

# Good Practices and Tools for Digitalization of SMEs in the Natural Fiber-based Value Chains

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**Abstract.** *Digitalization has become an important part of our daily lives. The benefits of its introduction into business are reflected in many success stories. On the other hand, it is increasingly recognized that small and medium-sized enterprises (SMEs) play a major role in contributing to the economy. However, there are various challenges that these companies face in their digitalization process. In our research, we have identified these existing challenges and good practices and analyzed them with SWOT analysis. The results showed that many different funding schemes and assistance are available for SMEs. The main disadvantages of this assistance are the lack of support during the application process, the large number of conditions and the unadjusted funding.*

**Keywords.** digitalization, SME, good practices, tools, SWOT analysis, natural fiber-based value chain

## 1 Introduction

Nowadays, the term digitalization is mentioned and used in a large number of areas. At the same time, the economic and innovational potential of small and medium-sized enterprises (SMEs) operating in different industry sectors is recognized increasingly by several European projects and initiatives. Various reports show that they can influence and contribute to a country's economy significantly in terms of innovations, employments, and economic growth (Organisation for Economic Co-operation and Development (OECD), 2017). One of the possibilities to enable these companies to develop further, grow, and operate successfully is the introduction of digitalization in their business process.

The establishment and usage of digitalization tools may accompany some issues and barriers, especially in less digitalized companies. Different indicators and measures are used to assess the digitalization level of countries. One of the most used is the Digital Economy and Society Index (DESI), which measures the level of digitalization in six different areas (connectivity, digital skills, use of Internet services by citizens, integration of digital technology by business, dig-

ital public services, and research and development of ICT) (European Commission, 2019). Existing measures do not provide an insight into the digitalization level, good practices and tools used within SMEs in the natural fibers' domain, so we focused on this area as part of this research. The study, which was conducted within the EU-project Smart SME's, includes four regions/countries from the Alpine region - Baden-Württemberg region (Germany), Lower Austria, Trentino (Italy) and Slovenia, from which we obtained existing tools and good practices and included them in the SWOT analysis. A SWOT analysis consists of four areas that describe the strengths, weaknesses, opportunities, and threats of a possible introduction of good practice into wider use among SMEs in the natural fiber value chain (VC). This value chain represents a list of activities performed within SMEs in the selected natural fiber domain (e.g. the wood value chain includes activities such as sawing, milling and production of wooden products).

In the following section, the related research from the area of digitalization in SMEs is presented, followed by a section on the methodology used in the implemented research. Section 4 includes examples of good practices of integrating digitalization into companies, and the final section describes the SWOT analysis of the presented good practices in the conclusion of the paper.

## 2 Related work

Several studies have already been published analyzing the challenges and opportunities that the Industry 4.0 revolution can bring to SMEs in different sectors (Matt, Modrák, and Zsifkovits, 2020; Autio, 2017).

Ezzel and Atkinson performed a benchmarking study of countries' policies and programs aimed at supporting manufacturing SMEs in their business growth, as well as research and development activities (Ezell and Atkinson, 2011). Their results provide a detailed overview of mechanisms implemented in different countries, such as technology acceleration funding or programs and practices, connections to and for SMEs, and involvement of support agencies.

Several examples of SWOT analyses from similar fields can be identified. For example, Falcone et al. performed a SWOT analysis of the strategies employed in the Italian forest sector to transition towards a circular bioeconomy (Falcone et al., 2020). The results indicate the importance of investments in forest planning tools, supporting entrepreneurship programs and innovations within the value chain. As the biggest weaknesses and threats, the authors identified inconsistent policy frameworks, lack of skilled professionals, excessive bureaucracy, and lack of long-term planning by government bodies.

Different ideas and approaches behind the Industry 4.0 paradigm and their impact on Bulgarian SMEs are presented by (Moraliyska, Antonova, et al., 2018). A SWOT analysis was performed on Bulgaria's readiness for Industry 4.0 focusing on the manufacturing industry. According to the analysis, the lack of research and development funds or dedicated programs for job training, as well as the high competitiveness of the sector, are the most significant weaknesses, while national and European Union policy initiatives and the growing international market present the most important advantages for Bulgarian manufacturing SMEs.

On the other hand, Issa, Lucke and Bauernhansl studied the effectiveness of approaches introduced in Germany to connect their manufacturing SMEs with specialized research institutions called "I4.0 test environments" (Issa, Lucke, and Bauernhansl, 2017), which highlighted the information deficit between SMEs and test environments as the biggest issue. Based on this finding, the authors proposed an approach to facilitate their collaboration. Their approach includes a competence-based matching mechanism between SMEs and test environments, funding schemes initiated by the government, and developing mechanisms for evaluating the success of funded SME projects.

### 3 Methodology

Our research methodology consisted of two steps:

1. Identification and analysis of existing examples of knowledge transfer on digitalization to SMEs, as well as identification of good knowledge transfer practices and tools, and
2. Performance of "bottom-up" SWOT analysis on the identified knowledge transfer practices and tools identified in the first step.

In the first step, existing examples of knowledge transfer on digitalization to SMEs were analyzed with regard to the four dimensions in which knowledge transfer is mostly required:

- **Skills of the staff** - refers to activities, such as workshops or training for employees, which aim at im-

proving the employees' skill set in working with digital technologies,

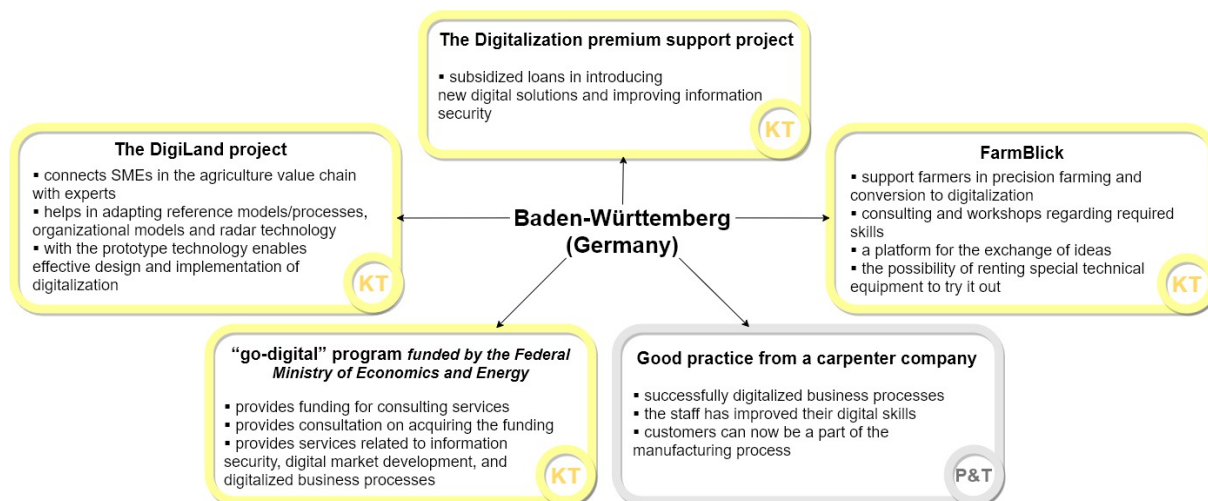
- **Methods** - refers to different mechanisms and endeavors for sharing the "know-how" about the digitalization process to SMEs,
- **Technologies and tools** - refers to various Information Technology solutions, such as platforms or websites, used to share knowledge on digitalization, and
- **New value generation** - which refers to innovative approaches, such as using Machine Learning or Blockchain technologies, which generate new value and knowledge for participants.

Based on these four dimensions, existing good practices and tools were also identified for implementing digitalization in SMEs by region/country.

The collected practices and tools for the digitalization of SMEs bring various benefits or impose limitations when implemented in different countries in the Alpine region. To further study the results of their implementation in a given country/region included in our research, and identify both their benefits and drawbacks, an individual SWOT analysis has been performed on each practice/tool presented in Section 4. The aim of our approach was to use the insights on the strengths and weaknesses of the country/region-specific practices/tools to draw more general conclusions about their characteristics necessary to perform a cross-border SWOT analysis of digitalization practices and tools.

### 4 Good practices, tools and examples of knowledge transfer within a region/country for the digitalization of SMEs

A good example of knowledge transfer which we identified in the Baden-Württemberg region (Germany) is The Digitalization Premium Support Project, funded by the Ministry of Economic Affairs, Labour, and Housing of Baden-Württemberg, which supports SMEs with subsidized loans in introducing new digital solutions and improving information security. It has the potential for knowledge transfer in all four dimensions. It can be used to promote training for employees (help them acquire ICT software and hardware knowledge), to help introduce new digital solutions in production processes, products, and services, and bring knowledge for renewal of strategies and organization, as well as bringing added value to bio-based and other value chains. In addition to this example of knowledge transfer in the Baden-Württemberg region, we identified three other examples shown in Fig. 1. Good practice of successfully digitalized business processes in Baden-Württemberg comes from a carpentry company



**Figure 1.** Identified good practices, tools (P&T) and examples of knowledge transfer (KT) within the Baden-Württemberg region.

that has largely digitalized its business processes. The staff has improved their digital skills and the customers can now be a part of the manufacturing process. Customers can choose preferable materials through video, and employees can track their working time through a mobile app. Due to the digitalization of all customer and production data, the data can now be accessed at any time.

Fig. 2 shows the identified good practices and knowledge transfer in the Trentino region. There, we find The Chamber of Commerce, which provides the “Punto Impresa Digitale” service to SMEs. This service helps to promote the digitalization culture and dissemination through the creation of a network of organizations, and assists enterprises in the digitalization process through educational events, workshops, and mentoring support. In the same region, several hubs participate to assess the level of digitalization of participating SMEs and evaluate possible strategies to optimize their internal processes. They organize web-conference training, provide advice on the implementation of technologies to increase digitalization, and provide SMEs with vouchers to improve and implement innovative ideas. A good example from this region is a medium-sized enterprise in the energy sector. The enterprise has implemented advanced Building Information Modeling (BIM) using Digital Twins technology, with the support of the national and local funding opportunities. After implementing this, the enterprise was able to avoid project and mounting mistakes during the 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 waste.

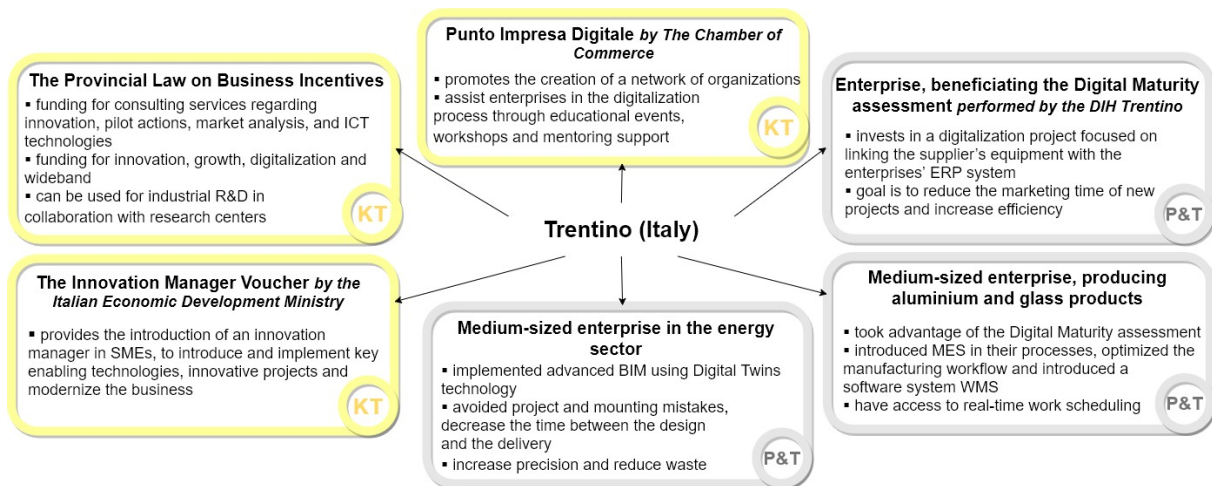
In Lower Austria, one of the good examples of knowledge transfer is the KMU Digital program from the Austrian Digitalization Initiative, which helps SMEs to analyze digital trends, opportunities, and

risks, helps them to determine the status quo in e-commerce and information security, and assists them in obtaining subsidized consulting and assistance in implanting the digitalization strategy. Another example from Lower Austria is The House of Digitalization, which connects SMEs with main IT knowledge providers in the region through specific IT seminars, and offers assistance in finding partners. It also offers the option of crowdsourcing in order to contribute to ideas for potential solutions.

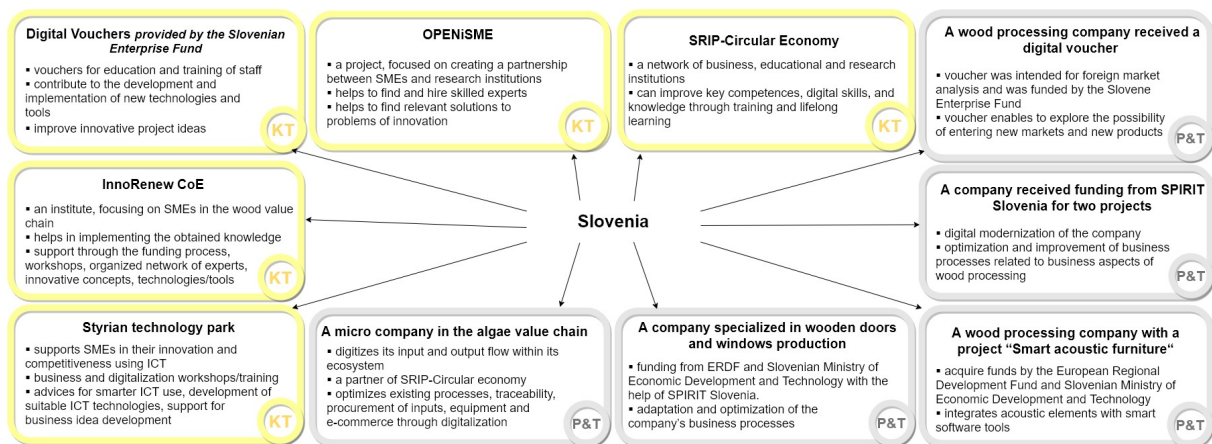
An example of good knowledge transfer in Slovenia, also seen in Fig. 3, are the so-called Digital Vouchers provided by the Slovenian Enterprise Fund. Vouchers are designed to increase the level of digital competences and skills of staff through education and training vouchers. They contribute to the development and implementation of new technologies and tools, and improve innovative project ideas. A detailed description of the vouchers can be found in Section 5.4. A Slovenian company operating in the wood value chain can be considered as a good practice of using existing financing, as it received funding from SPIRIT Slovenia for two of their projects. The first project focuses on digital modernization of the company, with the goals of developing and upgrading 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).

## 5 SWOT analysis of collected good practices

The identified good practices and examples presented in Section 4 share some common characteristics, even



**Figure 2.** Identified good practices, tools (P&T) and examples of knowledge transfer (KT) within the Trentino region.



**Figure 3.** Identified good practices, tools (P&T) and examples of knowledge (KT) transfer within Slovenia.

though they are found in different countries/regions. Furthermore, varying benefits and drawbacks can be observed in their implementation in SMEs. An initial general analysis of all collected practices and tools indicates that their positive and negative effects are highly influenced by their origin. Therefore, before further studying the characteristics of the collected practices and tools, we grouped them according to their type of origin into three categories with the following characteristics:

1. **Government-level practices and tools** - national and/or local government initiatives focusing on developing a support framework for the digitalization of SMEs through regulations and public funding schemes,
2. **Research center-level practices and tools** - incentives and programs offered by research institutions, focusing on providing support to SMEs throughout their digitalization process through workshops, consulting services and active project partnerships, and

3. **Private sector-level practices and tools** - projects and activities carried out by the private sector, with a focus on networking and the dissemination of the "know-how" regarding the digitalization of SMEs.

It is important to note that the relationship between the government, research centers and private sector SMEs is not necessarily mutually exclusive. This means, for instance, 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.

### 5.1 Government-level practices and tools

Usually, within every country, the national and local governments are those who have the widest range of possibilities to create a favorable environment for SMEs. In generating success and added value, SMEs depend on the availability of resources necessary for their business, which can be in the form of finances,

investments, knowledge networks, or similar resources (Organisation for Economic Co-operation and Development (OECD), 2017).

Our research on the included Alpine region countries/regions indicates that the national and local governments are highly supportive of initiatives related to the digitalization of SMEs operating in the natural fiber-based value chain. Specifically, in each analyzed country/region, there is at least one agency initiated either by the national or local government, dedicated as the "go-to-place" for SMEs included in the digitalization process. The baseline for each government-level digitalization practice and tool is the official national digitalization strategy (Mărcuț, 2017), which is, nowadays, established in most European countries. Based on this strategy, national and local governments are able to introduce support mechanisms and develop specialized frameworks to help SMEs throughout their digitalization efforts.

Besides funding schemes and dedicated policies, governments and their agencies can also develop mechanisms and organize events for informing SMEs and raising their awareness about the resources and options available to help them carry out the digitalization process since the lack of such information is often one of the strongest inhibitors of SMEs' digitalization. Some common examples of such government-level practices and tools identified in general, as well as through our research, are:

- Dedicated agencies that offer access to direct funding schemes and projects financed exclusively by national/local public funds (e.g. Digitalization Premium in Baden-Württemberg),
- Digitalization-oriented projects (co-)financed by the European Structural and Investments Fund (or any other European dedicated agency),
- Vouchers for helping SMEs in their digitalization undertakings (e.g. digital vouchers in Slovenia).

Fig. 4 presents the results of the SWOT analysis performed on the identified government-level practices and tools from all four involved countries. The analysis shows that government-level practices and tools create a number of digitalization possibilities for SMEs, especially regarding the funding of their digitalization-oriented projects. By using government funding opportunities, SMEs can enjoy different benefits, such as increased market share/recognition, income, innovative products, and so on. Government-issued policies can help SMEs as a guideline to accessing available resources and steps necessary in their digitalization efforts (Autio, 2017). They can also present a hurdle if they require too much administrative effort from SMEs. It is often the case that SMEs perceive government policies as inattentive to the actual market developments and their business needs, which results

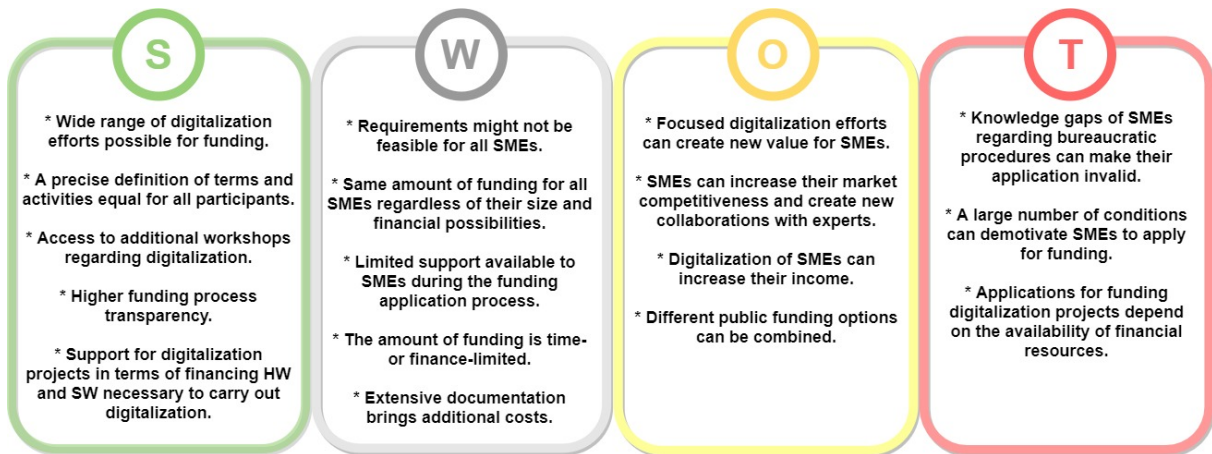
in SMEs not taking advantage of the potential opportunities offered by government initiatives (Minh and Hjørtso, 2015).

One of the strongest backbones of the government-level practices is the higher transparency and precise definition of terms and conditions for all participants, required since they are based mostly on public funding. However, it is important to be careful when specifying these conditions, as they are sometimes too restrictive for smaller SMEs, which is especially the case for the natural fiber-based SMEs. In these cases, the exhaustive preparation of documents necessary to apply for government-funded projects often generates additional administrative costs with questionable cost-efficiency, and without any assurance that, in the end, a given SME will receive the funding.

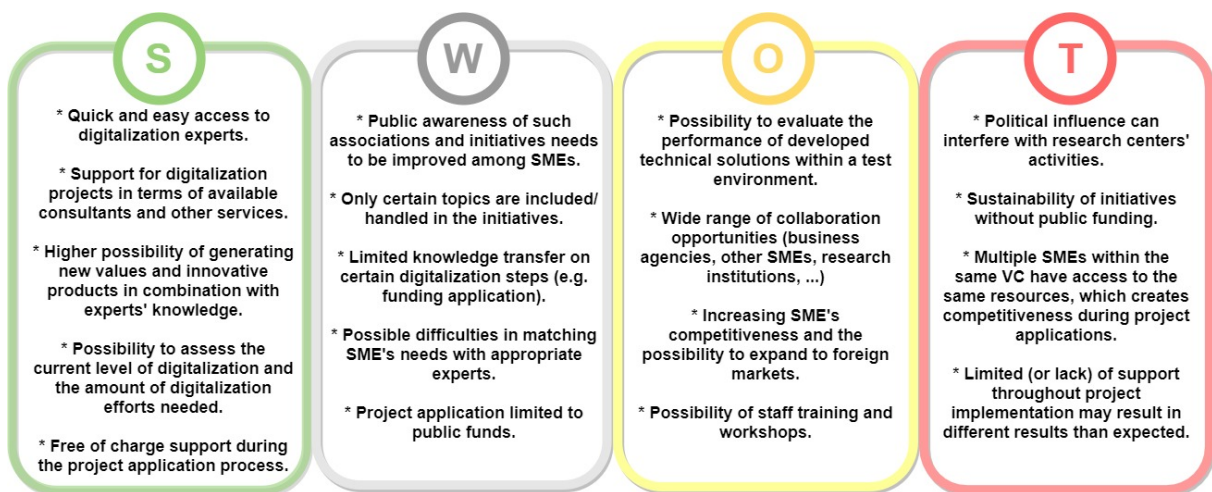
In general, one of the biggest threats to government-level practices and tools is the insufficient knowledge support for SMEs, as government agencies often invest limited efforts into informing SMEs about the funding opportunities and precise conditions, how to apply for funding, which is a possible pitfall, and this can result in a number of incorrect applications caused simply by their misunderstanding of the procedural steps. In addition, public funds are available to a wider range of national/local SMEs with the same goals. This creates an increased competition between SMEs but also decreases the chances of receiving the funds, which might discourage some SMEs from applying or indulging in their digitalization projects in the first place.

## 5.2 Research center-level practices and tools

Research centers represent an environment in which the knowledge and interests of universities and SMEs are brought together to generate new value for both parties. In recent years, an increasing number of countries have recognized the potential of research centers in overcoming challenges arising in both academia and industry. A number of research centers and innovation hubs can be found in the countries and regions of the Alpine region included in this research, such as the Kompetenzzentrum Stuttgart Mittelsland in Germany, House of Digitalization in Lower Austria, or the InnoRenew CoE in Slovenia. As a mediator, research centers enable SMEs to access the knowledge and research practices of universities, while enabling universities to bring their research ideas to the market and implement them in practice through partnerships with SMEs. Such organizations support SMEs in their digitalization efforts free-of-charge by providing financial, marketing, and operational information through discussion platforms, workshops, consulting services, partnerships in applying for funds, and similar. Various events organized and carried out by research centers bring the most opportunities for SMEs to improve their employees' digital skills, which is an important



**Figure 4.** SWOT analysis of government-level practices and tools for Alpine region countries.



**Figure 5.** SWOT analysis of research center-level practices and tools for Alpine region countries.

starting point in successful digitalization projects.

As shown in Fig. 5, research centers achieve their greatest advantage in creating networking opportunities for SMEs (especially those in the rural areas), which can then lead to new innovations (Minh and Hjortsø, 2015). By building networks of contacts with the necessary domain expertise, SMEs can reduce the risks and costs (administrative or any other) of their digitalization process greatly. The intermediary role of research centers helps SMEs to build their knowledge networks, as well as provide them with the necessary information related to available funding schemes and market information. In this way, research centers disseminate the knowledge necessary to SMEs, thus reducing their costs for researching the required information on their own (Kirkels and Duysters, 2010). Through such direct interaction with researchers and experts, SMEs can receive the valuable knowledge necessary for innovations and further improvements enabled through the digitalization (Collier, Gray, and Ahn, 2011).

The result of bringing SMEs and universities together may not always be as successful as expected,

mainly because of the differences in their interests and "cultures". Being research-oriented, the universities are more focused on performing scientific research for their own purposes, which can take years and/or require many adaptations before it can be implemented in practice by SMEs because it does not meet SMEs' needs (Cannarella and Piccioni, 2005). Also, the practices identified in our research show that some national/local government policies and strategies may inevitably affect the activities of research centers and innovation hubs (for example, national digitalization strategies focusing on only certain industries and areas in a given time period). Being co-financed (or entirely financed) by national or local governments can also present a significant risk to the operations of research centers.

### 5.3 Private sector-level practices and tools

Lastly, within the analysis, we identified one example of good practices and tools provided to SMEs by a private enterprise. This was a start-up company Farm-Blick from Baden-Württemberg, presented in Section 4. In addition to providing SMEs with direct access

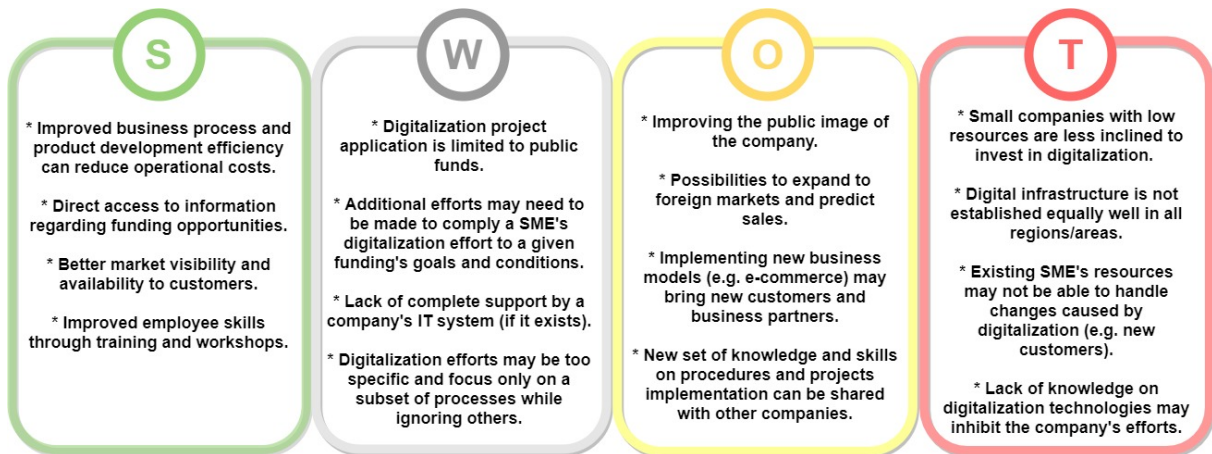


Figure 6. SWOT analysis of private sector-level practices and tools for Alpine region countries.

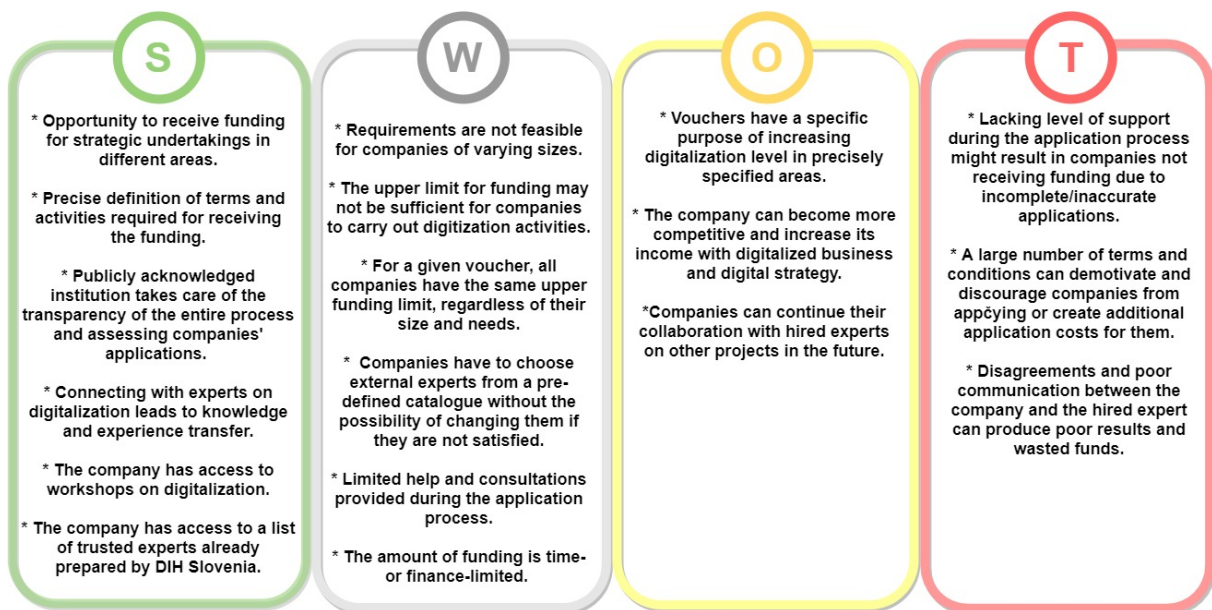


Figure 7. SWOT analysis of Digital vouchers in Slovenia.

to targeted solutions, such collaborations could lead to other opportunities, such as better market visibility, and implementing modern business models. Furthermore, they provide an opportunity for formalized cooperation between SMEs, although such formal cooperation was not identified in our analysis. Other strengths, weaknesses, opportunities, and threats posed by such a form of cooperation are presented in Fig. 6.

Despite the potential for cooperation between SMEs and private companies, our research reveals that such solutions are not common among the analyzed SMEs in the Alpine region. Most SMEs operate with limited resources, investing mainly into day-to-day business, and are often dependent on public funding, revealing the major downside of private sector-level practices and tools. Furthermore, the efforts for digitalization might be too specific and focused on a subset of processes, weakening the digitalization efforts of SMEs.

## 5.4 An example of SWOT analysis

An example of knowledge transfer in Slovenia, digital vouchers were analyzed using SWOT analysis, as shown in Fig. 7. The analysis shows that their strengths are in the field of the possibility of obtaining funding, in the detailed requirements for their acquisition, in the possibility of connecting with experts and professionals, and so on. They also show opportunities in the field of exact goals, and are aimed at enabling companies to be more competent and have larger incoming in the future. One of their weaknesses is that they are not achievable for companies of all dimensions. Especially small companies may have a problem, for example, in complying with the requirement that 20 % of workers must be included in the training, and, as a threat, there is a possibility that funding will not be obtained due to incomplete or inaccurate applications.

## 6 Conclusion

As part of the research, we analyzed existing good practices and tools used for the process of digitalization of SMEs in the Alpine region and performed a SWOT analysis. We found that in all involved countries/regions (Baden-Württemberg, Trentino, Lower Austria, and Slovenia) are examples of knowledge transfer in the form of support projects, programs, initiatives, vouchers, institutes, and hubs. We further identified small and medium-sized enterprises in these areas, which represent good practices for the introduction of digitalization and have already benefited from the offered support from the before mentioned sources. We divided these collected good practices and tools into three levels (Government-level, research center-level, and private sector-level), depending on the field from which the practice originates. The results of the survey suggest that the national and local governments are highly supportive of initiatives related to the digitalization of SMEs operating in the natural fiber-based value chain. One of the most important advantages is the possibility for SMEs to obtain various funding and advice from different institutions and experts, while a major drawback is their inadequacy to different sizes and areas of operation of companies and complex procedures/conditions for obtaining assistance. During the research, we identified one example of good practices and tools provided to SMEs by a private enterprise. That suggests that such solutions are not common among the analyzed SMEs. Most of them operate with limited resources, investing mainly in day-to-day business, and use mostly only public funding. Nevertheless, the strong relationship between these levels can help resolve some barriers in the digitalization process.

## Acknowledgments

The analysis included in this paper was performed within the Smart SME's Project, co-financed by the European Parliament through the Alpine Region Preparatory Action Fund (ARPAF II). The authors would like to express their appreciation to the project partners (Schweizerische Arbeitsgemeinschaft für die Berggebiete (SAB), BIOPRO Baden-Württemberg GmbH, Department for Economic Development, Research and Labour of the Autonomous Province of Trento, Hub Innovazione Trentino, Ecoplus. The Business Agency of Lower Austria and Anteja ECG) for their valuable contribution.

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