

PILOT REPORT

Deliverable D.T3.5.3

Version 1

Pilot report

02/2022

CCIS





Project Number	CE1492
Project Name	Towards the application of Industry 4.0 in SMEs
Project Acronym	4STEPS
Work package	WPT3 - The Digital Innovation Hubs in action
Activity	Activity A.T3.X
Deliverable	Deliverable D.T3.5.3
Responsible project partner	Chamber of Commerce and Industry Slovenia
WP responsibility	Vorarlberg University of Applied Sciences (FHV)
Dissemination Level	Public
Date of Preparation	January 2022
This document must be referred to as	Pilot report
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Executive Summary/Management Summary

With Central Europe in the middle of a new industrial revolution, new challenges face manufacturing companies. Slovenian manufacturing SMEs are struggling to keep up with large corporations in the digital revolution. In the scope of the project the CCIS aimed to help SMEs in starting and furthering their digital transformation process. As a horizontal actor the CCIS took an advisory and networking role instead of a technological one. It was with this in mind the services of our Hub were developed. A series of workshops were carried out with the goal of giving business guidance in the area of Industry 4.0 and digitalisation. In the scope of the workshop an evaluation of the digital readiness of a manufacturing business was done with the help of the TML index. A presentation was given to key employees in the companies on the facts and trends of Industry 4.0 and digitalisation technologies as well as possible financing sources and other projects and organisations that aid the digital development of manufacturing companies. With the help of a guided interview and a tour of the manufacturing facility key process and organisation improvements were identified. Along with the workshops a series of events were organised with the main goal of connecting different stakeholders involved in the digital transformation and I4.0 technologies. Technology end users, providers, research organisations, academia and the general public were brought together in various setting and key points were transferred into our Hubs activities. The Hub aims to keep operating with membership funding and to further Slovenian companies' advancements in the field of I4.0 and digitalisation.



1. Introduction (incl. business needs and requirements)

Much like the rest of central Europe, Slovenian manufacturing companies are faced with rising costs of labour and raw materials resulting in lower added value to their products. While lean manufacturing tools like Six Sigma and 5S methods add value to the manufacturing process the quickly developing digital world is proving to be the new path to business improvement.

As elsewhere in Europe there is a divide in digital development between large enterprises and Small and Medium-sized enterprises (SME's). Most large Slovenian companies are tied either to the automotive industry or to the electronics and electrical industry. Companies tied to the automotive already have a big initiative to digitise as automotive manufacturers already demand a high standard of information and organisation while the electrical and electronics industry is already largely automated from the start which results in higher digitalisation readiness. Due to all these factors and a higher R&D budget, most large Slovenian companies already have a digitalisation department or a digitalisation strategy and programme in deployment.

Most Slovenian SME's are in the early stages of digitalisation or are barely grasping the concepts of Industry 4.0. This is mostly due to the low budget for additional research. In the Slovenian business environment, there is also a lot of "If it works, don't fix it" culture, which results in a lot of reluctance in implementation of new technologies without concrete proof (financial calculations), that changes will lead to profit. This is a problem because most financial benefits of digitalisation and Industry 4.0 principals only become apparent indirectly after they are implemented into the manufacturing process. Most business need to grasp the concept of digitalisation as a continuous improvement tool and as a source of business automatization. While I4.0 technologies such as Big Data, VR, AR and digital twin can be powerful assets in the long run Slovenian SME's are faced with the problem of laying a strong foundation for their digital development. Considering these needs our DIH and its services were directed at giving businesses guidelines for digital transformation and improvements in the manufacturing process related to digital and I4.0 technologies. The lack of funds was tackled via information about financing options.

2. Digital Innovation Hub and its services

Our DIH was not set up to develop new technologies, but rather to serve as an information point for developing manufacturing business and a connector between these companies and digitalisation and I4.0 technology providers. It focuses on supporting the industries that are highlighted as priority ones by Slovene Smart Specialization Strategy (S4), such as: smart cities and communities, smart buildings, and smart factories. However, it does not exclude other industries from S4, ranging



from high-tech to more traditional ones. It offers services, such as individual digital readiness assessment and coaching on the concepts of industry 4.0 for manufacturing SME's, analytical assessment and individual coaching of SMEs on the topic of sustainable value chain reporting, workshops for manufacturing SMEs on understanding the importance of customer experience, it helps SMEs on topic of where and how to access finances for digitalisation of theirs' business model and technologies, it offers pilot platform for the e-life cycle of products (promotion, showcasing, coaching on topic of ETIM standards of ETIM), it raises awareness of the importance of cyber risk management in leading businesses and government bodies, develops the capacity of the cybersecurity competence centre for the needs of business and the public sector, develops the collaboration of cybersecurity service providers, the public sector, service users and professionals, promotes the development of specialist and user skills and enforces standards and certifications, joint development projects for government programs and specific solutions for SMEs.

2.1. The Hub

The smart factory cluster of our Strategic Research and Innovation partnership of the Factories of the Future represents the Hub in which our products and services are developed. The Hub aims to connect participants on all technological and social levels and create a supportive environment in which enables companies take part in different phases of digital and technological development. The Hub focuses on all the components needed to develop a smart factory including all relevant digital and I4.0 technologies: Smart products, smart equipment, smart people, smart processes and smart management. The key building blocks of this support environment are upgrading the support to already established value chains, establishing a single network of knowledge and information, a three-level demo infrastructure according to the Open innovation model and an internal market for real industrial scenarios. All of these activities aim to address the challenges most Slovene companies are facing today in introducing technologies of I4.0 into their business. Long term sustainability of the hub is predicted via membership fees of business, academia and business support organisations.

2.2. Products & services

2.2.1. Individual digital readiness assessment and coaching

10 individual digital readiness assessments and coaching of different manufacturing SME's were carried out in the scope of the 4STEPS projects. The service was developed as a workshop which takes place at the seat of the company. The workshop has three main goals. The first is to inform the company of their digital readiness and digital maturity level to give them an understanding of their progress and provide additional



information about Industry 4.0 and the digital transformation in theory. The second goal is to give the company guidelines and new ideas for further development in the area of I4.0 technologies and digitalisation. The last goal is to provide companies with information regarding public project calls and other financing options that may aid them in the digital transformation. To give the company an idea of their digital readiness the TML survey and index is used. The workshop participants include relevant actors within the company in the field of digitalisation as well as members of management. If possible, representatives of other relevant digitalisation projects take part as a networking function. The workshop consists of three main parts:

- **The lecture:** A presentation is given in which key topics of I4.0 and digitalisation are covered. The lecture serves as an informative tool to fill the knowledge gaps of the attendees, but also to establish a common terminology for the following interview. The topics of Industry 4.0 and digitalisation such as I4.0 technology pillars, the vertical and horizontal structure of the smart factory, typical types of manufacturing plants and key I4.0 concepts related to these types are covered. Relevant projects and organisations related to I4.0 and digitalisation are presented and, when possible, their representatives give a presentation on their work.
- **The interview:** A structured interview is carried out to identify the level of development of the following areas:
 - Vertical and horizontal systems integration
 - Shopfloor connectivity (IoT)
 - Manufacturing planning and control
 - Automatization
 - ERP and MES intelligence
 - Digital strategy
 - Human resource digital development
- **Manufacturing plant tour:** The interview serves as insight into the structure and concepts of the intangible processes in the company. Many missing key concepts can be identified while observing the physical system. During the walkthrough the concepts explored in the interview are further observed and crucial shortcomings in the processes are observed.

The results of the workshop are given in a report including the analysis of the TML survey, the level of development in the I4.0 and other digital pillars and recommendations for future focus areas in the field of digitalisation

2.3. Processes

DIHs activities and services aim to boost the development of a digital manufacturing environment in the region. Processes are crucial for this. By assessing digital readiness of the companies (manufacturing SME's) and then coaching them on the concepts of



Industry 4.0, DIH provides a service that gives SME's that are lagging behind on digital development the knowledge and ideas to start their digital transformation. The DIH itself does not implement these solutions, but presents SMEs the possible solutions, tailored specifically for them, and examples of good practices from similar SMEs in the region.

2.4. Networks

2.4.1. Regional stakeholder group

A regional stakeholder group was assembled to tackle the topics of manufacturing optimisation in the digital age. Relevant stakeholders from companies, research and academia and business support organisations were brought together in an on-line conference. A prominent topic was lean production taking a new role as digital lean. While traditional lean tools are still a very important subject it is important to place them in the new digital environment and take advantage of data the new integrated production systems provide. The meeting of the stakeholder group was also used as a field to test what approach would work, how new technologies can be used in companies and how we could transform these take-aways into potential DIH services.

The Hub plans to carry on various regional stakeholder group meetings to accelerate the exchange of information between businesses, academia and business support organisations. With CCIS's large network of connections and members such groups can have a large impact on the entire region and include the most important actors. After every stakeholder group meeting the relevant findings are used to improve the hub's services or to serve as guidelines for the development of future services.

2.4.2. B2B connector

Since the long-term financial sustainability of the hub depends on membership fees one of the main roles the hub takes is a business connector or even intermediary in B2B communication. Many companies have difficulty finding the right service or product provider for the problem they are tackling. Usually, the connection takes place between a business in need of a new service or product that is not available on the open market. In this case the business is connected with a technology or service provider or academia and research organisations. In some cases, technology and service providers require outside resources while developing a new solution and they are connected with academia and research organisations.

2.5. Business models

Our DIH serves as an information point for developing manufacturing business and a connector between these companies and digitalisation and I4.0 technology providers.



It helps companies to leverage their digital technologies to improve several aspects of their organisation. The final result is the digital business model - model that helps enhance its value proposition. This is achieved by individual digital readiness assessment and coaching on the concepts of industry 4.0 for manufacturing SME's, analytical assessment and individual coaching of SMEs on the topic of sustainable value chain reporting, workshops for manufacturing SMEs on understanding the importance of customer experience, it helps SMEs on topic of where and how to access finances for digitalisation of theirs' business model and technologies.

3. (Expected) Impacts for your tackled business/industry, region, country & Interreg

All the Hubs activities and services aim to boost the development of a digital manufacturing environment in the region. Individual digital assessments and coaching of companies and the venture capital connector are predicted to boost the digital development and I4.0 implementation of Slovenian SME's and increase the added value per employee which is the main goal of manufacturing companies. Connecting stakeholders is an important role in the Slovenian region and the newly established cooperation between large enterprises, SME's, research organisations and academia is expected to raise the level of innovation in the area. As these collaborations accumulate their results will be obtained for future use as good practice examples. As described in the introduction Slovenian businesses are reluctant to change stable business models and processes. Good practice examples gained from hub activities will be used to inform hesitant manufacturing companies of possible gains from following the I4.0 path.