like making coffee and taking meeting notes, which is completely irrelevant for an IT degree.”

- Cameron (Course Coordinator, Additional)

There is a chance that the tasks allocated to a student during a UIC are irrelevant, as Cameron expressed in the quote above. In addition to getting suitable assignments, it is important that the business understands the level of competence of the student and adjust the difficulty and feedback thereafter (Cooper et al., 2004). That is essential to provide a relational learning process from theory to practice (Hall et al., 2000; Higgins et al., 2013). In fact, literature states that the support and guidance of a mentor, such as an industry representative, is crucial

in the process of experiential learning (Jacobs et al., 2003). Also, as expressed in *Figure 2*, the level of wickedness in a problem given to students should be consistent with their course of study (Cooper et al., 2004).

5.2.2 IPR and Legal

As the scope of this study is technology courses, ownership of code and IPR are important aspects. When implementing a UIC, several contracts must be made between several parties: one for the project between the student and industry representative, and one for the collaboration between the HEI and the company. For some HEIs, there are standardised contracts for industrial collaborations. However, they might not be sufficient when working with start-ups and technology.

“I mean, if the students publish the source code on a website or decide to use it, that’s not good. So we had to discuss with other start-ups how to develop the contract on behalf of the uni [HEI].”

- Irvin (Industry, UIC 1)

“I guess we are kind of scared to think about someone stealing our code and making a competitive product. So you could say that the university definitely does not take our viewpoint into consideration when drawing up contracts for these projects [UICs].”

- Isac (Industry, UIC 2)

The legal challenges could be the effect of different motives between HEIs and the industry, and hence lack of putting oneself into the other party’s shoes. The HEI put their interests first, such as publishing results and enhancing their reputation, while the businesses are more reluctant to share due to secrecy and IPR-matters (Ankrah & Al-Tabbaa, 2015). However, after having interviewed course coordinators from different HEIs an interesting discovery came up. It appeared that the presence of a Technology Transfer Office (TTO) at the HEI made the legal processes much smoother. It is well expressed in the two statements from

Chris and Cameron, with Chris being affiliated at an HEI without a TTO and Cameron the opposite.

“We don’t have any structure for developing good contracts with regards to IPR and other aspects especially wanted by technology start-ups. Our [the HEI] legal department has around five employees working with all legal aspects of the entire uni.”

- Chris (Course Coordinator, UIC 1)

“We have several drafts of contracts with regards to the specific field of study a student belongs to. I guess our university’s history with the commercialisation of technology and technology transfer lies in our subconsciousness, and that’s why we are able to consider the commercial aspect of secrecy and IPR.”

- Cameron (Course Coordinator, UIC 1)

Even though this discovery must be reviewed with caution, as the two statements do not conclude anything, it is interesting to observe how Cameron is recognising the positive impact of the HEIs TTO. It further points to the importance of course coordinators possessing the correct knowledge to implement UICs, which is emphasised by literature to be lacking (Williams et al., 2022). Regardless of the great academic anchoring, these individuals might never have experienced the strict rules of patent applications, or the importance of IPR for a newly established start-up. This knowledge gap is emphasised as a stress factor by both scholars (Briggs, 2001; Murphy, 2003) and the course coordinators themselves in the following two quotes.

“We don’t have a good system for archiving these things [legal documents] and quality assuring them (...) so those vital things are just sitting on my cloud space. And I am the one with my signature on it. So if something happens, I am responsible. And that makes me worried”

- Chris, (Course Coordinator, UIC 1)

“We have this NDA and several different collaboration agreements. And none of them is fit for purpose. And we don't have a way of making them specific to the company. So I feel responsible if something happens.”

- Colin (Course Coordinator, UIC 2)

5.3 Summary of the Analysis

Communication is a huge struggle in UICs for all stakeholders. As the course coordinator is in charge of the UIC, it is, therefore, his or her main challenge as well. Due to the use of different platforms among the various parties, combined with the lack of one well-functioning platform anchored in the HEI, today's solution is the use of multiple communication channels. That further leads to messages being conveyed repeatedly between different parties, and hence risk being somewhat altered. Ultimately, the course content can be subject to change and further affect the student's learning outcome for the worse.

Strongly associated with communication issues is the amount of *manual labour* in UICs. When sending hundreds of emails with different signatures and documents, the chance of things going wrong increases every time one hits the send button. Further, these tasks are considered “donkey work”, meaning repetitive without the need for much expertise or training. Most HEIs have recognised the need for software to perform these tasks, in addition to handling some other processes. However, as financial resources are limited, the development time could be long. Also, as these platforms are mostly developed for a specific type of courses the risk is that the software becomes narrow. However, there is an immense need for something automatic to deal with tasks that take up too much of the course coordinator's time. Then, the experience of the smoothness in UICs from the students and industry representatives will most likely improve.

The last aspect derived from the analysis is the need for *knowledge*. Industry representatives express their concern for the lack of knowledge in terms of legal aspects, while course coordinators disclose their fear of doing something wrong. In turn, it affects the personal well-being of the course coordinator. In the case of sufficient knowledge, such as with the course coordinator from an HEI having an affiliated TTO, no distress was reported. It is

therefore apparent that sufficient and correct training of the course coordinator should be of focus. However, once again, such training is financial- and time-intensive.

Lastly, it is important to highlight the positive findings from this study, regardless of that not being the focus of the research question. The course coordinators' honest motivation and engagement in implementing UICs are one of the main reasons for the current UICs existence. Hence, the effect of these individuals as change agents is enormous.

6. Discussion and Implications

This chapter further elaborates on the analysis from the previous chapter with more emphasis on the literature presented in *Chapter 2* and the author's phronesis, as suggested by the abductive method (Lukka & Modell, 2010). The goal of this chapter is to highlight what the research question seeks to investigate, namely "*What are a course coordinator's challenges when implementing a UIC for technology courses in higher educational institutions?*".

Despite the research question being focused on the challenges of the course coordinator, some of the driving factors for managing a UIC are also highlighted in the discussion. That is due to them proving an important point for other challenges. Also, this chapter aims to propose some suggestions on how to ease the challenges presented, in addition to the focus of future research on this topic. That is in line with steps three and four of the abductive process (Kovács & Specs, 2005), also illustrated in *Figure 3*.

6.1 Knowledge and Technology Exchange

As the goal of UICs is to promote knowledge and technology exchange between higher education and the industry (Ankrah & Al-Tabbaa, 2015; Bekkers & Freitas, 2008; Siegel et al., 2004), the beginning of this discussion is devoted to just that. More specifically, the aspect of quality assurance, and hence learning outcome, in addition to the challenges raised by a lack of knowledge is discussed.

Multiple studies show that pedagogical strategies which implement UICs have a positive effect on students' learning outcomes (e.g. Green & Farazmand, 2012). Especially when it comes to technical degrees, where wicked problem solving is an important component of what one meets in work-life (Lönngren, 2019). That is further expressed by all interviewees in this study, who are representative in terms of pursuing or working with technical studies in higher education. However, for the transformative learning experience from theory to practice, and further internalisation (Dorland et al., 2020) to happen, quality assurance of the course content is needed (Williams et al., 2022). It is apparent that this responsibility lies with the course coordinator (Ladyshevsky & Jones, 2007). However, challenges arise as the industry representative plays an important role in conveying learning as an "instructor" (Mulder et al., 2009) and mentor (Cooper et al., 2004; Kubberød & Pettersen, 2018; Kubberød & Pettersen, 2017) in UICs.

In a perfect world, the communication between the course coordinator and industry representative should be flawless to ensure a relational learning process from theory to practice (Higgins et al., 2013). As that is not the case, course coordinators express frustration about the lack of one common system or communication platform to ease the contact throughout the whole UIC. The domino effect of bad communication continues to the industry representative who ends up not having any contact with the course coordinator after the initiation of the UIC, which in turn increases the risk of bad learning outcomes for the students (Kubberød & Pettersen, 2018). One could therefore argue that the lack of a good solution for communication between all parties is crucial for the quality assurance of the course content in UICs.

Another aspect of quality assurance is the lack of knowledge in certain areas of expertise. It was explicitly stated by one of the course coordinators how his well-being was negatively affected by the legal aspects of UICs, due to him being responsible in case something were to happen. That is in line with literature stating how the management of too many tasks outside what the HEI requires of competence in a course coordinator results in stress (Murphy, 2003). Further, scholars argue how the unrelated tasks do not correlate with the attention given to these positions in terms of promotion and allocation of resources (Ladyshevsky & Jones, 2007). Ultimately, the course coordinators in this study express that they feel inadequate due to the knowledge wanted by the HEI not corresponding with the knowledge needed to provide wicked problem solving using in-company work placement. With UICs providing experiential learning, exposure to the real work-life to students, and skills wanted by employers and society (Davey & Merman, 2018; Voogt & Roblin; World Economic Forum, 2020), it should be clear that today's existing knowledge gap, especially with regards to legal aspects, must be covered.

The challenge of limited knowledge in the field of IPR and legal aspects did not prove as a challenge for all course coordinators. With the presence of a TTO, the expertise was somewhat provided and hence eased some of the contract handling and other challenges for the course coordinator. Therefore, it could be suggested to implement TTOs in Norwegian HEIs to a larger extent, which in turn would promote even more knowledge and technology exchange between the industry and educational sector. However, as the implementation of such offices probably poses even more challenges, a temporary solution for the HEIs without a TTO should be developed. Measures such as professional development opportunities could

be provided by either the HEI itself or as a cross-institutional collaboration through one of the grants from the Norwegian Ministry of Education.

6.2 Driving Forces

Several drivers work towards the implementation of more UICs due to the many positive outcomes for all stakeholders involved. However, it seems as if the course coordinator's motivation is the ultimate engine to start it all off. The literature emphasises the importance of change agents to impact decision making, especially concerning change in the curriculum (Kolmos, 2006). This study further substantiates that, motivation for change towards more practice is the biggest reason for course coordinators to continue implementing UICs, regardless of their limited resources. It is, however, questionable how much longer these individuals are willing to work under such circumstances if they were to see little willingness to change in the HEI administration for years to come. Unfortunately, change in curriculum impacts the wider student community and hence complicates the introduction of new pedagogical strategies (Borah et al., 2019). It is therefore apparent that changes in HEIs are in fact a huge challenge for course coordinators. Therefore, external incentivising factors, such as governmental policies and support mechanisms, could be an important supplement to the course coordinators' motivation (Borah et al., 2021; Kolmos, 2006).

It is apparent that the Norwegian government is focused on implementing pedagogical strategies that introduce practice and collaboration with the industry (Kunnskapsdepartementet, 2021). Also, technology exchange between education and industry is crucial for global competitiveness (Barnes et al., 2002; Etzekowitz et al., 2000; World Economic Forum, 2021). However, the change towards such collaborations must be done within each HEI, and so it is crucial for the incentives given by the government to meet the current challenges. As the representative from the Norwegian Ministry of Education pointed out in this study, today's grants might be overly complex and too narrow in terms of focus. That ultimately results in course coordinators not receiving the external aid and pressure that is needed for more UICs to be implemented. The optimal solution would be if the grants are restructured, however, as that might be difficult, course coordinators across departments or institutions could apply for larger grants together to free resources.

Another external factor that could help speed up the change in curriculum toward more UICs is the industry. As discussed in *Section 6.1*, the interest in knowledge and technology

exchange with the industry is a large motivating factor for HEIs (Sherwood et al., 2004). As course coordinators in this study expressed, most businesses come back for more collaborations due to them being very satisfied. In turn, the contentment and eagerness of the industry result in the course coordinators not having to spend too much time recruiting potential partners for UICs. These partnerships are crucial for HEIs to fulfil their third mission of providing societal impact (Zomer & Bennewort, 2011), as it is a means to employ graduates (Dorland et al., 2020; Plewa et al., 2015). Also, close collaborations within education could open doors for research collaborations, which further aids HEIs in the battle of attracting funding (Hagen, 2002). It must be noted, however, that in the process of establishing such industrial relationships, a streamlined process for communication and follow-ups is needed. That issue of clear communication between these two parties was repeatedly expressed as a source of frustration and consumption of time.

6.3 Streamlined Processes

Limited resources, in terms of time, knowledge, and money, are all recurring challenges throughout this study, both from the interviewees' perspectives and as stated by literature (Hall et al., 2000; Kubberød & Pettersen, 2017; Paisey & Paisey, 2010). These limitations affect different aspects of a course coordinator's work, however, one major challenge they are all connected to is the amount of manual labour. The interesting finding is that these limitations are further worsened due to the many manual tasks associated with the implementation of UICs. Thus, a negative spiral of little resources being used on rather insignificant tasks makes the daily work of a course coordinator even worse. If one would have streamlined more processes, and perhaps even automated some of them, the few available resources would be discharged.

The structure of course coordination suggested by Williams et al. (2022) emphasises how the many stakeholders are all connected to the course coordinator. In other words, he or she is the core of everything that happens in a UIC, and so a well-developed structure is needed to manoeuvre all the messages and activities happening. However, it is important to note that in low-experiential pedagogical methods, such as lectures, or class visits by an entrepreneur, a less complex system is needed. Hence, one could implement a new parameter to the experiential learning continuum by Cooper et al. (2004), where the degree of involvement from the industry impacts the level of streamlined processes. As for this study, looking at in-company projects, the need for a streamlined process is hence large.

6.4 Limitations and Avenues for Further Research

The research setting for this study is unique, as few studies have investigated Norwegian UICs. However, the narrow focus might pose a limitation in the sense that most literature found in this study focus on international UICs. Hence, it could be argued that the abductive process has not considered cultural aspects when matching real-life observations to existing literature. Further, as it was found that several course coordinators in this study look to other countries for examples of good UICs, a cross-cultural study of Norwegian and international HEIs is suggested for further research.

An interesting finding was the difference in the course coordinator's perception of challenges posed by IPR and legal matters. With the presence of a TTO, no issues with the handling of legal aspects were reported as challenging. A limitation could hence be the lack of several cases with a TTO, however, that was not the aim of this study. Therefore, a recommendation for further research is to investigate the potential effect of a TTO on the implementation of UICs.

Lastly, the situation of COVID-19 could be regarded as a limitation of the findings. As more people have recently been used to the many digital platforms, and in some cases demand flawless solutions, the findings might be affected by that. Before the pandemic, it was possible to meet physically, deliver documents by mail, and establish relationships with other stakeholders in person. Several of the UICs that interviewees were asked about were conducted during times of restrictions, and elements such as bad Internet connection, lack of physical presence, and not least the uncertainty of illness, could have complicated the course coordinators' job. However, one could argue that the pandemic has changed our habits towards a higher level of digital presence, and so these effects could appear in the future as well. Hence, the following section considers the practical implications for practitioners with the hypothesis of a digital every day being the new normal.

6.5 Implication for Practitioners

It is evident that the challenges of a course coordinator implementing UICs are strongly linked to the lack of systems and streamlined processes. A quick fix to the problem is to allocate resources to course coordinators so they can either spend more time on these manual tasks or hire additional people to help deal with these challenges. On the other hand, HEIs could allocate resources to develop robust systems that can manage the many processes and

stakeholders, which ultimately result in a long-term, sustainable solution. Simultaneously, it is important to note that developing a long-term solution is time demanding, and so the need to hire additional resources to perform the “donkey work” is probably needed as a temporary solution.

Despite the challenges highlighted by this study, the findings do imply that course coordinators should continue with the implementation of UICs. With the many positive learning outcomes and further societal impact, there is no doubt such a pedagogical method to provide experiential learning is needed. That way, the mandate in the 16th deposit report can be fulfilled which in turn has a positive effect on the innovative solutions provided by Norwegian businesses. However, a change in the structuring of public grants in Norway should be considered so that they do contribute to the real challenges in society. By making more grants available to smaller projects, such as optimising the processes of UICs, the government would additionally support the skill and competency development of future graduates towards what is needed in the future.

7. Conclusion

From the initial literature read, one could believe that the main challenge of a course coordinator is the lack of resources (e.g. Hall et al., 2000; Kubberød & Pettersen, 2017; Paisey & Paisey, 2010). Even though that is true, the nature of challenges is not straightforward. From this study, it was found that the lack of streamlined processes poses the largest obstacle for course coordinators when it comes to implementing UICs. Underlying this problem are challenges involving quality assurance, lack of knowledge, and manual processes leading to difficulty in communication. All of these impact the workload of a course coordinator, in addition to some of them harming personal well-being (Murphy, 2003), and ultimately students' learning outcomes (Gibbs, 2006).

Without the proper quality assurance of courses implementing UICs, HEIs not only fail their mission of high-quality teaching but also the third mission of providing societal impact (Bellucci & Pennacchio, 2016; Zomer & Benneworth, 2011). Hence, closer communication between the industry and course coordinator must be established to ensure that the content of each UIC fulfils the course's curriculum (Williams et al., 2022). Further, the course coordinators need better professional development programs to fill the legal knowledge gaps if there is no TTO affiliated with the HEI. Lastly, an automatic process or solution for today's manual labour, or "donkey work", should be developed to discharge time spent by the course coordinator on tasks that deliver little or no value to the course itself.

Despite the challenges, there is no doubt that UICs should be implemented to a larger extent in Norwegian higher education (Kunnskapsdepartementet, 2021), especially for technology degrees (Lönngren, 2019). Not only does it contribute to graduates' employability and development of important skills, but also technology and knowledge exchange (e.g. Ankrah & Al-Tabbaa, 2015; Bekkers & Freitas, 2008; Siegel et al., 2004), and further global competitiveness (e.g. Barnes et al., 2002; Etzkowitz et al., 2000; World Economic Forum, 2021). This was further emphasised by the motivation of the course coordinators in this study, being an inevitable driving force for collaborations, in addition to all stakeholders expressing their contentment. However, if these collaborations are to happen, a restructuring of the role of a course coordinator is needed so that more resources and decision-making power is allocated to him or her (Ladyshevsky & Jones, 2007). Further, a cross-institutional solution for communication and handling of UICs on a general basis should be developed to ease the process for all stakeholders.

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9. Appendix

Interview guide - Industry representative

Introduction

- Introduction to the interviewer: quick intro about the author and the thesis
 - UICs - frameworks for establishing them
- Formalities in terms of length, recording, transcription (anonymous).
 - Asking for permission to record and transcribe the interview
 - All files and transcriptions are confidential, we will delete the files when we complete the thesis
 - Data included in the thesis is anonymized
- Do you have any questions before we begin?

Interview questions

0. Could you tell a bit about your role in the organization where you work?

- What is the organization's mandate/what do you aim to achieve?

1. What is your experience with UICs?

- Does your workplace have any involvement in UICs? (facilitating, allocation of resources, seminars, etc.). If yes, could you tell more about the nature of these projects/involvements (e.g. your role in such projects)?
- Have you talked to university representatives or industry actors about their experience?

1. What is your impression of today's solutions for implementing UICs?

- Do you believe today's solution(s) are sufficient? What could be done differently?
- Do you have any plans to establish new initiatives that will assist in the development of more UICs?

1. How do you work to share knowledge and findings across higher educational institutions?

- Are you under the impressions that these activities are sufficient? How could they be improved to increase the sharing culture?

End

- Do you have any questions or something you would like to add on to?
- What did you think of the interview? Anything I could have done differently?
- Is it okay to contact you later on in case of any follow-up questions/ambiguity in the answers?

Interview guide - Student

0. Introduction

- Introduction to the interviewer: quick intro about the author and the thesis
 - UICs - frameworks for establishing them
- Formalities in terms of length, recording, transcription (anonymous).
 - Asking for permission to record and transcribe the interview
 - All files and transcriptions are confidential, we will delete the files when we complete the thesis
 - Data included in the thesis is anonymized
- Do you have any questions before we begin?

Interview questions

1. Pre-project

- Your motivation for participating in a UICs - who initiated it?
 - Have you taken part in UICs before?
- Curriculum overview in terms of entrepreneurial theory - what is learned?
 - Preparation given from course coordinator before project period - what is done?
- Preparation given from startup before project period - what is done?

2. During project

- Follow-up from course coordinator during project period - how and what?
 - How do you communicate? What is the threshold of asking questions?
 - Do you only focus on course-related aspects? (or also entrepreneurial learning)
- Follow-up from startup during project period - how and what?
 - How do you communicate? What is the threshold of asking questions?
 - How much responsibility do you get when it comes to tasks/autonomy?
- Any challenges in terms of follow-up during the project period? (both with university+startup) - communication

3. Evaluation

- How are you evaluated in the course?
 - Do you think it is a fair evaluation?
 - Does it cover all aspects of what you learn?
- How are you evaluated by the startup?

End

- Do you have any questions or something you would like to add on to?
- What did you think of the interview? Anything we could have done differently?
- Is it okay to contact you later on in case of any follow-up questions?

9. Appendix

Interview guide - course coordinator

Introduction

- Introduction to the interviewer: quick intro about the author and the thesis
 - UICs - frameworks for establishing them
- Formalities in terms of length, recording, transcription (anonymous).
 - Asking for permission to record and transcribe the interview
 - All files and transcriptions are confidential, we will delete the files when we complete the thesis
 - Data included in the thesis is anonymized
- Do you have any questions before we begin?

Interview questions

0. Could you tell a bit about yourself, the course, and your role in the course?

1. Pre-project

- Your motivation for participating in a UICs - who initiated it?
 - Have you taken part in/established UICs before?
 - How do you evaluate this one compared to others?
- Curriculum overview in terms of entrepreneurial theory - what is learned?
- Project description - how open is it? How much responsibility do the students get?
- Preparation of students before project period - what is done?
- Preparation of startups before project period - what is done? Any standardized contracts or processes?

2. During project

- Follow-up of students during project period - how and what do you do?
 - How do you communicate? What is the threshold of asking questions?
 - Do you only focus on course-related aspects? (or also entrepreneurial learning)
 - What is your impression of the students' experience?
- Follow-up of startups - do you have any contact?
 - How do you communicate? What is the threshold of asking questions?

- What is your impression of the startups' experience?
- Any challenges in terms of follow-up during the project period? (both with startup+students)

3. Evaluation

- How are you able to evaluate the students according to the curriculum?
 - Are they only evaluated on course-related aspects? (or also entr. learning)
 - How do you implement the startup's perspective in the evaluation?

End

- Do you have any questions or something you would like to add on to?
- What did you think of the interview? Anything we could have done differently?
- Is it okay to contact you later on in case of any follow-up questions?

