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Higher Education of Digitalized Accounting Benefits from Networked Cooperative Learning and Working Life Collaboration

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Abstract Cooperative learning is a structured way of small group working. The key elements are positive interdependence, individual accountability, promotive interaction, social skills and group processing. In this study, we create a new approach of networked cooperative learning, and examine how it contributes to the learning of digitalized accounting in real-life problem-solving cases. The interaction between digitalized accounting and cooperative learning has not been studied before. The data consist of qualitative and quantitative data. The qualitative data were gathered from group work, where accounting firms, their customers and students as well as teachers from two educational institutes worked together to find solutions to practical situations digitalized accounting may cause. The quantitative data were collected through a feedback survey with 51 respondents and studied in four groups. The research provides a descriptive content analysis. Our results indicate that networked cooperative learning is an appropriate method for working life collaboration in the context of digitalized accounting. We argue that cooperative learning is helpful in grasping difficult tasks without an exact goal at the beginning. We identified the well-known five key elements of cooperative learning and found two enhancing elements. Learning motivation and usefulness as well as the heterogeneity of the group have a positive impact on learning.

Keywords Higher Education, Digitalized Accounting, Cooperative Learning, Network, Working Life Collaboration

1. Introduction

The background of this study is the disruptive impact of the digital revolution on the accounting industry. The digitalization of business is one of the most important trends that currently influences the development of accounting work [1]. The transformation to digital accounting practices appears to have been rather slow [2], but recently the rate of change has accelerated. Many routine tasks are becoming automated and, because of this, accountants have to change their work patterns. If routine work decreases, the work of accountants in the future may concentrate more on the interpretation of numbers, as an example [3]. The work of accountants will be automated to a great extent and certain tasks may disappear altogether [4].

Changes considering digitalization, accounting work and knowledge need to influence the work of accountants and education [5],[3]. The digitization of accounting means that the education of accounting professionals should be

developed in order to meet the challenges of the future development. IT knowledge and skills are in high demand among accounting professionals [6]. Concerns have surfaced regarding whether the education of accounting can meet the challenges the rapid development of information technology poses [7]. Accounting students need to have a sufficient understanding of information technology to cope with its development. Hands-on training in these technologies would be advantageous [8].

Cooperative learning has been widely employed in many disciplines and at many levels of education [9]. Cooperative learning is a structured way of working in a small group where students are more involved and engaged in learning compared to traditional lectures [10]. Several studies examine cooperative learning in the context of accounting (e.g. [11],[12]). However, according to our knowledge, no studies have examined the interaction between digitalized accounting and cooperative learning.

In this study, cooperative learning refers to a structured way of group work where development teams cross organizational boundaries and learn actively together. Our development teams intersect from both a value chain and network perspective. A team has participants from different stages in an accounting firm value chain and from two educational institutions. We call this approach as networked cooperative learning.

The general objective of this study is to investigate the possibilities and challenges of networked cooperative learning as a learning method to increase skills and knowledge in the context of digitized accounting.

Based on the literature (e.g. [13],[14],[15],[16]), we expect that all accounting firms have some sort of digitalization, and cooperative learning is a suitable method for complex real-life cases. We also expect that networked cooperative learning will increase the learning of digitalized accounting and its processes. The specific objectives of the study are:

- To explore the current state of digital transformation of the accounting industry in selected accounting firms and their client companies.
- To examine how networked cooperative learning can contribute to the learning of digitalized accounting in real-life problem-solving cases.
- To assess the suitability of the networked cooperative learning method in working life collaboration in higher education.

To achieve the objective of this study, we attempt to answer the following research questions:

- What are the key functions of networked cooperative learning?
- What are the benefits of using networked cooperative learning in working life collaboration in the context of digitalized accounting?

The data for our study are collected in a project aiming to increase knowledge of digitalized accounting among

students and companies. The data are based on group work where accounting firms, their customers and students of two educational institutions worked together in cross-organizational teams to find solutions to practical situations having emerged in accounting firms as a result of digitalized accounting.

This article proceeds as follows. The next chapter presents the theoretical framework. The data and the methodology are presented in the third chapter. Chapter four reports the results, and finally, chapter five is the conclusions.

2. Literature Review

2.1. Digital Accounting

Digital accounting does not have a standard definition but refers to the changes in accounting caused by IT and networking technologies [13]. The evolution of cloud computing is one of the major drivers of change and advances in the history of computing [17].

Digital accounting is a large entity that includes all of the financial processes across corporate and stakeholder boundaries. The success of these digital financial transactions requires the integration of different systems into financial management processes beyond the boundaries of the parties involved. Digital accounting is complete when all of its material and data flow electronically throughout the value chain [14]. Thus, one of the key requirements of digital accounting is the integrated systems and consistent methods among the accountants, customers and staffs. The development and implementation of new practices of digital accounting benefit joint development projects for all parties involved.

2.2. Cooperative Learning as a Trend

The concept that defines the idea of learning actively together has been used *inter alia* in terms of peer learning, collaborative learning, community learning, common learning and cooperative learning [18]. All of these have the central aim of getting out of the lecture hall. Cooperative learning is a trend that extends widely to the various concepts of communality and cooperation. From the 1940s until the 1970s, cooperative learning was not a well-known method, but it started to become widely accepted in the 1980s [9].

Cooperative learning means that students work in small groups and help each other in studying the subject under examination [19]. In small groups, students may, for example, complete tasks, solve problems and complete projects [15]. Cooperative learning techniques are adaptable to many business decisions, including systems development, strategy assessment, or ethical reasoning [20].

2.3. The Key Elements of Cooperative Learning

Cooperation exists under certain conditions, which are the essential elements of cooperation and cooperative learning. These elements are positive interdependence, individual accountability, promotive interaction, social skills and group processing [16],[9].

The first and most important element of cooperative learning is positive interdependence. Cooperative learning is based on the social interdependence theory [16][9]. Two types of social interdependence are possible. In short, positive interdependence leads to cooperation and negative interdependence leads to competition. If there is no interdependence, individuals are able to reach their goals regardless of the actions of others.

Positive interdependence is promoted by situations where students work in small groups and aim to maximize the learning of all members and cooperate by sharing their resources and providing support to each other [16]. Thus, positive interdependence means that members of the group need each other to attain their own goals. At best, individual goals can be linked to the overall goal of the whole group. When a group works towards a common goal, each member is aware of their own responsibility and its importance in achieving the common goal. In such a process, learners find themselves wiser than anyone alone [21]. The task of the group leader is to try to ensure that no one can succeed in achieving the goal without being successful [22].

The second element of cooperative learning is individual accountability. Individual accountability means that individuals' performances are assessed and the results are given both to the individual and to the group for comparison against a standard performance [16],[9]. In cooperative learning, students are responsible both for their own learning and for the group's learning [19]. While learning takes place by helping others, everyone bears responsibility for their own learning. Positive interdependence and individual responsibility are linked together. A good cooperative learning assignment is formulated so that one student does not have the skills required to complete it alone, but each member of the group has at least one skill that is needed to accomplish the task [21]. The aim of the students is to work together so that everyone can learn [22].

The third element of cooperative learning is promotive interaction. Promotive interaction means that individuals help each other complete tasks and achieve the goal of the group [16],[9]. Oppositional interaction would exist if the group members discouraged or prevented each other's efforts to achieve the goals [9].

The fourth element of cooperative learning is social skills. The success of cooperation requires interpersonal and small group skills [16]. These skills are the condition for effective group work, and that is why students have to learn the needed skills actively [9]. Cooperative learning activates students in a learning process and helps to

enhance their communication and team skills [23]. Interaction with others enables students to learn from their own experiences and from others' skills and experiences [15]. Jurkowski and Hänze [24] find that students benefit from elaborating on their partner's ideas, but also from having their own ideas elaborated on. Furthermore, social and thinking skills can be reaffirmed when the students pursue a collective and practical goal [25].

The fifth element of cooperative learning is group processing, which means that group members reflect on each other's actions and whether they were helpful or unhelpful. Consequently, the group decides which actions are continued and which actions have to be changed. Group processing is needed in order to improve the efficiency at which the group achieves its goals [16],[9].

2.4. The Other Factors Affecting the Use of Cooperative Learning

2.4.1. Motivation and activity

Cooperative learning is able to maximize student learning especially in complex and difficult situations. It also enables learning situations that do not exist when students work competitively or alone [16]. In addition, cooperative learning can increase interest in the subject under examination. Caldwell, Weishar & Glezen [26] have investigated whether cooperative learning influences positive perceptions of accounting compared to traditional lectures. They found that cooperative learning increases positive perceptions of accounting. Other researchers have also made similar observations [27],[28][29]. According to Hernandez [27], students regard team learning as favourable. Opdecam and Everaert[28] have confirmed the hypothesis that team learners are more satisfied compared to students who attended traditional lectures. Cavanagh [29] finds that students greatly value opportunities for cooperative learning and active engagement in lectures.

Cooperative learning is active learning. When students process information with other students, they are more likely to learn and retain that information. As the students are actively engaged in the learning process, it promotes deep learning [30]. Active learning aims at situations where students become acquainted with the subject while interacting with the mentors and each other. The methods can vary from long-term simulations to a few minutes of joint problem-solving. The different forms of active learning are based on the idea of student orientation, which usually leads to higher student motivation [31]. Cooperative learning enables students to discuss issues and build a common and conceptual understanding of what is learned [16]. Cooperative learning also contributes to psychological well-being and self-esteem [16],[9].

2.4.2. Group management

Group management is a prerequisite for the group being

deliberately used as a resource for work. Therefore, the group must have common goals, interests and working rules. It is also important for members to feel that they belong in the group and feel that the interaction in the group is rewarding [32]. The key to promote learning is to create a supportive learning environment in which the social and emotional atmosphere is safe and encouraging. Cooperative learning aims to reduce competition as it has been found to prevent learning in a group [9].

In cooperative learning, there are several ways to ensure that students work in a group so that they learn social skills, the group is able to maintain the right direction towards its goal, and each member of the group equally contributes to the group's contribution [33]. As a group leader, instead of a traditional authoritarian guide, the group learner is a trend maker, a learner of learning, an expert in interaction, a manager of work and an expert in the field [32]. In cooperative learning, the teacher does not provide constant input. The teacher also monitors the student interaction [30].

2.4.3. Heterogeneity

Webb [34] has stated that a number of factors appear to have an impact on how effective cooperative learning will be. One of the factors is the mixture of ability levels in a group. Opdecam et al. [15] believe that heterogenous groups enhance student learning. Less skillful students can actively cooperate with students who are more competent and thereby develop a deeper understanding of the learning material. Adelopo, Asante, Dart & Rufai [35] have investigated the impact of group diversity in group reflection. Group reflection increased progressively when the number of males in a group relative to females increased. They find that heterogeneous groups were more reflective than homogeneous groups. Emerson, English and McGoldric [36] have examined whether students' personality types help explain the differences in students' course perceptions in cooperative learning. They find that cooperative learning facilitates increased interaction among certain types of students who might not otherwise interact with classmates.

Van der Laan Smith and Spindle [37] have investigated cooperative learning and group forming. Examining how individual learning takes place, they have found that heterogeneous groups formed by the instructor are not necessary for effective cooperative learning. Self-selected groups may increase the effectiveness of individual learning among higher performing students in some contexts. Moreover, Van der Laan Smith and Spindle [37] have found that students with higher abilities perform better in groups that are more homogeneous. There may also be differentiated interests when group members come from different institutions. According to Leufkens and Noorderhaven [38], learning is difficult in multi-organizational projects because projects involve the risk of interests clashing.

2.4.4. Academic performance

Many studies have shown that cooperative methods increase the efficiency of learning. Tsay and Brady [39] examine the relationship between cooperative learning and academic performance pertaining to higher education. They find that active participation in cooperative learning has a positive correlation with a student's academic performance. Agyemang and Unerman [40] have explored whether group work enhances the development of skills in the introductory accounting module. They have found that students working in a group might perform better than students not working in one. Berry [41] has investigated the influence of group work in a study program at a UK university. The study indicates that the students' group work skills improved and their ability to work in teams developed.

Carland, Carland and Dye [42] have found that cooperative learning improves student performance. Ravenscroft, Buckless, McCombs and Zuckerman [43] have compared individual and group incentive (grading) effects in cooperative learning. Students in the control group were graded only on their individual performance, and students in cooperative learning groups were graded on both individual and group performance. The students engaged in cooperative learning performed better than the control group. Hsiung [44] has compared individualistic learning and cooperative learning in engineering students. He found that students within cooperative learning performed better.

The method of cooperative learning aims to reduce the problem of free-riding. All group members have their own responsibilities [45]. The team leader has to ensure that the members of the group also promote each other's success by helping, assisting, supporting and encouraging [22]. Free-riding may be the most problematic element of cooperative learning. Free-riders might be weak students or strong students who do not work as hard as they could. Free-riding could be reduced by adding a risk, such as the rotation of group members [46].

The study tests two null hypotheses based on the previous discussion. Firstly, cooperative learning is a suitable method for complex real-life cases. Secondly, networked cooperative learning will increase the learning of digitalized accounting and its processes. Hypotheses are tested with quantitative data.

3. Materials and Methods

The data for this study were collected in a project aiming to develop accounting professionals' skills and knowledge in digitalized accounting. Accounting professionals must be able to convert increasing data into business-relevant knowledge, and because of digitalization, they also need to reassess the way they work. The project also aimed to develop the skills and

knowledge of students and teachers in the field of digitalized accounting, and to promote working life collaboration.

This project was a joint effort of a Finnish university and a Finnish university of applied sciences (UAS). Nine accounting firms, their fifteen client companies, local and national trade unions, business development companies and the local Chamber of Commerce participated in this project. All the participants were invited to the project by the head of the project (university representative) and the project leader (UAS representative). In addition, students from both educational institutions were represented in this project.

The project is divided into five main phases:

- (1) start of the project and opening seminar in September 2016,

- (2) casework phase in the development teams from October 2016 until April 2017,
- (3) development and implementation of new online digital accounting study modules in the area of digital business and service processes and analytics from March 2017 until May 2018,
- (4) promotion of the regional expert network in the field of accounting with local partners throughout the project period,
- (5) closing seminar in June 2018.

This study reports the results from the casework phase of the project. The aim of the casework was to find real development needs and topics of current interest in business, which could be used to create the contents and materials for the online digital accounting courses. The representatives of enterprises, students and teachers formed sixteen development teams (Figure 1).

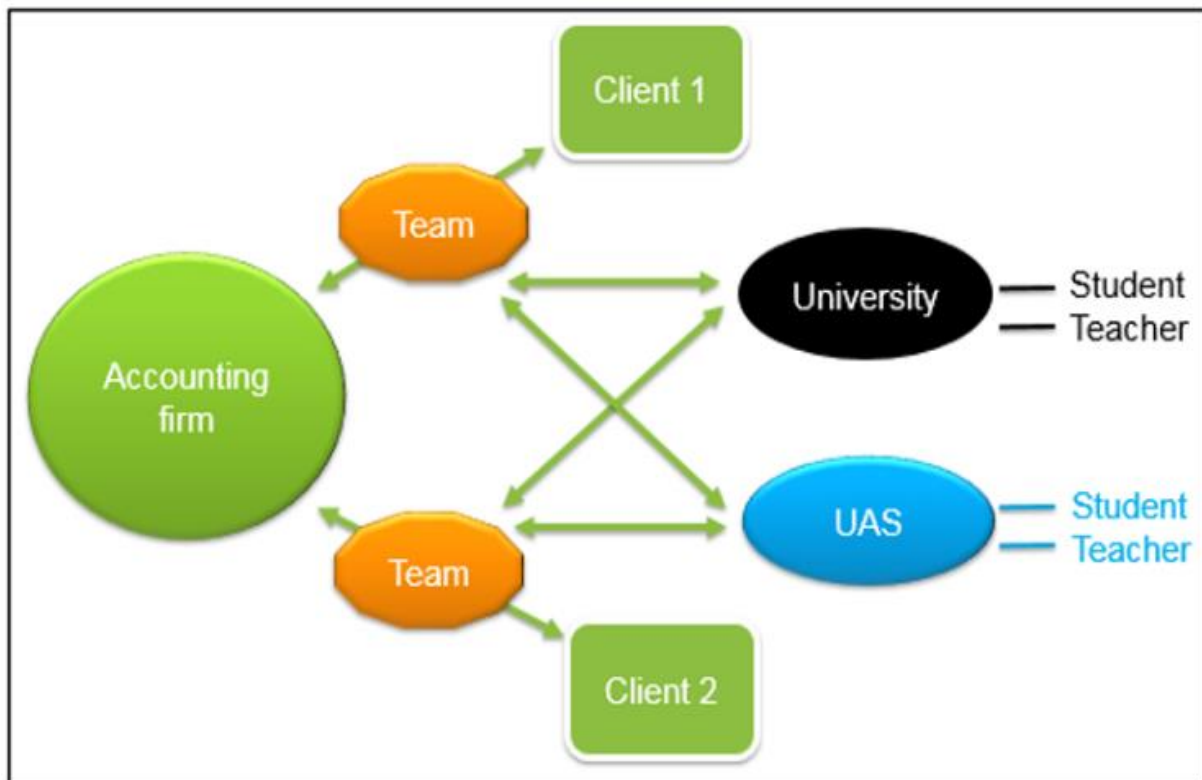


Figure 1. Creation of development teams from the perspective of organizations

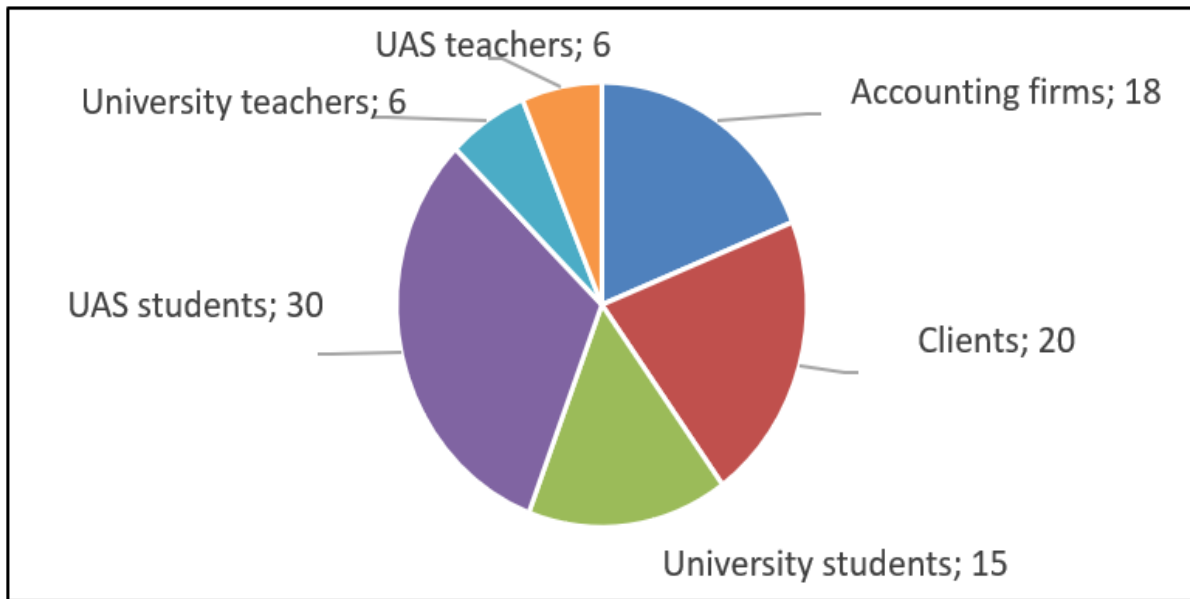


Figure 2. In total 95 people participated in the casework

The teams consisted of eighteen representatives from accounting firms, twenty representatives from customer companies, fifteen students from the university, thirty students from the UAS, six teachers from the university and six teachers from the UAS (Figure 2).

The purpose of the teams was to find and solve accounting development issues between accounting firms and their client companies. The idea behind the development team was to bring together students and accounting teachers from two different educational institutions as well as business representatives from the customer and supplier networks. There were representatives from both accounting service producers and their customers in the teams.

The casework included sixteen themes. The head of the project instructed accounting firms to select topics for the development work. The accounting firms selected the cases together with their customers. The cases reflect the current development needs and the state of digitalized accounting in the district. The cases were:

- (1) digitalizing sales and travel expense processes,
- (2) data transfer between financial management systems,
- (3) a tool for acquiring new customers,
- (4) an efficient process for managing staff leasing,
- (5) digitalizing the financial administration of a micro enterprise,
- (6) solutions to facilitate the financial administration of a micro enterprise,
- (7) small business digital financial management – threat or opportunity?,
- (8) from a paper format client to a digital customer,
- (9) growth business cash flow management,
- (10) accounting strategy and productization in a digital change,

- (11) modelling of the order process and cost comparison of development alternatives,
- (12) diagnostic performance measurement system for tracking occupancy rates,
- (13) clearing cash accounting,
- (14) plan for an electronic cargo book,
- (15) dashboard for management reporting,
- (16) cost-per-route calculation.

The students and teachers chose the cases from the list provided. Five standard meetings were scheduled for the casework: a starting meeting, three work meetings and a final meeting. The head of the projects and the project leader participated in the starting and final meetings. The teams also met independently subject to their needs. Meetings took place face-to-face or through Skype for Business. Eduuni was used as an official workspace in casework. Eduuni is a service environment for electronic work and networking provided by CSC – IT Center for Science. It is a platform which enables secure collaboration without organizational or ecosystem boundaries. All Eduuni Services are located at CSC's datacenter in Finland. Internal communication was arranged by WhatsApp, Facebook and e-mail.

Teams used standard documents during the working phase. The documents were a project plan, a project map, a final report and an updated project map. Eduuni enabled the sharing of documents and communication between team members. Student team leaders were chosen for the groups. The team leaders were liaisons between the companies and teachers. In addition, they coordinated tasks between group members. Teachers instructed the work of the teams.

The research data come from two different sources. Firstly, the students in the teams composed blog posts in

the casework final phase. Each development team wrote a blog post that answered at least the following questions:

- What did you learn during the development work?
- What was the most important thing you learned?
- How would you describe the work in the cross-organizational teams?
- How did you like working in a project related to real-life work?
- How would you develop the working method?

The blogs were published in Eduuni, but only the participants of the casework phase could access them. When the research work started, the blog posts were numbered and all the writings reviewed by the five researchers. In the content analysis, the texts were themed and analysed, and the results compared to the previous literature. Content analysis is a method of codifying a text or its content into different groups or clusters depending on the selected criteria [47]. We utilized the simplest form of content analysis [48] [49], because our only target was to establish the presence or absence of certain themes in each sampling unit. Even though this method is quite simple, many authors [50],[48],[49] argue that it may be the most reliable form of content analysis.

Secondly, the research data were collected through an online feedback survey. It was accomplished after the casework phase. In the feedback survey, the respondents evaluated how well they reached the goals of the project and expressed how satisfied they were working in groups. The survey comprised 23 questions. The first eight questions collected basic information on the respondents (e.g. organization and educational background). The next 12 questions were related to the casework method and its characteristics. Because most of the accounting firms and teachers participated in two cases, they responded to case-related questions separately for both cases. The last three questions asked whether the respondent would recommend participation in casework in the future, general development ideas, wishes for casework, and other comments.

The survey was sent to 93 participants (total 95 participants excluded the head of the projects and the project leader) and 51 responded, yielding a response rate of 55%. In the analysis of the case-related issues, 61 responses were analysed because 41 respondents only took part in one case, but 10 respondents took part in two cases. Therefore, the latter have assessed both cases separately. The quantitative survey data were analysed with descriptive statistics, Spearman's rank order correlation test, Paired Sample Test, and Kruskal-Wallis test. The study examines the effects of the selected variables on learning and not the correlation between variables in general.

4. Results

In this chapter, we first report the findings from the

qualitative analysis. Second, we present the results from the quantitative analysis. The research provides a descriptive content analysis.

4.1. Results of the Qualitative Analysis

When we analysed the blog posts, we found that higher education accounting students benefit from cooperative learning and that the method promotes their learning in digitalized accounting. The experiences reinforce the special benefits the students gained while studying cooperatively. The results of the qualitative study were divided into five distinct themes: (1) positive interdependence and individual accountability, (2) promotive interaction and social skills, (3) group processing, (4) learning motivation and usefulness, and (5) heterogeneity of the group. The first three themes are based on the work of Johnson, Johnson and Smith[16] and Johnson and Johnson[9], and the last two are based on the earlier research presented in chapter two [34],[26],[15],[35]. Finally, we combine the development suggestions and observations into further research ideas.

4.1.1. Positive interdependence and individual accountability

We found that learning in a group helps learning difficult content. Based on the feedback by the students, it is also more comfortable to study difficult things in a group. Students regard cooperative learning as favourable.

I immediately found out in the first meeting that the case is going to be really challenging... But the amount of learning that came with this project really opened my eyes... it was good to note that this project was not very easy even for professionals. (Blog 3)

The subject was really extensive and multifaceted, as there are many similar software programs on the market. We spent a lot of time exploring, comparing, and reporting the available software, but we got a clear view of the process description, i.e. what information will be useful in the future and how and for what it can be utilized. (Blog 8)

This project and case taught us that an impossible task could be accomplished when one only dares to undertake it. (Blog 10)

When a group is self-directed and positively interdependent, the group learns and achieves its goals. The casework involved several roles, and group members needed each other to achieve the goals. Teamwork also requires active participation from each group member. There is so-called peer pressure when you do not want to fail in front of the group. Although learning takes place in a group, everyone takes responsibility for their own learning.

After some confusion in the beginning, we got to work and assigned the team members each with their own tasks according to their strengths and interests. (Blog 14)

This is an extremely interesting way of working, but it requires a lot of initiative and activity to make it work with the group... it requires active participation from each party. When the project is successful, everyone will benefit from the results. Hopefully in the future, every financial management student will have the opportunity to participate in a similar project, as the world opens up in a completely different way and the view is significantly broader compared to traditional learning. (Blog 5)

The project was a very different experience compared to other studies because we had to stick to the timetables, and people outside the school had expectations for us. Thus, as the project progressed, we also learned about responsibility, and this gave a little insight into the real working world. (Blog 7)

We also found that the common goals and practices contribute to the work of the group and learning. In most of the cases, the goals were unclear at the beginning, but brightened and focused towards the end. This is a reflection of the general situation in the real professional world. Work is a continuous learning process that includes new choices and decisions every day.

At the beginning, we had trouble finding our bearings in terms of the work content and companies' needs. At first, it seemed that the companies did not really know what they wanted. Hence, we learned through reflecting on our own experiences that companies do not always know exactly what they want or in what direction to proceed and in what way. However, we turned the situation to our advantage and started to set up our own action plan and ways to implement it. (Blog 14)

We managed to stay relatively timely because it was designed in advance... As the work progressed, it was emphasized how important it is to start working with the shared electronic platforms and that the working methods between the different organizations and people are agreed on in advance and consistent. (Blog 9)

The coordination of time and schedules with many people is challenging, but setting the schedule right at the start of the project helped alleviate this problem. (Blog 5)

4.1.2. Promotive interaction and social skills

The results of the study confirmed that social skills are key in cooperative learning, and good interaction and social skills promote learning in groups. Cooperation and social skills were mentioned in all blog posts in some way.

The importance of continuous communication and timeliness was emphasized as the project progressed so that the project moved in the direction of the client company's and the accounting firm's view. (Blog 5)

The case taught us a lot about project work and certainly improved our interpersonal skills... It was

interesting to work together with different educational institutions and companies. (Blog 11)

... our team, especially the team leader, was able to be the intermediary of information between several companies, and at the same time, we learned from them the famous negotiating skills and, in general, the business practices of the business world... Such cases should be studied much more in school, allowing students to learn practical interaction skills and the right things about business. (Blog 14)

We found that the students did not maintain sufficient contact with the companies, maybe because the company representatives were busy. This may also be due to the fact that normally students are used to being in contact with the teacher.

The client company could have been better informed about the objectives and tasks. (Blog 2)

Communication between teachers and students worked smoothly, and WhatsApp was used diligently. However, December–January is the high season for the client company, which to a certain extent stopped the progress of the project. (Blog 13)

After identifying the problem, we collected information by visiting companies and by inquiring information via email. In the team, we learned from the process modelling and cost calculation, above all, teamwork... e-mail communication seemed to be slow at times. (Blog 16)

4.1.3. Group processing

We found that the group itself identifies the problem and decides the actions. The group will move forward in a direction that is unknown and not given. The group is self-directed and unique, as the case itself. The direction and learning are group-based in contrast to traditional learning. In addition, casework in cross-organizational teams as a working method was new to most of the students, so they treated it with an open mind.

The project is shaped by its creators. Casework is inherent in the concrete design of the actual subject only as the project progresses. This was a valuable lesson because both of us have become more used to a clear destination in work. Some kind of adaptability and innovation became familiar, and the most important thing we learned was that the project introduced some kind of flexibility and preparedness to adapt already set targets based on new emerging variables. (Blog 1)

The case started with some uncertainty because the implementation of the project and the real goals were a bit unclear. However, the first joint meeting helped to get started and we found some problems we tried to solve to help entrepreneurs. (Blog 2)

Casework was, at least for my own group, a new form of work, so there were few expectations. The success of the

teamwork and the importance of the division of labour were emphasized the further the project advanced. (Blog 5)

4.1.4. Learning motivation and usefulness

As one of the key results of the research, we found that if a student considers a topic useful, it helps in learning it. This finding was the same in both the qualitative and quantitative results. The survey results proved that the more useful the participants personally considered the case, the better they learned. When students are actively engaged in the learning process, it also promotes deep learning and leads to higher student motivation.

Moreover, working with a real company and a real problem gives us completely new energy to carry out the projects. Although generally cases in courses are mostly excellent, true situations bring a completely new depth and motivation. (Blog 6)

One of the good things about the project was that we worked on the right company and were looking for existing ERP systems. It warmed our hearts that our work was a concrete help to the company. (Blog 2)

It was great to get an opportunity to think about ways to utilize the data more efficiently... The project was really educational to us. (Blog 4)

We also found that the practicality of the cases motivates students to learn. Cooperative learning as a method can also increase interest in the subject. According to the feedback from the students, casework provides motivation for the degree studies overall, meaning that the effects will continue throughout the studies.

The project is certainly the most memorable event for the whole polytechnic. We noticed how things worked in practice in real life, and the project gave extra motivation to study things, knowing where and how to use them in the real world. (Blog 5)

Casework taught in particular what kinds of problems companies actually encounter when moving towards digitalized accounting. Overall, casework and business cooperation gave an idea of the degree of digitalization, especially at the level of micro-enterprises. (Blog 9)

In addition to learning, there was also a somewhat depressing illumination. Theoretical learning at the university is not enough. In the future, we need to be able to acquire and apply information to each client company's needs... even though the electronic cargo book was known in theory, the challenges of its implementation surprised us. (Blog 10)

We found that theoretical studies gained a new perspective from casework.

Theoretically oriented studies gained a new perspective from practical assignments. The most important aspect was that we were able to work with businesses and see how process modelling and actual work take place.

(Blog 11)

Working with real companies was an interesting variation to normal studies. Contacts to the actual working world brought a new perspective to studying.... Digitalization was a topic of great interest. It was also interesting to keep track of the accounting firm's ongoing accounting software changes, as the plan was to introduce cloud computing to client companies. It is great to see how smaller companies are developing their services and taking the opportunities created by digitalization into their business. (Blog 13)

This case went very well and we achieved our goals. In fact, I got an experience that the school alone cannot provide. (Blog 3)

4.1.5. Heterogeneity of the group

The heterogeneity of the team was measured by how many different types of participants there were on the team: representatives of an accounting firm, clients, university students, UAS students, university teachers and UAS teachers. The team size in the cases varied from five to eight participants, and the team heterogeneity varied from four to six types of participants. The groups were heterogeneous in many respects: with regard to gender, age, personality type, educational background, work experience and the current employer or place of study. We believe that the mixture of ability levels in a group played a remarkable role in our casework.

We noticed that participants from various educational institutions brought different perspectives to the issues. According to the results of the study, collaboration between the UAS and the university also introduced variety to the work.

The work in cross-organizational teams went without any problems and communication was smooth. Cooperation between the polytechnic and the university brought variation to teamwork, and things got a slightly different perspective. (Blog 12)

Collaboration between two educational institutions taught different ways of working. It helped to get to know other students as well. (Blog 9)

According to our observations, having participants from several organizations created uncertainty that, on the other hand, had a positive impact on learning. The group's heterogeneity may create peer pressure: no one wants to fail in front of the group. In addition, students were motivated when they were taken seriously and felt they belonged in the group.

Working in development teams that cross organizational boundaries opened up new perspectives. Working in the team was natural and the involvement of different organizations did not work in any negative way. On the contrary, it was rather inspiring that the team included representatives from different companies as well as from educational institutions. (Blog 1)

Working in a multidisciplinary team was a new experience for all group members, but one could say that this was definitely a strength rather than a weakness. (Blog 6)

Thank you very much to the company's representatives who listened to our opinions – we were not just students. (Blog 5)

The interests of participants may also conflict, and this may cause difficulties in learning. We did not find such results in our research, with the exception of difficulties in arranging joint meetings with all team members.

4.1.6. Development suggestions

The development teams also commented in their blog posts on how the working method should be developed. Students highlighted the need for better initial information on casework, project management and process modelling training, and increased interaction between the parties. Learning in groups would be even more effective if the work was more collaborative.

The initial information could have been more illustrative and informative so that the steps, requirements, and progress of the project could have been better understood from the outset. (Blog 13)

A lecture on project management would have been useful at the beginning, emphasizing the special features of this type of project. The method of describing processes could have been clearer or created together with different types of cases, and a better tool for modelling processes could have been selected. (Blog 9)

As a development target, if time and other resources allow, the whole team should carry out more of the work together. However, cases should be sufficiently multidimensional and wide-ranging. (Blog 1)

The students also provided feedback on the difficulty of matching the timetables of the various parties.

The coordination of the case companies, teachers and students was challenging, and most of the meetings overlapped with the lessons. We had the starting and final meetings at the accounting firm's office, all the other meetings were through Skype. (Blog 8)

It was also surprisingly difficult to combine regular weekly schoolwork with this kind of project-based case. (Blog 10)

We also found that we could ensure in advance that the group has the widest possible variety of skills. In the feedback survey, 27% of the respondents felt a lack of expertise in fields other than accounting. On the other hand, in the world of work, you cannot always decide with whom you work, and expertise in relevant fields is not always available.

The case became challenging because our team would have needed more knowledge of computer science.

There was only one student in the team who studied it as a minor subject. The theme turned out to be surprisingly demanding and more technical expertise would have been needed; at least it would have made the work easier... The project could be done together with students of the information systems science. You could get more information about information systems and how to solve technical problems. (Blog 8)

...the project should be at a time when students have a less demanding workload and have already accumulated the knowledge and skills they need. (Blog 15)

Casework simulates real life; that is, situations and cases that cannot be affected. However, in their blog posts students wish that their teachers tailor assignments to their need, tasks that can be solved.

I would suggest that future casework be sought and selected better from companies with a clear problem and an idea of what the goals of the project are. (Blog 7)

Casework might be more meaningful in the future if companies wanted to find a concrete solution to their problem through the project, not just look for alternatives. ... In addition, meetings could be organized with a wider range of experts. In this way, knowledge about the subject would deepen in a completely new way, and the quality of the case could be improved. (Blog 12)

We also found that it is difficult to estimate the benefits of the case immediately after it ends. The benefits can only be seen in the long term.

4.2. Results of the Quantitative Analysis

Firstly, knowledge and skills increased in all three areas of digitalized accounting during the cases in all participant groups. Secondly, the time spent working on the cases had a significant effect on the learning results. Thirdly, the more useful the participants considered the case, the more they learned.

The research confirms the null hypotheses that cooperative learning is a suitable method for complex real-life cases and networked cooperative learning will increase the learning of digitalized accounting and its processes.

Knowledge and skills increased in all three areas of digitizing accounting during the cases in all participant groups (Table 1). Perceived learning is measured as a difference between skills and knowledge before the case and after the case. It is measured on a self-reporting scale from one to five. The difference between the perceived skills and knowledge before and after the case (i.e. learning) is statistically significant on a 0.05 level (Paired Sample Test) in most cases as marked in Table 1.

The students' skills increased the most compared to the other three groups of participants. Learning during the cases was measured as the change in knowledge and skills

before and after the cases in three areas: 1) processes and modelling, 2) digital accounting and 3) analytics and visualization of data. The assessment scale of learning and skills was from 1= weak to 5= excellent. There were four different types of participants in the cases: representatives of the accounting firms, representatives of the clients, and students and teachers. Testing the differences in learning between the participant groups statistically is not possible

due to the small number of representatives in each group. However, students seem to assess their average knowledge and skills to have increased the most in all areas compared to the other three groups of participants. The obvious reasons for this were that the students were employees in the casework and had the least experience in the learning areas.

Table 1. Average knowledge and skills by groups of participants

	Accountant		Client		Student		Teacher		Total	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Process and modelling										
before	12	2.75	6	2.67	27	2.37	5	3.80	50	2.64
after	12	3.00	5	3.20	27	3.63	5	4.20	49	3.49
learning	12	0.250	5	0.400	27	1.259	5	0.400	49	0.837
Statistical significance		0.041		0.178		0.000		0.001		0.000
Digital accounting										
before	12	3.58	6	3.00	27	2.41	5	3.20	50	2.84
after	12	3.67	6	3.50	27	3.52	5	3.80	50	3.58
learning	12	0.083	6	0.500	27	1.111	5	0.600	50	0.740
Statistical significance		0.164		0.203		0.000		0.007		0.000
Analytics and visualization										
before	12	2.17	6	2.17	27	2.19	5	3.20	50	2.28
after	12	2.42	6	2.67	27	2.85	5	3.80	50	2.82
learning	12	.0250	6	0.500	27	0.667	5	0.600	50	0.540
Statistical significance		0.041		0.203		0.000		0.001		0.000
Average learning	12	0.194	6	0.444	27	1.012	5	0.533	50	0.700

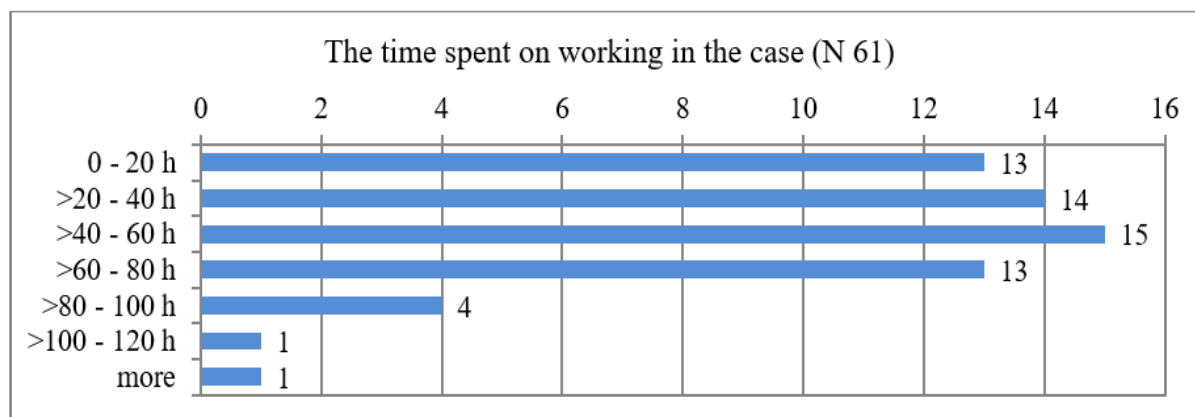


Figure 3. Time spent on casework

Table 2. Average learning compared to the time spent working on the case

Learning	0-40 hours		> 40-80 hours		Over 80 hours		Total	
	N	Mean	N	Mean	N	Mean	N	Mean
Processes and modelling	26	0.346	28	1.036	6	1.333	60	0.767
Digital accounting	27	0.333	28	1.000	6	1.000	61	0.705
Analytics and visualization	27	0.259	28	0.607	6	1.167	61	0.508
Average learning	27	0.305	28	0.881	6	1.167	61	0.656

Table 3. Usefulness of the case and learning

		Processes and modelling	Digital accounting	Analytics and visualization	Average learning
Usefulness of the case to the participants	Correlation coefficient	0.378	0.442	0.458	0.549
	Sig.(2-tailed)	0.003	0.000	0.000	0.000
	N	59	60	60	60

Secondly, we found that the time spent working on the cases has a significant effect on the learning results. The respondents of the survey were asked to estimate their time spent on the case (Figure 3). The average workload was between 40 and 60 hours per case and per person. The representatives of accounting firms spent fewer hours (0–20 hours) than the other parties, customer companies >20–40 hours, students >60–80 hours and teachers >40–60 hours.

The result was that the time spent on the casework has a statistically significant effect on the learning results on all three learning areas and on the average (Kruskall-Wallis test sig<0.05 on all three criteria). Time has a positive effect on learning based on a comparison of the learning results of those who spent less than a week, one to two weeks, or more than two weeks' worth of working hours on the case (Table 2).

Thirdly, the survey results prove that the higher the participants' satisfaction in the results of the case was, the more useful the participants considered the case (Spearman's correlation coefficient $r=0.636$ and sig=0.000). In addition, the more time the participants spent on the case, the more useful the participants considered the case (Spearman's correlation coefficient $r=0.387$ and sig=0.002). As a further result, the more useful the participants considered the case, the more they learned. This correlation is statistically significant in all three learning areas and on average learning (Spearman's correlation test, Table 3).

Thus, based on the survey analysis, it can be stated that learning takes place in all participant groups in the cross-organizational teams, and the time spent and the usefulness of the subject affect learning.

5. Discussion and Conclusions

5.1. Cross-Organizational Team and Network

In this study, we examined how networked cooperative learning can contribute to the learning of digitalized accounting in real-life problem-solving cases. The research provides a descriptive content analysis. The data were based on group work, where accounting firms, their clients and the students of two educational institutions worked together to find solutions to practical situations (i.e. cases) that digitalization development causes to accounting firms and their clients. We used both qualitative and quantitative data. Firstly, the students of the teams composed blog posts as the last task in the case working phase. Secondly, the research data were collected through an online feedback survey after the casework.

The aim of this paper is to present the findings of the cooperative learning in network environment and in the context of digitalized accounting. The main research questions of the study are the following: (1) what are the key functions of networked cooperative learning, and (2) what are the benefits of using networked cooperative learning in working life collaboration in the context of digitalized accounting?

Based on the content analysis of the qualitative data, we were able to identify five distinct themes: (1) positive interdependence and individual accountability, (2) promotive interaction and social skills, (3) group processing, (4) learning motivation and usefulness and (5) heterogeneity of the group. The first three distinct themes are in line with the most well-known theories of cooperative learning [16],[9]. Our study confirms the existence of these key elements in cooperative learning in a network environment. The latter two themes link our findings to the earlier research on the other factors of cooperative learning [34],[26],[15],[35]. These findings enhance our understanding of the key factors in cooperative learning in a network environment.

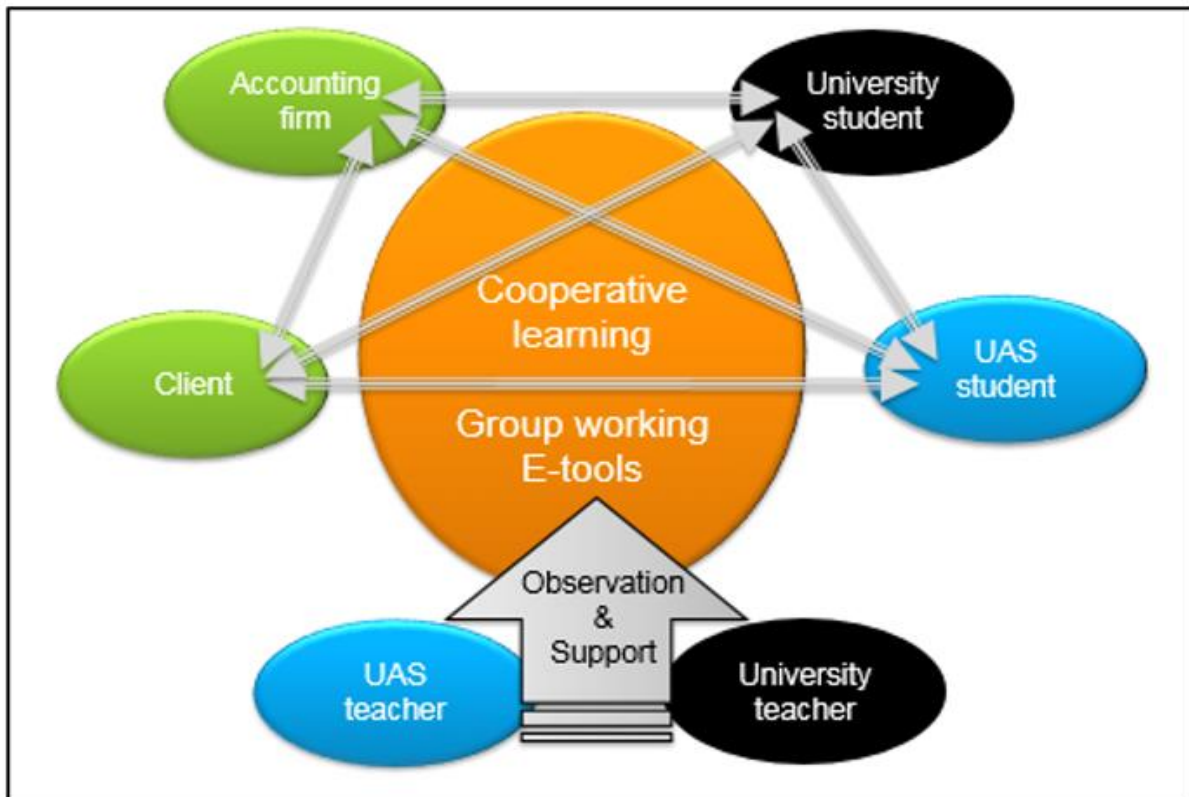


Figure 4. Cooperative learning ecosystem

5.2. Cooperative Learning Ecosystem Model

The results of this research support the idea of a cooperative learning ecosystem (Figure 4). The figure illustrates the interaction of learning between different parties. We found that higher education accounting students benefit from cooperative learning, and the method promotes their learning in digitalized accounting. These observations are in line with previous research [16],[26],[27],[21],[28],[29],[40],[41],[42],[43],[44]. Cooperative learning in cross-organizational teams is an appropriate method for learning digitalized accounting and becoming acquainted with real business practices. In any case, digitalized accounting requires close cooperation over organizational boundaries. This observation runs parallel to Bhimani's [51] argument that accounting information networks are needed in digital economy.

To generalize the results of the study, cooperative learning is a beneficial method for cross-organizational teams and for working life collaboration. Additionally, there is now much evidence to support the hypotheses that cooperative learning is a suitable method for complex real-life cases and networked cooperative learning will increase the learning of digitalized accounting and its processes.

5.3. Factors Affecting Networked Cooperative Learning

According to our qualitative research, many factors

influence learning. Firstly, the study confirmed the findings of earlier research that heterogeneous groups have a positive impact on learning [34],[15],[35]. The groups were heterogeneous in many respects (gender, age, personality type, educational background, work experience and current employer or place of study). According to our analysis, participants from several organizations generated uncertainty which, however, had a positive impact on learning. We believe that the mixture of ability levels in a group played a remarkable role in the casework. The interests of participants may conflict [38], but we did not find such results in our research.

Secondly, the study also confirmed the findings of earlier research that social skills are essential in cooperative learning and good interaction and social skills promote learning in groups [16],[9],[23],[15],[24]. Thirdly, we found that common goals and practices contribute to the work of the group and learning. Previous studies have also resulted in similar findings [16],[9],[33],[32]. Fourthly, based on our findings, cooperative learning is helpful in learning difficult tasks. This observation is in line with previous research [16], [26], [27], [21], [28], [29], [40], [41], [42], [43], [44]. These cases were difficult partly because the goals of the tasks were not clear in the beginning. Fifth, teamwork requires active participation from each group member, and we perceived that the groups had positive interdependence (cf. [16],[21]). Although the learning takes place in a group, everyone is responsible for their own learning. Similar observations have also been

made earlier [16],[9],[19],[21],[22],[30],[39],[45].

Based on the quantitative analysis, we found that learning takes place in all participation groups in cross-organizational teams, and the time spent and the usefulness of the subject positively affect learning. Learning was measured as self-reported and perceived learning.

We found that knowledge and skills increased in all three learning areas of digitalized accounting during the cases in all participant groups. Perceived learning during the cases is measured as the change in knowledge and skills before and after the cases in three areas: 1) processes and modelling, 2) digital accounting and 3) analytics and visualization of data. Our analysis indicates that higher education accounting students will benefit from cooperative learning, and the method promotes their learning in digitalized accounting.

It was also shown that the time spent working on the cases has a significant effect on the learning results. Additionally, this research proves that the higher the assessment of the usefulness of the case for the participants themselves was, the higher their learning was (cf. [30, 31]). If a student considers a topic useful to himself, it helps the learning. This finding was the same in both qualitative and quantitative results. Real business problems motivated learning.

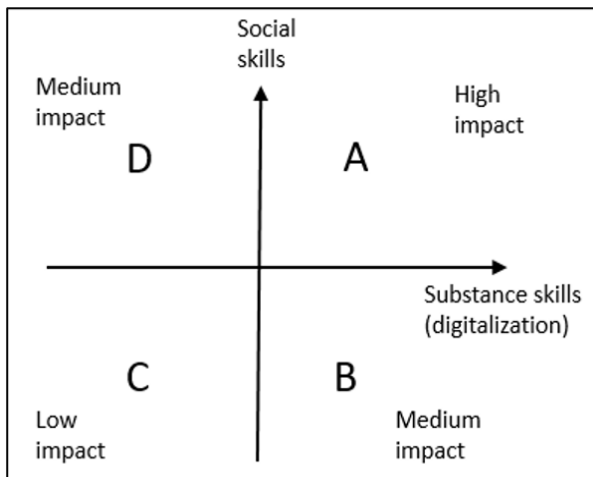


Figure 5. Networked cooperative learning dimensions and student clusters

As a final conclusion, we present a model of networked cooperative learning dimensions and student clusters. When we evaluated the students' perceived learning outcomes and experiences in networked cooperative learning, our findings were condensed into two dimensions: substance and social skills (Figure 5). Ideally, the student settles in cluster A. Social skills have a significant impact on the networked cooperative learning method, and therefore, students who settle in the D cluster have yielded value added to learning compared to traditional classroom teaching. The learning outcomes of those students who

settle in the B cluster resemble, despite the method, traditional classroom teaching. Cluster C has not achieved learning outcomes in either dimension.

5.4. The Significance of the Study

This paper is unique and different from existing research and other papers in the accounting education field for three reasons. The interaction between digitalized accounting and cooperative learning has not been studied before, nor in a networked context. In this study, we created a new approach of networked cooperative learning for higher education of accounting.

Secondly, the research design is a unique educational project in which two educational institutions, accounting firms and their clients are involved. In addition, the selected cases reflect the real development needs of digitalized accounting on the accounting industry.

Thirdly, this study merges qualitative and quantitative data. The mixed methods study strengthens the rigor and enrich the analysis and results.

5.5. Limitations and Suggestions for Further Research

Today, existing research in accounting education states cooperative learning as an appropriate learning method but there is still little research about networked cooperative learning and its effective implementation. Thus, the educational implication of this study is to bring the networking perspective into the cooperative learning method, i.e. extend cooperative learning with a cross-organizational approach. Despite the importance of collaboration between universities and polytechnics, less attention has been paid to the research field. The evidence of this study suggest that cooperative learning is beneficial in the context of working life collaboration, but also in collaboration between two educational institutions.

The empirical results reported in this study should also be considered in the light of limitations. There are two major limitations that could be addressed in future research. Firstly, the response rates of the feedback survey could be higher. Secondly, the learning measures could be more analytics-based instead of self-reported and perceived measures.

Therefore, an interesting topic for further research would be that the clusters (Figure 5) could be formed from larger quantitative data by statistical methods. The study would provide information on how students could be divided into different clusters. In addition, it would reveal how efficient the cooperative learning method is in a networked environment and in close cooperation with companies and educational institutions. This type of study could help develop a cooperative learning measurement system in the future, which would develop the cooperative learning method further.

This study introduces a value chain network where two firms buy from and sell to each other, accounting firm and

its client. It would be interesting to assess the effects of networked cooperative learning with more firms in a value chain. A further study could also explore the long-term effects of networked cooperative learning and working life collaboration. As argued in the result section, the benefits can only be seen in the long term. An interesting view would also be the use of new classroom technology tools during the networked cooperative learning process.

The requirements for accounting education are constantly growing. The world is becoming increasingly complicated and there is a need for effective teaching methods.

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