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Supporting the digital transformation of SMEs — trained digital evangelists facilitating the positioning phase

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Abstract:
As digital transformation (DT) sweeps over society, the exploitation of digital solutions is obvious, especially for large enterprises. Unfortunately, small- and medium-sized enterprises (SMEs) struggle with DT because of limited resources, understanding, and implementation skills. Thus, SME companies need both methods and tools to proceed with DT as well as support to exploit them. This article presents a study in which adult learners with professional experience are trained to use a digitalization development method and tools to analyze target organizations' digitalization state and identify improvement ideas. Thirty trained digital evangelists used the tools and methods while conducting digitalization status analyses in eleven organizations. The study results show that the method and tools work in the context presented in this research. The study's findings are beneficial for the educational professionals interested in educating students towards helping SME organizations along their digitalization pathway.

Keywords:
digitalization; digital transformation; small and medium-sized enterprise; digital transformation model; digital maturity; digital evangelist.

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1. Introduction

Digitalization has been commonly identified as one of the major trends and drivers for changing society and creating business opportunities in the near- and long-term future [1]–[3]. Table 1 presents the digital transformation playground with three drivers: business model-related concepts, other ICT and digitalization trends, and mainstream concepts (enabling technologies) [4].

Table 1. Digital transformation playground (modified based on Pihir et al. [4])

Business model–related concepts	Other ICT and digitalization trends	Mainstream concepts; enabling technologies
▪ Improvements, increased effectiveness/efficiency ▪ Ecosystems/green tech ▪ New business models ▪ New services, competencies, skills ▪ Customer experience, journey ▪ New alliances	▪ Social media and platforms ▪ Artificial intelligence and gamification ▪ Meta modeling ▪ IoT, Big Data, and analytics ▪ Virtual technologies and knowledge management ▪ Robotics and autonomous systems	▪ Cloud technologies ▪ Mobile technologies ▪ Reference models ▪ Enterprise resource planning and customer relationship management ▪ Supply chain management and data warehousing ▪ Business process and performance management

The business benefits of digitalization are widely recognized and reported [5], [6]. Even so, smaller companies often struggle to reach the potential benefits. The identified challenges can relate to, for example, a high investment cost, lack of time and knowledge related to technology implementation and business model innovation, unclear business benefits, lack of standards, and unclear effects on value chains and customer behavior [3], [7]–[9]. This highlights that the identified challenges are multifaceted, complex, and still largely unsolved. Excess inertia related to SME digitalization has also been recognized as one of the main economic challenges. The European Digital SME Alliance has highlighted the need to increase the adoption of digital transformation via supporting measures [10], [11].

One way to increase digital support for SMEs is to enhance academia's research impact and knowledge transfer and emphasize the role of universities in advancing both economic growth and technical change [12]. According to Chang [13], universities' role within the innovation system is vital and will increase in the future. To pursue this goal in the European Union, changes were made in national and international research policies and research funding instruments, emphasizing higher societal impact creation through interaction with different actors, including SMEs. However, there is still a significant lack of understanding of how to transfer research results efficiently to companies on a large scale [13], [14]. Despite the substantial research on digital transformation, there is a lack of practical grassroots-level, tool-supported approaches that are suitable and carefully tested to support the digital transformation of SMEs [15]. It has been stated that there is a need for a process model incorporating external support units into DT work to assist SMEs in their digitalization efforts [16].

In order to address the need of SMEs for support tools and mechanisms for DT, this article focuses on how a digitalization support service developed in a research project could be offered to SMEs with the needed support. More precisely, the article examines how adult learners with professional experience can be trained to act as digital evangelists to facilitate the improvement of digitalization in companies.

The structure of the article is as follows. The following section comprises the literature review, followed by Section 3, which describes the research design. Section 4 presents the results gathered from the research. The discussion is in Section 5, and section 6 concludes the article and presents proposals for future research.

2. Related research

Digital transformation (DT) is an emerging trend and has been considered in several literature reviews. Ograen and Herciu [17] found 787 DT papers published during 2003–2020; more than three-quarters of the articles were published in 2019 and 2020, and 47 papers had "SME" as a keyword. DT is a rich concept, not just an IT issue [18]. Pihir et al. [4] reviewed DT literature in 2019 and found the top three publication domains: computer science, business or economics, and engineering. Another DT literature review by Hausberg et al. [19] identified three dominant areas (finance, marketing, and innovation management) and nine streams or application domains. The literature review by Ograen and Herciu [17] defined digitalization and DT as follows:

> *Digitization is the first step of a complex process (with quite significant impacts) of digital transformation leading towards a digital economy—where digitalization, while making use of artificial intelligence (alongside automation, big data, cloud computing, digital twin, internet of things), is capitalizing on the digital technology.*

The literature review by Zhu et al. [20] highlights three important themes in preparing DT for firms. First, it is essential to formulate the right digital strategy because there are significant differences between digital business strategy and digital transformation strategy regarding objectives, content, and functions. A digital business strategy focuses on macro goals, and a DT strategy focuses on a specific DT implementation process. Second, adopting a digital technology combination suitable for the firm's development is important. This derives from the fact that different digital technologies and technological combinations impact firms differently. Third, regularly evaluating and adjusting the firm's digital strategy is crucial. Digitalization is not just about bringing new technology into use; these new technologies impact firms at a strategic, operational, and industrial level. Thus, the role of practitioners who understand DT strategies and can select the right digital technologies is vital [20].

Horlacher and Hess [21] describe the six roles of company information system managers as spokesperson, monitor, entrepreneur, resource allocator, leader, and liaison. Further, they reveal the tasks of the chief digital officer in four companies. These tasks relate to, for instance, the definition of the digital strategy, coordinating DT across the company, conducting workshops and employee training sessions, and visiting events to look for emerging innovations. In these companies, the chief digital officers drove the digital transition and acted as "digital evangelists" [21]. In addition, Singh and Hess [22] study how chief digital officers orchestrate the DT of their companies. Three role types were identified: entrepreneur, digital evangelist, and coordinator. They state that digital evangelists need good inspiration and digital pioneering skills to promote DT effectively [22].

DT in companies requires special preparation (e.g., analyzing the existing state) and guidance before implementation. The process should balance generic phases and adaptation of the DT to each company's context [23]. Most small companies move directly into action and apply solutions without a clear understanding of digital technologies [24]. There is a need to build systematics toward DT. Therefore, the process of how to support the DT of companies has received attention in the research community. Table 2 summarizes examples of research that has contributed to a digital transformation model or process, has SME cases or viewpoints, or provides tools or methods for SMEs to apply. A variety of approaches have been developed to support digital transformation, such as a two-phase procedure model to show how publicly funded organizations can support SME digitalization [16], a transformation process framework [25], a DT process model by an SME entrepreneur [26], a two-phase DT model for the SME sector [27], and a four-phase digital transformation model [3].

The limited resources of SMEs must be considered when their digitalization activities are supported. SMEs may not have the necessary resources, such as know-how, for digitalization ([26], [28]) on their own and cannot afford expensive consultants [16]. Thus, one approach to overcome this shortage is using free external public-sector facilitators, which Barann et al. [16] present as a means for the DT of SMEs. They added that the DT method needs to be practical and not an abstract model.

Ulas [28] explains how governmental intervention in the Accelerating Programme of Digital Transformation in Industry was established in Turkey to include external support from competence centers or research institutes. This kind of

external support by research institutes is also reported in Kääriäinen et al. [15], in which research scientists carried out the digitalization status analysis using a pre-defined method and tools for a set of SME companies. Pelletier and Cloutier [29] recognize the limited resources of SMEs (human, material, and financial) and propose public and support organizations to encourage companies to initiate rapid DT and elaborate a deliberate digital strategy. The public sector could use education to raise companies' digital knowledge [30] and to spread information about digitalization and encourage a positive attitude toward it in companies [31].

Table 2. Examples of research contributions to DT models, SME focus, and tools or methods

Title	**DT model or process**	**SME cases or viewpoints**	**Tools or methods for SMEs to apply**
Supporting digital transformation in small and medium-sized enterprises: a procedure model involving publicly funded support units [16]	Two-phase procedure model: orientation and iterative transformation		Eleven requirements for DT support models for SMEs
Collaborative approach to digital transformation (CADT) model for manufacturing SMEs [32]	Collaborative approach based on three sub-objectives	One case of collaboration between two manufacturing SMEs	
Role of government to enhance digital transformation in small service business [30]	Cognizant's digital transformation framework	Ten SMEs were selected by using judgment sampling and quota sampling	A model for drivers, barriers, and government support of digital transformation
Fostering digital transformation of SMEs: a four levels approach [33]	Four-level approach: awareness, enquirement, collaboration, and transformation	Four case companies	Roadmap
Applying the positioning phase of the digital transformation model in practice for SMEs: toward systematic development of digitalization [15]	Digital transformation process with four phases: positioning, current state analysis, roadmap, and implementation	Nineteen SMEs were guided through the positioning phase	Tools such as DigiMaturity, DigiSWOT, and DigiTriangle are available on ApuaDigiin.fi web service
Digital transformation by SME entrepreneurs: a capability perspective [26]	A process model of digital transformation by an SME entrepreneur	7 SMEs, cross-border e-commerce with a digital platform	
Leveraging digital technology to transform accounting function: case study of an SME [25]	Transformation process framework based on Lewin's (1951) theory of change	One SME accounting function case	
Tackling the digitalization challenge: how to benefit from digitalization in practice [3]	Four-stage model for digital transformation	One SME background case	SWOT tool as part of the first stage
Barriers to digital servitization in French manufacturing SMEs [7]		Eight manufacturing SME servitization cases	
Conceptualizing digital transformation in SMEs: an ecosystemic perspective [29]	Five-step model		Entrepreneurs' Strategic Action Go-Zones
Measures for successful digital transformation of SMEs [34]	Eighteen different digitalization measures	Eleven SME case companies	Acatech Industry 4.0. Maturity Index
The concept of building a digital transformation model for enterprises from the SME sector [27]	Two-phase digital transformation model for the SME sector	One SME case	A digitization index with 21 subindexes, Ichikawa diagram, SWOT analysis
Survival in the digital age – a framework for formulating a digital transformation strategy in an SME [35]		Seven SME cases; formulating digital transformation strategy	Four strategic dimensions in the digital transformation framework with 14 questions

One substantial effort to increase the digitalization of SME companies is identification and launching the European Commission's European Digital Innovation Hubs (EDIHs) [36]. These will function as one-stop shops that help companies (especially SMEs) dynamically respond to digital challenges and become more competitive. Sassanelli et al. [37] consider the support given to SMEs by DIHs, the predecessor of EDIHs. They propose the Data-Driven Business-Ecosystem-Skills-Technology (D-BEST) service portfolio for DIHs to support the DT of SMEs. The service-oriented approach enables the communication between the customer, provider, and registry. Furthermore, the service portfolio should include a service catalog and a pipeline containing services under development. Efforts like this are essential support functions for the competitiveness of European companies because digital readiness varies in the companies [38].

Despite the substantial research on DT, there is a lack of practical grassroots-level, tool-supported approaches that are suitable and carefully tried and tested for supporting the DT of SMEs [15], [16]. DT projects are complex and incorporate multiple factors [39]. DT is not only a technical achievement; solid top management support [40] and a corporate attitude that supports change and transformation [41] are necessary to get the most out of it. In addition, organizational structures may need to be changed or aligned during the digitalization process [42]. In a digital setting, firms should be able to recognize and respond to external environmental factors quickly. However, the challenge is that SMEs do not know how to begin with development [41]. It has also been stated that there is a need for process models incorporating external support units into digital transformation work to support SMEs in their digitalization efforts [16]. To bridge the gap, Kääriäinen et al. [15] constructed a digitalization support service, ApuaDigiin.fi ("help for digitalization" in Finnish), and a network to maintain it. The model and tools of ApuaDigiin have been published as Interreg Europe Good Practices [43], [44]. In this article, we demonstrate how the positioning phase (digitalization status analysis) method and tools of the DT model could be utilized by an external support unit (educational partner) to help SMEs in their digitalization by guiding adult learners to carry out digitalization status analysis for the selected target organizations.

3. Research design

This research focuses on studying how adult learners can be equipped to analyze the state of digitalization of target organizations, providing an important starting point for their DT. First, the section presents the method and tools of digitalization status analysis, namely the positioning phase of the DT model. Then we introduce different usage scenarios for the method and tools and describe the kind of usage scenario in this study—the digital evangelist approach—in more detail. Finally, the research setting for testing this approach is described.

3.1 Positioning phase of the digital transformation process

This research is part of our longer-term research path related to DT that began in 2015 and resulted in a conceptual framework of the DT model [3], [45], digital maturity model, and tool [46]. In 2018 and 2019, ApuaDigiin, a support service for SME digitalization, was built and tested to allow free-of-charge access for companies or other organizations to utilize digitalization support tools [47]. At the same time, the ApuaDigiin network consisting of educational partners, regional business development authors, research organizations, and associations was established. Various tools were added to the service to support the digitalization pathway of SME companies and provide a platform for sharing these tools, related guidance, and digitalization experiences. The steps of the DT model comprise positioning, a current state review, a roadmap, and implementation [3], [15]. The positioning phase aims to examine the digitalization status of the whole target organization and provide a backlog of ideas and visions—what the organization identifies as development items. Therefore, this phase can also be characterized as the digitalization status analysis phase. After the positioning phase, the selected digitalization vision(s) is examined in more detail in the current state review phase to understand more deeply how current processes and tools work in relation to it. Based on this, a solution concept is designed for the selected digitalization vision. The roadmap phase aims to plan the steps for achieving the concept defined in the current state review phase. The implementation phase realizes the steps defined in the roadmap phase.

The model has been equipped with practical tools and a process that enables SMEs to carry out each step. A crucial part of the model is the positioning phase. It forms the basis for companies' digitalization improvement work since it intends to understand the current status of digitalization in the target company and identify improvement ideas. Therefore, we have focused the support service on making this assessment as easy as possible [15].

The method for the positioning phase contains three tools (Figure 1) [15]. This toolset has been released as part of the ApuaDigiin online service. The first step of the positioning phase is to determine the organization's digital maturity using the digital maturity tool. The tool is a free-of-charge digitalization self-assessment tool for organizations to assess their current digital maturity level [46], [48]. It is organized under six dimensions: strategy, business model, customer interface, organization and processes, people and culture, and information technology. Therefore, it measures the digitalization status of an organization from a broad perspective, not only from its technological aspects. After the most suitable option is selected from the answers presented, the tool calculates the maturity level value (from 0 to 4) for each dimension [46], [48]. The tool then presents a diagram (radar chart) that shows where the company stands in digitalization and where it is compared to the average of other respondents [49]. This analysis already provides valuable information to the company, but further analysis is required to identify potential improvement actions [15].

Fig. 1. Digitalization status analysis tools in the positioning phase [15]

The second step of the positioning phase is a SWOT analysis to identify and assess a company's digitalization strengths, weaknesses, threats, and opportunities. This is done with the DigiSWOT tool (see Appendix A), which is based on the SWOT template and contains instructions on applying it. An organization should consider how its digitalization strengths can be utilized better, how its weaknesses can be turned into strengths, and how opportunities can be seized and threats avoided.

The third step of the positioning phase is to collect ideas for digitalization improvement from the previous phases, further elaborate them, and collect them into the DigiTriangle tool (see Appendix B). The tool is used to classify the digitalization vision priorities of a company. The tool's structure divides the digitalization visions into three areas [3]: internal efficiency, external opportunities, and disruptive change. This tool is used to collect digitalization ideas into one frame, indicating their focus based on whether the ideas relate to the following:

- Improvement of internal efficiency, such as the deployment of a new IT solution to streamline internal processes;
- Improvement of external opportunities, such as offering existing services in a new digital way for customers; or
- Radical digitalization that can enable entirely new business for an organization or new partnerships or lead to an entirely new role for the organization in the value network.

DigiTriangle helps the company structure and present digitalization visions. Also, visions should be marked, if possible, as being short-term in a way that could be practical and concrete. In contrast, others may be long-term, such that they are generic development ideas that will be specified in more detail in the future.

3.2 Usage scenarios for positioning phase tools

Based on the experiences, we identified three usage scenarios (Figure 2) for the positioning phase method and tools. In the first scenario, SMEs use tools on their own to identify their state of digitalization and development path. This usage scenario has proven challenging because using the tools was not as easy as initially assumed. In particular, the use of the DigiMaturity tool turned out to be challenging for micro-sized enterprises [49]. In addition, smaller companies want to discuss their digitalization opportunities with an external operator. This was supported by our previous research, which indicated that smaller companies find it useful to discuss digitalization with an external person to gain understanding and new insights into digitalization [15].

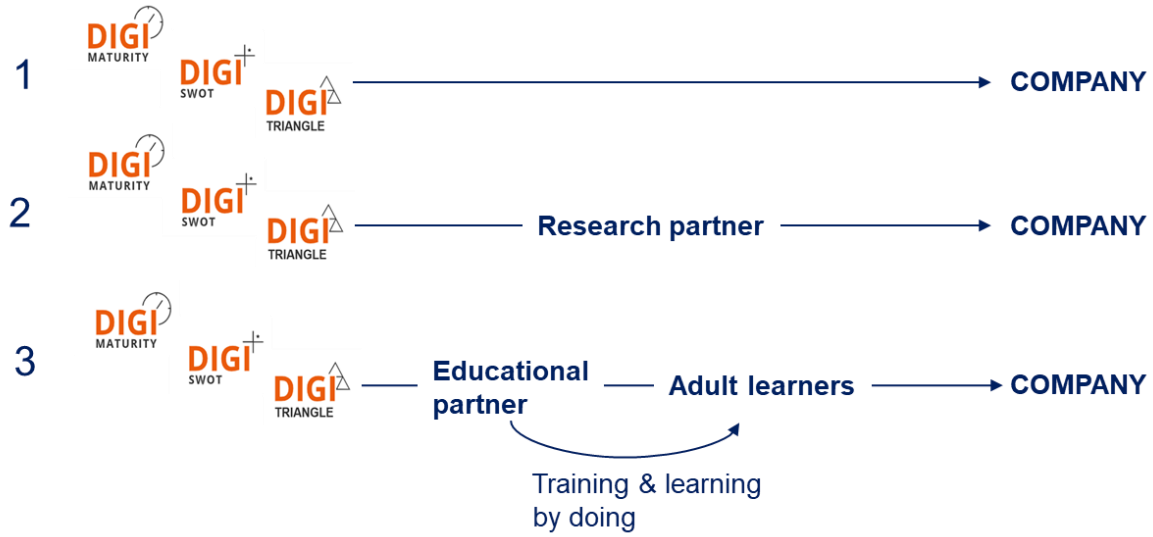

Fig. 2. Different usage scenarios of the digitalization status analysis

The second usage scenario relates to a situation whereby a researcher or other public sector actor is involved as an intermediary in helping an SME to use the tools and form interpretations of their digitalization results, providing insight into the potential of digitalization (Figure 3). This scenario was successfully tested and documented by Kääriäinen et al. [15]. The article describes how the research institute of the ApuaDigiin network helped 19 SMEs in the positioning phase of their digital transformation by using digital status analysis tools and methods, namely DigiMaturity, DigiSWOT, and DigiTriangle tools. Furthermore, the research institute continued with nine companies by coaching them through the subsequent phases of DT, namely current state review, road mapping, and implementation. The detailed experiences of the positioning phase effort have been analyzed and reported by Kääriäinen et al. [15]. However, in this scenario, the "intermediary" should have a strong understanding of the tools and digitalization to facilitate and support its assessment and finding improvement paths. In our case, the support work was done by a research institute that had been developing the service itself. Thus, it was already well acquainted with the tools and their application, which probably affected its success.

The problem with the second scenario is that the competence to conduct an analysis in the future does not permeate the company to enable it to analyze its future digitalization state. Nor will the second model develop new experts in digitalization status analysis and improvement for companies. Therefore, the third usage scenario relates to the idea of a trained "digital evangelist" and is inspired by the research literature. In this scenario, adult learners already working in organizations are trained to apply ApuaDigiin methods and tools as part of the training program. The group of students then assesses one organization's digitalization (one student's home organization) as a team. This way, so-called digital evangelists can be trained for the systematic development of digitalization. In the first two scenarios, this objective is

difficult to achieve since the use of a practical research-based model and tools, as well as an understanding of digitalization, will not permeate into the company.

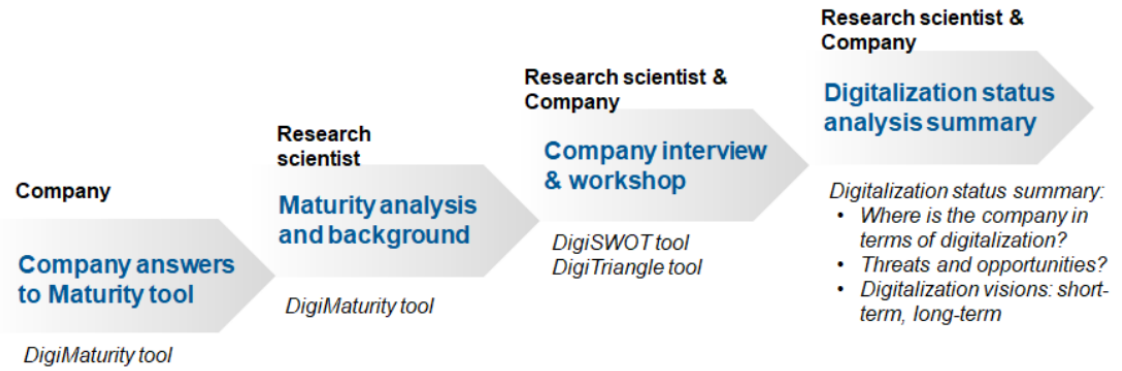

Fig. 3. The second usage scenario [15]

In this article, we present a study in which the digital evangelist approach has been applied to facilitate organizations' digitalization, focusing on the digitalization status analysis phase.

3.3 Research setting for testing the digital evangelist approach

This section presents the research method and question and explains how the research data have been collected and analyzed.

3.3.1 Research method and question

In this study, we adopt action research, allowing the researcher to engage with the training course students actively. Action research aims at transformative change through the simultaneous process of taking action and conducting research. Participatory action research (PAR) integrates research and action as a means to include the collection of data on the topic of investigation, analysis, and interpretation, as well as the planning and identification of action strategies to create positive changes [50]. The main idea of PAR is for research and action to be conducted with and for people rather than by experimenting on people [51]. Because of its approach, PAR enables the integration of research and practice so that the research informs and enhances practice and vice versa. Therefore, PAR differs from a case study approach, in which the researcher only acts as an observer of the studied subject or organization but does not engage in changing them [52].

The master's degree–level course entitled Leading in Digitalized Service Business at Lapland University of Applied Sciences in Finland aims to promote digitalization development in organizations. The goals of the course are such that after it, students will be able to analyze, evaluate, develop, and manage digital service businesses. All course participants have professional experience, and some already have experience in digitalization and its development in organizations. All higher education courses in Finland apply European Qualifications Framework (EQF) level 7 competence requirements [53]. Thus, the aim of studies leading to a master's degree is for graduates to have extensive and in-depth knowledge and the necessary theoretical knowledge to develop their careers in demanding specialist and management positions.

Furthermore, the aim is for students to have an in-depth picture of their professional field, its role in their professional life, and its social significance, as well as the ability to monitor and specify the development of research information and professional practice in the field. This is done at the course level by providing a theoretical knowledge base through lessons and students' individual research, as assigned during the course. Previously in the Leading in Digitalized Service Business course, there were lessons and an assignment whereby students familiarized themselves with VTT's DigiMaturity tool [48]. After this, they wrote an essay utilizing the latest theories and research articles concerning the

six dimensions of the DigiMaturity tool from their viewpoint or that of a selected company. The approach of the course was more theoretical than solution-oriented. The goal of the EQF7 level is for students to gain competence to develop their careers in demanding specialist and management positions. Therefore, Lapland University of Applied Science decided to include group work on practical digitalization status analysis in the course to enable students to achieve the required competences better.

Our practical aim was to provide students with the ability to analyze organizations' digitalization status systematically. We guided them to apply the method and tools of the positioning phase to carry out digitalization status analysis in target companies. From a research point of view, we were especially interested in studying the following question: how do the method and tools of the positioning phase of the DT model support the activities of a digital evangelist in a company? As described in the previous section, we refer to the digital evangelist approach as engaging intermediates trained to understand digitalization in companies and help those companies get started on improving digitalization.

The total number of students in the course was 31. The course started in September 2021 and ended in November 2021. Lectures provided students with an understanding of digitalization and digital business. The course included group work in which 11 groups of two or three students analyzed the digitalization status of one organization. Each group selected an organization to which one member belonged and analyzed its digitalization status (Figure 4). The groups then defined in more detail the unit of their target organization analysis (e.g., one department or whole organization). The unit of analysis was small (< 50 employees) in five groups, medium (> 50 and < 250 employees) in two groups, and large (> 250 employees) in four groups. Before the group work, the students were trained to use the digitalization status analysis method and tools.

Group ID		#1		#2		#3		#4		#5		#6		#7		#8		#9		#10		#11		In Total	
Domain		Mining /IT		Insurance		Energy		Consulting		Education /applied studies		Forest		Health services		Trade		Education /early childhood		IT		Education /vocational			
Organization (O) **T**argeted unit (T)		O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T
Size of O/T	> 250	x		x						x	x	x		x		x	x	x	x			x	x	8	4
	< 250 > 50		x			x							x							x				2	2
	< 50				x		x	x	x						x						x			1	5

Fig. 4. The characterization of the target organizations

3.3.2 Data collection and analysis

The research data comprised observations and notes from a results and feedback event, the groups' digitalization status analysis reports, and questionnaire responses. One researcher worked as a lecturer for the course and collected feedback for research purposes. This person was responsible for teaching the use of the method and tools. In addition, the person answered students' questions about using the tools and tried to ensure that they were understood and used correctly. The researcher also participated in the results and feedback event, where students presented the results of the digitalization status analyses they had completed for the target organizations. Each group compiled digitalization status analysis reports of their work comprising: a description of the target organization, how the tools were utilized, the analyses conducted, and the analysis report itself (showing the status of digitalization at the target organization and the improvement proposals). Observations from the results and feedback event were collected and documented as observation notes.

A questionnaire was also used to study the views of the course participants (see Appendix C). It aimed to determine how effective the method and tools were for the digitalization status analysis work and what kind of improvement proposals students identified related to the method and tools. The questionnaire was implemented with single-choice and Likert questions as well as open-ended questions using the Webropol tool. It was sent to the students (31 students) in November 2021. Answering the questionnaire was voluntary and anonymous.

All group reports were reviewed, and results and feedback session notes were interpreted to determine whether the method and tools were used and applied correctly and what kind of comments there were related to the method and tools. Additionally, the feedback from the questionnaire was analyzed. The research data from the questionnaire was transferred from the Webropol survey platform to Microsoft Excel. Thirty students answered the questionnaire. The material was then checked for errors, inconsistencies, and missing data. There were two single-choice background questions, two Likert-type questions related to the tools and method, and four open-ended questions. Open-ended questions resulted in a total of 53 free-text answers (90 lines of text). We used the descriptive technique [54] to analyze and describe quantitative data and content analysis [55] to analyze qualitative data. Two researchers analyzed the material from the open-ended questions by reading it several times and then categorizing it based on the respondents' interpretation of what worked well, challenges, and other observations.

4. Results

This research considers how the method and tools of the positioning phase of the DT model support the activities of a digital evangelist in a company in a setting in which adult learners carry out digitalization status analyses for a target organization.

The students produced digitalization status analysis reports of their group work. These reports were presented and discussed in a joint results and feedback session. The review of the group reports (digitalization status analysis reports) and observations from the results and feedback session supported the insight that all groups used the digitalization status analysis tools and workflow in an appropriate way. Principally, the groups also succeeded in identifying digitalization ideas and even divided them into short- and long-term ideas. The students saw the results and feedback session as an excellent opportunity to share their experiences with other groups and view practical example cases from different contexts.

The questionnaire seeking experiences and comments about the method and tools was sent to the 31 students, and 30 responses were received. Of the respondents, 27% indicated that they previously participated in developing their company's digitalization vision or strategy. The open-ended question asked how they were involved in this way. Most respondents said that their involvement had been in the form of making proposals for the digitalization of their organization. Subsequent questions were divided into two main sets: tools and the method. In addition, we asked respondents to describe what additional support or background information they would need to work as a digital evangelist at another company in the future.

We first look at how the students experienced using the digitalization status analysis tools. This was investigated using five Likert-scale statements and one open-ended question that enabled the students to comment on using the tools.

Figure 5 shows that over 70% (22) of the respondents felt that it was easy to select the appropriate answer from the DigiMaturity tool (Q1) and that the various answers had been discussed (Q2) in detail in groups. Discussion is essential for learning how to use the tool and what digitalization means in the different dimensions of the DigiMaturity tool in specific organizational contexts. Over 75% (23) of respondents indicated that the DigiSWOT tool was not difficult to fill in after the DigiMaturity tool was completed (Q3). Of the respondents, 60% (18) felt that it was easy to find digitalization improvement ideas, while ten (over 30%) responded neutrally, and two (~6.7%) felt that identification was difficult (Q4). Of the respondents, 60% (18) indicated that the components of DigiTriangle did not limit innovation in digi-ideas, while eight (over 26%) responded neutrally, and four (over 13%) responded that DigiTriangle limited innovation (Q5).

In the open-ended answers, the students considered the applicability of the tools for different situations. It was stated that the tools were suitable for small organizations. Nevertheless, when the company size is larger, it was found that limiting the analysis to a specific department or function and involving the right people in the organization was an essential approach for answering the DigiMaturity tool. This is understandable because as the size of an organization grows, understanding of its digitalization situation is scattered among different actors. This is related to understanding

the tool's application in different situations, which is part of the digital evangelist's competence—the ability to understand how and where the tools can be applied in an organization.

> *Everyone related to [digitalization] improvement must be involved in the DigiMaturity tool analysis. It is also required to delimit the area or function of the organization to get the most out of the tools.*
>
> *The [DigiMaturity] tool provided food for thought and taught us to understand the need for a digitalization strategy. For some questions, we had to change our perspective from the previous question to find the right answer from an organizational perspective.*
>
> *The tool sparked ideas and helped to understand the digitalization state of the organization on a large scale.*

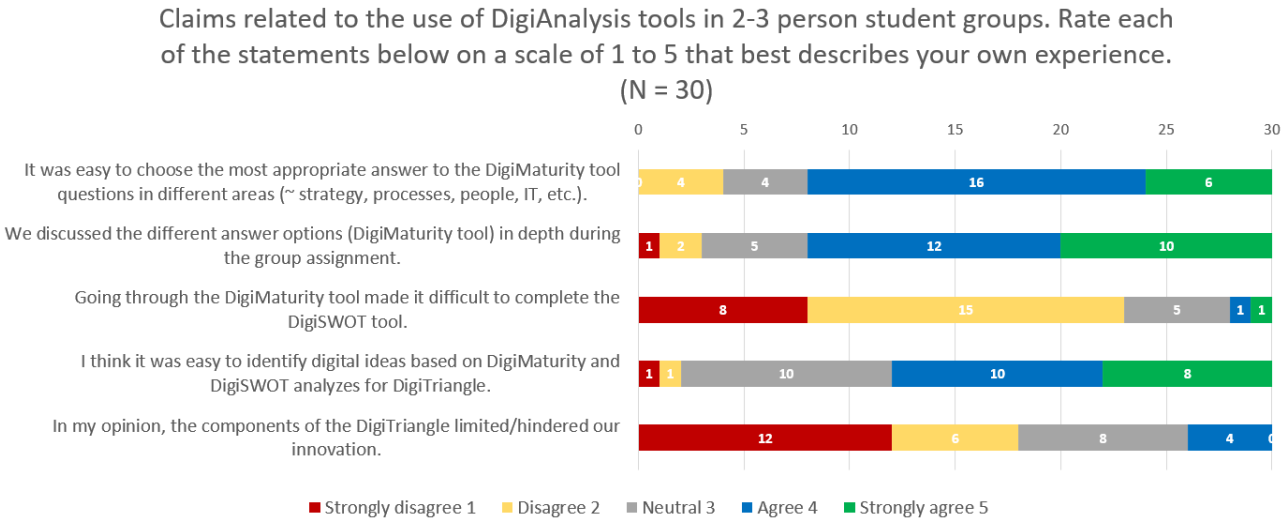

Fig. 5. Claims of the DigiAnalysis tools

However, some respondents found utilizing the tools to be challenging. For example, it was not easy to identify digitalization visions, although the respondents indicated that the tools had formed a logical step-by-step chain and facilitated this work.

> *At first, it felt like we were not getting external and disruptive digi-visions at all ... However, DigiMaturity helped with the SWOT analysis, and SWOT supported the making of the triangle. Yes, I will continue to use this tool.*
>
> *The DigiTriangle was the most challenging tool; staying at the SWOT level seemed easier.*
>
> *With the DigiMaturity tool, the transition from "level to level" was quite challenging to identify since the topics subject to assessment are pretty large and complex.*
>
> *The tools complemented each other in a logical order. DigiMaturity is extensive, and once it is done, you are pretty deep in the organization, and indeed it is easy to start looking for answers to the following tools.*

The students answered the claims related to the method (the tools' workflow) used in groups. This was also investigated with five Likert-scale statements and one open-ended question that enabled the students to comment on the method.

The method for digitalization status analysis presented in this article gave the students a better understanding of digitalization (Figure 6). The respondents felt that the method broadened their understanding of the concept (~85% (26); Q1), and they had gained the confidence that they could also apply the method at a new organization (~73% (22); Q5). Of the respondents, 60% (18) felt the method helped them understand the current status of digitalization in their target

organization (Q2). Moreover, just over 50% (16) of respondents indicated that the method helped them generate digi-ideas (Q3). This relates to the challenges of identifying digitalization improvement ideas using tools (see the tools-related questions). Of the respondents, 50% (15) estimated that the results had been useful for their target organization (Q4). Seven (over 23%) were neutral responses, and over 25% (8) felt that the results were not useful for their target organization (Q4). Although, this is difficult to estimate since only one person in each group was an "insider" in the organization. In contrast, the others had to evaluate an organization that was unfamiliar to them.

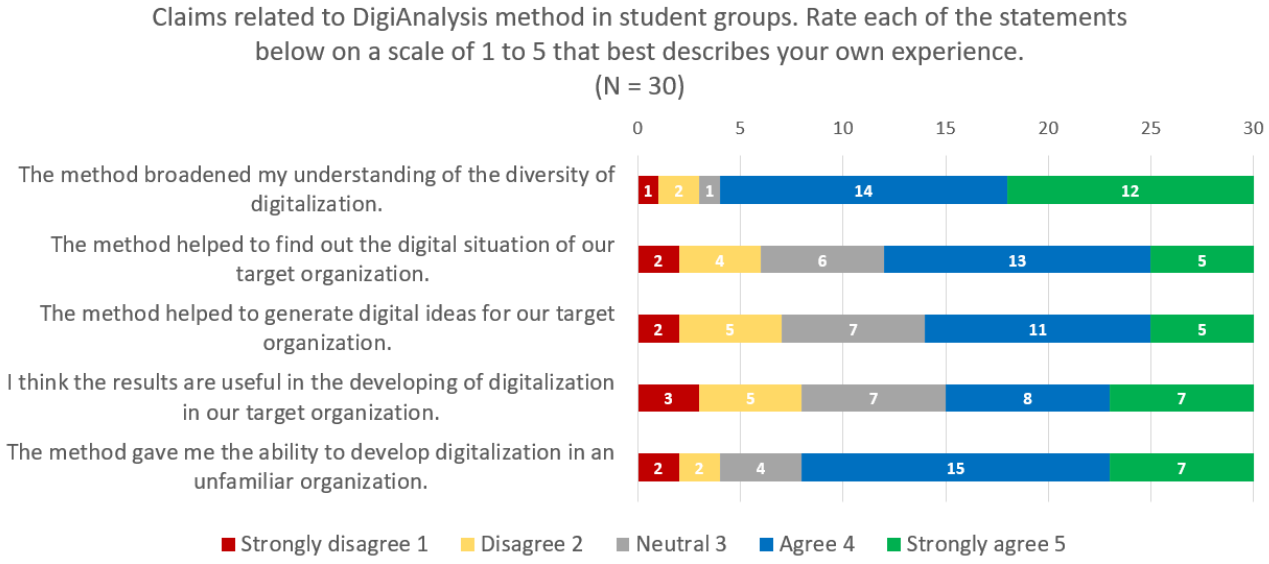

Fig. 6. Claims of the DigiAnalysis method

In the open-ended questions, it was identified as a challenge that only one person in each group knew the target organization well. Others found it more difficult to participate in the assessment. Nevertheless, several students also saw group work as positive since they could share ideas and discuss topics. The purpose of the course was for students to learn to operate in different situations, be an active part of a group, and be able to apply what had been learned. The results and feedback session broadened the students' views on digitalization, as they could hear the analyses made by other groups. The competence requirements at the EQF7 level require students to work independently, search for information, and apply theoretical knowledge in new operating environments. Still, based on the results, this seemed challenging for some.

> *The challenge was that one company was selected in the group that was familiar to only one student. Others found it challenging to participate in the analysis. It would have required significant initiative and interest from others.*
>
> *The working model made the group discuss the organization's digital solutions, from which one can also learn. At first, getting started was a bit sticky, but there was much discussion later.*
>
> *It was good to go through the topics together [the DigiMaturity tool]; it increased the discussion and different ideas on developing digital solutions in an organization.*
>
> *It was interesting to see and discuss [in the feedback session] how different organizations operate.*

Furthermore, we asked the respondents to describe what additional support or background information they would need to utilize the method and tools for future cases more effectively, even in an unfamiliar organization. For example, there was a need to understand better various digitalization and digitalization status analysis concepts, such as "disruptive change". Also, presenting practical example analysis cases would be beneficial for understanding the method and

digitalization. It was also stated that the students needed knowledge about how to justify digitalization for companies; this would be something that could be used to influence people's attitudes toward digitalization. The comments also highlighted the importance of background information on the organization being evaluated and that the right group of people should participate in assessing the status of digitalization in the target organization.

> *I still need more reasoning and ideas for digitalization to cope with the attitude problems toward digitalization and understand why digitalization is worthwhile. In many cases, even those with attitude problems know that digitalization brings benefits, but more reasoning is still needed.*
>
> *Access to accurate input data [from the target company] is a critical area that must be available in order to be able to work as a digital evangelist.*
>
> *Getting started was a bit sticky, and the task assignment went too fast. Some practical example cases could give me an idea of how to proceed.*
>
> *Probably, I need more understanding of disruptive change, what it means in practice, etc.*
>
> *The introductory lecture could have opened up tools and defined more complex concepts. If I were a digital evangelist in a company, I would have to understand the [digitalization] concepts and tools that I present very profoundly, so I should have better background knowledge of them.*
>
> *The analysis requires time and multi-level reflection. It is worthwhile to conduct the reflection with a larger group [finding the right people] in a company, but with clear guidance. Finding out the company's background information, together with the staff, is essential.*

5. Discussion

This research considers how external support units can facilitate SME digitalization. This was studied by examining how the method and tools for the positioning phase of the digital transformation model support the activities of a digital evangelist in a company in a setting where adult learners are equipped to carry out digitalization status analyses in target organizations. The method and tools have already been used successfully in research organization–supported analysis for SME companies [15]. This article complements previous studies by analyzing how this method and its tools can be utilized in new usage scenarios where adult learners are trained to carry out digitalization status analyses in target organizations and thus learn through the learning-by-doing principle to apply the method in practice.

Our results show that the method of training digital evangelists to improve digitalization in companies was proven to work, at least in terms of analyzing the digitalization status and getting started with digitalization improvement. Practical support and guidance for the digital transformation journey of organizations were also emphasized by Zaoui and Souissi [23], Ulas [28], and Sándor and Gubán [41]. Barann et al. [16] stated that an important issue in this context, especially from the SME companies' point of view, is using a practical approach for companies and not abstract frameworks. Moreover, they highlighted the integration of external supporters to help in the digitalization pathway who would preferably be free-of-charge supporters. This is needed since SMEs do not have the resources to develop their digitalization [29]. Ulas [28] further called for support for SME digitalization, such as through customized training programs or support and coaching initiatives. In our approach, adult learners were trained to apply the digitalization status analysis method and tools as part of the digitalization course and carry out (free-of-charge) analysis in their home organizations. In the best case, when these students return to their home organizations, they can continue digitalization improvement work using free-of-charge tools. It is also good to note that the digitalization status analysis carried out as group coursework was done in a safe environment (lecturers and researchers guiding students) for students to learn and discuss how to use the method and tools and gain hands-on experience in digitalization.

Our results show that challenges were also encountered. For example, we interpreted that students' initial knowledge should be more comprehensive before they engage in practical analysis work. This requires the teaching of more comprehensive digitalization concepts as well as providing practical examples. Räisänen and Tuovinen [31] state in their research that entrepreneurs find opportunities for digitalization engaging, but the unique vocabulary in the ICT

sector is not understood, and entrepreneurs would like to be shown concrete examples. To cope with this, they developed a workshop method that involved steps to clarify concepts, utilizing expert lectures and practical examples from other entrepreneurs to deliver peer learning. Ulas [28] advised SMEs to collaborate with SME helpers, innovation labs, and research institutions to guide them through current digitalization trends and demonstrate their importance based on practical examples (best-practice and real-life examples). It would also be useful for our approach, as the digitalization examples provided by business representatives are closer to the interest and experience of students already working in companies compared to research scientists providing examples. In practice, the course should be equipped with company case presentations, preferably presented by case company representatives. It would be relatively easy to achieve, as the target educational organization already uses recorded lectures (webinars) by the case companies in other courses; therefore, the operational model is familiar to the education organization. Also, analyzing digitalization in groups makes it possible for students to share their ideas and discuss them. However, this way of working requires students to have an active and participatory attitude; otherwise, they would not be able to participate sufficiently in the group work. Therefore, some adult learners must be encouraged to discuss group work actively. This should be highlighted at the beginning of the course since the competence requirements at the EQF7 level require this.

As discussed in Section 3, the method and tools used in this article result from long-term research and are part of the free ApuaDigiin web service and network. This service can be seen as a platform comprising methods, tools, and knowledge to support SME digitalization (Figure 7). This service incorporates external support units into digital transformation work to support SME digitalization efforts in practice. The network currently consists of educational partners, regional business development authors, research organizations, and associations (13 partner organizations in total) (Figure 7). There is already research evidence concerning publicly funded actor (research institute)–supported digitalization status analysis in this context [15]. On the other hand, the research reported in this article provides further empirical evidence of how educational partners can harness adult learners to carry out digitalization status analysis as part of their digitalization courses. In a broader scope, the ApuaDigiin approach also facilitates taking research results from universities and research institutes to support practical grass-root-level SME digitalization. It, therefore, contributes to the research impact and knowledge transfer from research to practical actions [12].

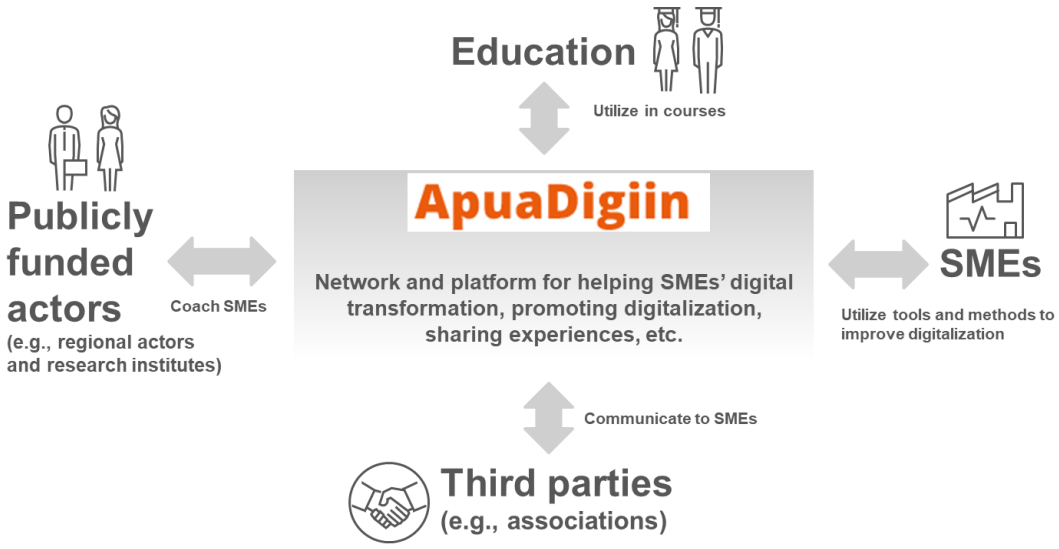

Fig. 7. ApuaDigiin network's stakeholders

6. Conclusion

This article contributes to the discussion of the digital transformation of SMEs and how publicly funded organizations can support it. The DT of SMEs is challenging since companies typically do not have the resources to advance it. Therefore, there has been a discussion on how public sector organizations can help in this. Our article examines how adult learners with professional experience can be trained as digital evangelists to facilitate the improvement of digitalization in companies. Our research sheds light on how digitalization status analysis can be supported as part of a course organized by an educational organization. The results show that the method and tools work in the context presented in this study. Based on these experiences, the proposed model and open tools may also be applied in other educational organizations to help teach new digitalization skills and perform practical digitalization status analysis in companies. Therefore, this study's findings benefit educational professionals interested in educating students to help SMEs along their digitalization pathway. This would promote how educational actors can support SME digitalization using open, free-of-charge tools and train adult learners to improve digitalization in their home organizations. The article also contributes to the discussion of how the research results of universities and research institutes can be transferred to practice. Moreover, the results will allow the positioning method and tools to be further developed and new user organizations to be included in the evolving ApuaDigiin open network to take advantage of the methods and tools available.

Limitations and future research

The results of the study cannot be interpreted without considering the limitations. Our study is based on eleven practical digitalization status analysis cases, of which seven were focused on SME organization units, and four were large organization units. This naturally limits the generalizability of our findings, and we need further experiments, especially in SME companies. It would also be interesting to study micro-sized companies since their digitalization has proven problematic [49]. Moreover, our research did not follow the DT process onwards to collect evidence on which digitalization ideas will be implemented in the case organizations in the future. This would require a longitudinal study and long-term access to case organizations, but it would be a fascinating future research topic. Finally, future practical improvement practices of ApuaDigiin should consider the systematics of how new research-based methods and tools can be incorporated into its service catalog, as was also stated by Sassanelli et al. [37] in their study, by referring to the concept of a service pipeline.

Acknowledgments

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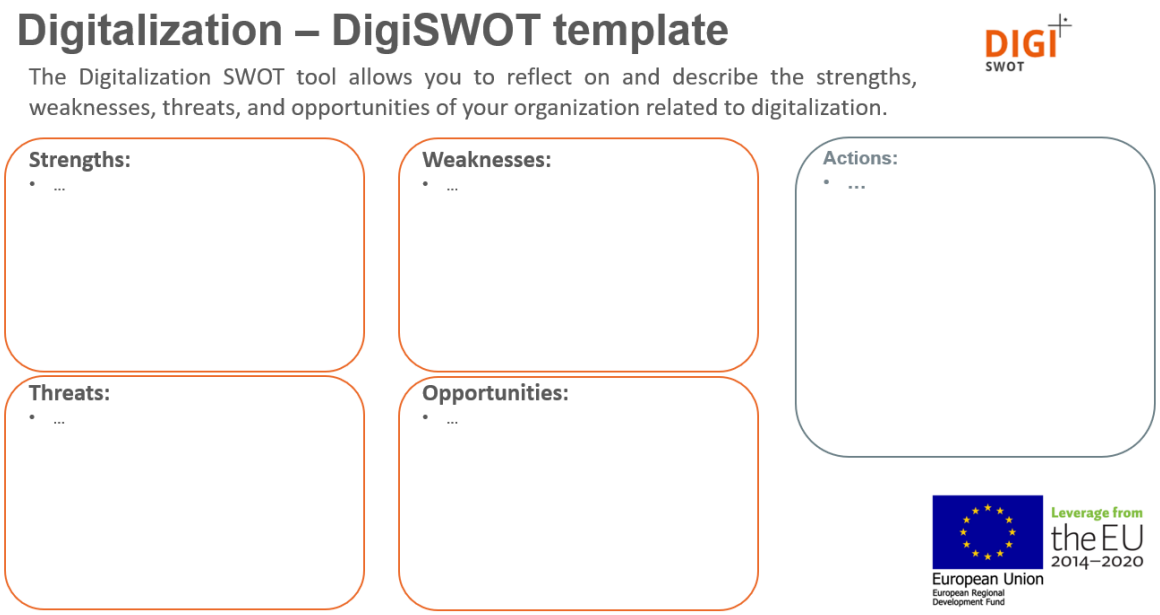
Appendix A. DigiSWOT template



Guidelines – DigiSWOT template

DIGI SWOT

Write the results of the analysis and actions in the boxes. Save the document containing your SWOT analysis for future development iteration rounds.

The DigiSWOT tool is used to analyze the strengths, weaknesses, threats, and opportunities of digitalization in a company.

- Strengths: What do you see as the strengths of your organization in leveraging digitalization?
- Weaknesses: What do you see as weaknesses in your organization to take advantage of digitalization?
- Threats: What do you see as threats to leveraging digitalization in your organization?
- Opportunities: What do you see as opportunities in your organization to take advantage of digitalization?

Based on the SWOT analysis, the company should consider the following issues and define actions based on them:

- How can digitalization strengths be utilized better?
- How can digitalization weaknesses be turned into strengths?
- How can opportunities be seized?
- How can threats be avoided?

Make a practical action plan for how to proceed in your organization.

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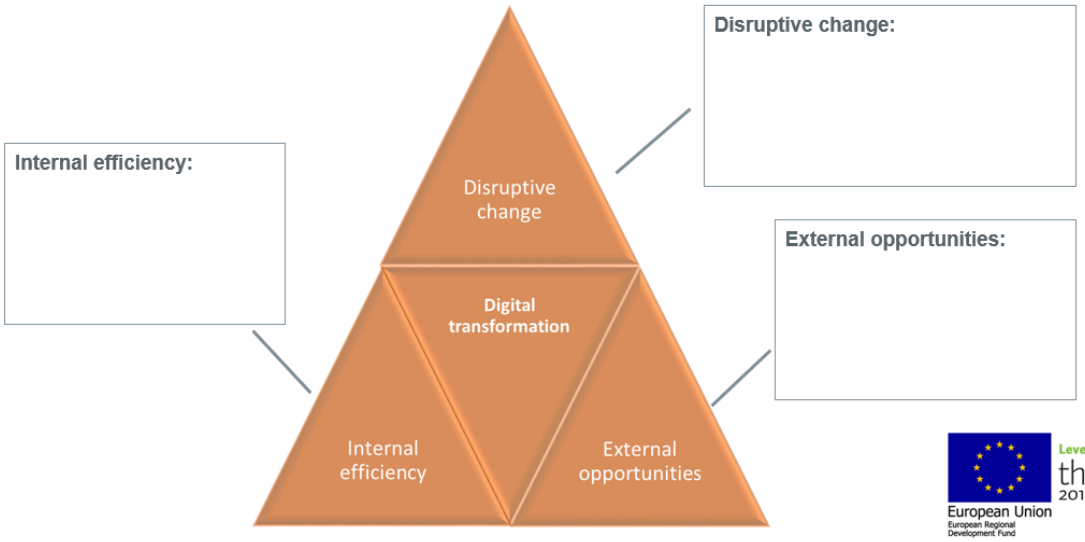
Appendix B. DigiTriangle template

Digitalization – DigiTriangle template

DIGI TRIANGLE

Use the digital transformation triangle to ideate and visualize the organization's digitalization improvement ideas. The triangle divides the improvement ideas into three areas: internal efficiency, external opportunities and disruptive change.



Leverage from the EU 2014–2020
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Appendix C. Questionnaire template

Dear recipient,

We welcome you to answer the survey, with which we will gather your experiences and thoughts on how the DigiAnalysis tools (DigiMaturity, DigiSWOT, DigiTriangle) and method used in the course and group work performed in regards to achieving the course's competence goals.

Answering this questionnaire is voluntary and anonymous. All responses will be treated as anonymous and confidential. All data will be stored securely, and all answers will be treated confidentially. The data will be analyzed using qualitative and quantitative research methods so that individual answers cannot be identified.

1. Have you previously (before the course) participated in drafting the company's digital visions or developing the digitalization strategy?
    - ○ Yes
    - ○ No
2. If you answered "Yes" above, describe what you have done in more detail.
3. What is the size of the target organization you selected?
    - ○ Small (1–50 employees)
    - ○ Medium (51–250 employees)
    - ○ Large (over 250 employees)

4. Claims related to the use of DigiAnalysis tools (DigiMaturity, DigiSWOT, and DigiTriangle) in two to three -person student groups:

Please, rate each of the statements below on a scale of 1 to 5 that best describes your experience.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

Claims	**1**	**2**	**3**	**4**	**5**
It was easy to choose the most appropriate answer to the DigiMaturity tool questions in different areas (~ strategy, processes, people, IT, etc.).					
We discussed the different answer options (DigiMaturity tool) in depth during the group assignment.					
Going through the DigiMaturity tool made it difficult to complete the DigiSWOT tool.					
I think it was easy to identify digital ideas based on DigiMaturity and DigiSWOT analyzes for DigiTriangle.					
In my opinion, the components of the DigiTriangle limited/hindered our innovation.					

5. Please, write below (freely and if you wish) your observations about using the tools.

6. Claims related to the DigiAnalysis method in two to three -person student groups.

Please, rate each of the statements below on a scale of 1 to 5 that best describes your experience.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

Claims	**1**	**2**	**3**	**4**	**5**
The method broadened my understanding of the diversity of digitalization.					
The method helped to find out the digital situation of our target organization.					
The method helped to generate digital ideas for our target organization.					
I think the results are useful in the developing of digitalization in our target organization.					
The method gave me the ability to develop digitalization in an unfamiliar organization.					

7. Please, write below (freely and if you wish) your observations about the working process during the course (DigiAnalysis method).

8. Please, describe your opinions (freely) below. What kind of additional support or background information did you miss during the course that would enable you to better utilize the method and tools in another company in the future?

Biographical notes

Jukka Kääriäinen
Jukka Kääriäinen works as a senior scientist at VTT Technical Research Centre of Finland Ltd. He received his PhD degree in 2011 and Licentiate degree in 2007 in Information Processing Science from the University of Oulu, his MSc degree in 1999 in Information Processing Science from the University of Kuopio and BSc degree in 1994 in Industrial Engineering and Management from the Walter Ahlström Institute of Technology. He has over 20 years of experience with digitalization, configuration management and application lifecycle management. He worked as a project manager of the DigiLeap European Regional Development Fund (ERDF) project that piloted and published tools and methods for the digitalization of SME companies. The project published the ApuaDigiin digitalization support online service for SME companies. Currently he works as the coordinator of the online service. He has worked as a project manager or researcher in several Prime Minister's Office's analysis, assessment, and research activities -projects related to digitalization. Furthermore, he has worked as a project manager, work package manager or researcher in various national and European research projects - such as ITEA, ITEA2, Artemis, Business Finland, EU and European Regional Development Fund (ERDF) projects.

Leila Saari
Leila Saari received her MSc degree from the University of Oulu, Department of Information Processing Science 1993. Currently she is a senior researcher in the Cognitive Production Research Area at VTT. From January 2018 to June 2019, she acted as the facilitator of Analytics plus growth network, an alliance of Finnish data analytics, machine learning and AI companies. The network is part of one AI Digital Innovation Hub (DIH), SuperIoT. Currently she is the contact person for AI maturity and willing to talk with the companies and organizations that have assessed their AI maturity with our free on-line tool. In May 2019 she completed the AI diploma organized by Aalto University and Helsinki University. During 2019 she contributed to the DigiLeap project that piloted and published the tools and methods supporting the digitalization of SMEs at ApuaDigiin online service.

Maarit Tihinen
Maarit Tihinen works as a principal lecturer for the master's degree programs at Lapland University of Applied Sciences. She is responsible for the curriculums of Expert in Foresight and Development as well as Service Management in the Digital Era. In addition, Tihinen participates strongly in various RDI activities and she is a certified Project Manager (IPMA-C). Tihinen graduated in department of Mathematics from the University of Oulu in 1991 and received her PhD in 2014 in Information Processing Science from the University of Oulu, Finland. Tihinen has worked in several national and international research and customer projects, and written scientific publications for both international conferences and journals. Her research interest includes topics of education, foresight, management, digital transformation, the Industrial Internet, business ecosystems and models as well as sustainable development.

Sari Perätalo
Sari Perätalo works as a doctoral researcher for Martti Ahtisaari Institute in Oulu Business School. Her thesis is on smart city business models. Specifically, she is interested in business models, strategies, and ecosystems. In addition, she has worked in several national and international projects of digitalization since 2016, for example in DigiLeap project creating new tools for SME companies for digitalizing their services and developing their business models.

Timo Koivumäki
Dr. Timo Koivumäki is an associate professor of Business Analytics at Martti Ahtisaari Institute, Oulu Business School. Previously he has worked as a professor of digital service business in OBS and as a research professor of mobile business applications at VTT Technical Research Centre of Finland. Koivumäki has over 20 years of experience in digital business research. His research interests include business analytics, consumer behavior, and digital service business.