UMEÅ UNIVERSITY

DIGITAL TRANSFORMATION THROUGH COLLABORATION

Exploring the dynamics of a multi-organizational project

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Abstract

The use of digital technologies has changed the way organizations operate. Engaging in digital transformation has become a crucial activity for organizations to stay relevant in today's rapidly changing business environment. Recent research has started to focus on digital transformation at a project level but limited research has been done on projects at a multi-organizational level. To contribute to this research gap, an exploratory case study investigating an ongoing multi-organizational digital transformation project in the forestry industry has been conducted. The research question is "What is the role of collaboration in a digital transformation project and how does it affect the expected outcomes?". The findings reveal that collaboration is a requirement to realize the expected project outcomes, but also that the outcomes can generate further collaborations. This creates a continuous process that can induce digital transformation at an industry level.

Keywords: Digital transformation, digital transformation project, multi-organizational collaboration, forestry industry

1. Introduction

Efficiently incorporating digital technologies and their capabilities into business processes and business models has become standard practice and works as a way to help organizations navigate in a rapidly changing business environment (Sambamurthy and Zmud, 2017). While many organizations are eager to explore and exploit the benefits of digital technologies (Matt, Hess, and Benlian, 2015), others are forced due to competitive pressure from highly digitalized organizations and from changes in the traditional industry structures. To respond to these changes, organizations engage in digital transformation (Gimpel, Hosseini, Probst, Röglinger, and Faisst, 2018). There is a lot of ambiguity regarding the definition of digital transformation (Vial, 2019). In this research, an interpretation of the phenomenon by Hinings, Gegenhuber, and Greenwood (2018) will be used. They describe it as the combined effect of multiple digital innovations which can change, challenge, or replace the way value is created in organizations, ecosystems, and industries. Based on a literature review, Vial (2019) has developed a framework of the process and impact of digital transformation. The framework includes eight building blocks and the relationships between them. While the framework provides a comprehensive illustration of the process and impact at an organizational level, it does not include what it can look like at a project level. Although this could be explained by the limited literature available on the topic (Henriette, Feki, and Boughzala, 2015), such research is starting to emerge.

A recent study by Barthel and Hess (2019) aimed to define and characterize digital transformation projects. These are described as projects that seek to transform organizations by developing and implementing digital innovations. Based on four case studies, Barthel and Hess (2019) have created a framework of digital transformation projects. They emphasize the importance of sharing knowledge between departments and mention that cross-functional collaborations between the IT and business departments are commonly occurring. They mean that this can be crucial in digital transformation projects as the competence needed in these

projects rarely is found within one department. However, Barthel and Hess's (2019) study focused on digital transformation projects that were conducted at an organizational level but did not consider projects at a multi-organizational level.

As an attempt to fill the research gaps identified in Vial (2019) and Barthel and Hess (2019), this research seeks to explore the dynamics of a multi-organizational digital transformation project. The research question is: *What is the role of collaboration in a digital transformation project and how does it affect the expected outcomes?*

To answer our research question, a qualitative case study was conducted. We had the opportunity to investigate an ongoing digital transformation project in the Swedish forestry industry. In Sweden, the forestry industry has an important role. 70 percent of the country's area is covered by forest and one percent of the forest resource is felled annually. The industry employs about 115, 000 people and accounts for 9-12 percent of the Swedish industry's total employment, export, and sales (Skogsindustrierna, n.d.). It is claimed that the increased use of digital technologies is affecting every industry (Fitzgerald, Kruschwitz, Bonnet, and Welch, 2014). As mentioned by Nylén and Holmström (2011), the forestry industry is no exception. Today, the industry is highly digitized, referring to how analog information is converted into digital format (Yoo, Henfridsson, and Lyytinen, 2010). Despite this, the industry is lagging behind in digital transformation. A reason that the forestry industry is behind on this is that there is a lack of understanding of how to extract value from digital technologies (Holmström, 2020). Additionally, most organizations in the forestry industry are considered incumbent. This type of organization tends to have separated IT and business departments, which is claimed to hinder digital transformation (Haffke, Kalgovas, and Benlian, 2016).

Our findings revealed that a multi-organizational collaboration was seen as a requirement to realize increased operational efficiency and industry development, which were the expected project outcomes. By conducting this study, we have contributed to research within an unexplored area in the field of information systems. We believe that this study will provide value and insights to both researchers and practitioners. Researchers can utilize the outcome of this study as a foundation for future research and the development of frameworks. To practitioners, such as organizations, a better understanding of the dynamics of a multi-organizational digital transformation project can inspire to explore new approaches to the digital transformation process.

2. Theoretical foundation

This section presents the theoretical foundation of the study, which consists of two theoretical frameworks. First, a framework by Vial (2019) of the process of digital transformation, and second, a framework by Barthel and Hess (2019) of digital transformation projects. The reason to use two frameworks covering different areas was to make the theoretical framing of this research more inclusive. Due to identified limitations and weaknesses in both of them, we found it necessary to combine them as an attempt to broaden the theoretical foundation.

2.1 Defining digital transformation

There is a wide variety of opinions on how the phenomenon of digital transformation should be defined. Kane (2017) describes it as a way that organizations can adapt their business practices and processes to remain competitive and efficient in a digital world. According to Skog, Wimelius, and Sandberg (2018), it refers to how organizations integrate digital technologies into their processes, aiming to change and improve the way value is created and delivered. In this research, a definition by Hinings et al. (2018) will be used. They refer to digital transformation as:

> *The combined effects of several digital innovations bringing about novel actors (and actor constellations), structures, practices, values, and beliefs that change, threaten, replace or complement existing rules of the game within organizations, ecosystems, industries, or fields. (Hinings et al., 2018, p. 53).*

Digital innovations are combinations of physical and digital components that are integrated in new ways to generate new products, services, and values (Yoo et al. 2010). The fundamental components of digital innovations are digital technologies. Digital technologies have several characteristics that distinguish them from non-digital technologies (Yoo et al., 2010), but can also explain why they serve as a vital component of digital innovations, and consequently, digital transformation. One of them is that digital technologies can be reprogrammed (Yoo et al., 2010). This means that they can be separated into physical and digital units, which opens up the opportunity for reprogrammability since it is possible to change its original form, features, and capabilities (Yoo et al., 2010).

Vial (2019) describes the process of digital transformation at an organizational level by identifying eight building blocks: *Use of digital technologies, Disruptions, Strategic responses, Changes in value creation paths, Structural changes, Organizational barriers, Positive impacts,* and *Negative impacts*. This is illustrated in a framework based on an extensive review of existing research and literature on digital transformation in the field of information systems. The different building blocks and their relationships are derived from the most discussed components in digital transformation literature from Vial's (2019) review.

The core of digital transformation and the starting point of the framework is the *use of digital technologies* (Vial, 2019). The digital technologies mentioned by Vial (2019) are the ones that are referred to as SMACIT which includes social, mobile, analytics, cloud, and Internet of Things (IoT) (Sebastian, Ross, Beath, Mocker, Moloney, and Fonstad, 2017). Another category that is considered being important in digital transformation is platforms, as well as the combinations of technologies. Vial (2019) exemplifies the combinations of technologies with how organizations can combine big data and analytics to implement algorithmic decision-making.

The use of digital technologies can fuel digital *disruptions* at a societal and industrial level (Vial, 2019). Digital disruptions refer to rapid or drastic alterations in the business environment (Skog et al., 2018). Digital disruption is often the outcome of one digital innovation (Skog et al., 2018), in contrast to digital transformation, which results from multiple innovations (Hinings et al., 2018). The increased use of digital technologies in society changes customers' behavior and expectations. For example, today customers demand

ubiquitous access to mobile services. To remain competitive, Vial (2019) explains that organizations have to respond to, and even anticipate, changes in their customers' expectations. Furthermore, digital technologies disrupt the competitive landscape by favoring services over products and thereby challenge incumbent players' competitive advantage. The competitive landscape is also affected by the creation of platforms since they allow for a redefinition of existing markets where goods and services become digital. The use of digital technologies also increases the availability of data, for instance, through digital traces from mobile devices. Vial (2019) claims that the goal for organizations is to exploit data to improve their services or to monetize them through selling the data to third parties. For example, organizations can use analytics, such as data-driven algorithmic decision-making, to make processes more efficient or to better respond to customers' needs.

Disruptions in societal and industrial trends trigger *strategic responses* at an organizational level. Vial (2019) states that these responses can be formulated in either a digital business strategy or a digital transformation strategy. A digital business strategy is described as a fusion between organizational strategy and information systems strategy, where digital technologies are leveraged to create value. A digital transformation strategy, on the other hand, focuses on how the use of digital technologies transforms products, processes, and organizational aspects. Vial's (2019) framework also suggests that the strategic responses rely on the use of digital technologies.

Further, Vial (2019) means that the use of digital technologies in organizations enables *changes in value creation paths*. The framework brings up four areas that the use of digital technologies can change within organizations: value proposition, value networks, digital channels, and agility and ambidexterity. While digital technologies themselves do provide some value to organizations, it is when they are exploited and used in new contexts that they open up new opportunities for organizations to create value. Vial (2019) describes that organizations commonly find this type of opportunity in services, and use digital technologies as a way to shift from traditional physical products into services.

Value networks can also be altered as digital technologies allow for changes in how value is mediated. Vial (2019) presents three mediation strategies that organizations can implement: disintermediation, remediation, or network-based mediation. The first strategy refers to how digital technologies can let organizations omit intermediaries to make the exchange with their customers and other network participants in a more direct manner. In the remediation strategy, digital technologies such as platforms can bring network participants closer which opens up for closer collaborations as well as cooperation between participants. Lastly, network-based mediation includes a strategy in which technologies provide an opportunity to create complex relationships with different actors. Network-based mediation also gives customers the ability to become value co-creators, which is commonly found in social media platforms that are highly dependent on input from users.

Another way that organizations can use digital technologies to alter their value creation is by implementing digital channels (Vial, 2019). This can be done in two ways where one is to change the customer-facing channels which, for example, includes communicating with customers on social media. The other way includes using digital technologies to enable algorithmic decision-making. Utilizing sensors and other digital technologies with IoT

connectivity can in the manufacturing sector lead to improved efficiency in the supply chain by automated procurement. Vial (2019) means that exploiting digital technologies in this way provides organizations with extraordinary opportunities as it allows for software to coordinate across multiple areas of an organization.

The last aspect of changes in value creation paths is how organizations better can detect and act upon changes in the business environment, also referred to as agility and ambidexterity. Vial (2019) explains how digital technologies, in the shape of analytics and IoT, can be used to optimize current business processes and resources. With these technologies, possibilities to exploit new market opportunities arise, such as offering maintenance on products based on data derived from sensors within the product (Vial, 2019).

The changes in value creation paths can be affected by *structural changes*, which are categorized as organizational structure, organizational culture, leadership, and employee roles and skills (Vial, 2019). An important element regarding the organizational structure is cross-functional collaboration, which refers to collaboration across business units. However, the literature highlights that this form of collaboration has faced difficulties when it comes to digital transformation (Vial, 2019). To deal with these difficulties, organizations can create a separate unit that works with innovation. Another way to manage the difficulties is to create cross-functional teams that remain within the current organization. For instance, this can be done through creating competence networks (Vial, 2019), which are decentralized competence units that complement the traditional organizational structure (Dremel, Wulf, Herterich, Waizmann, and Brenner, 2017).

Further, Vial (2019) highlights that the organizational culture may have to be altered in order to change the value creation paths. This is especially important in incumbent firms where IT and business functions traditionally are separated. In the journey toward digital transformation, organizations also need to create a culture where experimenting and risk-taking are encouraged (Vial, 2019). Regarding leadership, the digital transformation could be led by a new and temporary role, referred to as chief digital officer. The digital transformation may also demand employees to perform tasks outside of their traditional functions. For instance, employees outside of the IT function may have to be in charge of a technology-intensive project (Yeow, Soh, and Hansen, 2017). This requires organizations to develop the skills of their existing workers, as well as their future workers (Vial, 2019).

The changes in value creation paths can also be affected by *organizational barriers*. First, Vial (2019) presents that inertia, which refers to how current organizational resources and capabilities, can hinder the advancement of changes. Vial (2019) mentions that this is commonly found in incumbent organizations that are deeply embedded in established relationships, processes, and resources. While these structures often are characterized with high optimization, they are also considered to be inflexible and dependent on resources without reconfigurability. This rigidity can lead to difficulties in responding to the disruptive changes that digital technologies can generate. The second barrier mentioned by Vial (2019) is resistance. Resistance, in the context of digital transformation, can occur when new technologies are brought into an organization. Vial (2019) describes that the pace and by which methods these new technologies are introduced play a significant role in the occurrence of resistance. A common issue when disruptive technologies are introduced is that there is a lack

of understanding of the potential and anticipated benefits of the technologies. It is also claimed that resistance stems from the inertia that is embedded in everyday work activities and that only changing employee behavior will not solve the issue (Vial, 2019). Instead, it is suggested that processes need to be changed in a way that enables flexibility during the transition.

The changes in value creation paths can generate *positive impacts* (Vial, 2019). At an organizational level, operational efficiency can be increased, for instance, by automating and improving business processes or reducing costs. It is also believed that the decision-making process can be sped up with help from big data and analytics (Vial, 2019). At an organizational level, Vial (2019) further describes positive impacts on organizational performance. These impacts are, for example, financial performance, firm growth, and competitive advantage. Digital transformation can also generate positive impacts at an industrial, as well as a societal level. Vial (2019) exemplifies this with digital transformation in the healthcare industry where technologies such as big data and analytics have improved both organizations and the quality of life of individuals.

Further, the changes in value creation paths can generate *negative impacts*, also referred to as undesirable outcomes. In regard to this, Vial (2019) highlights security and privacy as potential issues. One example mentioned is algorithmic decision-making. Even if it is described as beneficial in many ways, it may involve risks for both individuals and society. Vial (2019) further argues that security, privacy, and safety always should be considered important areas when working with digital transformation.

Although Vial's (2019) framework provides a detailed description of the digital transformation process at an organizational level, it is lacking in an explanation of what the process can look like at a project level. While there is limited research on digital transformation at a project level (Henriette et al., 2015), which can explain why Vial has not included that aspect, recent research by Barthel and Hess (2019) has started to focus on this. Because of this, a framework by Barthel and Hess (2019) has been applied as an attempt to make the theoretical framing for this research more inclusive.

2.2 Digital transformation projects

According to Barthel and Hess (2019), projects play an important role in digital transformation and in developing a strategy to manage this process. They propose a definition of digital transformation projects derived from the literature in the field of digital transformation and from case studies. They define digital transformation projects as "*projects that initiate, develop, implement, and exploit digital innovations, aiming to advance organizational digital transformation.*" (Barthel and Hess, 2019, p. 6). Further, Barthel and Hess (2019) identify characteristics that are unique to digital transformation projects. To begin with, they suggest that these projects resemble innovation projects and that the outcome of such projects often is unclear at the beginning. It is pointed out that digital transformation projects often are implemented by the organization's business department and thereby bypass the IT department. Despite this, they mean that digital transformation projects require integration with both business and technology (Barthel and Hess, 2019). Moreover, Barthel and Hess (2019) argue that digital transformation projects are conducted to achieve organizational

transformation, but highlight that the impact can range from a departmental level to an organizational level.

Barthel and Hess (2019) conducted case studies within four different organizations where the unit of analysis was one digital transformation project in each of the organizations. Based on the outcome of the case studies, a framework was designed to describe the digital transformation process at a project level. The framework includes three components: *target and solution*, *resources*, and *approach,* and provides a description of these and their characteristics.

Barthel and Hess (2019) first present that the *target and solution* of a digital transformation project is to initiate a large organizational transformation with help from digital innovations. The *target*, or objective, of a project, refers to the anticipated outcome. In two of the cases described in Barthel and Hess (2019), it is illustrated that the objectives of these projects were to increase efficiency by automating and digitalizing processes as well as moving from and extending physical products to digital services. In another case study, it was mentioned that the initial objective was to increase the efficiency of the sales processes. However, as the project proceeded, they realized that it had potential to transform the entire sales process. Another objective of digital transformation projects is to explore new digital business models that are sustainable over time (Barthel and Hess, 2019). This is especially of interest to organizations that operate in industries that already are far into digital transformation. Interestingly, it is also pointed out that organizations in industries that currently do not face any pressure to transform, also are working to develop digital business models.

The framework has identified that these objectives are realized by different types of digital innovations, such as process-, product-, and service- innovations, which in the framework are referred to as *solutions*. These innovations often include a combination of a technical and a digital business solution. On a technical level, a solution in digital transformation projects can be to utilize sensors and applications that are connected to an organization's database. This allows them to collect data from customers' products and by combining these data, they can provide their customers with information on their product such as technical errors and current operations. On a digital business level, solutions such as changes in how the organization is structured and creates value.

Second, Barthel and Hess (2019) identify that a *resource* commonly included in digital transformation projects is a cross-functional team where both experts within business and technology are considered equally important. It is mentioned that to achieve a more inclusive set of capabilities, internal and external partners may be needed. This is described to be important in digital transformation projects as the implementation of this type of project often requires competencies that cannot be found within one specific department (Barthel and Hess, 2019). By bringing knowledge from multiple departments together, the chances of a successful implementation increase. Some of the projects described in Barthel and Hess (2019) reported that new employees were hired or that external consultants were used to improve the skill set in the project team. While the main focus on resources in the framework lies in human resources and capabilities, another aspect mentioned is financial resources. Not surprisingly, the budgeting and funding of a digital transformation project are described to be crucial components in the project's potential to achieve the objectives.

Lastly, Barthel and Hess (2019) claim that the *approach* is an important component of a digital transformation project, and emphasize an integrated view on technology and business. Further, they argue that project method, leadership, and project success are affected by the chosen approach. Barthel and Hess (2019) describe that in two of the cases, the project method was chosen to fit the overall digital transformation strategy where the goal was to foster department-spanning or company-wide cooperation. Regarding leadership, one of the cases had one leader who represented the business department and one who represented the IT department, since the cross-functional collaboration was viewed as a necessity (Barthel and Hess, 2019). Project success was experienced somewhat differently in the described cases. In one of them, it was viewed as rewarding to strongly integrate the business department in the development process of the project. In another, the integration of IT and business was considered successful as it triggered organizational change (Barthel and Hess, 2019).

In contrast to Vial (2019), Barthel and Hess (2019) do include the aspect of digital transformation at a project level. While they provide a rich and including framework for digital transformation projects, limitations and weaknesses have been identified. The framework only presents what digital transformation can look like at a project level within *one* organization but does not consider the aspect of multi-organization projects. They do bring up the importance of combining capabilities from different departments within the organization and that utilizing external resources *could be necessary*. However, it is reasonable to assume that there are instances where sufficient competence is not available within a single organization and where multiple organizations in the same industry have to collaborate to realize digital transformation.

3. Research methodology

In this section, the chosen research methodology and its limitations are presented and discussed. The section also includes a case description and ethical considerations.

3.1 Research design

The most common way to distinguish between research methods is by categorizing them as qualitative or quantitative (Myers, 2013). In this research, a qualitative method was considered to be the most suitable. According to Myers (2013), qualitative research methods allow researchers to study and understand social and cultural phenomena. The main focus in qualitative research is text, most commonly records of what people have said in interviews. In contrast, the main focus in quantitative research is numbers. Myers (2013) explains that quantitative research is favorable when studying a large population in order to find patterns or trends. However, when studying a particular subject in-depth, within one or a few organizations, a qualitative method is better suited. Since the goal of this study was to understand a digital transformation project and different actors' expectations on the project, a qualitative approach was considered more appropriate than a quantitative one. Nevertheless, there are disadvantages to qualitative research. A major one is the difficulty to generalize the results to a larger population, which can be done with quantitative research. However, it is still possible to generalize the results of qualitative research to theory (Myers, 2013).

Within qualitative research, there are a number of different methods (Myers, 2013). The method that was chosen for this research was a case study. According to Yin (2014), case studies are used to thoroughly examine a contemporary phenomenon in its real-world context. Case studies are also appropriate when the boundaries between phenomenon and context are not necessarily evident, which is common in real-world situations (Yin, 2014). Moreover, Myers (2013) suggests that a case study attempts to research the subject in context by using empirical evidence, mostly in the form of interviews and documents, gathered from one or a few organizations. Case studies are also suitable when a researcher seeks to discover features, factors, or issues that could be applied to similar situations (Myers, 2013). Since the project examined in this research is a contemporary event that takes place in a real-world context and includes actors from multiple firms, a case study was considered suitable. However, one disadvantage of conducting a case study is that the researcher has limited, or no control over the situation. On the other hand, case studies allow the researcher to explore real-life situations, which are likely to be messy due to multiple different interpretations of the same situation (Myers, 2013).

Furthermore, case studies can be used in both explanatory and exploratory research. In explanatory research, a case study is conducted to test, explain, or compare phenomena. Exploratory case studies, on the other hand, aim to discover or explore phenomena as well as building theories (Myers, 2013). Because of this, exploratory research is usually conducted when there is a lack of previous research on the topic (Myers, 2013). As presented in the research gap, limited research has focused on digital transformation projects at a multi-organizational level. Therefore, an exploratory case study was chosen for this research. A potential weakness of exploratory case studies that are looking to build a theory based on only one case is that the outcome of the study may be narrow as it only considers one specific case. This can also make it difficult to generalize the outcome of the case study due to the unique nature of every case (Eisenhardt, 1989). While we were aware of the weaknesses, we still argue that our chosen case was a representative example of the phenomenon of digital transformation projects at a multi-organizational level. Because the area of concern is unexplored, we argue that all theory-building research contributes with valuable insights.

3.2 Case description

To answer our research question and to contribute to the research on digital transformation projects at a multi-organizational level, we had the opportunity to analyze an ongoing research and development project on digital transformation in the forestry industry. The purpose of the project is to provide forest owners with a tool that can help them get a better overview of their forests. With the help of AI, data from satellites, from GPS-trackers, and from sensors on the forestry machines will be combined, and an algorithm will be trained. The algorithm will be applied to a map that shows a detailed overview of the forest as well as provides predictions of what the forest will look like in the future. A better overview of the forest will help the forestry firms and forest owners to better manage their estates, which can increase efficiency, profitability, as well as the quality of the forest.

The project is an initiative from a Swedish research institute and is partly funded by a state-owned innovation agency. The research institute is working to advance the forestry industry by developing new methods that can improve the forests and forestry in the aspect of efficiency, quality, and environment. Besides the research institute, six other actors are participating in the project. Three of these actors are forestry firms, one is an IT-firm specialized in IT solutions in the forestry industry, one is a university specialized in AI, and lastly, a product manufacturer. Due to confidentiality, names of the organizations and detailed information about the project have been removed.

The forestry firms are the ones responsible for the data collection procedure. These firms, in turn, employ people who conduct forestry management, often by using entrepreneurial firms specialized in forestry management. These workers will from now on in this research be referred to as *entrepreneurs*. To collect data, the entrepreneurs are using forestry machines equipped with sensors that retrieve data on the usage of the machines. These machines and sensors are provided by the product manufacturer that is specialized in these types of products. Along with this, the entrepreneurs carry mobile phones that document their movements with help from GPS-trackers. The data is transferred to the IT-firm that merges them. By getting an overview of how the entrepreneur has moved across an area in combination with information on machine usage in a given area, the density of vegetation in the area can be calculated. The university will then apply AI techniques and machine learning algorithms that predict the need for forestry management in an area. Following this, the IT-firm will merge the algorithms and satellite images to produce a map that illustrates what the forest looks like as well as an assessment of the need for management. However, upon the finalization of the project, the method will be available to all project participants. This means that organizations other than the IT-firm also have the possibility to offer a product or service involving the project outcome. What the outcome of the project will look like is at the moment of this research not determined, meaning that there is uncertainty regarding if it will be a product or service. Because of this, the project outcome will be referred to as a *product or service* in this research.

The project is planned to go on for three years and when this research is being conducted, it has just passed half-time. The data collection has been going on during the past year and the method is currently under development and is expected to be completed in a year from now.

3.3 Data collection

In qualitative research, there is a variety of techniques that can be used when collecting data. Myers (2013) lists methods such as interviews, fieldwork, and using documents. In this research, the data was obtained from semi-structured interviews with participants in the project under investigation. The reason for this choice of data collection method was that it allowed us to collect data from people with various roles and perspectives which can provide richness to the study (Myers, 2013). Interviews is also the most common data collection method in qualitative research within the field of business and management. Further, Myers (2013) describes that interviews is the most appropriate method in case studies, which is the type of approach that has been used in this research. While other data collection techniques could have been utilized, we argue that interviewing was the most fitting for our research. Alternative methods would not have generated the data that we needed to answer our research

question as we would not have been able to obtain information about this specific project and the actors' expectations on it in other ways than interviews.

As mentioned above, the interviews were constructed in a semi-structured manner. The strength with, and the reason for our choice, is that it includes both structures from having predetermined questions but also provides the flexibility of unstructured interviews. This allows for follow-up questions and gives the interviewee an opportunity to say what he or she believes is important, but at the same time making sure that the data is in alignment with what the researcher hoped to collect (Myers, 2013). The interviews were conducted in Swedish, a choice that was made since that was the native language of the interviewees as well as the researchers. The respondents were located in different areas of Sweden and the interviews were therefore conducted over Zoom. After consent from the respondents, the interviews were recorded and transcribed immediately upon the end of the interview.

In this research, we conducted six interviews with representatives from the participating actors in the digital transformation project that we are researching. In qualitative research, the sample size and number of interviews is not as important as it is in quantitative research where the number of data points has a large impact on the reliability of the data (Myers, 2013). Instead, Myers (2013) means that it is more important to make sure that the chosen interviewees can provide the researcher with various perspectives on the topic under research. To select our respondents, we decided to pick one representative from each of the participating actors but one. The reason for this choice was that the project role and background knowledge of the omitted participant was not of interest in this research. The chosen interview participants had various roles, (see Table 1), both in the project but also in their organizations. Because of this, the interview guide was partly adjusted to make sure that the questions were of relevance to the interviewee. A strength of the fact that the interviewees had different roles and backgrounds was that it, as Myers (2013) points out, gave us a richer understanding of the project since the participants were able to provide us with different perspectives.

Table 1. Summary of interviews

Respondent	**Organization**	**Role in organization**	**Interview length**
Respondent 1	Research institute	Process leader	55 minutes
Respondent 2	Forestry firm A	Business developer	50 minutes
Respondent 3	IT-firm	CEO	40 minutes
Respondent 4	Forestry firm B	Forestry manager	43 minutes
Respondent 5	Forestry firm C	Tech specialist	53 minutes
Respondent 6	Product manufacturer	Business developer	50 minutes

3.4 Ethical considerations

As highlighted by Myers (2013), ethical considerations arise when conducting research. It is important to acknowledge these principles in order to protect the participants of the study. This study followed guidelines from Vetenskapsrådet (2002), which include principles for research within social sciences. One of these is informed consent, which means that the participants should be informed about the purpose of the study and their participation. The guidelines also include informing the participants that participation is voluntary and that they have the right to leave the study at any time. A further principle by Vetenskapsrådet (2002) concerns confidentiality. It involves providing the participants with the highest possible confidentiality, as well as ensuring that the gathered data cannot be accessed by unauthorized people. There is also a principle regarding what the collected data can be used for, which is for research purposes only (Vetenskapsrådet, 2002). By following these guidelines, the participants of the study were informed about the principles before participating in the interviews. The principles were communicated to the participants either orally before the interview began or both in writing via email and orally before the interview.

3.5 Data analysis method

In this study, the data analysis was based on thematic analysis, which is an approach that seeks to identify patterns within the collected data by generating codes and sorting them into themes (Braun and Clarke, 2006). A benefit of the approach is its theoretical freedom, meaning that it is not connected to a specific theoretical framework. With this being said, the data can be analyzed with a deductive, theory-driven approach, where codes are based on theory. In contrast, the data can also be analyzed with an inductive, data-driven approach, where the codes are based on the data (Braun and Clarke, 2006). In alignment with the exploratory nature of this study, the data analysis was conducted with an inductive approach where the codes were generated from the empirical data (Myers, 2013).

To perform the data analysis, a qualitative data analysis software program named ATLAS.ti was utilized. After the transcription, the six interviews were uploaded as separate documents to the program. Through an inductive approach, initial codes were generated from the interviews by extracting individual sentences or paragraphs of text. Following the recommendations in the guide by Braun and Clarke (2006), as many codes as possible were generated, and some of the extracts were placed within two or more different codes. This step was repeated until all six interviews had been coded. The next step of the data analysis included searching for patterns across the generated codes, and sorting the codes into themes (Braun and Clarke, 2006). This step generated a number of themes, as well as some sub-themes within these broader themes. At this point, a theory-driven approach, where Vial's (2019) eight building blocks would have served as the main themes, was considered. However, we decided to continue with the data-driven approach as it was more suitable together with the exploratory approach. We also saw a risk of losing important aspects of the data if we applied a theoretical framework in the findings section. Hence, a data-driven approach was used to name and define three main themes: *collaboration*, *operational efficiency,* and *industry development*. Since the interviews were conducted and transcribed in Swedish, the data analysis was also conducted in Swedish. Translation to English was first performed when the main themes were

named. Further, this means that all the citations in the findings section are translations of what the respondents said during the interviews.

4. Findings

This section presents the findings from the six interviews that were conducted in the study. The findings are structured based on the three themes that were derived from the data analysis: *collaboration*, *operational efficiency,* and *industry development*.

4.1 Collaboration

Multiple respondents mentioned the importance of collaborating with multiple organizations in digital transformation projects like this. They said that it was beneficial to share financial resources and competence. Respondent 4 from forestry firm B described the industry as being mature and meant that industries like that often are faced with pressure and financial difficulties, which have hindered the process of digital transformation. Respondent 5 from forestry firm C meant that IT projects usually are resource-intensive, but said that this project, thanks to the collaboration between actors, is a low-risk project. He considered this to be a low-risk project because the firm sees great potential in the project and the anticipated outcome, along with the fact that the expenses are shared.

> *This is a good example of a project where the benefits are very large and the risk is very low. Being able to share the expenses and collaborate is very important because you would not, or it would be more difficult to motivate, to run projects like this on your own. You don't know if you get a return on the investment. - Respondent 5*

Respondent 5 from forestry firm C further related this to a previous digital transformation project they participated in. In that project, a solution to the issue in question was found, but the implementation costs were extremely high. Concerns about whether the investment would pay off or not arose, and he explained that there is a risk that this will be the case in this project as well.

Respondents from the forestry firms meant that their proficiency lies in forestry and that there is a lack of IT competence in the industry. Respondent 5 from forestry firm C brought up that this is a challenge for them as they often have to choose between hiring someone with knowledge in forestry or in IT since it is difficult to find people with experience in both and that the former is often prioritized.

> *It is easy to separate people into different categories. The ones with digital experience and the ones without. It is like an A-team and a B-team, that is a challenge. It is also a challenge to find people that are both digitally mature but also proficient in forestry. Sometimes you have to make a choice, and most of the time, we choose someone who knows forestry, not IT. That leads to an increased burden on the organization, but at the same time, it adds a lot of value to be good at forestry. - Respondent 5*

The product manufacturer, on the other hand, described that they are capable of putting the data together into a final product or service, but have limited knowledge in the forestry industry. Being a part of the project allowed the product manufacturer to get a closer relationship with the end-users, the forestry firms. This generated a better understanding of the industry for them as well as opportunities to identify new areas to digitalize, which they found valuable. The IT-firm is specialized in IT solutions in the forestry industry and is, therefore, the only project participant with knowledge in both IT and forestry. Respondents from the forestry firms said that a strength of this project is that there are participants that have the skills to create a product or service of the project outcome, something they mean that they would not have been able to do on their own. Respondent 5 from forestry firm C mentioned that they have participated in similar research projects before but without participants that hold IT skills. This is described to be a major problem since the forestry firm does not have the competence or time to implement it on their own.

> *The difficulties with research projects often come in the second step. "Now that we have an answer, how can we apply it to our everyday tasks?" To be self-critical, we have methods the research institute have come up with that still have not been implemented because it requires quite a lot of time and resources. - Respondent 5*

While all participants had a positive attitude toward collaboration projects similar to this one, a challenge that was identified during the interviews was regarding owning the final product or service. Since the data and results from the project will be available to all participants, concerns about competition were brought up. Respondent 1 from the research institute described that the role of the IT-firm in the project is to be the service provider since they have knowledge and experience in creating the type of maps that will be used in the final product or service. However, the research institute respondent mentioned that there is a possibility that the product manufacturer also has an interest in being a product or service provider. Further, the respondent mentioned that the research institute does not have an opinion on who the product or service owner is - their only goal with the project is to develop the forestry industry.

> *We produce reports and methods, but we do not put them into practice. That is something the IT-firm or the product manufacturer, or the forestry firms could do themselves, (...) we do not have an opinion about that. - Respondent 1*

When asked about the firm's role in the project, respondent 3 from the IT-firm said that they are responsible for managing the collected data and that they in a later stage of the project will be involved in developing the final outcome. He explained that his firm will create a product or service from the satellite images and the AI-method developed by the university. However, the respondent recognized and highlighted that the project outcome will be open which can lead to competitive tensions between a variety of actors, including actors outside of the project. It was mentioned that they still will be interested in being a provider as they see a need for and value in a product or service like this, even after the project is finalized.

Our goal is, of course, to bring together knowledge gained from the project and produce something for our customers. (...) But the method will be open and we might face competition and the forestry firms could also do it themselves, but we are still interested in offering it. - Respondent 3

Respondent 6 from the product manufacturer also expressed an interest in taking the outcome of the project, developing it further, and creating a product or service. The respondent mentioned that this is what they hope to get out of the project and that they want to be a partner that can provide products and services that solve this type of problem. The respondent also described that they would like to connect the project outcome specifically to their products. By doing this, they hope to be able to gain a competitive advantage as it would be required to utilize their products to take part in the project outcome. Additionally, as of right now, their main group of customers is entrepreneurs and private forest owners, not large forestry firms. However, by offering this feature in their products, they hope to become a product supplier for the larger forestry firms as well, which would generate an even further gain for them.

We do, of course, want to be an actor that can offer this to the forestry firms. (...) We notice when we meet the forestry firms, both inside and outside the project, that there is an interest in this and that there is an expectation that we can do something with this. They see us as a potential partner in this kind of exchange, so this is something we really want to do. - Respondent 6

While interest in owning the product or service was expressed by the IT-firm and product manufacturer, respondents from the forestry firms experienced that there is no competition between the actors about being the product or service owner. Respondent 2 from forestry firm A also described that they do not have any interest or want in owning it.

We are not interested in being some kind of data supplier, but actors such as the product manufacturer could definitely deliver information to other entrepreneurs but also be entrepreneurs. - Respondent 2

A majority of the respondents described that the collaboration between the actors has gone well so far. However, respondent 5 from forestry firm C pointed out that one risk with collaborations across multiple organizations is that no one takes the main responsibility and that a lack of commitment can occur. He compared this to internal projects where a project manager is appointed, which he meant creates another sense of commitment and higher expectations on the project outcome. It was explained that a poorly conducted project within the organization could lead to a bad reputation and review or in the worst case, being fired. However, in projects like this, the respondent meant that the consequences of a bad performance are not as severe.

Regarding the outcome of the project, respondent 1 from the research institute also explained that it is important to remember that it is a research and development project, meaning that a successful result cannot be guaranteed. However, two of the forestry firm respondents expressed that they will settle for an outcome that is "good enough". Respondent 2 from forestry firm A said that a method with an 80 percent accuracy would be beneficial since

it still would be better than the current methods. Respondent 3 from the IT-firm also said that a method with an 80-90 percent accuracy would be considered a successful result. Further, respondent 2 expressed concern regarding collaborating with researchers since they tend to strive for perfection. Related to this, both respondent 2 and respondent 3 mentioned that one risk of research and development projects is that the result is not released and implemented on time. They explained that this could mean that another innovation might already have fulfilled the purpose of the project, which would make the outcome of the project outdated and useless. However, respondent 3 seemed to be positive about the digital transformation project:

> *There is an aspect about this that I think is very important. The fact that it's not just a research thing and not just about bringing out a method, instead, you implement and apply it to the different organizations. To walk the extra mile, I think that is the most important part of this project. - Respondent 3*

Respondent 4 from forestry firm B described that the collaboration in this project will lead to benefits beyond the project's boundaries. A closer relationship with the research institute is explained to open up new opportunities for future digital transformation projects, which is pointed out as a valuable aspect of the project. Even though the project is not finalized yet, multiple respondents expressed an interest in future collaborations and agreed that digital transformation projects similar to this one is an efficient way to digitalize the industry.

4.2 Operational efficiency

Multiple respondents mentioned that the project outcome could lead to large improvements in the efficiency of forestry management. Decreasing the number of visits to the forest was an expectation that was brought up during the interviews. Today, forest owners are often required to physically visit their forests to assess the need for forestry management. The size of owned property differs largely depending on the type of forest owner. Forestry firms often have very large and scattered areas of forest that they manage, and because of this, it can be difficult and time-consuming to assess these areas with the accuracy that would be needed. Respondent 1 from the research institute reported that it is often determined whether an area requires management or not based on what the vegetation looks like from the roadside. The respondent meant that this is an issue since the needs might vary across the area. As a result of this, areas that require management might be missed due to poor screening. Today, much time is spent driving a car to get an overview of the forest and the respondents hoped that the time in a car could decrease as a result of the project outcome. The scanning can also be done by flying helicopters or drones, but respondent 1 described how the process could be done more efficiently and accurately by using data and AI.

> *It is important to find things that will really support the work. (...) That is why it is important to find new methods. You can't have one guy who flies a drone and then two weeks later you go back to watch the same area in person. It is important to find ways to work together. - Respondent 1*

Another aspect of this that was mentioned by several respondents regarded the entrepreneurs. As a part of the project, data on their movements have been collected by using GPS-positions

and data on machine usage have been collected through sensors. This has provided the project actors with data on the entrepreneurs' working patterns since these two combined shows the movements and usage of the machines over time. This has created an opportunity to provide the entrepreneurs with information on how they can increase their efficiency and optimize their work. By getting a detailed overview of what the forest looks like, including information on the varied need for management over different areas in the forest, they can better plan their work. For example, if they can see that a given area requires more work than another, they can better divide the workforce and thus optimize their work.

> *Before they start, they could get a map that shows what it looks like, these are the needs in the northern part and these are the needs in the southern part, so maybe we should park our cars here (...) so you don't run back and forth in the forest without doing any work. They can have this in their planning to better allocate the work, like sending one guy to the northern area and four guys to the southern. Before you start, you can use this as documentation, like a map. - Respondent 1*

Respondent 2 from forestry firm A mentioned that the data from the machines were not included in the original project description and that it was seen as a useful added value. Respondent 6 from the product manufacturer, which is the actor that provides the machines used in the project, explained that the firm was not an initial project participant. However, when they joined, they added sensors that collect data from the machines. Respondent 6 further explained that the sensors were not originally created for this project, but were believed to be useful in the project despite this. The combination of the other data sources and the data from the sensors was also seen as an added value by several respondents. Additionally, respondent 6 explained that the data could be used with gamification to make the entrepreneurs' work more efficient.

> *Who has followed the plan in the best way? Or who has gone the furthest way? Or who has gone the smartest, shortest way? You can do a lot with gamification that might make the job more fun. I don't know, there are a lot of aspects in this that I think are exciting for us to think about. (...) We want to be involved where it happens in order to understand how it can affect things we already do or should do. - Respondent 6*

At the same time, some of the respondents also saw challenges connected to the data collection and use of digital technologies. Respondent 1 from the research institute mentioned that it would be problematic if the entrepreneurs forgot their phones at home since the GPS-positions are tracked on them. He also saw a risk of losing data, for example, if the data from the machines were not uploaded to a cloud storage within a certain time. Another risk is that the quality of the data from the satellites is weather-dependent and that it can be ruined by cloudy weather. Respondent 5 from forestry firm C raised that a problem, although a small one, was that the batteries in the sensors ran out. He further explained that he had experienced a larger problem with the application that the entrepreneurs were supposed to use to enter field data from the forest. It ended up crashing several times, which made them decide to not use it, and he explained that it felt like the ones who delivered the application were disappointed in them.

Increased use of digital technologies in the forestry industry has also led to more data available. Respondent 4 from forestry firm B explained that they currently collect data from multiple sources and that using data can lead to increased efficiency. He mentioned that during the last 5-10 years, they have incorporated more digital technologies in their organization and that they see potential in it as well as in the use of data. However, a challenge with the amounts of data collected is that they currently do not have the capacity to take advantage of it. This concern was also mentioned by respondent 5 from forestry firm C:

> *Another issue with IT is that you drown in data. You do not understand it and can't take advantage of the huge amounts of data that we have. Data from satellites is a good example of how you can drown in data, you get paralyzed. - Respondent 5*

4.3 Industry development

Another expectation on the outcome of the digital transformation project is that it can lead to development within multiple areas of the forestry industry. The respondents expressed that being able to plan forestry management in a better way would be valuable. Some of the respondents mentioned that the planning would help to preserve areas with biological diversity, as well as to increase focus on recreation, nature conservation, and culture. It was also believed that the planning would enable conducting forestry management at the right time, which seemed to be beneficial in several ways. To begin with, it would increase the growth of the forest and improve the quality of the trees. In turn, this would lead to more timber, as well as higher quality of the timber. Further, improved quality of the timber would lead to better products, and thereby increase profitability. Respondent 4 from forestry firm B was also convinced that the product or service itself would create business opportunities, which he believed would lead to a few million SEK in increased revenue for his forestry firm each year. Respondent 1 also explained that the product or service would help the forestry firms to allocate resources and to do follow-up work when the forestry management is completed.

> *A possibility would be to see what the needs are, then you can allocate the resources. Last year it was 80 thousand hectares, this year it will be 60 thousand hectares. (...) These are the kind of results you want to achieve. It's both about budgeting and follow-up for the forestry firms. - Respondent 1*

Several respondents explained that today's poor overview of the forest makes it difficult to determine the price of forestry management, both in regard to the forestry owner who purchases it and for the entrepreneurs who perform it. Respondent 4 from forestry firm B mentioned that this creates a risk of some forest owners paying too much for forestry management, while others pay too little. Therefore, it was believed that automated pricing would provide a more accurate price. For the entrepreneurs who perform the forestry management, the respondents believed that better documentation of the need would help in estimation of the time needed to perform it and thereby determine the cost. Respondent 4 also believed that by providing this documentation, the firm's business relationship with the entrepreneurs would be strengthened.

Since the project is not finished yet, it is currently unknown what the final result will look like. However, the forestry firm respondents thought that the process of ordering forestry management today is too complicated and wished for a project outcome that would simplify that process. Today, the forest owners need to contact the forestry firms that then contact the entrepreneurs that perform the forestry management. When asked about the desired outcome, respondent 2 from forestry firm A said:

> *A good comparison is Airbnb. They only offer a platform where those who have an apartment can meet me who needs an apartment for the weekend. And then we have removed a lot of steps and administration for the value we wanted to create, I wanted somewhere to sleep. The same thing, I'm just interested in having my forest managed in a good way. - Respondent 2*

Respondent 4 from forestry firm B wished for an outcome that could be integrated into their business system, which their forest owners could access through an already existing member application. There, the members would be able to outline their needed forestry management on a map, and the application would estimate the price and time of the service. A similar idea was mentioned by respondent 3 from the IT-firm that will be the ones in the project that put the outcome into practice. He explained that the outcome of the project can be implemented in the customers' business system. However, when asked about what the outcome would look like on a detailed level, respondent 3 could not describe it either. He explained that this will depend on what the customer wants, and also described it as a challenge:

> *It is something you always struggle with in all projects, the customer has a problem that they want to solve, but they don't know how to. We don't know how we should create a solution if the customers don't know what they want. It will be somewhat of an iterative process where we come up with a proposal and they let us know what they think about it, and so on. - Respondent 3*

All respondents mentioned that the forestry industry is highly mechanized and digitized but not digitalized. According to respondent 4 from forestry firm B, the reason that the industry is still in business is that they constantly have been working toward becoming more efficient. Further, multiple respondents explained that the industry has a history of prioritizing projects that provide high returns in the short run, and that it is easy to identify processes that can be automated.

> *The possibility to make big and fast digital steps has been limited. Also, I think we've seen that the largest returns have come from the technical development of machines to a large extent. That's where there have been much potential and low-hanging fruits, so the focus has been on that, and quite a lot of the development resources have been used for that. - Respondent 4*

Despite that there has been a lack of focus on digitalization in the industry, many of the respondents stated that they do see benefits of it. Two respondents even expressed the possibilities of digitalization as "extremely large". For instance, it was believed that digitalization could create many new ways of working. Respondent 4 from forestry firm B also

said that digitalization *"is absolutely crucial for the industry to continue being profitable"*. Furthermore, several respondents mentioned that the industry is positive toward digitalization. Respondent 1 from the research institute experienced a general interest, respondent 2 from forestry firm A described a strong dedication, and respondent 4 from forestry firm B experienced an incredible commitment.

> *I do not experience any resistance to digitalization or to change. Rather, I notice expectations and some kind of anticipation, everyone is just waiting for a shift and knows that there are opportunities around the corner yet not realized. So, there is great anticipation rather than any resistance. - Respondent 4*

Nevertheless, other respondents mentioned that the development of the forestry industry and the outcome of the project may face resistance. Respondent 1 from the research institute explained that a challenge within large organizations is how to implement working methods, especially if there is a lack of expressed routine descriptions. Respondent 5 from forestry firm C also mentioned that a common challenge in the industry is that people are comfortable with their current ways of working, which complicates the transition to new methods. Therefore, he believed that if the project outcome will lead to major changes in the work routine, there is a risk for resistance. Further, respondent 2 from forestry firm A expressed concern regarding how the forest owners would react to purchasing the service without the forestry firm's involvement. He explained that this might create behavioral or cultural challenges among their customers.

> *How will this work when we don't sit at the kitchen table when signing contracts anymore? What will happen when the forest owner and the entrepreneur meet directly on a platform? How will the forest owners feel about that? - Respondent 2*

5. Discussion

The purpose of this study was to explore the dynamics of a multi-organizational digital transformation project. The research question was: *What is the role of collaboration in a digital transformation project and how does it affect the expected outcomes?* To answer our research question, a model based on the findings and the theoretical foundation was derived (see Figure 1). The model illustrates the role of collaboration, its impact on the expected outcomes, as well as further identified relationships between the three elements (Collaboration, Operational efficiency, and Industry development) shown in the model. This illustration will work as a foundation for the discussion below where each of the elements and their relationships will be discussed in detail.

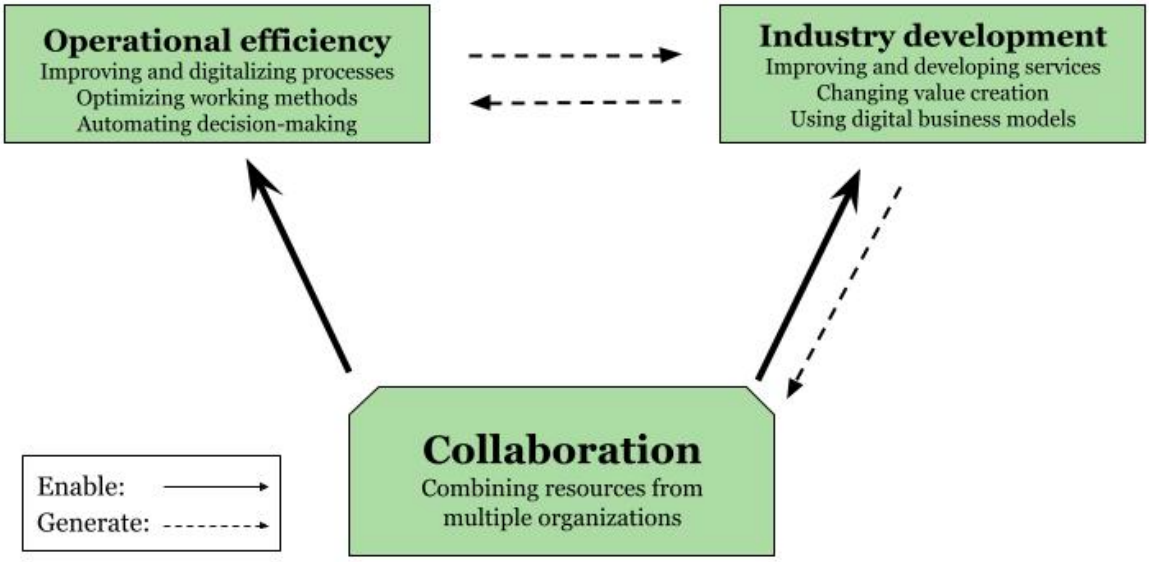

Figure 1. A model of multi-organizational digital transformation projects' dynamics

5.1 The role of collaboration

The findings showed that collaboration between multiple industry actors was not just a way to structure and conduct the project. Instead, it turned out that the respondents viewed combining resources as a fundamental requirement to enable the realization of the expected project outcomes. Both Vial (2019) and Barthel and Hess (2019) describe that cross-functional collaborations are commonly found in digital transformation since it often requires competencies that cannot be found within one single department. This means that combining knowledge from different departments, typically IT and business, is necessary (Barthel and Hess, 2019). However, both Vial (2019) and Barthel and Hess (2019) only focus on cross-functional collaborations within a single organization. While Barthel and Hess (2019) bring up that external resources such as outside consultants could be necessary, neither they nor Vial (2019) mention collaboration between multiple organizations. In our case study, it was found that collaboration between multiple actors was required, both in the aspect of sharing expenses and competence. The forestry industry is described to have limited financial resources which makes it difficult for organizations to conduct digital transformation projects on their own, but also to utilize consultants for this. As discussed by Barthel and Hess (2019), the funding of a project is an important component. In a collaborative project with multiple organizations, the expenses can be shared which can be valuable, especially in financially pressured industries.

Additionally, a cross-functional collaboration within each of the organizations would not have generated the competence needed to conduct the digital transformation project. Since utilizing outside consultants was not an option due to limited financial resources and that the required IT and business competencies could not be found within a single organization, a multi-organizational collaboration was necessary in aspect of competence as well. In the project, the forestry firms' proficiency in forestry is equivalent to the type of knowledge Barthel and Hess (2019) mean can be found in the business department. In this case, business

competence refers to having industry expertise such as an understanding of how to manage forests. The competence usually found in an IT department was contributed by the IT-firm as well as the AI-specialized university. The product manufacturer, on the other hand, does not fit into any of the departments mentioned by Barthel and Hess (2019). Instead, their main contribution to the project was the technical components and machines, which were reported to facilitate the digital transformation project. The competence provided by the research institute cannot either be placed within the two departments discussed by Barthel and Hess (2019). While they do hold competence in forestry, thus business, they also contribute with competence in how to organize and manage digital transformation. In contrast to previous literature, our research has therefore identified areas of competence other than business and IT to be useful in digital transformation, especially having a participant with competence in managing digital transformation projects.

However, challenges regarding the collaborative structure of the project were also identified. First, it was believed that projects involving multiple organizations may cause uncertainty about the different organizations' areas of responsibility. The uncertainty can cause low expectations regarding what the contribution is supposed to be, and thereby a lack of commitment from the participants, which is likely to have a negative impact on the project outcome. Additionally, different actors may have different views on the project and its expected outcomes, which was believed to cause eventual complications in the collaboration. However, it was highlighted that an iterative process will be applied when creating the outcome to allow for communication between the different project actors during the process. Further, a potential competitive tension was noticed between two of the participating actors in the project. Since the outcome will be available to all participants, this provides the actors with an opportunity to utilize the project outcome to develop it into a product or service on their own. The findings showed that both the IT-firm and the product manufacturer expressed interest in developing the project outcome into a service rather than a product. This can be connected to the phenomenon where the development of services is favored over products, which is common in the process of digital transformation (Vial, 2019). The IT-firm visualized that they would offer a service incorporated into the forestry firms' business systems. The product manufacturer wanted to offer a similar service but their idea was to connect the project outcome to their products in order to gain a competitive advantage, especially against other product manufacturers.

Although challenges regarding collaboration can occur, the findings showed that the opportunities it generated were seen as a requirement to realize the objectives, which worked as a motivation for the organizations to conduct a multi-organizational project.

5.2 The effect of collaboration on the expected outcomes

Vial (2019) claims that operational efficiency is one of the positive effects that can be generated through the process of digital transformation. A similar conclusion is presented by Barthel and Hess (2019), who found that increasing efficiency is a common objective in digital transformation projects. To increase operational efficiency also turned out to be one of the objectives of the project examined in this study. More specifically, the findings showed that it was the collaboration between actors, and especially the combination of their resources, that

was expected to enable increased operational efficiency. In addition to the various competencies held by the project actors, they also contributed with different technical components and digital technologies. For instance, the product manufacturer contributed with sensors that generated data from the machines, the forestry firms with GPS-data collected by the entrepreneurs, and the university with an AI-method. In a later stage of the project, these different technological components and digital technologies will also be combined, which Vial (2019) means is an important aspect in digital transformation. In this case, the combination is expected to create a digital overview of the forest. Further, the AI-method is expected to enable automated decision-making regarding the need for forestry management, which will save time for the forestry firms. To digitalize (Barthel and Hess, 2019) and improve (Vial, 2019) processes are two ways to increase operational efficiency, which were found within this study. A further finding was that the data collected from the sensors and by the GPS-trackers could be used to optimize the entrepreneurs' work. However, this was explained to be an additional value beyond the expected project outcome. The realization of additional objectives was also found by Barthel and Hess (2019), which indicates that digital transformation projects can have the ability to realize objectives that are outside the anticipated project outcome.

Although the use of digital technologies is an important part of Vials' (2019) framework, and the technical components of a solution in digital transformation projects is discussed by Barthel and Hess (2019), neither of them mention any challenges connected to digital technologies. However, the findings in this study showed that issues with digital technologies could be a potential hindrance in the realization of efficiency. Challenges that were mentioned were, for example, to lose data, collect data of bad quality, or encounter technical issues. Another challenge that was identified in the findings was the difficulty of managing the large amounts of data that are collected from several data sources. This can be connected to inertia, which hinders change since organizations may have insufficient resources and capabilities (Vial, 2019).

The findings also showed that collaboration between multiple actors enables industry development. Vial (2019) describes that an impact of digital transformation is improvements in the industry, which was proven to be the case in this case study as well. Development in the way the forestry management service is mediated was one of the most mentioned expected outcomes. As a result of the use of digital technologies, Vial (2019) means that mediation strategies can be altered. The outcome of the project would allow for a move from an overly complicated process to a more direct one by eliminating intermediaries. It would also open up opportunities to develop a strategy aligned with what Vial (2019) describes as remediation. This includes utilizing a platform to bring network participants closer and is mentioned to enable closer collaborations between actors.

However, resistance and inertia were reported to be potential hindrances in the realization of industry development. The forestry industry has a history of favoring automatization of processes that generate high returns in the short-term rather than emphasizing on development and reinvention of processes that can provide long-term benefits. Alterations like these, such as changes in value creation and implementing digital business models are often associated with digital transformation and can trigger organizational change (Barthel and Hess, 2019). Radical changes in the forestry management service, thus a radical change in how

value is created, was described to be a potential problem, even if it would have a positive impact on the service. Vial (2019) means that inertia can occur if the process that the change affects is deeply embedded in the organization. Further, Vial (2019) describes how resistance is more likely to occur if there is a lack of understanding of the potential benefits. Both of these tendencies are identified in the forestry industry where there has been a lack of focus on investments and changes that lead to benefits in the longer term. Despite this, a strong interest in digitalization in the industry was expressed, but the lack of competence and resources has hindered them from realizing this, something that now is possible as a result of the collaboration.

5.3 The dynamics of the model

As described above and illustrated in the model, collaboration enables operational efficiency and industry development. Additionally, our findings showed that relationships between the two outcomes also can exist. Along with that, a connection between industry development back to the initiating element, collaboration, was found. First, collaboration can enable operational efficiency which in turn can generate industry development. Optimization and automation of processes can increase operational efficiency but can also generate the development of the industry since these improvements can lead to the developments in how value is created. Second, industry development enabled by collaboration can generate operational efficiency. The combination of resources from multiple actors can allow for a shift in focus from short-term digital investments to long-term such as developing digital business models. Consequently, this can provide opportunities to improve ways of working and decision-making, which are areas operational efficiency is concerned with. Lastly, industry development, which initially is enabled by collaboration, can, in turn, lead to improved collaboration. This was shown in the findings where a respondent described how improvements in the mediation of the forestry management service would strengthen business relationships between industry actors. Additionally, doing a project in collaboration with a research institute also improved connections and was described to be a gateway for participation in future projects.

5.4 Implications for research and practice

This research has been conducted as an attempt to fill the identified research gap on digital transformation projects conducted at a multi-organizational level. Since research on digital transformation at a project level recently started to emerge, we mean that by solely providing our rich and detailed empirical research conducted on the topic, we contribute with valuable insights to both research and practitioners. However, by extracting concepts from Vial's (2019) framing of digital transformation and combining them with the project level approach presented by Barthel and Hess (2019), we derived a more inclusive foundation to base our research on. We applied this foundation to a multi-organizational project with the aim to add an additional dimension to digital transformation that previous research has not included. To researchers, we hope that the outcome of this study serves as a trigger and encouragement for future research on digital transformation at a multi-organizational level. Practitioners, such

organizations, can use the outcome of this research to get a better understanding on how digital transformation projects can be formed and what the outcomes can be.

6. Conclusion

In this research, we aimed to explore the dynamics of a multi-organizational digital transformation project. We have, through a case study, answered the research question: *What is the role of collaboration in a digital transformation project and how does it affect the expected outcomes?* The findings showed that the collaboration and combination of resources between actors was a fundamental requirement in the project. The collaboration enabled opportunities to increase operational efficiency and for industry development, which were the expected project outcomes. However, potential challenges such as competitive tensions and resistance were identified as hinders in achieving the expected project outcomes. To illustrate the dynamics of a multi-organizational digital transformation project, a model was created. The model depicts a process in which collaboration acts as the catalyst that enables the expected project outcomes. Additionally, the outcomes could, in turn, generate collaborations which can induce a continuous digital transformation process. As the process keeps going, higher level impacts, such as digital transformation at an industry level, could potentially be achieved.

7. Limitations and future research

Limitations to this study have been identified. First, the case study only examined one case which can generate a narrow outcome that cannot be generalized (Eisenhardt, 1989). Including multiple cases would have provided a more nuanced understanding since it would have taken more aspects, experiences, and situations into consideration. Second, the chosen case is an ongoing project and the project outcomes discussed in the research are therefore expectations that were expressed by the project participants. This means that the final outcome might differ from the expectations and that hinders that were not described in this research might arise. Because of this, we encourage other researchers to conduct a follow-up study on the project to investigate whether or not the expected outcomes were realized. Further, as described, existing research on multi-organizational digital transformation projects is limited and we hope that our study inspires other researchers to continue to explore this area. We suggest that researchers should conduct studies similar to this one but include multiple cases, provide comparisons between them, as well as develop frameworks.

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