Smart SME's

Co-financed by the European Parliament through the

Alpine Region Preparatory Action Fund (ARPAF)

Smart SME's

WP 3 Collection of good practices and existing tools

SYNTHESIS REPORT

August 28, 2020

Prepared by:

Assist. Prof. Dr. Aida Kamišalić Latifić

This report was produced within the framework of the Smart SME's project funded by the Alpine Region Preparatory Action Fund (ARPAF). The report has been prepared by assist. prof. dr. Aida Kamišalić Latifić, UM-FERI, Slovenia, and it includes summarized results of the desk research and analysis activities conducted under Actions 3.1 (desk research on knowledge transfer on digitalization of SMEs), 3.2 (SWOT analysis of existing good practices and tools for the digitalization of SMEs) and 3.3 (Bottlenecks and constraints). The author would especially like to thank dr. Tina Beranič, Martina Šestak, Katja Kerman, Špela Pečnik and Patrik Rek for their support, inputs, and helpful suggestions. The author is also thankful for valuable contributions submitted by all project partners and contributors, which helped to carry out project activities within this work package: BIOPRO Baden-Württemberg GmbH from Germany (Olga Boyarintseva and Julia Hartmann), Hub Innovazione Trentino – Fondazione from Italy (Elisa Morganti, Silvio Antonioni, Luca Mion, Silvia Gaspari, Angela Lenzi and Elisabetta Sovilla), ecoplus GmbH from Lower Austria (Erika Shwaiger and Simone Hagenauer) and Anteja ECG d.o.o. from Slovenia (Darja Osvald and Mateja Dermastia).

For the purposes of this report, the farmers or any form of non-government business units formed with intention of making economic activity or producing the raw material for bio-based value chains shall be understood as SMEs and included in the report.

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1 Introduction

Following the analysis of the current state of digitalization of SMEs in selected regions/countries within the Alpine space, WP3 includes a set of activities aimed at analyzing knowledge transfer activities and practices within each region/country, which help SMEs to receive the necessary information and knowledge on how to digitalize their business.

Overall, different activities were performed in order to achieve the following objectives of WP3 package:

1. Identification and collection of existing good practices and tools for digitalizing SMEs, evaluated by SWOT analysis.
2. Identification of existing bottlenecks and constraints in implementing digitalization into companies.
3. Development of a digitalization plan for SMEs based on discovered good practices and tools.
4. Specification of a methodology for assessing the maturity of the digital value chain (VC).

In order to focus on specific knowledge regarding digitalization most relevant for SMEs, a research methodology has been established, which was followed by all project partners throughout research activities. In addition to identifying examples of knowledge transfer, the desk research also includes the identification of existing good practices and tools, which SMEs in a given region/country used to carry out their digitalization efforts. Special attention is given to how these practices and tools influenced the company's business in terms of the skills of the staff, methods, technologies and tools, and new value generation.

The collected examples of good practices for knowledge transfer are then analyzed using the SWOT (Strength, Weaknesses, Opportunities and Threats) technique in order to gain insights into the strengths and weaknesses of various practices developed in given regions/countries.

In Chapter 2, summarized results of the analysis of the current state-of-the-art on SMEs digitalization in project partners' regions/countries are presented (Action 3.1), as well as an analysis of existing indicators used by these regions/countries to measure the level of digitalization of their SMEs. These results were obtained based on the results produced by all project partners in the previous work package (WP2).

Chapter 3 contains an overview of examples of knowledge transfer on digitalization to SMEs identified by project partners for every region/country during Action 3.1. Each example is briefly elaborated and categorized depending on the source and primary participants involved in the

knowledge transfer process. Throughout the desk research, examples were analysed with respect to their contribution to the development of digital skills of SME employees, a better understanding of methods and the digitalization process, technologies and tools supporting the digitalization process, and the generation of new value for SMEs.

In Chapter 4, as part of Action 3.2, the SWOT technique has been applied on identified practices and tools for the digitalization of SMEs in order to identify the benefits and current drawbacks of practices coming from different sources (government, research centres, or private sector initiatives).

As part of Action 3.3, a desk research on the existing indicators and digital maturity level assessment indexes was performed to obtain a comprehensive list of indicators, which can be used to measure the level of digitalization of SMEs in natural fiber-based value chains in general. The final list of indicators is enriched with new indicators that were proposed based on measurements introduced in the scientific literature. The description of the methodology and the resulting list of indicators are presented in Chapter 5.

In Chapter 6, the main bottlenecks and constraints for the digitalization of SMEs are identified based on the results of the SWOT analysis. For each source level (government, research centres and private sector), the weaknesses and threats for its practices are further analysed to categorize them into groups of constraints based on similar issues that they address. For each identified group of constraints (e.g. digitalization climate, support mechanisms), some recommendations are given on possible mitigation strategies.

Finally, the overall results and activities performed within WP3 are summarized in Chapter 7, where the most important findings of all activities are briefly discussed.

2 Current state of digitalization of SMEs in Alpine space countries

Within this project, the state of digitalization of SMEs has been analyzed for the following regions/countries: Baden-Württemberg (Germany), Lower Austria, Trentino (Italy), and Slovenia. In general, the digitalization level of these Alpine space countries is measured by the Digital Economy and Society Index (DESI), an index developed by the European Commission to measure each country's digital competitiveness through a pre-defined set of indicators (e.g. connectivity, integration of digital technology, etc.). In addition to the DESI index, some of the afore-mentioned regions/countries developed some custom mechanisms to measure the success of their digitalization efforts (e.g. Digital Intensity Index in Slovenia, digital maturity level assessment in Trentino). As one of the outputs of WP3, a comprehensive survey of indicators for assessing the digitalization level of SMEs will be presented and complemented by new indicators identified through WP3 activities.

In the Lower Austria region, SMEs take up 99.9% in the total number of companies[1], which operate in diverse sectors and branches and are grouped into thematic clusters (e.g. Food Cluster of Lower Austria, Plastics Cluster, Mechatronics Cluster, etc.). The digitalization efforts are supported by the Digitalization Strategy Lower Austria[2] published by the Lower Austrian Department of Economic Affairs [1]. The Digitalization Strategy addresses skills, infrastructure and new solutions and supports various activities such as awareness raising events, training and education, R&D projects, broad band infrastructure and e-government solutions. The lighthouse project of the strategy is the digital innovation hub "House of Digitalization" co-funded by the Regional Government and ERDF, which will be discussed later. In general, digitalization is seen as a chance to "modernize" SMEs' business models. To increase their domestic and foreign market visibility and facilitate the usage of modern "smart" technologies in their business, the Lower Austrian region focusses on four research and development locations in the region called "technopoles". Technopoles represent hubs of research institutes, educational institutions, and companies in very specific technology niches coordinated by the regional business agency *ecoplus, f.e. the Technopole for bio energy, agro- and food technology in Wieselburg*. With the help of this technopole, SMEs included in the agricultural value chain analyzed within this project, may optimize the crop rotation, pest control, modernize their working machines, develop strategies for early disease detection, etc.

[1] https://www.ecoplus.at/media/6518/noe-facts_englisch_bf.pdf

[2] http://www.noe.gv.at/noe/Topics-in-English/Digitalization_Strategy.html

In the Trentino region in Italy, 88-89% of companies within the general economic sector are SMEs [2]. The Trentino ecosystem is continually investing efforts in the modernization of manufacturing sectors. Even though the size of companies in Trentino is rather small, with the help of a number of public and semi-public research institutions (e.g. University of Trento, Bruno Kessler and Edmund Mach Foundations, Digital Innovation Hub Trentino, etc.) the local SMEs are still able to innovate their businesses. In the agricultural value chain, their innovation efforts are mostly directed towards precision farming and artificial intelligence-driven technological operations and developing novel business models for agri-food production. Besides research institutions coming from public or private sectors, the region itself supports SMEs digitalization efforts through numerous funding opportunities, support in innovation projects, technology transfer services, and others, which follow guidelines described in the official Italian Industry 4.0 strategy. At the moment, the strategy resulted in 22 Digital Innovation Hubs, 89 Punti Impresa Digitale, and various Competence Centres being started to provide various services (digitalization included) to SMEs, which will be further analysed later. In the Trentino region, Digital Innovation Hubs can use the digital maturity level assessment custom survey to measure the digitalization index of SMEs. According to [2], the most severe difficulties which SMEs face in their digitalization efforts is the lack of knowledge on innovation (i.e. funding opportunities).

In Slovenia, 99,8% of SMEs has been part of the general economic sector in 2017, where 85% of them are included in the fiber-based sectors (e.g. furniture, food processing, etc.) [3]. Several research and development platforms, such as different Strategic Research and Innovation Partnerships (SRIPs), The Wood Industry Cluster, InnoRenew Centre of Excellence and others, focus their work towards gathering SMEs, research institutions, investors and other interested parties in order to facilitate economic and innovation growth of SMEs from different value chains. Knowledge on digitalization is available to SMEs through technology parks (e.g. Styrian Technology Park), Digital Innovation Hubs (DIH), university incubators, Digital vouchers, and other practices, which will be discussed later. Apart from the public government incentives, various initiatives and research centres have been started in collaboration with companies with the aim of developing a knowledge base on digitalization for SMEs. Since the countryside broadband connection has been identified as one of the main digitalization obstacles, the Slovenian government is investing heavily in building a cyber-security network, which covers rural areas as well.

2.1 Analysis of existing SME digitalization level indicators in Alpine space countries/regions

In Slovenia, Germany, and Italy, different assessments of the level of digitalization in SMEs were identified in WP2 activities. For instance, Slovenia uses the Digital Intensity Index that consists of 12 specific indicators, which monitor the use of ICT in enterprises with at least ten employees. Germany (Stuttgart region) uses the Digital Economic Index to assess the degree of digitalization in economy. The index focuses on three themes: the usage of digital devices and infrastructures, the digital development of enterprises, and business success through digitalization. Last is the Digital Maturity Index, used in the Trentino region, which provides SMEs with an assessment of their digital maturity by analysing their business processes (design and engineering, maintenance, human resources, production, supply chain, quality, logistics, marketing, sales, and customer service, and monitoring and control). The stated processes are evaluated with respect to four dimensions of analysis:

1. Monitoring and control,
2. Technologies,
3. Execution, and
4. Organization.

For the analysis of the current level of digitalization, the dimension related to technologies is especially relevant.

An overview of indicators relevant for measuring the level of digitalization is presented in *Table 1*. Since the Lower Austria region does not have any country-specific measurements aside from the European DESI index [4], this region was not included in the analysis.

Table 1. Indicators used for measuring the digitalization level in Alpine space countries/regions.

Slovenia	**Germany**	**Italy**
Digital Intensity Index (DII)[5]	**Digital Economic Index (DEI)**[6], [7]	**Digital Maturity Index (DMI)**[8]
Enterprises in which more than half of persons employed use computers with Internet access for business purposes.	More than the half all employees uses: - Stationary devices - Mobile devices - Digital services - Digital infrastructures	Human resources (ICT systems, technologies, hardware/software used to support the processes).

Enterprises employing ICT specialists.	Digital developments in companies - Share of digital processes - Strategic involvement - Investments in digitization	
Enterprises provided more than 20% of the persons employed with a portable device that allows a mobile connection to the Internet for business use.		/
Maximum contracted download speed of the fastest fixed Internet connection is at least 30 Mbit/s.		
Enterprises have a website.		Marketing, customer service and sales (ICT systems, technologies, hardware/software used to support the processes).
Enterprise website provides at least one of the advanced functionalities.		
Enterprise website has links or reference to the enterprise social media profile.		
Enterprises purchase medium or high cloud computing services.		
Enterprises were sending e-invoices for automated processing to other enterprises or public authorities in the previous year.	Business success through digitization - Influence of digitization on corporate success - Sales with digital offers - Degree of digitization of the offer	
Enterprises pay to advertise on the Internet.		
Enterprises generated at least 1% of their turnover in the previous year via computer networks – with orders via websites or via electronic data interchange (EDI).		/

Enterprises generated more than 1% of their turnover via web sales and more than 10% of their web sales to private customers.		

When comparing the three indicators, several overlapping areas can be identified. All indexes measure the use of digital technologies by the employees in SMEs, such as the use of devices, or access to the internet. Furthermore, the DII and the DEI both assess investment into ICT, such as employing ICT specialist, providing employees with mobile devices, having a website (Slovenia), or evaluate generally digital developments in SMEs regarding the share of digital processes, strategic involvement, and investments in digitization (Germany). When it comes to the DMI, this aspect is partially measured through the assessment of the ICT use in marketing. Furthermore, all indexes measure to some extent, the use of ICT when it comes to commerce and related business processes of SMEs. Specifically, the DII measures the use e-invoices as well as online advertisement, the DEI measures the digitalization of the offer and digital sales, and the DMI assesses the use of ICT in marketing, customer service, and sales. Lastly, the DII measures business success through the use of ICT, similarly to DII, which estimates how much turnover was generated via computer networks and web sales.

3 Knowledge transfer on the digitalization of SMEs

According to the results of the analysis of the current digitalization level performed by all project partners, one of the biggest hurdles to increase the digital maturity level of a given region/country's SMEs is their limited access to the relevant information regarding digitalization opportunities. To deal with this challenge, regions/countries within the Alpine space developed a series of mechanisms and practices aimed at their SMEs in given value chains to help facilitate the transfer of knowledge on digitalization from research institutions and universities to the private sector. Their successful implementation in those regions/countries shows that the barriers between research-driven institutions and SMEs can be reduced, and that the cooperation between the two can bring various benefits (e.g. increased digital maturity level of the region/country, higher product quality, innovative products and methodologies, etc.).

In the context of digitalization, knowledge can be shared and transferred in various aspects and levels. Specifically, throughout desk research activities, knowledge transfer has been studied in the following four dimensions:

1. **Skills of the staff** – refers to activities, such as workshops or trainings for employees, which aim at improving the employees' skillset in working with digital technologies,
2. **Methods** – refers to different mechanisms and endeavours for sharing the "know how" about the digitalization process to SMEs,
3. **Technologies and tools** – refers to various IT solutions, such as platforms or websites, used to share knowledge on digitalization, and
4. **New value generation** – refers to innovative approaches, such as using machine learning or blockchain technologies, which generate new value and knowledge for participants.

During the desk research activity, each project partner identified several examples of knowledge transfer on digitalization available within their region/country to SMEs in general, as well as in a selected value chain. For each identified example, a detailed analysis was performed in order to determine stakeholders participating in knowledge transfer for this example (e.g. SMEs, local government, universities, etc.), as well as how this example contributes to each of the aforementioned dimensions, in which knowledge transfer on digitalization is possible.

In the following subsections, the examples of knowledge transfer on digitalization identified by all project partners (Baden-Württemberg, Lower Austria, Slovenia, Trentino) are summarized and briefly elaborated. Furthermore, the detailed results regarding the identified knowledge transfer examples are presented in tables for each region/country in Appendix A.

It is possible that a given example does not contribute to knowledge transfer in all four dimensions, which was noted by "-" table entry for the example in question.

Following the identified examples of knowledge transfer, the project partners also performed activities to identify good practices and tools for the implementation of digitalization in non-technology-oriented SMEs within their region/country. Apart from a detailed analysis of the good practice/tool in terms of its impact on the SME's skills of the staff, methods, technologies and tools, and new value generation areas, the results of this activity include describing companies that introduced the good practice/tool example and their reasons for the implementation of digitalization in general.

Overall, the identified possibilities, opportunities, and solutions for knowledge transfer on digitalization for SMEs are divided into three categories (levels). These categories are based on the source of provided solutions, and are identified as following:

- Public (funding) schemes
- Innovation or research hubs, centres or networks
- Private sector solutions

The first category encompasses different government initiatives, to which SMEs in each region have access to in terms of public schemes, aiming to enable digitalization in enterprises. More specifically, this category includes laws, public funding or subsidies, that assist enterprises in implementing projects, related to the digitalization.

The second category consists of solutions that are provided by publicly funded or non-profit organizations, such as innovation hubs or research centres. These research and development (R&D)-oriented associations assist SMEs in their digitalization-related projects in several ways, such as providing assessments, guidance in applying for funding opportunities, connections or networks with HE institutions and other experts, etc.

The latter category represents solutions that are provided by private enterprises or organizations. The main difference between the second and the third category is that the enterprises, providing solutions in the third category are privately funded and usually provide precise and targeted solutions. Throughout the analysis of examples of knowledge transfer, we were able to identify only a few such enterprises.

3.1 Baden-Württemberg (Germany)

3.1.1 Examples of knowledge transfer

The first example from the Stuttgart region (Germany) is *The Digitalization premium support* project, funded by the Ministry for Economic Affairs, Labour and Housing of Baden-Württemberg. The project supports SMEs in introducing new digital solutions and improving IT security in the form of subsidized bank loans. The example has the potential of knowledge transfer in all four dimensions, as it can be used to promote trainings for employees (contribution to skill of the staff), acquire ICT software and hardware knowledge (contribution to methods), for digital solutions in production and processes, in products and services and in strategies and organization (contribution to technologies and tools), as well as bringing added value to bio-based (among other) VCs (contribution to new value generation).

The second example comes from the *"go-digital"* program, funded by the Federal Ministry of Economics and Energy, supporting SMEs in advancing their digitalization. The program provides funding for consulting services, to keep pace with technological and social developments in online trade, digitalization of everyday business life, and need for IT security. The project has the potential to contribute to skills of the staff through consultation on acquiring the funding, to methods through practical consulting, and services to keep up with various technological developments, as well as contributing to technologies and tools through services related to IT security, digital market development, and digitalized business processes.

The following identified example falls into the category of Innovation/research hubs/centres. The *DigiLand* example provides farms within the region with reference models along the nutritional value chain, in order to increase sustainability. The project operates within KMUdigital Lab and connects SMEs in the agriculture VC with HE experts, potentially contributing to the skills of the staff through the adaptation of reference models. Furthermore, through providing them with reference processes, organizational models, and technology radar, the program can contribute to methods, as well as tools and technologies. The new prototype technology that was derived based on a process map across the entire VC enables effective design and implementation of digitalization, contributing to new value generation.

The example of *FarmBlick* falls into the Private sector solutions category. The FarmBlick start-up company provides services to farmers in order to support them in precision farming and conversion to digitalization. The company contributes to skills of the staff by providing them with services needed for precision farming, such as consulting and workshops regarding required skills (how to satellite maps, take soil samples, etc.) and providing them with a

platform for the exchange of ideas. The company offers the possibility of renting special technical equipment to try it out, contributing to technologies and tools. Last, adaptation of precision farming can lead to more effective production, and the reduction of resources used, contributing to new value generation.

3.1.2 Identification of good practices and tools

Last is an example of SME that has successfully digitalized its business processes. Specifically, it comes from a carpenter company that has completed the digital chain in its business processes. Through the adaptation, the staff has improved their digital skills (e.g. video technologies), and digitalization has contributed to methods, as well as technologies and tools, by allowing the customers to be a part of the manufacturing process. Specifically, through digitalization, customers can choose preferable materials through video, and employees can track their working time through a mobile app. Furthermore, through the digitalization of all customer and production data, a new value is generated (e.g. the data can be accessed by both customers and employees at any time).

3.2 Trentino (Italy)

3.2.1 Examples of knowledge transfer

The first example from the Trentino region in the category of public sector solutions is the "*Provincial Law on Business Incentives*", providing funding for investments for companies in the craft, trade, cooperation, industry, and tourism sectors. The funding scheme contributes to methods by providing funding for consulting services regarding innovation, pilot actions, market analysis, and ICT technologies. Through investment funding for innovation, growth, digitalization, and wideband for new enterprises, the funding scheme can contribute to technologies and tools of the enterprises. The funding can also be used for industrial research and development in collaboration with research centres, contributing to new value generation.

The *Innovation Manager Voucher* is another example of solutions provided by the public sector, specifically by the Italian Economic Development Ministry. The vouchers provide the introduction of an innovation manager in SMEs, to implement key enabling technologies and modernize the enterprise. The level of digitalization is increased through provided vouchers for consultation and analysis, contributing to methods of SMEs. Furthermore, the vouchers enable the introduction and implementation of key technologies, as well as implementation of

innovative projects, and hence, contribute to technologies and tools, and new value generation.

Regarding the solutions provided from innovation/research hubs or centres, the Chamber of Commerce provides the "*Punto Impresa Digitale*" service to SMEs. Specifically, the service structure promotes the digitalization culture and dissemination through the creation of network of organizations, assisting enterprises in the digitalization process. Workshops, as well as educational events and trainings, are offered to SMEs to contribute staff's skills by increasing knowledge regarding digital technologies. Furthermore, by providing mentoring support in the identification of best strategies, the SMEs can improve their methods.

The assessment of digital maturity is included in the category of provided solutions by innovation/research hubs or centres as well. Several hubs participate in order to assess the level of digitalization of participating SMEs and evaluate possible strategies to optimize their internal processes. Specifically, the service contributes to the skills of the staff through web-conference trainings regarding knowledge on the assessment tool and contributes to methods by providing SMEs with advice on the implementation of technologies to increase their digitalization. As SMEs are provided with vouchers to improve and implement innovative ideas, there is potential for new value generation.

3.2.2 Identification of good practices and tools

Due to the low level of digitalization in the natural fiber-based sector in Trentino region, the provided examples of good practices in the region come from several sectors.

In the first example, a small enterprise in the natural fiber-based sector beneficiated the Digital Maturity assessment, performed by the DIH Trentino. Based on the assessment, the enterprise committed to investing in a digitalization project focused on linking the supplier's equipment with the enterprises' ERP system. The goal of the project is to reduce the marketing time of new projects, increase efficiency, and allow for emergency management through a mitigation plan.

A medium-sized enterprise, producing aluminium and glass products, took advantage of the Digital Maturity assessment as well. Following the assessment, the enterprise introduced MES in their processes and optimized the overall manufacturing workflow. As a result, workers now have access to real-time work scheduling. Furthermore, the enterprise introduced a software system WMS, which keeps track of the incoming goods and the collecting/fetching of components by the operators, supporting the warehouse physical flows operational management.

The last example comes from a medium-sized enterprise in the energy sector. The enterprise implemented advanced Building Information Modelling (BIM) using Digital Twins technologies, with the support of the national and local funding opportunities. After implementing the technology, the enterprise was able to avoid project and mounting (of the product) mistakes during implementation (of the product), and furthermore, to decrease the time between the design and the delivery of the product, increase precision in the offer phase, as well as reduce site waste.

3.3 Lower Austria

3.3.1 Examples of knowledge transfer

The first example of good practice regarding knowledge transfer in the Lower Austrian region comes from *KMU Digital*, the Austrian Digitalization Initiative for SMEs, and falls into the category of public sector solutions. The program provides financial support and consulting services for SMES, investing in new technologies. Several Toolboxes are offered, addressing different dimensions of knowledge transfer. The first toolbox contributes to methods of SMEs by analyzing digital trends, opportunities, and risks for the companies and helps determine their status quo when it comes to e-commerce and IT security and develop a strategy. In the second toolbox, the SMEs receive subsidized consulting and assistance in implanting the digitalization strategy, contributing to technologies and tools.

The second example is the Lower Austrian *House of Digitalization*, suited in the category of solutions, provided by innovation/research hubs/centres. The house of digitalization connects SMEs with main IT knowledge providers in the region (HE institutions). Especially through the virtual House of Digitalization, an interactive platform (www.virtuelleshaus.at), SMEs have access to inspiring examples implemented by local peer companies and specific IT seminars contributing to the skills of the staff. Furthermore, the House of Digitalization offers matching and assistance in finding partners, contributing to methods. Lastly, the option of crowdsourcing in order to contribute to ideas for potential solutions provides an opportunity for SMEs to generate new value.

3.3.2 Identification of good practices and tools

According to the results of research conducted by project partners from this region, no examples of good practices and tools in the hemp production/processing/selling value chain could be identified due to very limited use of digital technologies.

3.4 Slovenia

3.4.1 Examples of knowledge transfer

The first example of good practice of knowledge transfer from the Eastern region of Slovenia describes *Digital Vouchers*, provided by the Slovenian Enterprise Fund. The public system for small-value incentives co-finances SMEs in their digitalization projects. With collaborating educational/research institutions, SMEs can acquire education and training vouchers to increase the level of digital competences of their staff and contribute to their skills. Digital Vouchers can contribute to technologies and tools, as SMEs have access to vouchers to implement new technologies or develop tools to increase their level of digitalization. Additionally, SMEs can generate new value by using vouchers to improve and implement innovative project ideas. The example falls into the category of solutions provided by public schemes or funds.

InnoRenew CoE is an independent research institute, focusing on renewable wood materials and is categorized as Solutions, provided by innovation/research centres/hubs. The goal of the institute is to not only to advance the state-of-the-art technologies through interdisciplinary research but to help SMEs in implementing the obtain knowledge. When it comes to the skills of the staff, SMEs are offered workshops regarding projects funding, as well as a network of experts, contributing to the skills of the staff. Furthermore, the institute provides support throughout the entire funding process, helping SMEs in developing the new business models, and contributing to their methods. Additionally, through research, focused on exploring innovative concepts, technologies, and tools for renewable materials, the institute can contribute to new value generation in SMEs.

The second example of good practice from the category of solutions provided by innovation/research centres/hubs is the *OPENiSME* project, which focuses on creating a partnership between SMEs and research institutions through an online platform. SMEs are able to find skilled experts, matching their specific interest. The platform can contribute to methods of the SMEs, as they are linked with appropriate sources of external data, expertise,

and insight, supporting them in reaching strategic decisions. Furthermore, SMEs can hire experts on specific technologies and tools or reach relevant solutions to problems of innovation. Hence, the platform can contribute to technologies and tools, as well as new value generation.

Styrian technology park is another example of solutions provided by Innovation/research hubs/centres. It is a non-profit organization that supports SMEs in their innovation and competitiveness through the use of ICT. To contribute to the skills of the staff, business and digitalization workshops and trainings are offered to SMEs. Improving framework conditions for smarter ICT use is possible through research and development of suitable ICT technologies, potentially contributing to methods of SMEs. SMESs are supported in business idea development, and establishing a digital presence, through assessment and competition analysis by a network of involved partners, contributing to new value generation.

Last example from Western region of Slovenia is an Innovation/Research center/hub, called the *SRIP-Circular Economy*. SRIP is a network of business, educational and research institutions, and other parties, focusing on the transition into a circular economy. Members of the network can improve key competences, digital skills, and knowledge of their staff through training and lifelong learning, provided by the SRIP. Skills and tools can be developed to adapt to a circular economy, contributing to methods. Last, trainings for digital competencies, knowledge, skills, and tools for developing a circular economy can contribute to methods of partner SMEs.

3.4.2 Identification of good practices and tools

As the first example, a wood processing company from Eastern Slovenia was able to acquire funds by the European Regional Development Fund and Slovenian Ministry of Economic Development and Technology for a project called “Smart acoustic furniture“. The project aimed at developing and implementing smart modular acoustic furniture by integrating acoustic elements with smart software tools, providing new features for end-users.

Next, a company from Eastern Slovenia operating in the Application component of the wood value chain received funding from SPIRIT Slovenia for two of its projects. The first project focuses on digital modernization of the company, with the goals of developing and upgrading the companies' e-business elements through improved electronic exchange between partners, website and web-shop upgrade, as well as staff training. The second project focuses on the optimization and improvement of business processes related to business aspects of wood processing (administration, HR and finances, manufacturing, commerce).

Also, a wood processing company received a digital voucher for foreign market analysis, funded by the Slovene Enterprise Fund, enabling the company to explore the possibility of entering new markets and new or existing products.

As another example, a company specialized in wooden doors, and windows production received European Regional Development Fund and Slovenian Ministry of Economic Development and Technology funding with the help of SPIRIT Slovenia. The funded project focuses on the adaptation and optimization of the company's business processes through digitalization to successfully increase export.

Conversely, in the algae value chain, a company (micro SME) from the Western region of Slovenia is digitalizing its input/output flow with its ecosystem (e.g. suppliers, R&D, project partners, companies/consumers). The company is a partner of SRIP-Circular economy, which provides them with support in the transition to a circular economy, as well as digitalization. Specifically, the main goal of the funded project is to optimize the company's existing processes, traceability, procurement of inputs, equipment and machinery, and e-commerce through digitalization.

4 SWOT analysis of existing good practices and tools for digitalization of SMEs

After the initial collection of examples of knowledge transfer on the digitalization of SMEs performed by each partner, this section presents the results of a detailed analysis of selected examples. Specifically, the implementation of each knowledge transfer example identified in the previous activity brings certain benefits, but also challenges and issues. The goal of this activity is to identify the strengths, weaknesses, opportunities, and threats of identified practices and tools by employing the SWOT analysis technique. Similar to the previous activity, all project partners performed the SWOT analysis on a selected number of identified practices and tools from their country/region. The results of the individual SWOT analysis performed by the project partners were then used as an input for a more general SWOT analysis of identified practices and tools on the following levels of origin of digitalization initiatives:

- **Government-level practices and tools** – includes national and local government initiatives and projects, as well as regulations,
- **Research & development-level practices and tools** – includes initiatives and programs offered by research-oriented institutions, associations, hubs, etc., and
- **Private sector-level practices and tools** – includes projects and other activities started by private sector SMEs.

Based on the SWOT analysis of individual practices and tools identified in each country/region, more general conclusions on the benefits and drawbacks of SMEs' digitalization practices and tools originating in the previously described levels can be drawn.

Specifically, as shown in *Figure 1*, government-level practices and tools bring a variety of digitalization efforts and possibilities (mostly in the form of funding of digitalization-oriented projects in companies), along with higher transparency and precise definition of terms and conditions for all participants. By using government funding opportunities, SMEs can bring different benefits to their business (e.g. increased market share/recognition, income, innovative products). However, it is often the case that the conditions and criteria for receiving government funding are too restrictive for smaller SMEs operating with fewer resources, and the extensive documentation required during the project funding application process brings additional costs to SMEs with no guarantee that the company will receive funding. Additionally, often the government agencies and other bodies do not offer good enough support to SMEs in terms of clarification of funding opportunities and conditions, how to apply for funding, etc., so the insufficient access to relevant information is a common issue on this level. Last,

increased competition due to limited funding can discourage SMEs with limited resources to invest part of their resources into the project application.

Figure 1. SWOT analysis of government-level practices and tools across countries/regions.

On the other side, research-oriented initiatives and associations offer more free-of-charge support to SMEs during applying for funding of digitalization projects (*Figure 2*). Innovation hubs, research centres, and other R&D-oriented associations provide SMEs with the knowledge and skill set necessary for their digitalization efforts, coming directly from field experts and consultants. Experts' knowledge can also result in generating new value during these projects, as the collaboration with SMEs provides them with an environment, in which they can test and deploy their recent research developments and ideas. Initiatives in this level

bring the most opportunities regarding employees' digital skills improvements, which is often the initial obstacle for SMEs for even considering indulging in any digitalization projects.

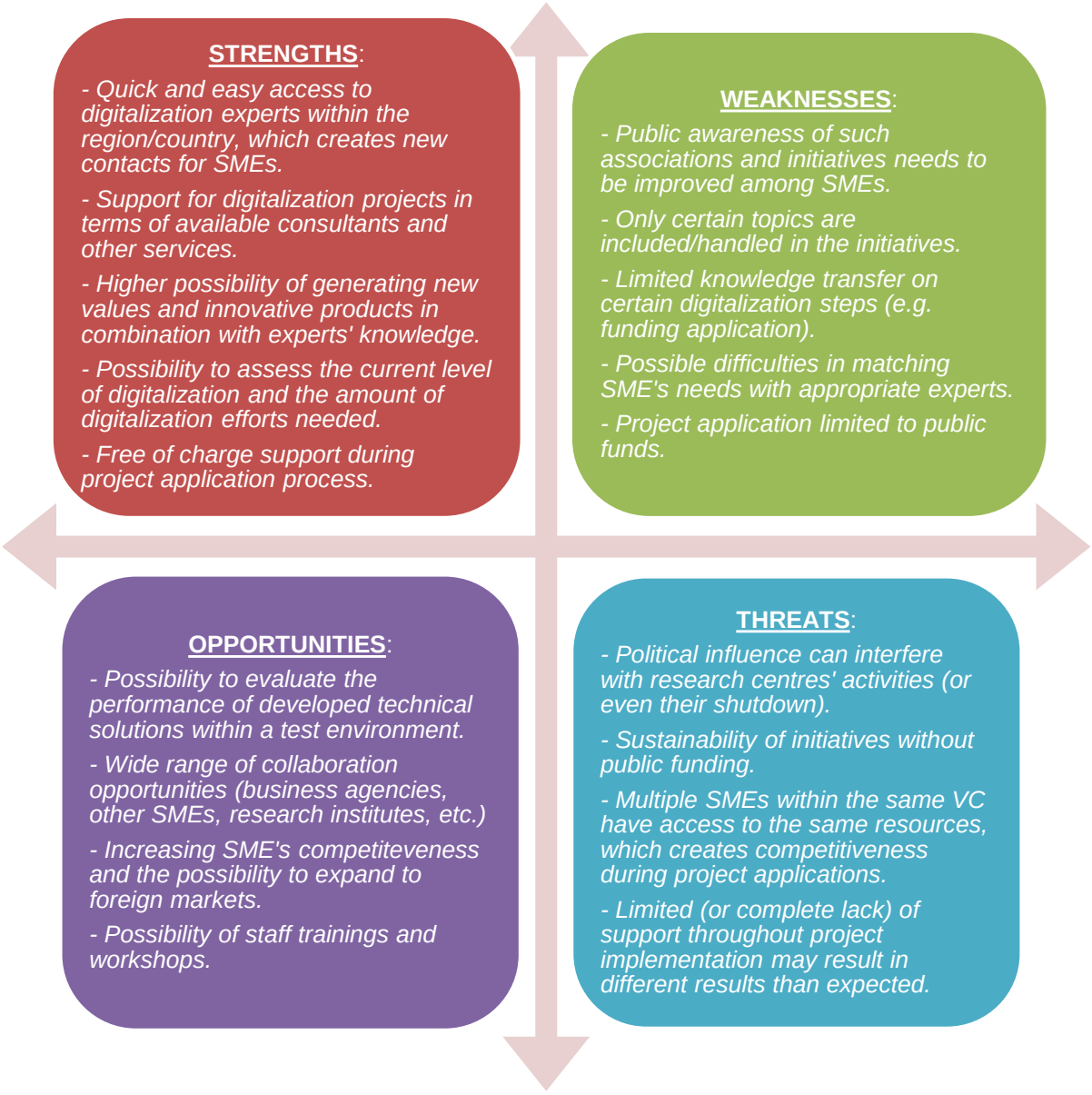

Figure 2. SWOT analysis of research & development-level practices and tools across countries/regions.

Nevertheless, the analysis of individual examples of practices and tools indicates the presence of a certain amount of external (political) influence, which can affect the activities of these institutions. Also, their digitalization support activities sometimes focus on certain areas/fields/topics (e.g. Internet of Things, cybersecurity, etc.), often depending on the national/regional digitalization strategies.

Finally, digitalization initiatives coming from the private sector, i.e., SMEs, bring more direct access to the necessary information about funding and other opportunities (*Figure 3*). This

category of initiatives provides more detailed insights into the entire digitalization process and various benefits that it brings to SMEs in terms of business process and product development efficiency.

Figure 3. SWOT analysis of private sector-level practices and tools across countries/regions.

Private sector-level practices and tools for digitalization also create a number of opportunities related to better market visibility, implementation of modern business models and collaboration with other SMEs. However, since most SMEs operate with a limited amount of resources (financial and other), these initiatives are often dependent on public funding. This "issue" increases the risk of digitalization projects, which focus is not entirely in accordance with SME's needs, because more effort has been invested in complying with a given funding's criteria or government strategies rather than on applying for the funding of the digitalization of

a company's segment, which really needs to be digitalized (e.g. a company receives funding for marketing, but neglects production). Another significant threat stems from the fact that SMEs invest most of their resources into their day-to-day business, so they are not inclined towards investing into digitalization projects, which, in their case, often requires significant resources.

A more detailed overview of individual SWOT analysis of selected examples of good practices and tools per each country/region is available in Appendix B.

5 A comprehensive measure of the level of digitalization of SMEs

In this chapter, a comprehensive list of indicators for measuring the digital maturity level of SMEs in the natural fiber-based value chains is presented. The indicators designed or adapted specifically to measure the level of digitalization of SMEs in the natural fiber-based VCs were identified through desk research. First, the following relevant digital maturity level assessment indexes/schemes were identified:

- *Digital Economy and Society Index (DESI)* - designed to measure the digital competitiveness of European countries [4],
- the Innovation and Technology indicators proposed by the *Organization for Economic Co-operation and Development (OECD)* [9],
- *Regional Innovation Scoreboard* - an extension of the European Innovation Scoreboard focusing on assessing the innovation performance of SMEs in terms of framework conditions, investments, innovation activities and impacts at the regional level of European countries [10],
- *Digital Transformation Scoreboard* - provides data and analysis methodology to assess the success of digital technology integration in businesses in EU Member States [10], and
- Relevant indicators used within the *Eurostat* framework for monitoring digital economy [11].

The indicators for measuring the level of digitalization obtained from the afore-mentioned indexes/schemes were then further refined to select the indicators most applicable to SMEs. Furthermore, several measures of the level of digitalization of SMEs were also identified in the scientific literature to gain insights into other indicators that should also be considered when measuring the level of digitalization of SMEs, based on which we proposed new indicators. In the final step, the identified indicators (from existing digital maturity level indexes and scientific literature) were analysed once more to assess their applicability to the natural fiber-based VCs. The obtained list (*Table 2*) represents a comprehensive overview of all relevant facets when it comes to measuring the level of digitalization in SMEs in nature fiber-based VCs. The specific indicators were gathered into comprehensive dimensions: connectivity, online presence, online activity, ICT infrastructure, ICT policy, ICT usage, human resources, and research and development. When relevant, the dimensions are broken down into further sub-dimension. The

indicators can be adapted and used to gain a detailed insight into the level of digitalization of SMEs.

Table 2. Dimensions, sub-dimensions and indicators for measuring the digital maturity level of SMEs operating in the natural fiber-based VC.

Dimension	Sub-dimension	Indicator
Connectivity	Fixed-line broadband	Connection via phone line [12]
		Fixed BB / NGA [4], [11]–[14]
		Fast BB [4], [11]–[14]
		Ultrafast BB [4], [13]
	Mobile broadband	Connection to 4G [4], [12]
		Connection to 5G [4], [12]
Online presence		Possession of an own website [11], [12], [15], [16]
		Digital/electronic catalogue [12], [16]
		Presence on social media [4], [11]–[13], [15]
		Online communication with customers [16]
		Customer participation in the final product / service
		E-marketing activity [12], [16]
Online activity	E-commerce	B2C e-business model [12]–[16]
		B2B e-business model [12]
		B2G e-business model [12]
		E-commerce turnover [4], [12], [13]
		E-banking (use) [4], [11], [12]
		E-government (use)
ICT infrastructure		Intranet [12], [16]
		Electronic records [12]
		Automatic invoice generation [13]
		Electronic information sharing [4], [11]
		Upgrades to software and hardware [15]
		Big data [4], [11], [13]
		Cloud computing [4], [11]– [14]
		Robots and 3D printing [11], [14]
		Decision support tool [12]
		Automation [11], [12]
		Twin technology
		Unique and automated product identification throughout the supply chain, RFID technology [11]– [13]
		Integrated or specialized systems (ERP, SCM, CRM) [11], [13], [15], [16]

		Business intelligence/knowledge base [15]
		Digital supply chain management and supplier relationships [11]
		Investments in or upgrades to ICT infrastructure [10], [13], [15], [16]
ICT policy		ICT security policy [11], [14], [15]
		Data protection policy [14], [15]
ICT usage		Share of employees using a computer or a mobile device [11], [13], [15]
		Share of employees using internet [4], [11], [12], [14], [15]
		Use of e-mail or IM to communicate [11], [12], [15]
		Use of standard application software [12], [15]
Human resources		Use of video calls or video conferences [4], [11], [12], [15]
		Employment of ICT specialists, experts, programmers, or STEM graduates [10], [12]– [15], [17]
		ICT department [10]– [15], [17]
		ICT training [11], [15]
		Telework [12], [14]
		Self-learning skills [11], [15]
Research and development infrastructure		R&D department [14]
		R&D or ICT investments [10], [13], [15], [16]
		Patents, trademarks (application) [10], [14], [15]
	Innovation	Innovation capacity [10], [13], [15]
		In-house innovation [10], [13], [15]
		Innovative collaboration with others [10]

6 Constraints and recommendations

The results of the SWOT analysis show a variety of possible weaknesses and threats, which may arise from digitalization practices originating at different levels (government, research community or private sector). Based on their nature, these weaknesses and threats have been grouped into five categories representing possible bottlenecks and constraints to the digitalization process listed in *Table 3*:

1. **General digitalization climate** – include constraints related to the fulfilment of requirements necessary to successfully carry out digitalization projects in SMEs (e.g. government policies and regulations, the amount of financial resources available, etc.), which setup the overall environment for SMEs,
2. **Digitalization project financial viability** – include constraints arising from the cost/benefit analysis of the digitalization projects carried out by SMEs, which may affect their willingness to digitalize in the first place,
3. **Availability of support mechanisms** – include constraints, which inhibit and decrease the success rate of digitalization projects because of the weak support for SMEs,
4. **Uncertainty of the digitalization project success** – include risks that come with the digitalization projects, which must be resolved to ensure their success, and
5. **Scarcity of information** – include constraints related to the timely availability of information necessary to SMEs, which must be proactively resolved to avoid digitalization project failure or low digital maturity of SMEs in general.

Table 3. Bottlenecks and recommendations to increase the success rate of digitalization projects in natural fiber-based VC SMEs.

Category	Weakness/Threat	Level of origin	Recommendations for natural fiber-based VCs
General digitalization climate	Requirements might not be feasible for all SMEs.	Government	Requirements, conditions and criteria for receiving public funding should be defined based on the "as is" digital maturity of selected VC
	Large number of conditions can demotivate SMEs to apply for funding.	Government	
	Digital infrastructure is not established equally well in all regions/areas.	Private sector	Continually work on meeting the infrastructural requirements of SMEs on the country/region-level
	Political influence can interfere with research centres' activities.	R&D	Minimise political influence on the digitalization projects and research centres on ensuring their transparency or providing additional help only
	Sustainability of initiatives without public funding.	R&D	Explore and extend additional funding possibilities to other European- or global-level financing programs
	The amount of funding is time- or finance-limited.	Government	
	Same amount of funding for all SMEs regardless of their size and financial possibilities.	Government	Weighted distribution of public funds among different-sized SMEs (e.g. based on the current digitalization priority)
Digitalization project financial viability	Small companies with low resources are less inclined to invest in digitalization.	Private sector	Carry out continuous public campaigns explaining the benefits of indulging in the digitalization process
	Digitalization project application is limited to public funds.	R&D/Private sector	Encourage larger companies in investing in SMEs' digitalization to provide alternative funding mechanisms

	Applications for funding digitalization projects depend on the availability of financial resources.	Government	
	Extensive documentation brings additional costs.	Government	Continually work on establishing paperless procedures and decreasing the paperwork necessary to apply for funding (e.g. through government portals)
Availability of support mechanisms	Limited support available to SMEs during the funding application process.	Government	Establish initiatives to strengthen the interaction between research centres or consulting agencies and SMEs and build a support framework
	Limited knowledge transfer on certain digitalization steps.	R&D	
	Limited or complete lack of support throughout project implementation may result in different results than expected.	R&D	Provide single-point contacting options for SMEs in need for some help or consultations
	Lack of complete support by a company's IT system.	Private sector	Identify IT experts interested in providing consultant services for low-digitalized SMEs and ensure their contact details are available to SMEs
	Lack of knowledge on digitalization technologies may inhibit the company's efforts.	Private sector	
	Only certain topics are included/handled in the initiatives.	R&D	Continually spread the scope of digitalization expertise to different VCs
Uncertainty of the digitalization project success	Possible difficulties in matching SME's needs with appropriate experts.	R&D	Use modern data-driven methods and techniques to ensure best-possible matching between SMEs and experts (e.g. machine learning)

	Multiple SMEs within the same VC have access to the same resources, which creates competitiveness during project applications.	R&D	Identify experienced experts with knowledge on the digitalization project to increase the probability of its success
	Digitalization efforts may be too specific and focus only on a subset of processes, while ignoring others.	Private sector	
	Existing SME's resources may not be able to handle changes caused by digitalization.	Private sector	Organize workshops and trainings held by other SMEs or research centres with experience in similar undertakings to inform interested SMEs about benefits and pitfalls
Scarcity of information	Public awareness of such associations and initiatives needs to be improved among SMEs.	R&D	Launch marketing campaigns to raise public awareness of possibilities available to help SMEs
	Knowledge gaps of SMEs regarding bureaucratic procedures can make their application invalid.	Government	* Regularly organize workshops and similar events open for SMEs to join free-of-charge to learn about their possibilities and prepare for the process * Establish a contact point to help resolve questions regarding the procedures for SMEs that can be easily accessed by everyone (e.g. a platform)

As shown in *Table 3*, each category includes weaknesses and threats of digitalization practices on different levels of origin. Nevertheless, the relationship between the government, research centres and private sector SMEs is not necessarily mutually exclusive. Instead, these three levels interact in a bi-directional manner, which is depicted in *Figure 4*. Hence, **the recommendations on resolving the identified constraints within each category are proposed based on the bi-directional relationships between the strengths and weaknesses of these levels**. Specifically, this means that some strengths of the government-level practices (and the government itself) can help in resolving weaknesses and threats, which appear with practices on the private sector or research & development levels, and vice-versa.

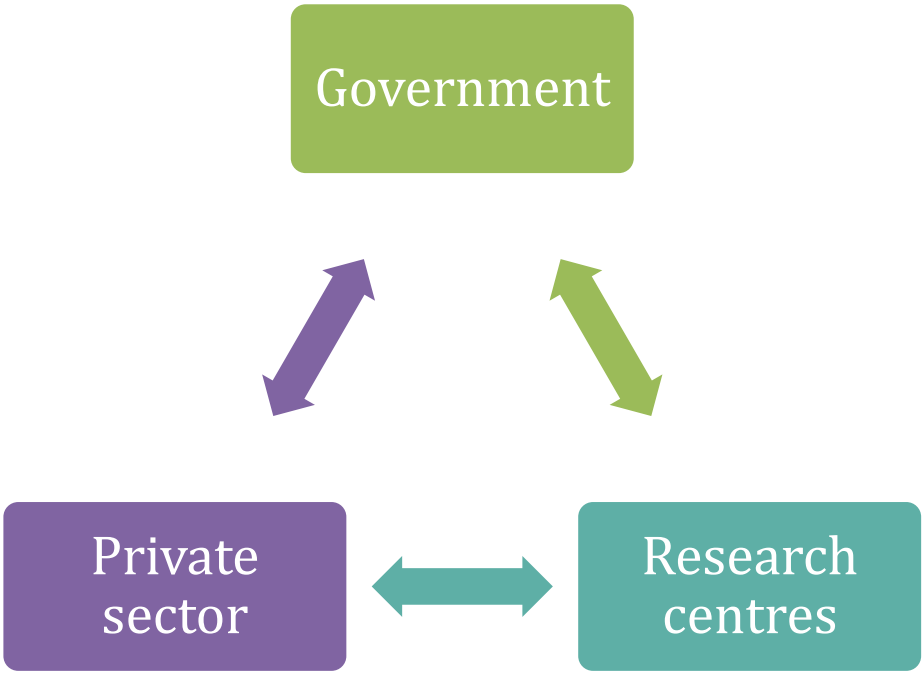

Figure 4. The interaction between the three levels of digitalization practices.

For instance, the "Limited support available to SMEs during the funding application process" weakness of the government-level practices can be resolved by employing the strengths of the research & development-level practices (e.g. workshops). On the other side, the "Limited knowledge transfer on certain digitalization steps." weakness of the research & development-level practices can be resolved by establish a general country- or region-level platform or other form of contact point by the government. However, it is intuitive that some government-level (maybe even other-level) practices heavily depend on other external factors, which go beyond the country- or region-levels and are difficult to influence, so the recommendations on dealing with constraints on these levels are limited. However, the goal of this project was to help identify the bottlenecks for the digitalization of SMEs in the natural fiber-based VC on different levels and provide useful recommendations where possible.

7 Conclusion

The relatively low level of digitalization of SMEs in the natural fiber-based value chains in the Alpine space is the result of several factors. There are some good practices and examples of successful SME digitalization initiatives in natural fiber-based VCs from this area; however, in some regions/countries, the number of these good practices is more limited than in others. Through the activities within Work Package 3, a detailed analysis of these examples has been carried out to identify the most significant factors, which present the biggest hurdle for SMEs in their digitalization efforts. The main research findings in these activities were obtained through desk research performed by all project partners (Actions 3.1 and 3.2) and the WP lead (Actions 3.1, 3.2 and 3.3) and through the SWOT analysis of the identified examples.

Overall, the WP activities focused on identifying good practices of knowledge transfer on digitalization from academic institutions to SMEs. All project partners were able to identify at least two examples of knowledge transfer in terms of skills of the staff, methods, technologies and tools and new value generation in a selected value chain in their region/country. During this activity, the low digitalization level of SMEs in some value chains became apparent through the limited number of good digitalization practices and tools for SMEs in these value chains (e.g. hemp production).

Furthermore, the identified general knowledge transfer initiatives and practices in each region/country were further analysed by following the bottom-up approach to gain insight into how they facilitate the knowledge transfer and the digitalization of SMEs in general. The results of the SWOT analysis performed by each project partner for the selected practices indicate the similarities in their benefits and drawbacks, which mostly originate in their source – namely, the government, the research centres or the private sector. Hence, the results of individual SWOT analysis were generalized into the benefits and drawbacks identified in the SWOT analysis performed for each level of origin. In the next step, the weaknesses and threats from the SWOT analysis for each level were further categorized based on their common characteristics/aspects into five groups of general bottlenecks and constraints for the digitalization of SMEs – namely, general digitalization climate, digitalization project financial viability, availability of support mechanisms, uncertainty of the digitalization project success and scarcity of information. Each of these constraint groups refers to a different aspect, which may become an important factor in the digitalization level of SMEs. For each potential weakness and threat appearing on a given level of origin, some recommendations based on the bi-directional relationship between these levels are presented in order to illustrate how the

benefits of practices in one level (e.g. government) can be combined and used (to some degree) to resolve the drawbacks of practices in another level (e.g. private sector).

In addition to identifying the aspects with the strongest influence on the level of digitalization of SMEs in the natural fiber-based VCs in the Alpine space, a focused study of the indicators used to measure the digital maturity level of enterprises (SMEs, specifically) was performed. The result of the analysis is a comprehensive list of the most relevant indicators adapted to measure the digital maturity level of SMEs in the natural fiber-based VCs, which also includes some additionally proposed indicators from the scientific literature that are not included in the existing wide-spread measuring schemes/indexes (DESI, OECD and Regional Innovation Scoreboard).

In general, the results of activities performed within WP3 indicate the presence of good practices of knowledge transfer on digitalization to SMEs in the Alpine space, since the limited information about available digitalization possibilities is the most common hurdle for SMEs. As the results show, the role of research institutions as the mediator between the government and SMEs must not be disregarded. Each participant (government, research centres and private sector) can employ the strengths to facilitate the digitalization of SMEs and increase the success rate of the digitalization projects in various natural fiber-based VCs in different aspects (e.g. regulations and bureaucracy, support, expert knowledge and similar). The overview of the identified good knowledge transfer examples presented in this report can contribute to the exchange of the "know-how" between regions/countries in the Alpine space to create a more stimulating environment for the digitalization of SMEs in the natural fiber-based VC.

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Appendix A

A.1 Knowledge transfer good practices in Baden-Württemberg (Germany)

Name	**Digitalization premium**[3]
Description	The Digitalization premium supports projects in the introduction of new digital solutions and improving IT security in small and medium-sized enterprises (SMEs). The digitalization premium is a measure of the "Initiative Economy 4.0", which is part of the state-wide digitalization strategy "digital@bw". Conditions for receiving the premium: - max. 100 employees; - participation of a public institution in the company must be max. 25%; - completely new projects (not yet started); - projects must be run in Baden-Württemberg only. How does it work? It is a bank loan from 10,000 to 100,000 euros. For loans of 10,000-50,000 euros, companies receive a repayment subsidy of 5,000 euros. For bigger loans, the repayment subsidy is 10% of the loan amount. A repayment subsidy reduces the remaining debt, which means that the company does not have to repay the loan in full. Companies can apply for the Digitalization premium unlimited number of times, but not more often than once within two years.
Participants	- SMEs; - L-Bank; - Ministry for Economic Affairs, Labour and Housing of Baden-Württemberg.

[3] https://wm.baden-wuerttemberg.de/de/service/foerderprogramme-und-aufrufe/liste-foerderprogramme/digitalisierungspraemie/

Contribution(s) to skills of the staff	The Digitalization premium can also be used to promote training courses for employees. A condition for this is that the training courses must be related to the acquisition of ICT (Information and Communication Technologies) hardware and software knowledge, which should lead to significant progress in the digitization of a company.
Contribution(s) to methods	-
Contribution(s) to technologies and tools	Funding is provided for new digital solutions in production and processes (e.g. 3D printing), in products and services (incl. creation of digital platforms) and within strategies and organization (e.g. introduction of a comprehensive digitalization strategy in a company). The introduction of digital systems to improve IT-security is also eligible for funding.
Contribution(s) to new value generation	Almost all sectors on their way to the digital transition can be supported with the Digitalization premium, which brings extra value to numerous value chains, also bio-based ones. A disadvantage in the program is that agriculture, forestry, fishery, and aquaculture are excluded.

Name	**Funding programme "go-digital"[4]**
Description	The programme supports SMEs and handicraft enterprises in advancing their own digitalization in three areas (see methods). Criteria for receiving funding: less than 100 employees; annual turnover or annual balance sheet total for the preceding year not exceeding 20 million euros; establishment or a branch office in Germany; eligibility to be supported under the De-minimis-Regulation. Funding is provided for consulting services in a selected main module with any necessary auxiliary modules at a funding rate of 50% up to

[4] https://www.bmwi.de/Redaktion/DE/Artikel/Digitale-Welt/foerderprogramm-go-digital.html

	a maximum daily consultant rate of 1100 euros. Funding is provided for a maximum of 30 days within a period of six months.
Participants	- SMEs (incl. start-ups) - Federal Ministry of Economics and Energy (BMWi).
Contribution(s) to skills of the staff	Staff benefits from the provided consulting services.
Contribution(s) to methods	Practical consulting services to keep pace with technological and social developments in the following fields: online trade; digitalization of everyday business life; a growing need for security in digital networking.
Contribution(s) to technologies and tools	Services are related to IT security, digital market development, and digitalized business processes.
Contribution(s) to new value generation	In order to relieve SMEs and handicraft enterprises of the burden of bureaucratic requirements, authorized consulting firms take over the application for funding. They are also responsible for the consulting services themselves as well as for accounting and checking of the statement of the application of funds.

Name	**DigiLand - Digital agriculture Lake Constance (Digitale Landwirtschaft Bodensee)[5]**
Description	Reference models for farms along the nutritional value chain. The goal is to create competitive advantages for agriculture in the Lake Constance region in order to guarantee more sustainability. The project is implemented within two years (February 2018 – February 2020).
Participants	- SMEs; - KMU digital; - International Lake Constance University (IBH); - University of Applied Sciences St. Gallen (FHS); - University of Applied Sciences Buchs (NTB);

[5] http://www.kmu-digital.eu/de/projekte/digiland

	- Ravensburg University of Cooperative Education (DHBW).
Contribution(s) to skills of the staff	The models can be adapted and quickly implemented by companies with a different level of staff knowledge and skills.
Contribution(s) to methods	Reference processes (blueprints), organizational models, and a technology radar were developed based on the application domain of fruit (apples) and vegetable (cabbage) cultivation (in simple words, it is about understanding how cabbage and apples reach consumers).
Contribution(s) to technologies and tools	The reference processes were brought together on a process map across entire value chains. From this, new technological challenges were derived in order to develop a prototype technology. The models can be adapted and quickly implemented by companies with a different range of basic technological equipment.
Contribution(s) to new value generation	Enabling the effective design and implementation of digitalization of agricultural and processing companies, local traders, and small regional technological and consulting firms along the nutritional value chain.

Name	**Competence Center Stuttgart Mittelstand 4.0 (Kompetenzzentrum Stuttgart Mittelstand 4.0)[6]**
Description	The Competence Center Stuttgart Mittelstand 4.0 supports SMEs resp. individual projects of different sectors, sizes, and levels of experience in the effective integration of digital applications, incl. technical questions and aspects of business organization. For the project "Smart SMEs", the following fields are interesting: optimization and digitalization of production processes; cloud-computing and smart services; IT security; service and business model development.
Participants	- SMEs; - Competence Center Stuttgart Mittelstand 4.0; - Federal Ministry for Economic Affairs and Energy (BMWi).

[6] https://digitales-kompetenzzentrum-stuttgart.de/

Contribution(s) to skills of the staff	Staff is trained in the mentioned above fields.
Contribution(s) to methods	Informational events, demonstrational workshops, trainings, networking, consulting in funding opportunities.
Contribution(s) to technologies and tools	Development and improvement of the instruments and technologies already used by companies and the introduction of the new ones.
Contribution(s) to new value generation	Value creation processes of an individual company improve thanks to their optimization and integration of digital applications.

Name	**FarmBlick**[7]
Description	The start-up FarmBlick in Sulzfeld, state Baden-Württemberg, supports farmers in precision farming as well as in the conversion to digitalization as a whole. Thanks to its independence, the young company is able to respond to specific requests and find suitable solutions together with farm managers (customers).
Participants	- FarmBlick specialists; - customers (mainly farm managers).
Contribution(s) to skills of the staff	Farm managers learn from the FarmBlick expertise.
Contribution(s) to methods	Consulting services and workshops on precision farming; creation of various Google-Earth maps with the help of satellites in which the needs of soil and plants are specifically addressed (maps for fertilization, plant protection, sowing, and soil cultivation); creation of soil samples for fertilization planning; renting out devices for precision farming; online-platform, so that people can exchange ideas in a community.
Contribution(s) to technologies and tools	Companies, which just want to try precision farming out, are offered to rent special technical equipment for that, e.g. devices for georeferenced soil sampling, modern soil scanners, and plant sensors (ISARIA).

[7] https://farmblick.de

	Online-platform FarmBlick is a community that provides all practical, digital tools for smart farming required for sustainable farm management. Members can exchange their ideas and also help decide on the further development of the platform.
Contribution(s) to new value generation	Precision farming is a very effective tool, especially in view of the new fertilizer regulations and climate change. Moreover, the optimization of the entire production process relieves farmers and saves resources.

A.2 Knowledge transfer good practices in Trentino (Italy)

Name	**Digital maturity level assessment**
Description	A survey for assessing the level of digitalization of enterprises and evaluate possible strategies to optimise its internal processes with technologies 4.0. The output is a report showing innovation opportunities for companies and advice for developing and optimizing the company's departments.
Participants	- SMEs; - Digital Innovation Hub; - Hub Innovazione Trentino; - Confindustria.
Contribution(s) to skills of the staff	Web-conference training aimed at acquiring knowledge on the assessment tool.
Contribution(s) to methods	Meetings with companies to explain and show innovation opportunities. Data analysis and development of the assessment & innovation report.
Contribution(s) to technologies and tools	Advice for implementing technologies or developing tools for increasing the digitalization level of SMEs within the framework of their activity.
Contribution(s) to new value generation	Vouchers for improving and implementing innovative project ideas in different departments of the company, ranging from marketing, logistics, quality management, production, maintenance management, human resources.

Name	Innovation Manager Voucher
Description	Voucher for the introduction of an innovation manager in the company, who is able to implement key enabling technologies and modernize the management and operative assets of the enterprise.
Participants	- SMEs; - Italian Economic Development Ministry.
Contribution(s) to skills of the staff	-
Contribution(s) to methods	Vouchers for consultation and analysis given by the innovation manager with the purpose of increasing the digitalization level of SME and to optimize the organization assets of SME.
Contribution(s) to technologies and tools	Vouchers for the introduction and implementation of key enabling technology in SME (e.g. AI, IoT, VR, AR, cloud, fog, quantum computing, big data, additive manufacturing, etc.)
Contribution(s) to new value generation	Vouchers for improving and implementing innovative project ideas and for modernizing management and organizational assets, including access to new markets and funding.

Name	Punto Impresa Digitale
Description	Service structures dedicated to the promotion of the digitalization culture and its dissemination. The main scope is to create a network of organizations to assist enterprises in the digitalization processes.
Participants	- SMEs; - Chamber of Commerce.
Contribution(s) to skills of the staff	Workshops and events for education and trainings of employees to increase their knowledge and awareness about digital technologies.
Contribution(s) to methods	Mentoring to support SME with the identification of the best strategy.
Contribution(s) to technologies and tools	-

Contribution(s) to new value generation	-

Name	**Legge Provinciale 6/99**
Description	The "Provincial Law on Business Incentives" (L.P. 6/99) is addressed to companies that intend to make fixed investments, both movable and immovable, relocation initiatives, interventions for the promotion of environmental protection measures, research, export aid and access to participatory loans. The law is currently under revision.
Participants	- Companies in the craft, trade, cooperation, industry, and tourism sectors with an operating unit in the provincial territory; - Research centres.
Contribution(s) to skills of the staff	
Contribution(s) to methods	Funding for acquired consultancy services for: a) innovation, b) quality; c) pilot actions; d) Market analysis; e) ICT technologies
Contribution(s) to technologies and tools	Funding for investment projects for new enterprises, networks, quality, innovation, growth, digitalization, and wideband (in the revised version of the Law).
Contribution(s) to new value generation	Funding for industrial research and development in collaboration with research centres.

A.3 Knowledge transfer good practices in Lower Austria

Name	**House of Digitalization – Lower Austria's ecosystem for digital transformation**[8]
Description	The Lower Austrian Digital Innovation Hub **"House of Digitalization"** is an initiative supporting the digital update of Lower Austrian

[8] https://www.virtuelleshaus.at/digistart/home

	companies by offering as a one-stop-shop the services described below. The House of Digitalization is currently financed as a project (2018-2021) by the Lower Austrian Regional Government, an ERDF (Investment in growth and Jobs). It is managed by the Lower Austrian Business Agency ecoplus (non-profit, owned by Regional government) in collaboration with the main IT knowledge providers in the region: the universities of applied science in Wiener Neustadt, St. Pölten and Krems, the Institute of Science and Technology Austria, the Wieselburg Josephinum Research (JR), the Institute for Economic Promotion (WIFI) Lower Austria and the New Design University.
Participants	- Lower Austria SMEs; - Research & educational institutions (IT knowledge providers); - Citizens; - ecoplus GmBH.
Contribution(s) to skills of the staff/	The House of Digitalization offers: - Information: Lexicon for digital terms, good practice examples of already implemented digital solutions, all relevant training and education offers in the region, relevant events. - Education: specific seminars for companies (with the help of IT knowledge providers in the region).
Contribution(s) to methods/	The House of Digitalization offers: Matchmaking: opportunity to post planned projects, a short description of relevant competencies of companies and R&D institutions in the region, assistance in finding partners (with the help of digitalization manager, cluster managers, technopol managers at ecoplus)
Contribution(s) to technologies and tools	-
Contribution(s) to new value generation	The House of Digitalization offers Crowd Sourcing (not crowd funding!) campaigns. Companies or public institutions describe a specific challenge and ask the crowd in open or closed formats,

	depending on the challenge, to contribute their ideas for potential solutions.

Name	**KMU Digital - the Austrian Digitalization Initiative for SMEs"** [9]
Description	The digitalization program SME DIGITAL (in German: KMU DIGITAL) of the Austrian Federal Ministry of Digital and Economic Affairs in cooperation with the Austrian Economic Chambers provides consulting services and financial support for investments in new technologies and digitalization for SMEs.
Participants	- Austrian SMEs (beneficiaries); - Austrian Federal Ministry of Digital and Economic Affairs; - Austrian Economic Chambers.
Contribution(s) to the skills of the staff/	-
Contribution(s) to methods/	Toolbox 1 – Status- and Potential Analysis: "What should change?" The entry-level consulting service Potential Analysis helps entrepreneurs to systematically analyze digital trends, opportunities, and risks for their company. Status Analyses help entrepreneurs to determine their status quo in the areas of electronic commerce and IT-security. The outcomes of the analyses are summarized in a digitization map, and the company gets an overview of possibilities for improvement. The analyses are conducted by certified digitization consultants and especially recommended for smaller companies. The service is subsidized so that they only have to pay 20 % of the regular price – 80 % of the price is funded by the state.
Contribution(s) to technologies and tools	Toolbox 2 – Strategic Consulting: "How do I get there?" Through certified consulting services, companies get assistance in defining and implementing concrete steps of their respective digitization strategy. For this purpose, the company can apply for

[9] https://www.kmudigital.at/Content.Node/kampagnen/kmudigital/the-austrian-digitalization-initiative-for-smes.html

	financial support and is offered consulting in four areas (the 4th area of digital administration is currently being developed): a. Electronic commerce: online marketing & social media b. Business models & processes: electronic invoices, logistics, etc. c. IT security: to prevent data loss, security gaps, and security weak points d. Digital administration: automation of administration processes, electronic bills etc. The analyses are conducted by certified digitization consultants. The service so that they only have to pay 50% of the regular price – 50 % of the price is funded by the state.
Contribution(s) to new value generation	-

A.4 Knowledge transfer good practices in Slovenia

Name	**SRIP Circular Economy - Competence centre for HR - network for the transition to circular economy[10]**
Description	Public call (ongoing) by the Public scholarship, development, disability and maintenance fund of the Republic of Slovenia in assistance of the European Social Fund, the Ministry of Labour, Family, Social Affairs and Equal Opportunities and companies doing business within the industry with the purpose of common development of employee competences.
Participants	- Members of the SRIP Circular economy;

[10] https://srip-circular-economy.eu/

	- The Public scholarship, development, disability and maintenance fund of the Republic of Slovenia; - Training and educational institutions.
Contribution(s) to skills of the staff	Improve the key competences of the employees of the SRIP Circular economy partnership and thus increase their flexibility, employability and efficiency, especially in the circular economy,
Contribution(s) to methods	Digital competencies, knowledge, skills and tools for developing a circular economy – training, lifelong learning for human resource managers in partnership companies.
Contribution(s) to technologies and tools	Promoting the use of the circular economy within S4, Industry 4.0, and interdisciplinary integration with other S4 domains and the horizontal priority area of ICT (ICT support).
Contribution(s) to new value generation	N/A

*The good practice is identified also in SRIP Food - Competence Centre for Human Resource Development in Agri-Food - KOC FOOD. Among others, the training for Digital Age Competencies is dedicated to improving the competencies of employees to be able to recognize and introduce innovative technologies and processes in the agri-food sector.

Name	**Digital vouchers**[11]
Description	Public system for small-value incentives, which provides SMEs with access to co-financing schemes for their digitalization projects in order to increase their competence.
Participants	- SMEs; - Slovenian Enterprise Fund; - Educational institutions.
Contribution(s) to skills of the staff	Vouchers for increasing the level of digital competences co-finance expenses of employees' digital skills education and training.

[11] https://www.podjetniskisklad.si/sl/produkti-sklada/sps-dvojcekdpora-pri-produktih/vavcerski-sistemi/vavcer-za-digitalni-marketing

Contribution(s) to methods	-
Contribution(s) to technologies and tools	Voucher for implementing technologies or developing tools for increasing the digitalization level of SME.
Contribution(s) to new value generation	Vouchers for improving and implementing innovative project ideas in different areas, ranging from marketing, security to entering new markets.

Name	**InnoRenew CoE research institute**[12]
Description	Research institute, where research about renewable wood materials and sustainable buildings is conducted, and the obtained knowledge is transferred into the industry. The goal of the institute is to advance state-of-the-art technologies in the field of renewable materials through interdisciplinary research and help SMEs implement knowledge obtained through research activities.
Participants	- Individual researchers and experts; - Universities; - SMEs; - National institutes.
Contribution(s) to skills of the staff	Participants with different areas of expertise form a network, in which knowledge and experiences are shared. Institute members also offer workshops to industry members (e.g. about Horizon projects funding).
Contribution(s) to methods	The institute helps SMEs throughout the entire funding process. This includes support provided through trainings, workshops, and other consulting activities in applying for different funding opportunities and finding the right funding instrument, which can help SMEs develop new business models. Also, the institute organizes conferences and events for sharing knowledge between academia and industry.

[12] https://innorenew.eu/

Contribution(s) to technologies and tools	-
Contribution(s) to new value generation	The institute is open for collaboration with other research and industry partners in research & development activities and projects. Research activities focus on exploring innovative concepts, technologies and tools for sustainable usage of renewable materials.

Name	**OPENiSME**[13]
Description	Project, co-funded by the CIP Programme of the EC, focusing on the partnership between SMEs and research institutions, which are able to contribute novel resources, expertise, and insights. The platform allows SMEs to find skilled experts, matching the very specific interest of the company.
Participants	- SMEs; - Experts; - Research institutions.
Contribution(s) to skills of the staff	-
Contribution(s) to methods	SMEs are linked with appropriate sources of external data, expertise, and insight, supporting them in reaching strategic decisions in the context of high risk. SMEs can also contact experts with a research background to gain insight into new methods and approaches to improve their business.
Contribution(s) to technologies and tools	The partner matching technology enables SMEs to access the knowledge of appropriate experts to innovate products or processes. Also, SMEs can find and hire experts on a specific technology or tool they need in order to organize trainings.
Contribution(s) to new value generation	SMEs, seeking to innovate are matched with knowledgeable experts and researchers, which can propose relevant solutions, reaching a quicker solution to the problems of innovation.

[13] http://www.openisme.eu/

Name	Styrian Technology Park[14]
Description	Public, a non-profit organization, supporting SMEs by promoting innovation and competitiveness through their digital update and the use of ICT.
Participants	- SMEs; - Styrian Technology Park; - External organizations.
Contribution(s) to skills of the staff	Workshops and trainings, oriented toward business and digitalization.
Contribution(s) to methods	Improving framework conditions for smarter use of ICT through research, development, and analysis of most suitable advanced ICT technologies.
Contribution(s) to technologies and tools	-
Contribution(s) to new value generation	SMEs are provided support in business idea development and assessment, competition analysis, a network of digitally involved partners, and in establishing the digital presence.

[14] https://www.stp.si/

Appendix B

B.1 SWOT analysis of practices and tools for digitalization of SMEs in Baden-Württemberg (Germany)

Practice/tool name: Digitalization Premium **Origin level:** Government	
STRENGTHS - The Digitalization premium supports projects in the introduction of new digital solutions and improving IT security, which is along with the digitalization strategy of Baden-Württemberg. - SMEs can save costs for hardware and software and related services, which could be a serious burden for a SME. - Companies can get started directly with their new digital projects. - Since 2017, approximately 4.500 applications eligible for approval have been submitted with digitalization investments of well over 130 million euros. The high demand shows that the introduction of the Digitalization premium has met the needs of companies.	**WEAKNESSES** - The agriculture, forestry, fisheries, and aquaculture sectors are excluded from the program. - The program is not suitable for companies with more than 100 employees (taken into account that a medium-sized enterprise can have up to 250 employees). - Basic IT equipment such as PCs, notebooks, smartphones cannot be financed. - Only projects with a cost volume below 100.000 euro can be financed.
OPPORTUNITIES - Can be alternatively used to promote training courses for employees under the condition that they are related to the acquisition of the	**THREATS**

respective ICT hardware and software knowledge and lead to significant progress in the digitization of a company. - Can be combined with other grant funds.	- Since the Digitalization premium is a repayment subsidy and the funds for it may be exhausted at some point, applications can only be submitted again when money is available.

Practice/tool name: Kompetenzzentrum Stuttgart Mittelstand **Origin level:** Research and development	
STRENGTHS - The Competence Center supports enterprises of all sizes on their way to digitalization, so SMEs can also get full support. - Wide range of services is available free of charge. - Information is provided in different ways, e.g. at events, lectures, trade fairs, in the demo centres and trainings, and it is easily accessible.	**WEAKNESSES** - In Baden-Württemberg, there are only two contact points in Stuttgart and Karlsruhe. - The Competence Center offers support only for 5 topics: Production Technology and Processes; Mobility; Intelligent Building; Healthcare and IT Security expertise. - Competition with research centres.
OPPORTUNITIES - In the demo centres, SMEs have an opportunity to test the technical solutions first. Also, companies' staff can get trainings with this regard. - The Competence Center offers a space for the exchange of experience with other companies.	**THREATS** - Due to the fact that the competence center is funded by the Federal Ministry of Economics and Energy (BMWi) only for a period of 2 years, it is not clear how many times its existence will be prolonged or, if not, whether its offers will be subject to charges. - The digitalization options tested in the demo centres may then look completely different in practice.

	- Other companies in the same value chain have access to the same services and potentially create competitiveness during project application.

B.2 SWOT analysis of practices and tools for digitalization of SMEs in Trentino (Italy)

Practice/tool name: Digital Maturity Level Assessment **Origin level:** Research and development	
STRENGTHS - A customized report indicating company's areas to improve the digital maturity. - It can generate new value by fostering innovative projects ideas in various department of the company. - It increases the awareness of the digitalization level by promoting the adoption of 4.0 technologies and digitalization tools.	**WEAKNESSES** - It needs a relevant effort from enterprises to fill in all the questions - Companies do not weight the real value of the assessment. - Difficulty to match company needs with Industry4.0 technology providers.
OPPORTUNITIES - Increases the company's competitiveness. - Eliminates geographical borders. - Collaboration with business agencies and innovation intermediaries.	**THREATS** - Enterprises may not be willing to invest in the digitalization. - Without support during the compilation, the collected data can be inaccurate.

- The tool can open new collaboration opportunities with research institutes.	- Sustainability without public funding.

Practice/tool name: Trentino SME from natural fiber-based VC **Origin level:** Private sector	
STRENGTHS - Reduced time to market for new products. - Good product development efficiency. - Robust contingency plan management. - Best in class customers' data analytics.	**WEAKNESSES** - Supplier equipment not yet connected to the company's ERP. - Digital twin product not always compliant to customers' needs. - Digital traceability of the raw material missing.
OPPORTUNITIES - Improving the public image of the company. - Strengthened supply chain. - Predictive market sales.	**THREATS** - Lack of knowledge in digitalization technologies can penalize the company. - Companies in the value chain are small and with low resources and less inclined to invest in digitalization. - Digital infrastructure is not well implemented in all regional areas.

B.3 SWOT analysis of practices and tools for digitalization of SMEs in Lower Austria

Practice/tool name: House of Digitalization

Origin level: Research and development

STRENGTHS	**WEAKNESSES**
- Quick and easy access to high-class digitalization experts and their knowledge in Lower Austria (and beyond). - Existing infrastructure and state-of-the-art devices / equipment available within the network. - Financial resources and support by Lower Austrian Government, currently 100% financed by public funds, services free of charge/at low costs for companies. - Well advanced project development compared to other federal states. - New personal contacts.	- Awareness for House of Digitalization among customers needs to be improved. - Traffic on website, click rates, conversion rate needs improvement. - Search function and recommender on website needs improvement.
OPPORTUNITIES	**THREATS**
- Increased awareness and more services of House of Digitalization recently introduced through DIHOST: information events, digitalization maturity assessment, financial support for project implementation. - Cultural change will increase demand of new technologies - Use of social media and media cooperation (#DigiTuesday: Each Tuesday a digiPEDIA-term is explained by experts of the DIH network on the local radio and on television (ORF 2 NÖ, at 7:20 pm) to increase awareness.	- Political influence: regional support for House of Digitalization could be stopped/not continued. - Speed of change. - Broad spectrum of topics, but lack of detailed knowledge.

B.4 SWOT analysis of practices and tools for digitalization of SMEs in Slovenia

Practice/tool name: Digital vouchers **Origin level:** Government	
STRENGTHS	**WEAKNESSES**
- Opportunity to receive funding for strategic undertakings in different areas (marketing, cybersecurity, digital competences, etc.). - Precise definition of terms and activities required for receiving the funding. - Publicly acknowledged institution takes care of the transparency of the entire process and assessing companies' applications. - Connecting with experts on digitalization leads to knowledge and experience transfer. - The company has access to workshops on digitalization. - The company has access to a list of trusted experts already prepared by DIH Slovenia.	- Requirements are not feasible for companies of varying sizes (e.g. 20% employees must be included in trainings). - The upper limit for funding might not be sufficient to carry out digitalization activities, depending on the company's financial state. - For a given voucher, all companies have the same upper funding limit, regardless of their size and needs. - For certain vouchers, companies are required to identify external experts from a pre-defined catalogue without the possibility of changing them if they are not satisfied. - Limited help and consultations provided during the application process. - The amount of funding is time- or finance-limited (max. one voucher per year or max. 20.000EUR).

	- Certain vouchers require extensive preparation (e.g. forms, detailed execution plan, draft documents).
OPPORTUNITIES - Vouchers have a specific purpose of increasing digitalization level in precisely specified areas. - The company can become more competitive and increase its income with digitalized business and digital strategy. - Companies can continue their collaboration with hired experts on other projects in the future.	**THREATS** - Lacking level of support during the application process might result in companies not receiving funding due to incomplete/inaccurate applications. - Large number of terms and conditions can demotivate and discourage companies from applying or create additional application costs for them. - Disagreements and poor communication between the company and the hired expert can produce poor results and wasted funds.

Practice/tool name: InnoRenew CoE **Origin level:** Research and development	
STRENGTS - Increased knowledge transfer from other research institute members regarding project funding possibilities. - Collaboration in terms of research, material development, industry optimization for public funding application purposes.	**WEAKNESSES** - Collaboration limited to the process of applying for project funding. - Less focus on supporting the implementation of the funded project. - No knowledge transfer regarding specific technologies and tools. - The project application is limited to public funding schemes.

- The company generates new value by offering high quality products following recent production trends. - Promoting a circular economy by employing processes to increase the amount of recycled wood.	
OPPORTUNITIES - Research institute's network can open new collaboration possibilities with other members for future projects/ideas. - More possibilities to expand to foreign markets. - Participation in the project increases the probability of SME taking part in more projects in the future. - Increased possibility to become an established member of project consortiums.	**THREATS** - Without support during project implementation, project success is not guaranteed. - Lack of knowledge transfer regarding technologies can lead to insufficient knowledge on the use of technologies for business process optimization/digitalization. - Companies in the same VC have access to the same research institute's resources (potentially creating competitiveness during project application).

Practice/tool name: SME from wood processing VC **Origin level:** Private sector	
STRENGTHS - The company improves its business process with low internal costs due to public funding.	**WEAKNESSES** - Project is oriented towards support functions (e.g. administration, marketing), neglecting production processes. - The project application is limited to public funding schemes.

- Digitalization can improve or simplify business processes (e-commerce) and decrease costs. - Trainings for employees regarding new technologies in production can increase their knowledge and skills. - The company is more accessible to customers and business partners through establishing e-business. - Direct access to information regarding public funding.	- Funding is focused towards implementing development strategies of the country rather than specific company's needs.
OPPORTUNITIES - More possibilities to expand to foreign markets. - e-commerce can bring new customers and business partners (both domestic and foreign). - Improved business process can generate higher income for the company. - Participation in the project increases the probability of taking part in more projects in the future. - The company can share newly generated knowledge and skills about improving business processes and project funding application with companies in the VC. - Improving the public image of the company.	**THREATS** - Existing production resources and processes are not able to meet the needs of new customers and partners obtained through e-commerce improvements. - Improvements in production processes fall behind improvements in e-commerce. - Other companies applying for the same funds.