Interreg
CENTRAL EUROPE
European Union
European Regional
Development Fund
4STEPS

SMART SERVICE FACTORY DEVELOPMENT

Deliverable D.T3.3.2

Deliverable Report

12/2021

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.T3.3
Deliverable	Deliverable D.T3.3.2
Responsible project partner	Vorarlberg University of Applied Sciences (FHV)
WP responsibility	Vorarlberg University of Applied Sciences (FHV)
Dissemination Level	Public
Date of Preparation	12/2021
This document must be referred to as	Deliverable report
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Contributors	Prof. (FH) Dr-Ing. Jens Schumacher, Dr. Michael Hellwig, Dr. Steffen Finck, David Hutter MSc, Viktoriia Simakova

Contents

Executive Summary/Management Summary

The Digital Innovation Hub "Business Intelligence & Innovation" is a regional innovation hub within the Federal State of Vorarlberg / Austria. It is a service centre of the FHV which appears -currently- mainly cyber-physical. This Hub on "Business Intelligence & Innovation" is an output of the Interreg Central Europe project "4Steps" (Towards the application of Industry 4.0 in SMEs): this project is addressing the main challenges of Industry 4.0 (I4.0) as tool towards a new, digital industrial revolution holding the promise of increased flexibility in manufacturing, mass customisation, increased speed, better quality and improved productivity and its development is supporting the RIS3 in the target regions in the different sectors.

As depicted in figure XXX, the development of the Digital Innovation Hub "Business Intelligence & Innovation" occurred in three successive phases and deliverables. Phase 1 is about the "Prototype of smart service factory of the future" (deliverable WP3, D.T3.3.1) and includes the definition of the resource-base for the Hub. Phase 2 is about the "Smart service factory development" (deliverable WP3, D.T3.3.2) and presents the actions and activities undertaken within the pilot phase. Phase 3 is about the presentation of the pilot report (deliverable WP3, D.T3.3.3), including a SWOT analysis.

This deliverable is about phase 2 and presents the Smart Service Factory development. It extends the deliverable D.T3.3.1 Prototype of Smart Service Factory of the Future and presents how the resources defined in the deliverable D.T3.3.1 are brought to action: it presents the actions and activities undertaken within the pilot phase.

The deliverable at hand consists of XXX chapters. Chapter 1 is about the introduction of the smart service factory development. Chapter 2 presents the theoretical embeddedness of the Hub on "Business Intelligence & Innovation" and its contextual underpinning. Chapter 3 presents the Hub ontology and responds to the questions how the Hub's resources contribute to the prototype of smart service factory of the future. Chapter 4 and chapter 5 present the available resource stock of the Hub on "Business Intelligence & Innovation". These two chapters are about the presentation of internal

and external resources available for the Hub. Chapter 6 presents the Hub's Service Portfolio. Chapter 7 provides the closing remarks of the deliverable at hand.

Sincerely yours,

Prof. (FH) Dr-Ing. Jens Schumacher
Head of Research Department Business Informatics
Research Professor

Dr. Florian Maurer
Head DIH "Business Intelligence & Innovation"

1. Introduction: Digital Innovation Hub in Action

This deliverable at hand is about the Smart Service Factory development: the Digital Innovation Hub (DIH) on "Business Intelligence & Innovation" with main focus on its actions and activities within the project period. It is the second out of three process and implementation steps about the design and development of the Hub. This Digital Innovation Hub is the Vorarlberg University of Applied Sciences (FHV) main result in the Interreg Central Europe project 4Steps: Towards the application of Industry 4.0 in SMEs.

1.1. Physical appearance

The Digital Innovation Hub "Business Intelligence & Innovation" is a regional innovation hub in the Federal State of Vorarlberg / Austria. It is a service centre of the FHV, and its appearance is -currently- mainly cyber-physical. The DIH's headquarter is located at the Vorarlberg University of Applied Sciences.

1.1.1. Address

Hochschulstraße 1

6850 Dornbirn

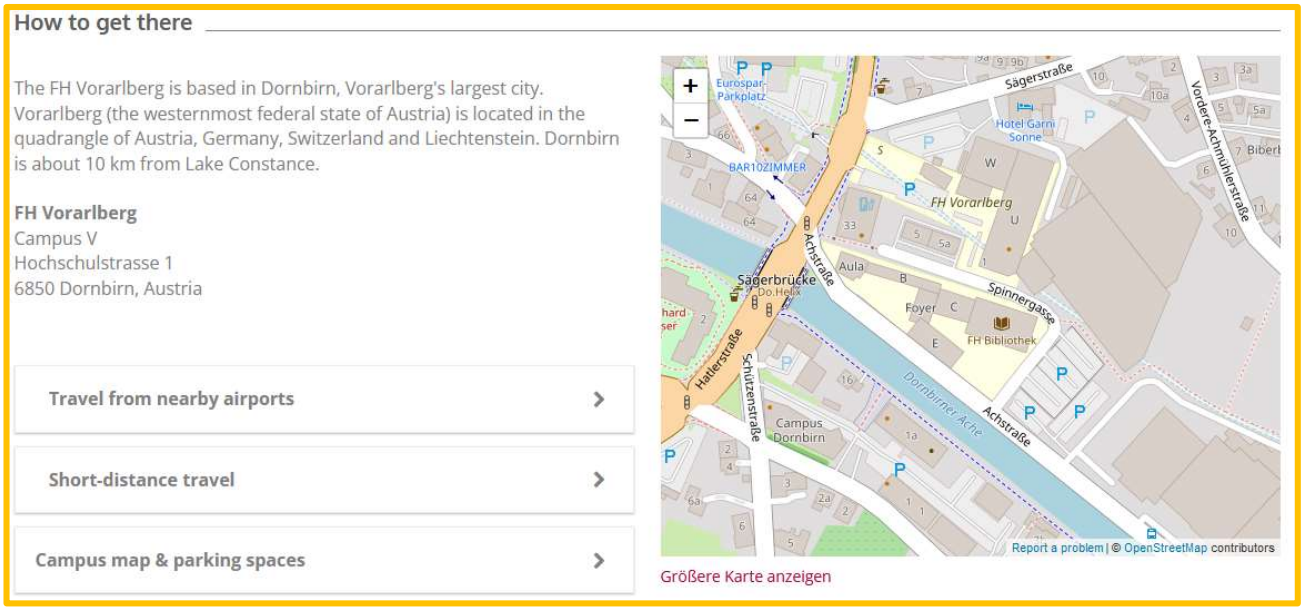
Vorarlberg / Austria

Telephone: +43 (0) 5572 792 0

Telefax: +43 (0) 5572 792 9500

1.1.2. How to get there - link

https://www.fhv.at/en/fh-vorarlberg-overview/information-desk-contact-directions/



1.1.3. Building and building floor

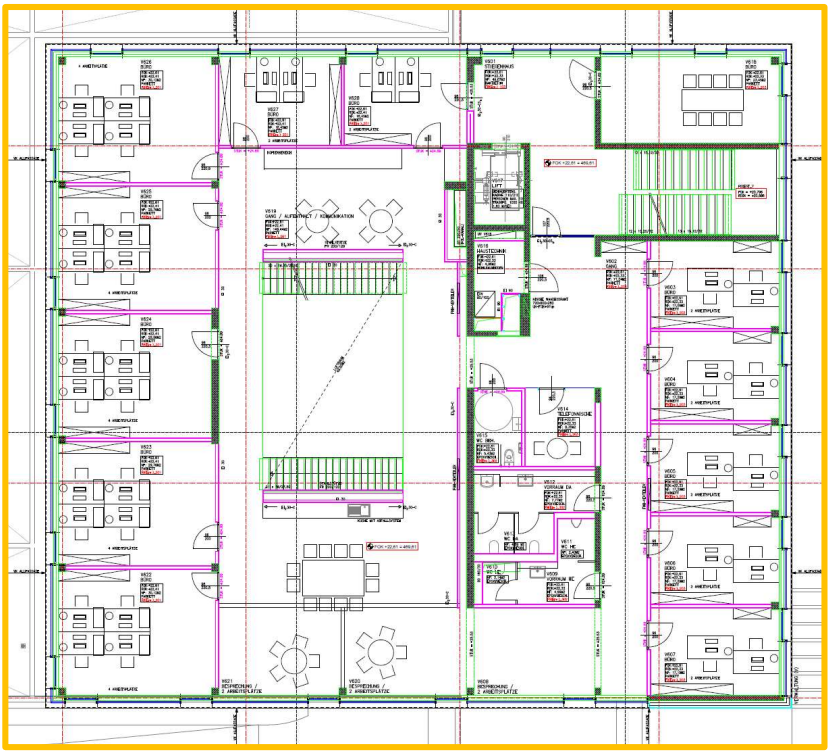
By the end of April 2022/beginning of March 2022, the DIH will move to a new premise. Below presented pictures (Pic 1-3) document the various construction phases of the building in which the DIH on Business Intelligence & Innovation will be situated.

Pic 1: Spring 2020

Pic 2: Winter 2020/2021

Pic 3: Autumn 2021

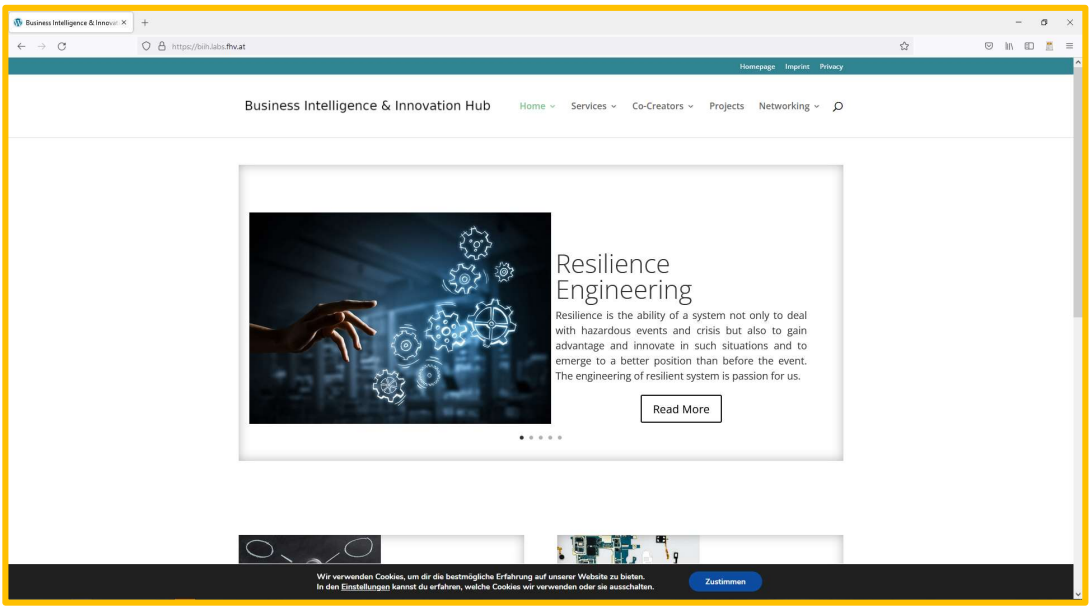
Within this building, some facilities and shared facilities are reserved for the Hub on Business Intelligence & Innovation. Pic 4 presents the building floor where the DIH on Business Intelligence & Innovation is situated.



Pic 4: Building floor

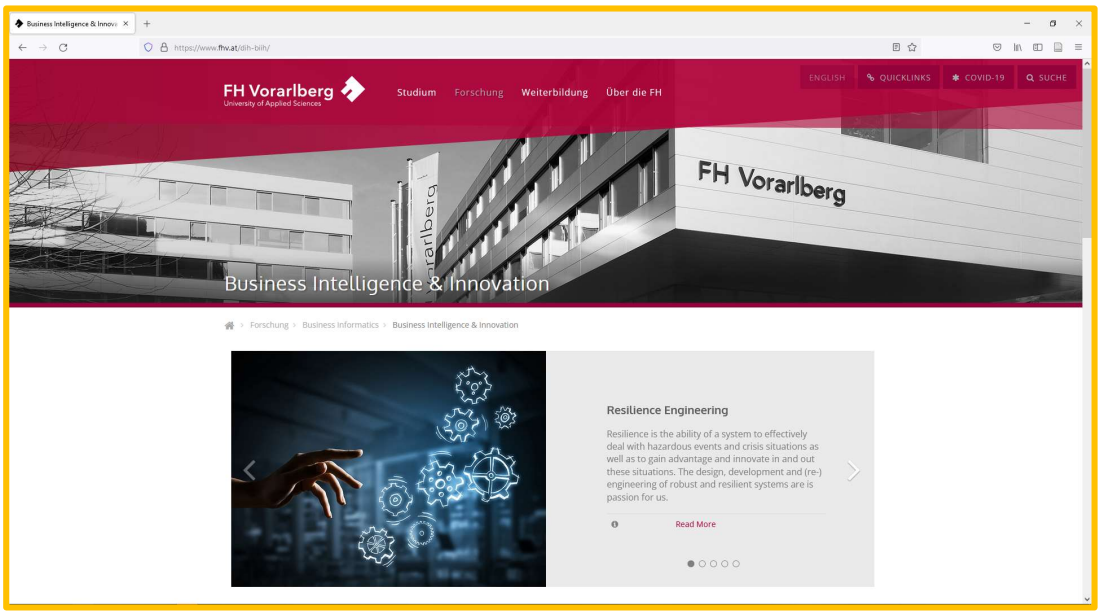
1.2. Digital appearance

Information about the Digital Innovation Hub on Business Intelligence & Innovation is available in the internet. The Hub's main homepage is: https://biih.labs.fhv.at



Pic 5: The Hub's main homepage

A second internet presence is included in the main homepage of the Vorarlberg University of Applied Sciences. Link: https://www.fhv.at/dih-biih/



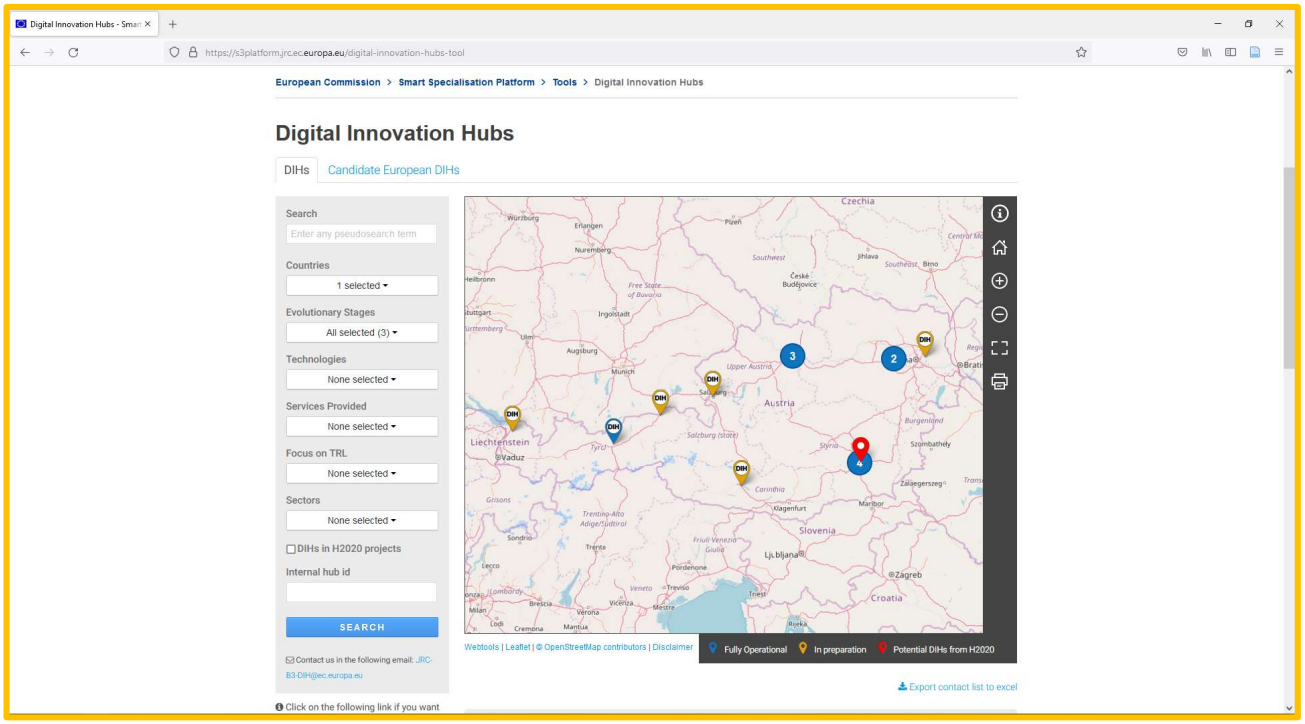
Pic 6: The Hub's integration into the homepage of FHV

1.3. International consideration

During the project lifetime, the Hub on Business Intelligence & Innovation gained high attraction and international stakeholders awarded the Hub-employee's actions and activities. As presented in the following sub-section, the Hub is listed in the Smart Specialization Platform of the European Commission and was voted Digital Innovation Hub of the Month in June 2021 (selected by EU Horizon 2020 project: DIHNET.eu).

1.3.1. Smart Specialization Platform

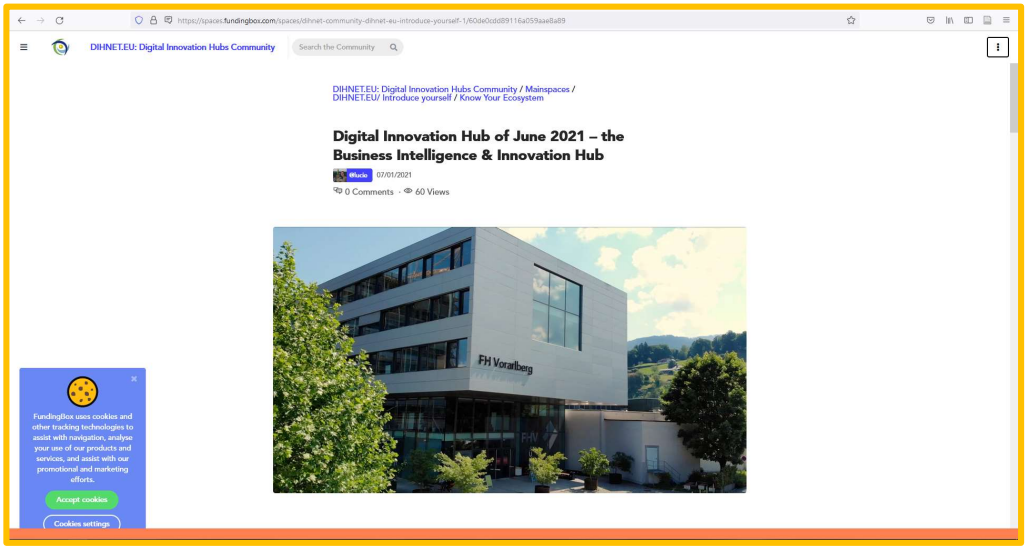
In August 2021, the DIH on Business Intelligence & Innovation was registered as a Digital Innovation Hub at the Smart Specialization Platform of the European Commission. Link: https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool

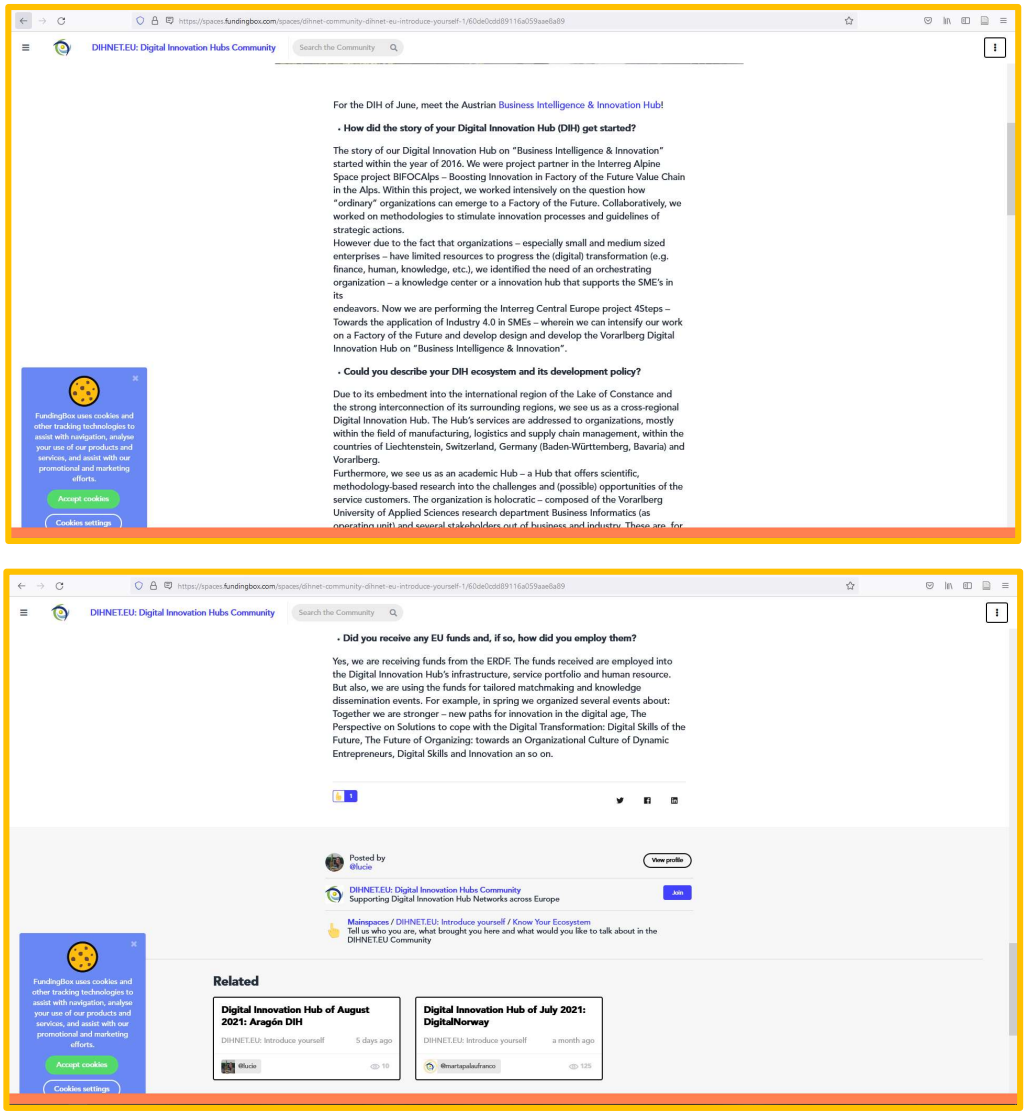


Pic 7: Digital appearance of the DIH at the EC's Smart Specialization Platform

1.3.2. Hub of the Month June 2021: Business Intelligence & Innovation

In June 2021, the DIHNET.eu project awarded the Vorarlberg University of Applied Sciences Digital Innovation Hub Business Intelligence & Innovation as the Hub of the Month. The DIHNET.EU project supports the coordination of European, national, and regional initiatives, directly supporting the digital transformation and Digital Innovation Hubs (DIHs). The project aims to create a sustainable pan-European network of networks, with a focus on regional DIHs. Link: https://spaces.fundingbox.com/spaces/dihnet-community-dihnet-eu-introduce-yourself-1/60de0cdd89116a059aae8a89





Pic 8-10: Digital appearance of the DIH at DIHNET.eu

2. The Hub as a collaborative platform

The DIH on Business Intelligence & Innovation is set-up as a collaborative platform. In doing so, the Hub aims to integrate as many resources (internal & external; regional, national, international; PESTEL) as possible. In the centre of becoming a collaborative platform is the gaining and sharing of knowledge and expertise as well as the interconnection and matchmaking of the Hub's stakeholders and target groups.

The following sections present the endeavours and activities to become a collaborative platform – an (industrial) research anchor for the region and beyond.

2.1. Organization of Service Artificial Intelligence as Josef Ressel Center

With increasing digitalization, many companies are striving to derive precise conclusions for their own business processes from collected data. The identification of new relationships in data and the targeted use of this knowledge (beyond mere visualization) requires tailored methods from the field of artificial intelligence. Particularly, robust solutions are required to ensure practicable decisions even under uncertain conditions. An interdisciplinary team at the Josef Ressel Centre for Robust Decision Making is developing robust algorithms that reduce process uncertainties and enable stable decisions. The concrete questions come from the production as well as the financial sector.

The participating partner companies are Hirschmann Automotive GmbH, Hypo Vorarlberg Bank AG, proTASK Consulting GmbH und myPEX. The Josef Ressel Centre of Dr. Michael Hellwig is integrated in the Research Centre Business Informatics of Vorarlberg University of Applied Sciences and currently comprises ten employees. The research funding of around 1.2 million euros comes from the Federal Ministry for Digital and Economic Affairs (BMDW), the National Foundation for Research, Technology and Development and the participating companies. Examples of use cases within the JR Centre for Robust Decision Making are:

- Learning and prediction of individual maintenance times
  In a production line, product quality is highly dependent on material and machine condition. To prevent machine failures and to be able to react to wear-related quality degradation in time, companies are interested in enhancing maintenance plans with data-based insights. At the JR Centre, in cooperation with Hirschmann Automotive and proTASK, support early warning systems are being developed that are capable of robustly marking maintenance points beyond the use on one machine but across different company locations.

- Measurement and evaluation of sustainable businesses
  The increasing impact of climate change requires societal and economic changes towards a more sustainable way of life. This is accompanied by the requirement of the financial sector to measure the economic risks to hedge against threats and to make adjustments towards increased sustainability in companies. Conversely, such financial industry assessments can serve as an incentive for companies to implement innovative sustainability strategies.

With Hypo Vorarlberg and myPEX, the Josef Ressel Centre is developing procedures and strategies for a robust database and assessment models of regional sustainability risks.

Pic 11-13: Application fields of Artificial Intelligence at Ressel

2.2. Organization of/participation at regional events and meetings

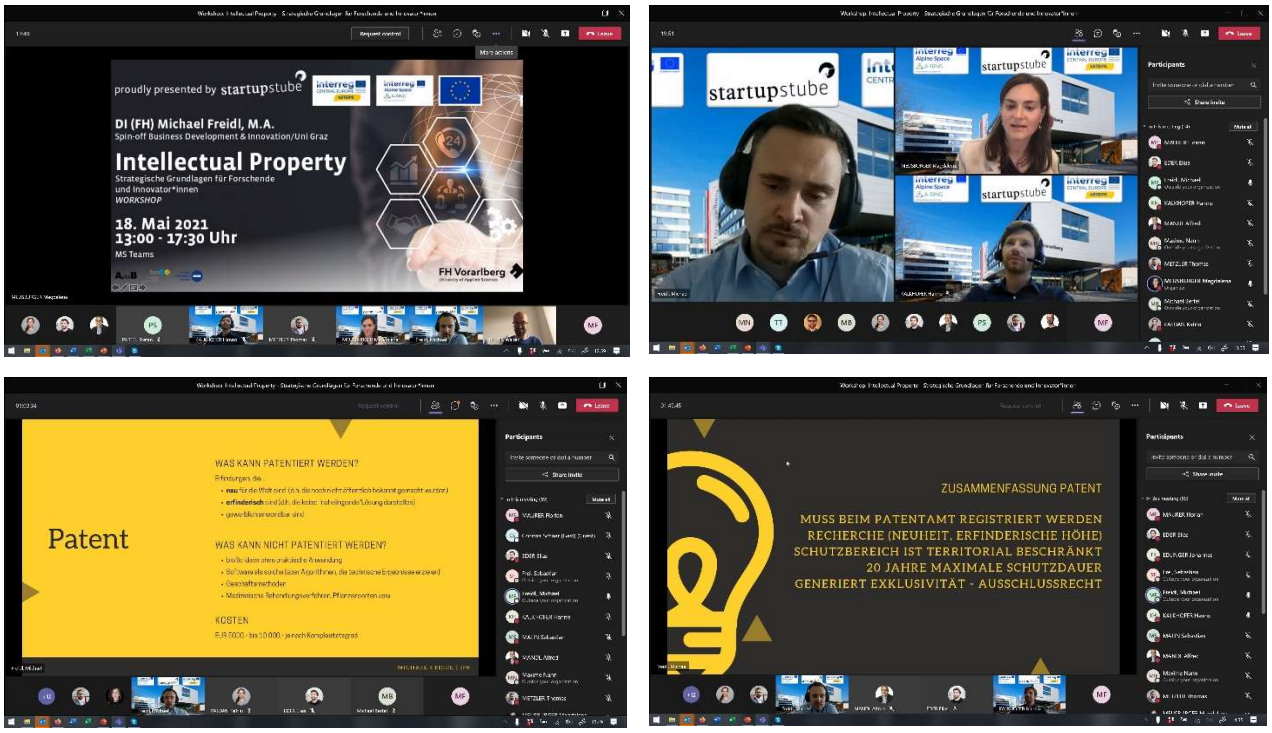
With the context of collaborative platforms and matchmaking, the Hub (co-) organized several regional events and meetings.

2.2.1. Matchmaking Parley on Intellectual Property Rights

In conjunction with the startupstube and the Interreg project A-Ring, the DIH on Business Intelligence & Innovation co-organized a Matchmaking Parley (18th May 2021). This event revolved around the topic of Intellectual Property Rights – Strategic Foundations for Researchers and Innovators. This guiding theme was chosen based on the results of a Transnational R&I Focus Report, which, among other things, highlights the topic of Intellectual Property Rights as a significant factor in enabling transregional and transnational research cooperation.

In this Matchmaking Parley, participants learned how to identify intellectual property and how to advance and secure the commercialisation of their own technologies and intellectual property. Furthermore, they were given the opportunity to engage in discussions and share their experiences of research cooperation partnerships and the importance of IP in the context of their own research and innovation activities.

The participants consisted of representatives from academia, the information industry and business support organisations. They gave each other exciting insights into their main activities in the fields of digitalization (e.g., Internet of Things, Industry 4.0, edutech, software development, cloud computing, simulation, health technologies) and sustainability (e.g., energy storage technologies, industrial waste heat utilization, biotechnologies, environmental technologies).



Pic 14-18: Snapshots during the Matchmaking Parley

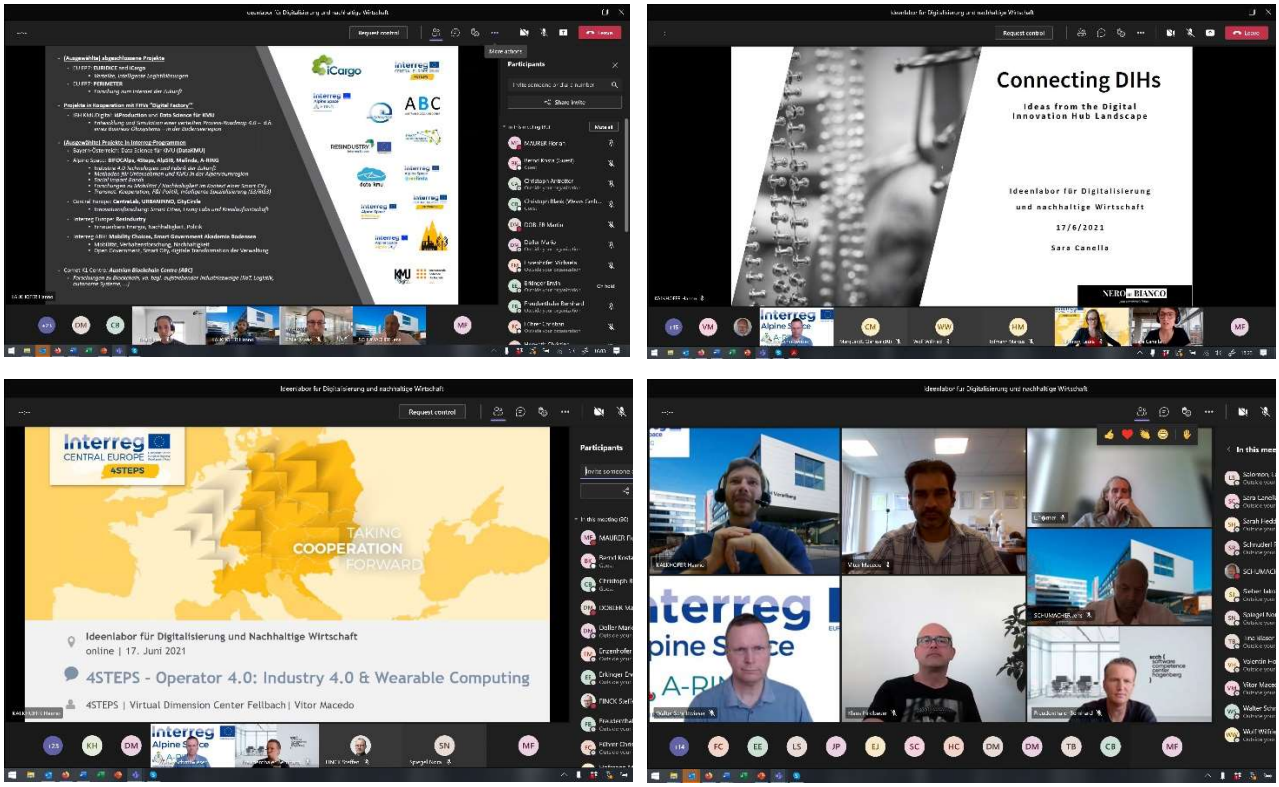
2.2.2. Ideas Seed Lab for Digitalization and Sustainable Economy

On June 17th, 2021, the DIH on Business Intelligence & Innovation co-organized the Ideas Seed Lab for Digitalisation and Sustainable Economy. To warm up, the workshop started with two keynote presentations, one highlighting national and international funding opportunities for companies and research collaborations, and the other presenting selected good practices and projects, each related to the research areas of digitalisation and sustainability.

Thereafter participants were provided with the opportunity to explore their specific interests together, report their pertinent activities within these two research areas, discuss where the greatest opportunities for new project ideas are seen and which of these could possibly be deepened and concretised in the future.

The field of participants consisted of a wide range of stakeholders from institutions of higher education and research, business support organisations, SMEs and public

administration. As a result, a great variety of topics was raised and discussed. The discussions revolved around topics such as digitalisation supporting sustainable mobility, smart production and green innovation, knowledge transfer in the field of data science and industry 4.0, network for smart materials, sustainable building technologies, digital security, regional solutions for energy efficiency and the use of renewable energy, digital innovation hubs in healthcare, AI-based optimisation in manufacturing and smart wearable computing.



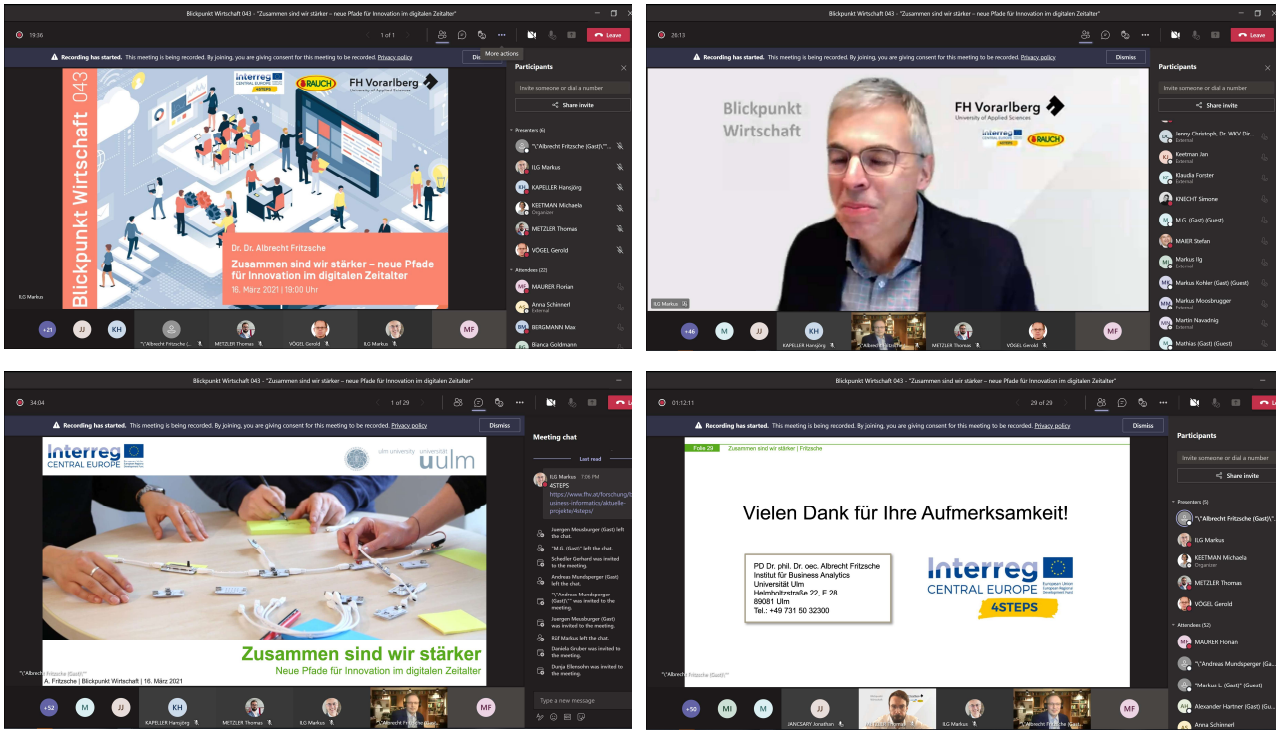
Pic 19-22: Snapshots Ideas Seed Lab

2.2.3. Regional workshop: New Paths for Innovation in the Digital Age

On the 16th of March 2021, the DIH on Business Intelligence & Innovation co-organized the workshop “Together we are stronger – New Paths for Innovation in the Digital Age” with Blickpunkt Wirtschaft.

Event summary: Innovation is a communal achievement. Its success depends on a broad range of contributions from different actors, such as designers, engineers, strategists, marketing experts, but also customers. Digital technologies offer many possibilities to support the collaboration of these actors in order to maximize its efficiency and effectiveness. As a consequence, innovation management nowadays has to deal with a whole new set of tasks and responsibilities, far beyond the interaction with specific expert groups. Innovation managers create and maintain holistic ecosystems. They

provide spaces – physical, digital and cyber-physical – where all relevant interest groups can participate in innovation activities. The presentation shows how such spaces can create a sustainable benefit, using different examples from academia and industry.



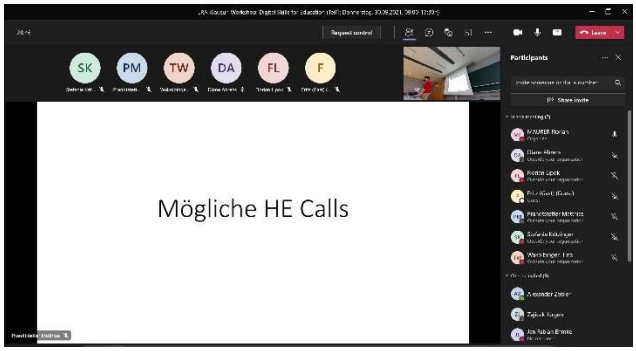
Pic 23-27: Snapshots Regional workshop: New Paths for Innovation in the Digital Age

2.2.4. Regional Design-Workshop: Ziele, Kompetenzen, Strategien internationaler und -regionaler Forschungsprojekte

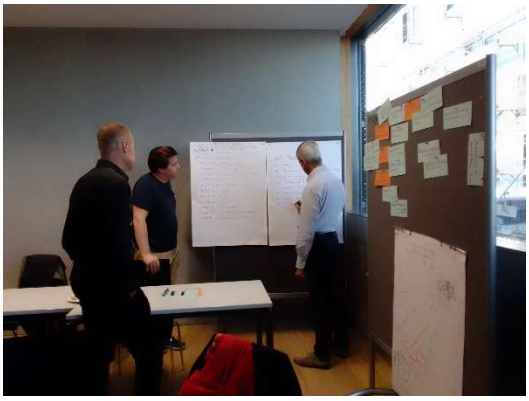
Under the roof of WP2, on the 29th of Sept to the 01st of Oct 2021, the project partners organized the regional design workshop entitled: "Ziele, Kompetenzen, Strategien internationaler und -regionaler Forschungsprojekte". In this workshop, the participants got enabled to identify and prototypically further develop a short version of an application text to submit to the European Commission. Keynote speeches by the lecturer on digitization and artificial intelligence, platform business models and ecosystems served to inspire further tasks across disciplinary boundaries. The work in the workshop took place in three steps.

- Participants named their own research priorities and formulate project goals.
- They identified competence needs and discussed possible consortia in Germany and abroad.
- They formulated application strategies that they can pursue alone or together after the workshop.

In this way, participants not only gained insights into potential topics for project proposals, but also practice application work in a practical way. This took place in an open, informal atmosphere that enabled participants to give free rein to their creativity and develop new ideas without administrative barriers.







Pic 28-32: Snapshots Regional Design-Workshop: Ziele, Kompetenzen, Strategien internationaler und -regionaler Forschungsprojekte

2.2.5. Interreg Europe Workshop “Resindustries”, Dornbirn

On the 03rd and 04th of March 2020, the Vorarlberg University of Applied Sciences hosted the second RESINDUSTRY meeting, which brought together project partners, local, regional, and national stakeholders. The event gathered participants covering all four helices - industry, government, academia, and citizens.

The first day of the meeting started with FHV’s welcome ceremony and continued with the lead partner presentation on the current status of the project. Stepanka Holeckova presented the current status of the project implementation, subsequently followed by discussions on communication management and the current on-line ranking of the project. Further discussions encompassed market analyses for the Czech Republic, as well as the common understanding on identifying best practices and measuring their contributions to RES, both locally and in a regional context of the project. Lastly, further activities were performed to introduce stakeholders to the local RES framework - challenges and opportunities that Vorarlberg government faces in applying RES

policies to industrial sector. In this regard, stakeholders were informed about the background of the workshop and the study visit that took place on the second day of the meeting.

On the following day, Wednesday March the 4th, an Interregional Workshop took place, covering the circular economy aspect of RES policies implementation perceived through an international innovation ecosystem perspective, as well as the Industry 4.0 RES frame of reference. In addition, both national and international partners and stakeholders learned about regional policy instruments applied in the industrial sector and implemented through the Digital Factory Vorarlberg.

In this regard, the study visit focused on showing physical areas of the Digital Factory Vorarlberg, and representing how its performance supports and influences implementations of RES in the region. In line with this, partners and stakeholders had the opportunity to increase their understanding on how various aspects of green digital transformation and digitization in the production of goods support renewable energy sources by implementing Industry 4.0 approaches – by increasing transparency in the energy system, providing demand flexibility and by increasing energy efficiency.

The participation of the FHV had several positive effects for the project. Among others, the FHV was able to disseminate the project and the interview results to an international group of stakeholders. Furthermore, the FHV collected feedback and positive comments to work on its Digital Innovation Hub (WP3).

Pic 33: Snapshot Interreg Europe Workshop “Resindustries”

2.2.6. Initiative RUN-EU (internal coordination and management WP2)

Alignment of the initiatives RUN-EU Innovation Hub, European Innovation Hub, Digital Innovation Hub, Digital Europe, Digital Innovation Hub on Business Intelligence & Innovation, 4Steps.

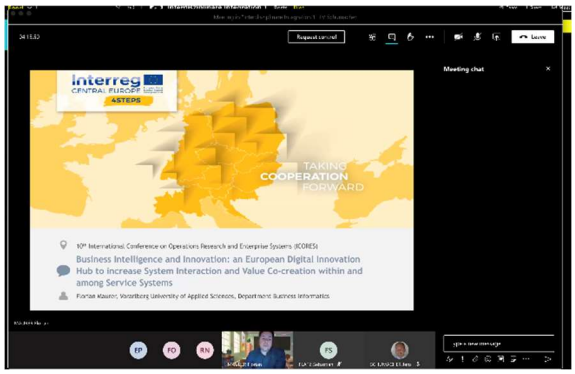
Pic 34: Design & Development of European Innovation Hubs in RUN-EU

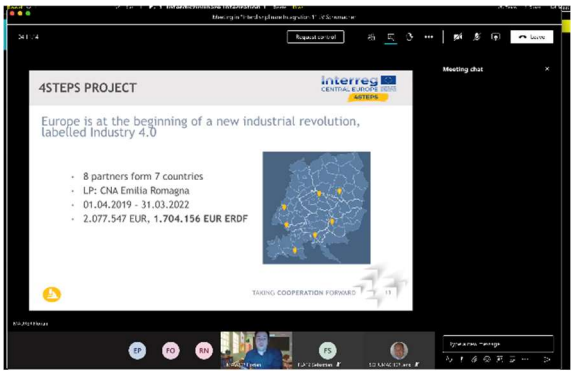
2.3. Academic obligations: lectures & supervision

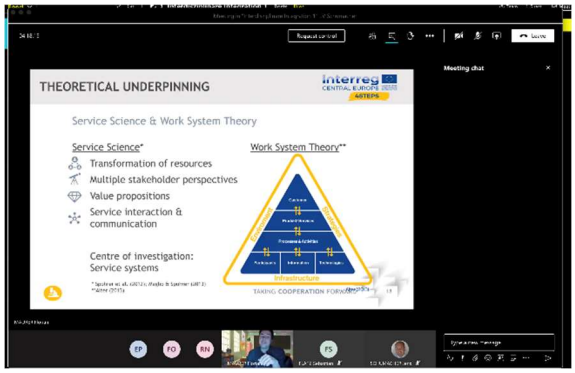
Within the project lifetime, researchers of the FHV provided internal and external students with tailored lectures and supervision. In doing so, the FHV capitalized the project results and disseminated it to the students – this are the managers of the future.

2.3.1. Lecture: Interdisciplinary integration – WING 2021

In the beginning of Feb 2021, Mr. Florian Maurer was invited to hold a keynote lecture at the FHV's Bachelor Course: WING – Interdisziplinäre Integration. Part-time students, the managers of the future, from well-known organizations within the region (both: small- and medium sized organizations & multi-national organizations) took advantage of the presentation entitled "Business Intelligence & Innovation: a European Digital Innovation Hub to increase Service Interaction and Value Co-Creation within and among Service Systems".







Pic 35-37: Interdisciplinary integration (WING 2021)

2.3.2. Lecture: Interdisciplinary integration - WING 2022

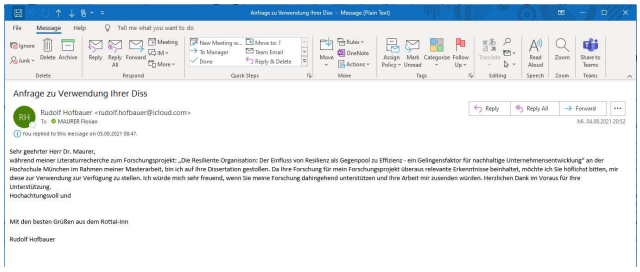
On the 28th of Jan 2022, Dr. Florian Maurer was invited to give a keynote presentation lecture at the FHV's Bachelor Course: WING – Interdisziplinäre Integration. Part-time students, the managers of the future, from well-known organizations within the region (both: small- and medium sized organizations & multi-national organizations) took advantage of the presentation entitled "XXX". This presentation summarized the results and success out of the third reginal workshop XXX, in collaboration with be-friended projects and initiatives: A-Ring, Digital Village, DITA Erasmus+, S3HubsinCE.

Pic XX-XX: Interdisciplinary integration (WING 2022)

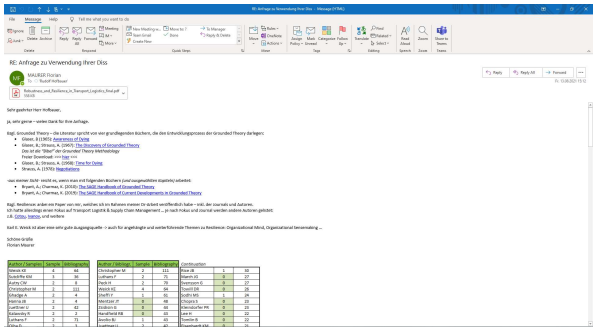
2.3.3. Supervision of students (external to the region of Vorarlberg)

Based upon on the Service "Resilience Engineering", employee Florian Maurer offered supervision services to Mr. Rudolph Hofbauer from the Hochschule München.

Request Mr. Rudolph Hofbauer



Response after supervision



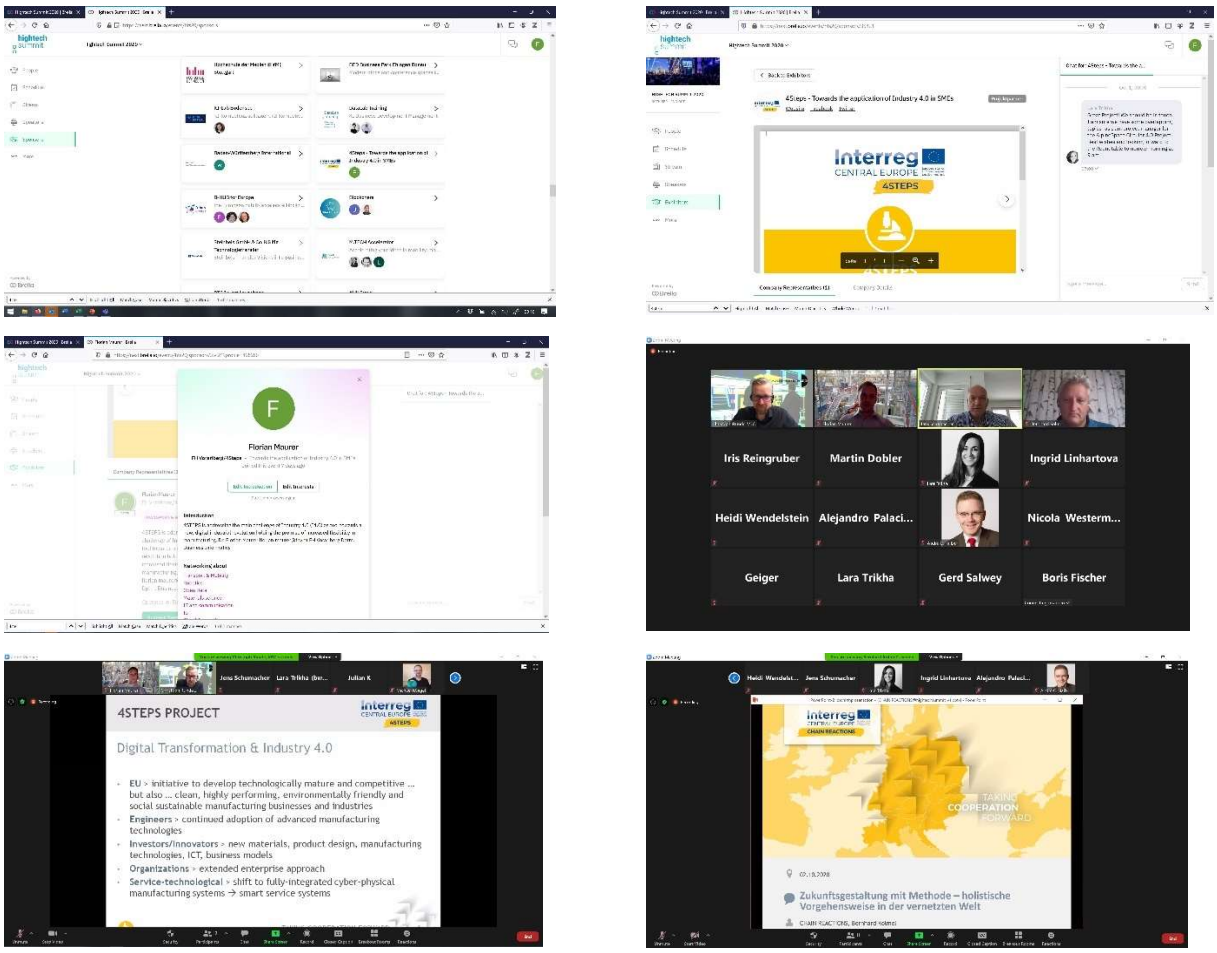
Pic 38-39: Supervision: Request & Feedback

2.4. Organization of/participation at interregional events and meetings

With the context of collaborative platform and matchmaking, the Hub (co-) organized several interregional events and meetings.

2.4.1. High Tech Summit Baden-Württemberg

From the 30th Sept – 02nd Oct 2020, project partner "FHV" organized a virtual booth and a virtual round table workshop titled "The Perspective on Solutions to cope with the Digital Transformation: Digital Skills of the Future". The virtual booth and the virtual workshop contributed to the partner's activities within WP2 – Activity A.T2.2 Preparing the CE citizens towards the digital future (deliverable: T2.2.1: Regional workshop: Digital skills for all). Objective of the FHV/4Steps' participation at the High Tech Summit was not only to present and disseminate the 4Steps project to representatives from S3: business, industry, society, government & academia, but also to pro-actively engage these targets groups in the 4Steps projects. In doing so, on the 30th of Sept and 01st of Oct, 2020, the FHV virtually presented the 4Steps project to participants of the High Tech Summit in a tailored digital booth and exhibited project communication materials (e.g. poster, roll-up, project PowerPoint, video, etc.). The presentations in the digital booth were accompanied by a face-to-face discussions and chat conversations about the Digital Transformation and Industry 4.0 paradigm within business and industry. Feedback of visitors was e.g.: "Great project! We should stay in touch […] looking forward to the Roundtable tomorrow morning at 9 am".



Pic 40-45: Snapshot High Tech Summit

2.4.2. Workshop: Future of Work/Industry5.0

On 26th August 2021, the Digital Innovation Hub on Business Intelligence & Innovation organized a meeting to discuss the risks, challenges, and opportunities of the Future of Work/Industry5.0. Within this meeting, participants tackled the topic the Future of Work in combination with risks, challenges and opportunities of the ongoing digital transformation of organizations and its resources, processes, business models, etc. The participants intensively discussed the idea of Industry 5.0 (Reference: European Commission, R&I Paper Series, Policy Brief) and further designed and developed the Idea of a human-centred approach within organizations.

The meeting and its follow up meeting ended in the elaboration and submission of a project proposal entitled:

NEW WORK LAB

Design- & Experimentierräume für ein

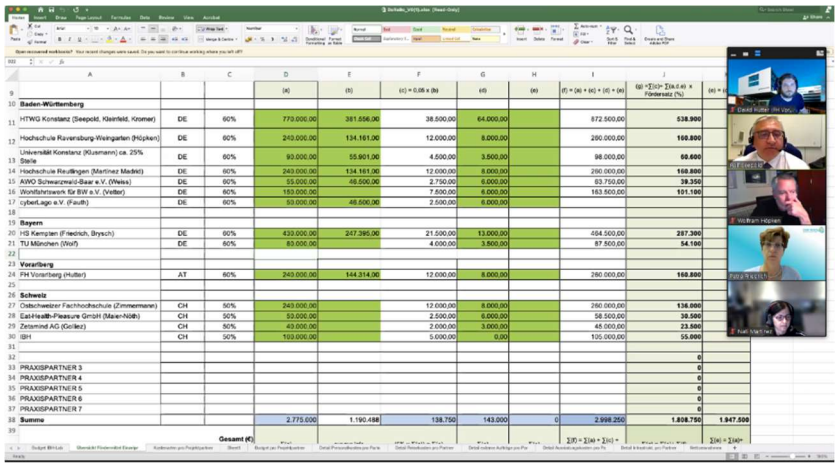
«Human Valley Bodensee»

2.4.3. Lab on the Future of Mobility

A further interregional action of the DIH on Business Intelligence & Innovation was the discussion about the Future of Mobility, including the elaboration of a project proposal entitled "Datenraum Bodensee" (DaRaBo) being submitted to Interreg IBH on the 30th of Oct 2021.

The IBH-Lab aims to provide a cross-border Open-Data-Room which provides open data using a Linked-Open-Data platform gathered in all countries around Lake Constance. Using the provided data of local data silos, a knowledge-graph was implemented to use all the collected data to it's full potential. Using the knowledge-graph, cross references between data gathered in different countries or business areas can be connected and utilized together, to find more information, potential solutions for challenges and enable new project ideas and business models. To showcase the utilization of the created Open-Data-Room, the lab will work on exemplary projects in the areas of health, nutrition, and tourism. An additional goal of the lab is to train interested actors to handle the Linked-Open-Data platform and the data that can be gathered and utilized through it with workshops, hackathons, and bar camps where participants can explore the provided data with the help of experts. This way, innovative ideas get enabled and advanced, which facilitates cross-area networking and exchange of ideas to encourage and foster new projects.

Abstract: There is enough Open Data available in the Lake Constance region, which can, condensed into a central platform, provide previously unrecognized added value for Areas like Health, Nutrition, Mobility and Tourism. To stay a strong location for economy, work, science and innovation, the four-country region needs more than national and physical infrastructure. Therefore, the lab will create and provide a Linked-Open-Data platform to connect citizens, service providers and municipal actors. It will further provide long term successful (and sustainable) business models/value chains and contribute to the removal of cross-border barriers. The lab focuses on the platforms for Marketplace-/Community-Applications in the areas Health, Nutrition and Tourism.



Pic 46: Workshop/Lab Future of Mobility

2.5. Organization of/participation at national events and meetings

With the context of collaborative platform and matchmaking, the Hub (co-) organized and participated at several national events and meetings.

2.5.1. Internationaler Dialog Vorarlberg – Burgenland

On a continuous basis, employees of the Hub on Business Intelligence & Innovation pro-actively participated at the quarterly event Internationalisierungsplatform Burgenland to promote cooperation and collaboration with regions in Austria and beyond.

Florian Maurer presented the design and development progress of FHV's Digital Innovation Hub on Business Intelligence & Innovation.

Pic 48-51: Snapshots Internationaler Dialog Vorarlberg – Burgenland

2.5.2. Industrie 4.0 Summit, Linz

On 12th of December 2019, the 4Steps partner Vorarlberg University of Applied Sciences (FHV) organized the Austrian local focus groups event „Sensitization and Collaboration with the Local“. This event was organized in conjunction with the Austrian Industry 4.0 Summit in Linz, which again is one of the most important events in Austria related to Industry 4.0 and Digital Technologies.

At a tailored booth, participants of the Austrian Industry 4.0 Summit were able to get in contact with the 4Steps project and to ask and discuss questions about the project, its scope and the FHV's target: development of a digital innovation hub that supports managers and employees to cope organizational digital transformation. Representatives of the FHV, namely Mr. Florian Maurer and Mr. Martin Dobler, provided information on the path of the Vorarlberg Digital Innovation Hub.

During the Austrian Industry 4.0 Summit, the 4Steps project was able to meet representatives from the Central Europe ECOS4IN project. Together, Ms. Iris Reingruber, Mr. Zdenék Husek (Interreg Central Europe project ECOS4IN) and Mr. Florian Maurer (4Steps) discussed ideas and strategies for increased project cooperation and collaboration as well as knowledge exchange and learning.

Pic 52-55: Snapshots Industrie 4.0 Summit Linz

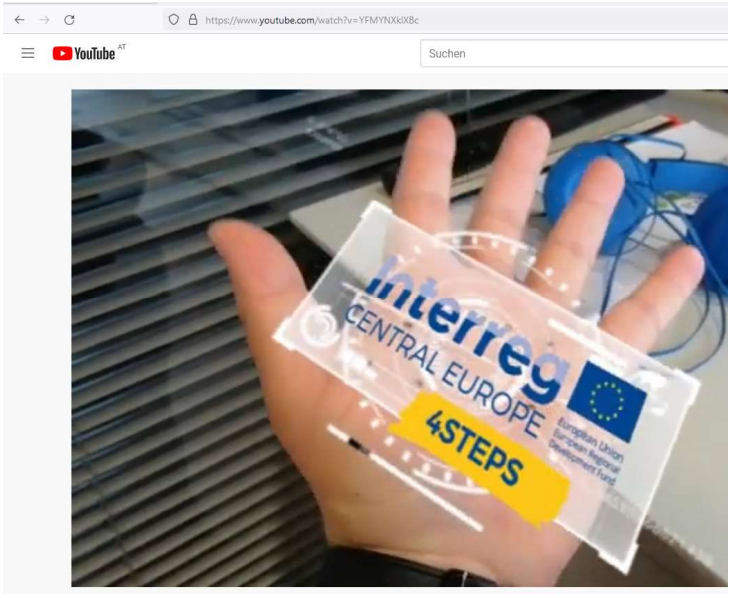
2.5.3. Industry 4.0 Summit, Graz

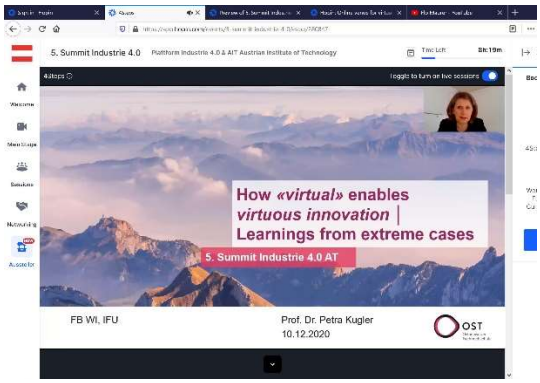
On 10th December 2020, the project partner "FHV" organized a virtual booth and a virtual workshop titled "The Future of Organizing: towards an Organizational Culture of Dynamic Entrepreneurs, Digital Skills and Innovation". The virtual booth and the virtual workshop contributed to the partner's activities within WP2 – Activity A.T2.2 Preparing the CE citizens towards the digital future (deliverable: D.T2.2.1: Regional workshop: Digital skills for the Labour Force).

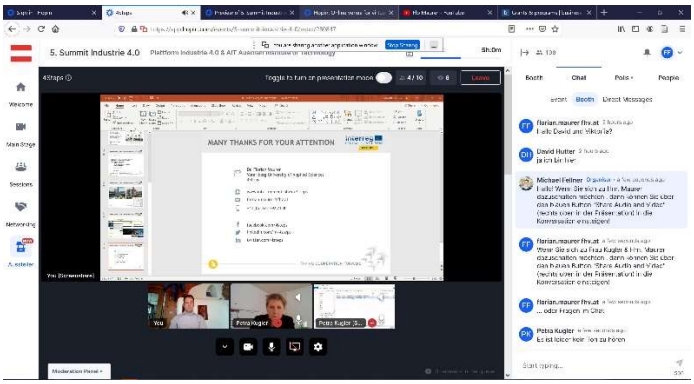
Objective of the FHV/4Steps' participation at the Industrie 4.0 Summit was to disseminate the 4Steps project to representatives from S3: business, industry, society, government & academia. In doing so, the FHV performed the regional Workshop "Digital Skills for the Labour Force: The Future of Organizing: towards an Organizational Culture of Dynamic Entrepreneurs, Digital Skills and Innovation" and pro-actively engaged the target groups and stakeholders in the 4Steps projects.

Additionally, the FHV virtually presented the 4Steps project to participants of the Industry 4.0 Summit and exhibited project communication materials (e.g. poster, roll-up, project PowerPoint, video, etc.). The presentations at the digital booth were accompanied by networking discussions and chat conversations about the impact of

Digital Transformation in organizations and Industry 4.0 paradigm for managers, decision makers and employees.

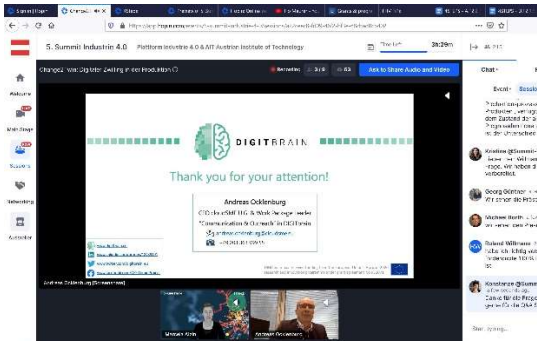


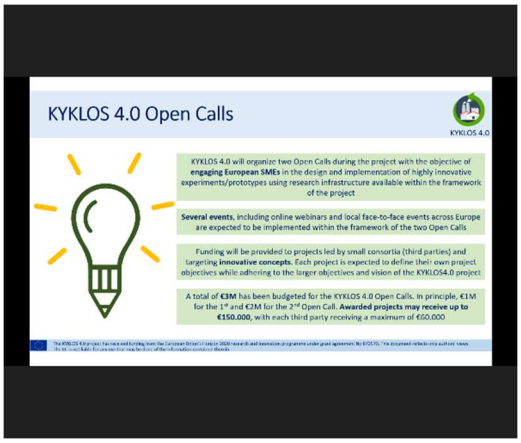




Pic 56-59: Snapshots Industrie 4.0 Summit Graz

Interconnection with several projects, such as:



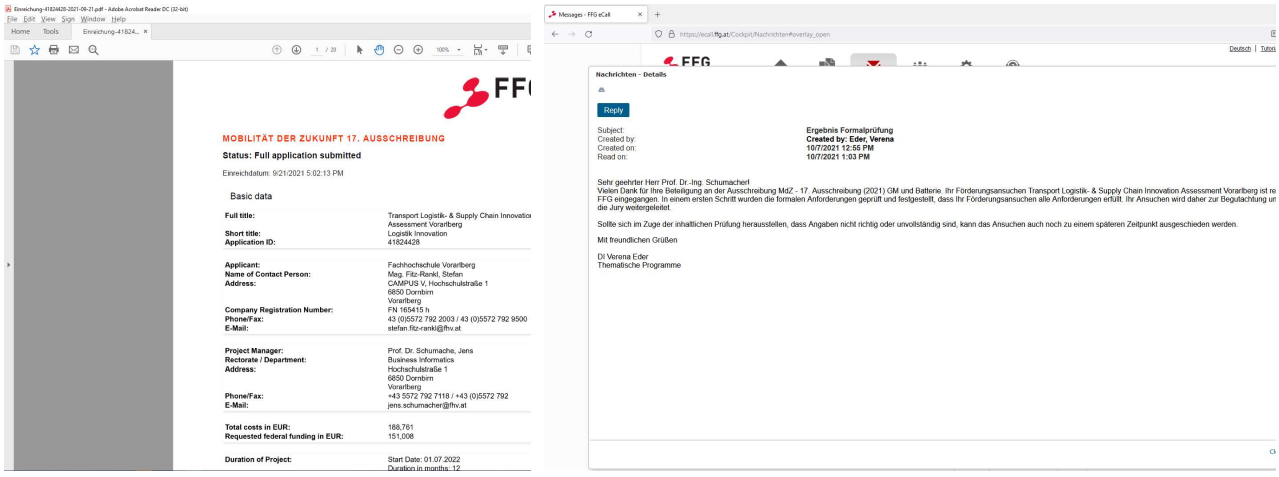


Pic 60-61: Project cooperation and collaboration on Industry 4.0/Digitalization

2.5.4. Transport Logistics- & Supply Chain Innovation Assessment Vorarlberg

On the 21st of Sept 2021, employees of the DIH on Business Intelligence & Innovation elaborated a project proposal about a Transport Logistics- & Supply Chain Innovation Assessment in Vorarlberg. This proposal was submitted to the FFG – the Austrian Research & Promotion Agency.

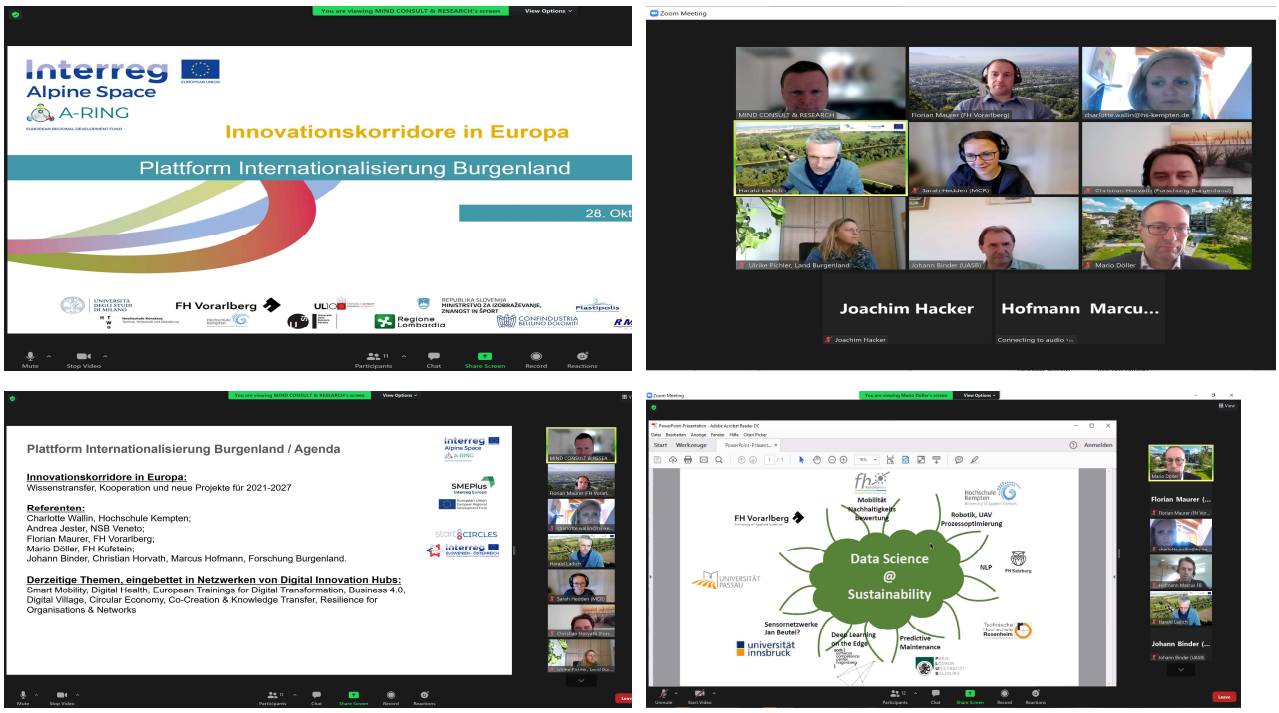
Abstract: The increase in traffic and transport volume is a burden and competitive disadvantage for the economic area of Vorarlberg. Within the scope of the project, a study for inter-company collaborative transport logistics and supply chain concepts in Vorarlberg is to be conducted in order to elaborate models/frameworks for inter-company cooperation and collaboration of Vorarlberg companies in the field of collaborative transport logistics and supply chain management. A feasibility study to work out the status quo and state of the art and a technology impact assessment to determine the expected and future technical developments are to be carried out. The resulting creation of frameworks and models will lay the foundation for a freight transport model region Vorarlberg. The economic and socio-political focus of this project is on the research and development of collaborative and alternative logistics concepts in Vorarlberg.



Pic 62-63: FFG project submission platform

2.5.5. Internationalisierungsplatform Burgenland

On the 28th Oct 2021, the FHV participated at the autumn edition of the Internationalisierungsplatform Burgenland. This event is a regional/transregional event, organized by the Regional Management Burgenland. This edition tackled the topic of “Innovation Corridors”; Dr. Florian Maurer was invited to present the 4Steps project, including the presentation of the pilot study and already achieved results.



Pic 64-67: Snapshots Internationalisierungsplatform Burgenland

2.5.6. Matchmaking with the Logistics Research Austria and its members

On a continuous basis, Dr. Florian Maurer is in contact with the Logistics Research Austria. Logistics Research Austria is a cooperative initiative of Austrian universities, universities of applied sciences and non-university research & development institutions in the fields of logistics, supply chain management and transport with the following objectives:

- Intensify interdisciplinarity
- Utilization of complementarity in content and avoidance of redundancies
- Enabling a greater variety of topics without losing scientific depth
- Higher international visibility
- Balancing resources (personnel, equipment) in the event of content and/or time bottlenecks

The goals of LRA are in particular the interdisciplinary exchange with focus on research and development in the field of logistics applications. These include in particular transport logistics, intralogistics, warehouse logistics, production logistics and technical developments for use in the field of logistics applications such as transport units and transport techniques.

Meeting dates:

10.11.2021 – Meeting (online)

29.09. – 01.10. – Annual meeting (Dornbirn)

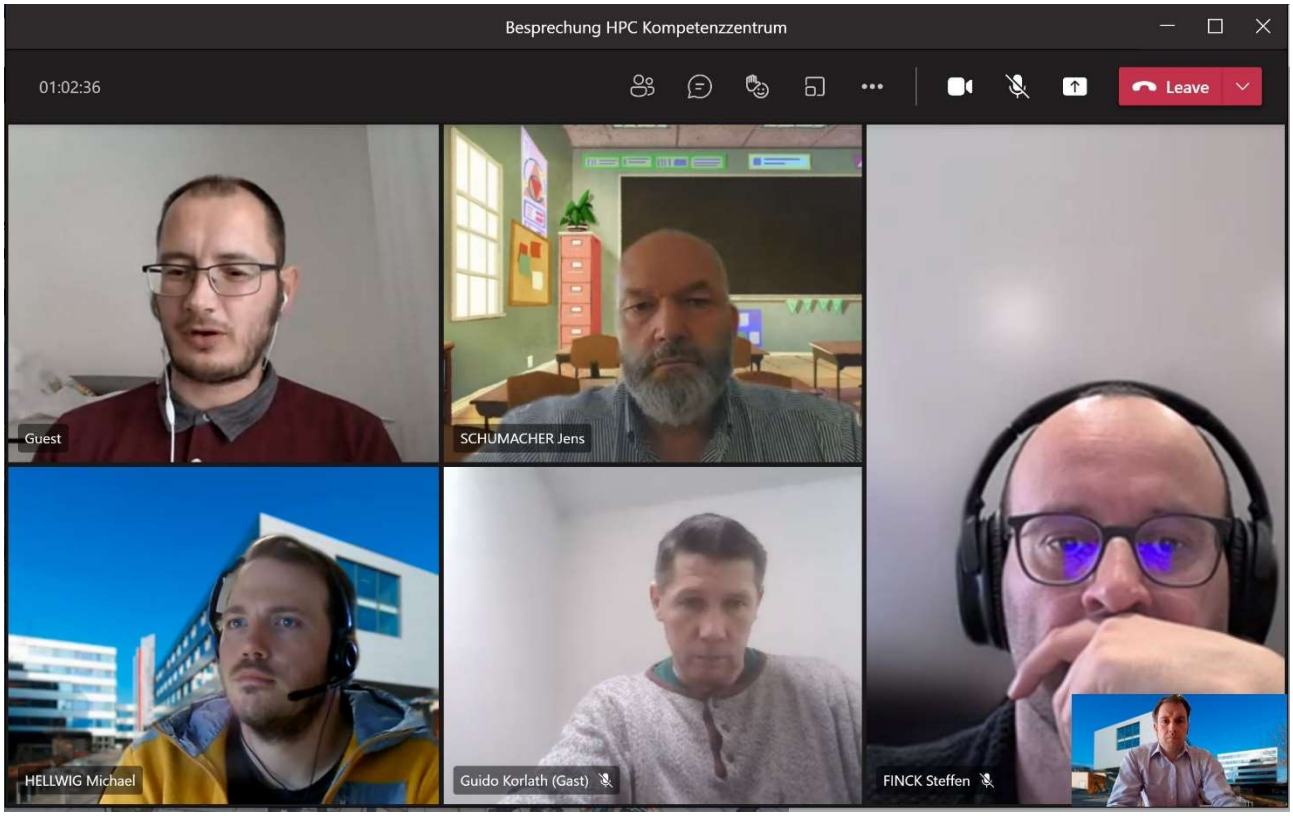
23.06.2021 – Meeting (online)

… and further meetings in 2020 & 2019

The Logistics Research Austria is promoting the 4Steps project and the Hub on Business Intelligence & Innovation on their homepage (Link: https://www.lra.at/?page_id=8) and to several stakeholders (e.g. the Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility, Innovation and Technology; and to the Austrian umbrella brand "Austrian Logistics", whose goal is to strengthen Austrian logistics competence and increase its visibility).

2.5.7. Workshop HPC Kompetenzzentrum

On the 1st of March 2021, researchers of the DIH Business Intelligence & Innovation organized and participated in a meeting with the High Performance Computing Kompetenzzentrum of the Technical University of Vienna. Aim of this workshop was to identify possible ways for cooperation and to interconnect resources of the Hub with the Kompetenzzentrum for integrated service manufacturing and engineering.



Pic 68: Workshop with TU Vienna

2.6. Organization of/participation at international events and meetings

With the context of collaborative platform and matchmaking, the Hub (co-) organized and participated at several national events and meetings.

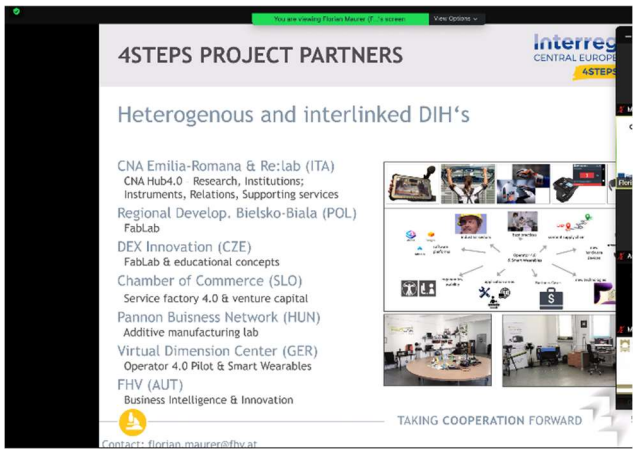
2.6.1. RUN-EU

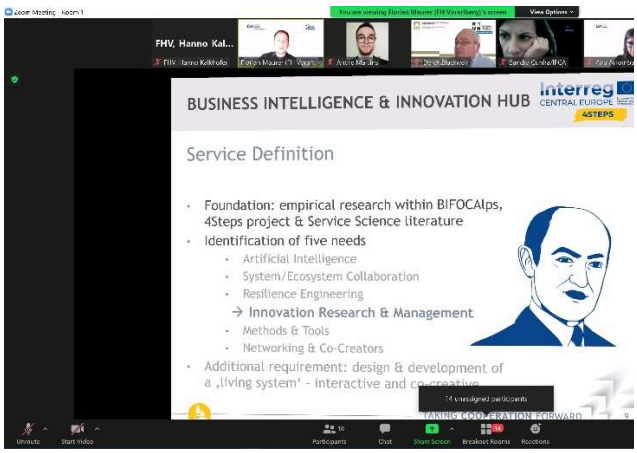
The Regional University Network – European University (RUN-EU) is a network of higher education institutes across the European Union. It is committed to societal transformation in the participating regions in the context of emerging regional and global challenges and to sustainable regional development. The network promotes future and advanced skills-based teaching, learning, research and engagement activities across the network. This is supported through the development of Future and Advanced Skills Academies (FASA), European Mobility Innovation Centre (EMIC) and the European Innovation Hubs (EIH).

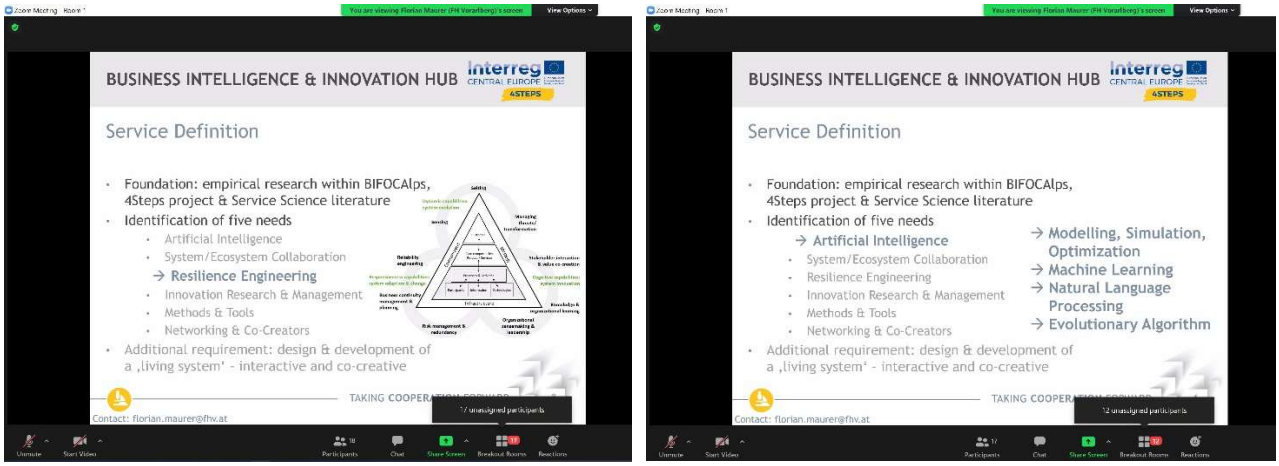
Innovation and European Innovation Hubs were the topics of the recent online conference hosted by RUN-EU on November 3rd and 4th, 2021. The conference enabled researchers, academics and cluster, innovation hubs and enterprise managers to present current innovative initiatives, projects and activities in the thematic areas of:

- EUN-EU Innovation Hubs / Clusters
- Future Industries and Sustainable Development
- Bioeconomy
- Social Innovation

A total of around 60 presentations were held during the conference. As a partner of the Regional University Network, the Vorarlberg University of Applied Sciences participated in this conference and presented the 4Steps project, its goals and the results of the Digital Innovation Hub on „Business Intelligence & Innovation" achieved so far.







Pic 69-72: RUN-EU Conference participation

2.6.2. A-RING Alpine Transnational Live Learning

On the 20th of October 2021, Dr. Florian Maurer presented the 4Steps project at the A-Ring Alpine Transnational Live Learning Session. This event was organized and hosted (online) by Polymeris (France). A broad audience from transnational and international Digital Innovation Hubs participated and took advantage of Dr. Maurer's presentation entitled: Business Intelligence & Innovation – a regional Digital Innovation Hub goes transnational.

Pic 73: Snapshot A-Ring Live Learning Session

2.6.3. Foundations of Genetic Algorithms (FOGA)

As a scientific anchor within the 4Steps project, from the 6th-8th of September 2021 the project partner FHV organized and conducted the 16th edition of the international conference "Foundations of Genetic Algorithms" (FOGA 2021). The conference was hosted by the FHV's 4Steps managers Steffen Finck and Michael Hellwig from the Business Informatics research centre in collaboration with Pietro Oliveto from the University of Sheffield (UK).

FOGA is an international conference on basic research in optimization and machine learning. Since 1990, the organization of FOGA has been assigned by the Association of Computing Machinery (ACM) to changing institutes in an application process. After 2011, FOGA was organized already for the second time by representatives of the FH Vorarlberg and held in Vorarlberg.

The conference aims to increase the understanding of the working principles of Evolutionary Algorithms and related Randomized Search Methods. The increased theoretical knowledge can thus be incorporated into the development of application-oriented solutions.

This year, FOGA was hosted by the auditorium of the FH Vorarlberg over three conference days as an online event. From 21 submitted technical articles, the 10 best articles were previously selected for presentation in a double-blind review process. The acceptance rate of 48% was very competitive compared to previous years. With 84 registered participants, FOGA2021 became the best-attended FOGA in terms of participation since the beginning of the conference series. On average, about 35 listeners attended the technical presentations.

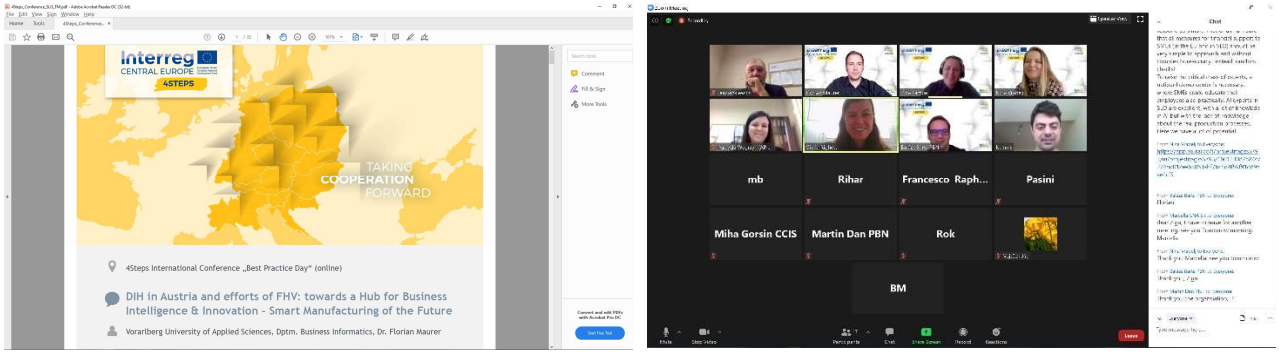
Two keynote lectures presented by internationally renowned experts from related research fields, complemented the conference program. The talk "Sex, recombination and the fundamental nature of mutation" by Dr. Adi Livnat from the University of Haifa (Israel) addressed a new way of thinking about the role of sexual recombination in biological evolution and the related implications for the Deep Learning revolution. Professor Tim Roughgarden of Columbia University (USA) discussed theoretical insights from his work on selecting the best algorithm for a given application domain in the talk "Data-Driven Algorithm Design." The two keynotes each drew an audience of about 50 listeners.

Based on a vote among conference attendees, the FOGA Best Paper Award was given to Luke Branson and Andrew Sutton of the University of Minnesota (USA) for the paper "Focused Jump-and-Repair Constraint Handling for Fixed-Parameter Tractable Graph Problem." This and all other technical papers are published in the conference proceedings and can be viewed in the ACM Digital Library by following the link https://dl.acm.org/doi/proceedings/10.1145/3450218.

Pic 74-77: Snapshot FOGA conference

2.6.4. 4Steps International Conference „Best Practice Day“ (online)

As part of the first 4Steps International Conference on Best Practices (Sept/Oct 2020), Dr. Florian Maurer was invited to present FHV's endeavours to become a transregional Digital Innovation Hub. The presentation held to project partners and international project stakeholders was entitled "DIH in Austria and efforts of FHV: towards a Hub for Business Intelligence & Innovation – Smart Manufacturing of the Future".



Pic 78-79: Snapshot 4Steps Best Practice Day

2.6.5. Workshop Interreg CE Project Chain Reactions

The Interreg Central Europe Project "Chain Reactions" invited representatives from the 4Steps project to give a presentation about the 4Steps project, its scope and individual development. Mr. Florian Maurer (representative of the project partner: Vorarlberg University of Applied Sciences) presented the partner's endeavour to design, develop and launch the first Digital Innovation Hub within the region of the Federal State of Vorarlberg called: Business Intelligence & Innovation.

Within his presentation, Mr. Florian Maurer highlighted the 4Steps partnership, its pilots and digital innovation hub development. Mr. Maurer highlighted the project scope and its origin within the field of Digital Transformation and the Industry 4.0 paradigm. In doing so, Mr. Maurer highlighted the different perspectives on the manufacturing of the future and provided definitions from the EU Commission, Engineers, Investors/Innovators, Organizations and the academic field of Service Science.

As next, he presented the origin of the design and development of the first Digital Innovation Hub in Vorarlberg. He gave a brief introduction of the Interreg Alpine Space Project "BIFOCAlps", wherein the vision of the DIH titled "Business Intelligence & Innovation" emerged. Afterwards, Mr. Maurer presented FHV's activities within 4Steps' work package n°1: The SME towards the scenario and themes of Industry 4.0. He presented the research approach applied to tap into small- and medium-sized enterprises within the region of the Federal State of Vorarlberg and achieved research results. For example, he presented the motivation for Digital Transformation within investigated SMEs, the strategy for Digital Transformation within these SMEs and the level of adaption of Industry 4.0 technologies.

Afterwards, he presented the status quo of the design and development of the Business Intelligence & Innovation Hub, which currently consists of seven services: Artificial Intelligence, System Collaboration, Resilience Engineering, Innovation Research (& Disruptive Innovation), Methods & Tools and Co-Creators. Based on service Resilience Engineering and Methods & Tools, Mr. Maurer exemplified the Hub's service portfolio.

Finally, Mr. Maurer presented the status quo of the physical and digital developments of the Hub and presented the next steps: involvement of project stakeholders and target groups into the Hub.

Thursday 23 July 2020 Venue: online, zoom https://us02web.zoom.us/j/89133669613	
TIME	CONTENT
11:00	WELCOME Luc Schmerber, BWCON
11:10	Interreg Central Europe „4Steps“: Towards the development of the first Digital Innovation Hub in Vorarlberg Florian Maurer, FH Vorarlberg - Preliminary research: BIFOCAlps - The 4Steps project - Key enabling technologies - Q&A
12:00	CONCLUSION

Pic 80: Agenda Workshop Interreg CE Chain Reactions

2.6.6. EUSALP

3. Scientific conferences

As a research partner within the 4Steps project, research at the FHV took the obligation and elaborated several scholarly articles for international conferences and journals. These conferences are, for example, the International Symposium on Logistics, International Conference on Operations Research and Enterprise Systems, NITIM Doctoral School, International Conference on Engineering, Technology & Innovation, etc.

3.1. International Symposium on Logistics, 2019 (Würzburg, Germany)

The International Symposium on Logistics is a well-known scientific conference. More than 300 researchers and practitioners within the field of logistics, supply chain management, industry 4.0 and factory of the future participated at the 24th edition of this symposium. The participants were able to get in contact with researchers within these fields and able to discuss bi-laterally as well as in the plenum, emergent approaches, ideas and innovation within these fields.

3.1.1. Edition 2019, Würzburg, Germany

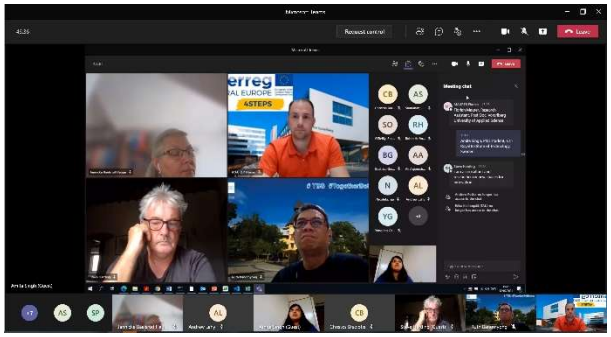
The 4Steps partner FHV pro-actively participated at the 24th edition of the International Symposium on Logistics. This well-known conference was hosted in Würzburg/Germany. The representative of the FHV, namely Mr. Florian Maurer, took this opportunity and presented

FHV's studies about digital innovation hubs. His presentation titled "Evolving towards a Smart Factory of the Future within supply chains: selected cases out of the Alpine Space and Central Europe" raised enormous attention at this community. Mr. Maurer was involved into several discussions with experts from academia and industry and was able to sustainably promote the 4Stepts project.

Pic 81-82: Snapshot International Symposium on Logistics 2019

3.1.2. Edition 2021, Online

Based on its pro-active attitude towards science and research, the FHV – Dr. Florian Maurer – was invited to chair the scientific session entitled "PS2-C: Transport and Distribution". Three presenters from international universities presented their research and research progress on resilience of rail freight traffic flows, the impacts of COIVD-19 on logistic sector companies, Air Cargo Industry after Covid-19 and baggage policy design.



Pic 81-82: Snapshot International Symposium on Logistics 2021

3.2. ICORES: International Conference on Operations Research and Enterprise Systems

The purpose of the International Conference on Operations Research and Enterprise Systems (ICORES) is to bring together researchers, engineers, faculty, and practitioners interested in both theoretical advances and practical applications in the field of operations research.

The ICORES conference tackled a broad variety of topics, such as Optimization in Routing Applications, Decision Analysis and Simulation, Dynamic Programming and Network Optimization, Optimization in Energy and Telecommunications, OR in National Defence, OR in Transportation, Logistics and Queuing Theory, Decision Support Systems, Optimization Theory, Project Management, Optimization Health Care and three Key Notes within the field of OR and Enterprise Systems.

FHV's participant Florian Maurer, was accompanied by the chairing of the tailored session entitled Decision Analysis and Simulation and also presented his scholarly article entitled „Business Intelligence and Innovation: a European Digital Innovation Hub to increase System Interaction and Value Co-creation within and among Service Systems. This paper was awarded with the ICORES best poster award.


INSTICC
Institute for Systems and Technologies of Information, Control and Communication

Best Poster Award Certificate

for the paper entitled:

Business Intelligence and Innovation: An European Digital Innovation Hub to Increase System Interaction and Value Co-creation within and among Service Systems

authored by:

Florian Maurer

received at the

10th International Conference on Operations Research and Enterprise Systems (ICORES)

held from February 4 - 6, 2021

On behalf of the Organizing Committee,

Greg H. Parlier
ICORES Program Co-chair

e-mail: secretariat@insticc.org website: http://www.insticc.org

Pic 83-84: Snapshot ICORES conference

Downloads:

- Paper:
- Video:
- Poster:

3.3. NITIM

The NITIM Doctoral School facilitates the development of doctoral research in the interdisciplinary field of Networks, Information, Technology and Innovation Management, bringing together PhD candidates and faculty members in a focused, in-depth, and constructive discussion of the candidates' research work. At NITIM 2021 around 30 PhD candidates participated and were advised by around 20 faculty members. The PhD candidates were split into groups of 3 with 2 faculty members to present their research, discuss it and get feedback to improve their research work.

During the presentation sessions of the PhD candidates, the FHV employee David Hutter presented the research proposal with the title "Distributed learning for Multi-Agent Systems with uncertain information in uncontrolled environments". This was presented and discussed with two other PhD candidates and two faculty members.

3.4. ICE/IEEE: International Conference on Engineering, Technology & Innovation

The ICE/IEEE (Innovation, Technology, and Engineering Management) Conference brings together leading academics, researchers and practitioners, contributing to the global debate on research, science and innovation. The participants of these conferences were able to digitally switch between the conferences and participate within the heterogenous tracks and sessions. Over the course of 3 days, Workshops and Paper Sessions were held covering the topics "Digitalisation in the Built Environment", "Open Innovation and NPD", "Industry 4.0", "Service Design and Engineering", "Digitalisation", "Sustainability", "Innovators and Wellbeing", "Applications of Artificial Intelligence", "Digital Innovation Management", "Data Management and Use of Artificial Intelligence in Manufacturing", and "Corporate Venturing & Digital Entrepreneurship".

Two papers were presented by FHV participants, "On a theoretically cup of inspiration with Schumpeter and von Foerster – creative destruction and emergence as means to prevent system lethargies: conceptual paper" by Florian Maurer, and "Robust and resource-efficient cooperative exploration and mapping using homogeneous autonomous robot teams" by David Hutter.

Link to the paper "On a theoretically cup of inspiration with Schumpeter and von Foerster – creative destruction and emergence as means to prevent system lethargies: conceptual paper":

Link to the paper "Robust and resource-efficient cooperative exploration and mapping using homogeneous autonomous robot teams":

Pic 85-86: Snapshot ICE/IEEE conference

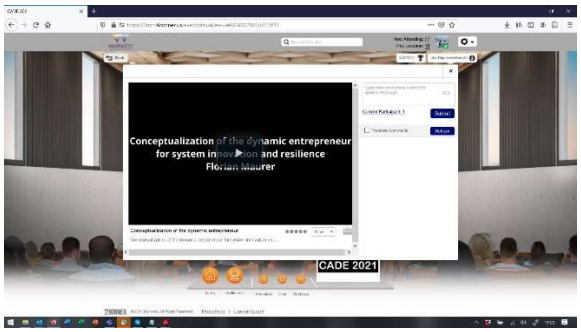
3.5. CADE: Competitive Advantage in the Digital Economy

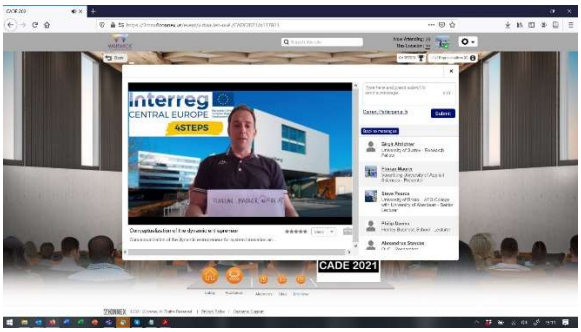
The CADE conference tackled a broad variety of topics, such as Cyber security, Security and Privacy, Artificial Intelligence & Machine Learning, Trust & Privacy, DEAS, Security & Resilience, Security & Privacy, Health & Psychology and Economics & Management.

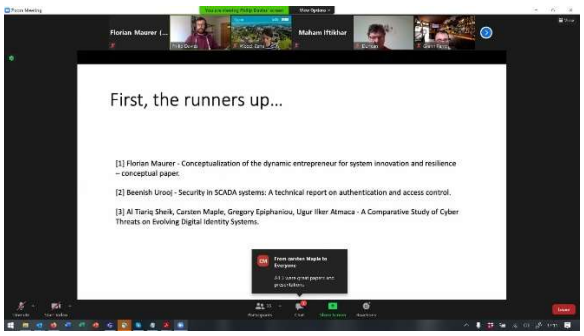
Dr. Florian Maurer, manager and main contact of the 4Steps project at the FHV, presented its scholarly article entitled "Conceptualization of the dynamic entrepreneur for system innovation and resilience". This article introduces the work of Joseph A. Schumpeter and his Dynamic Entrepreneur and gives a taste of FHV's Hub-service "Innovation research and management". Besides the elaboration of the scholarly paper, a digital presentation and a video (June 2021) have been elaborated as presentation media. The presentation and video will be available on the FHV's Digital Innovation Hub's homepage and the 4Steps project homepage.

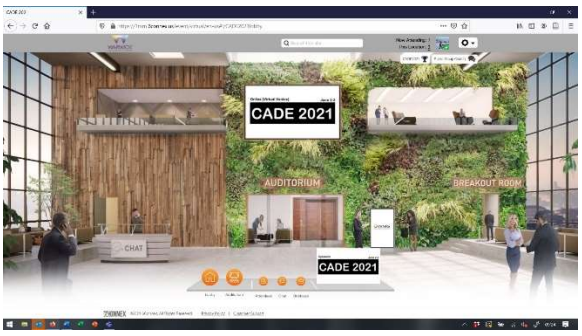
Link to the paper "Conceptualization of the dynamic entrepreneur for system innovation and resilience":

Link to the video:









Pic 87-90: Snapshot CADE conference

3.6. PRO-VE 2021: Smart and Sustainable Collaborative Networks 4.0 & 22nd IFIP/SOCOLNET Working Conference on Virtual Enterprises

From the 22nd to the 24th of November 2021, Dr. Florian Maurer participated at the PRO-VE 2021 conference on Smart and Sustainable Collaborative Networks. In doing so, Dr. Maurer participated in scientific session tailored for managers of Digital Innovation Hubs as well as presented the scientific paper: "Business Intelligence & Innovation: A Digital Innovation Hub as intermediate for service interaction and system innovation for small and medium-sized enterprises". The PRO-VE conference took place online and physically in St. Etienne/France.

Link to the paper:

Link to the video:

4. International networking & partnering

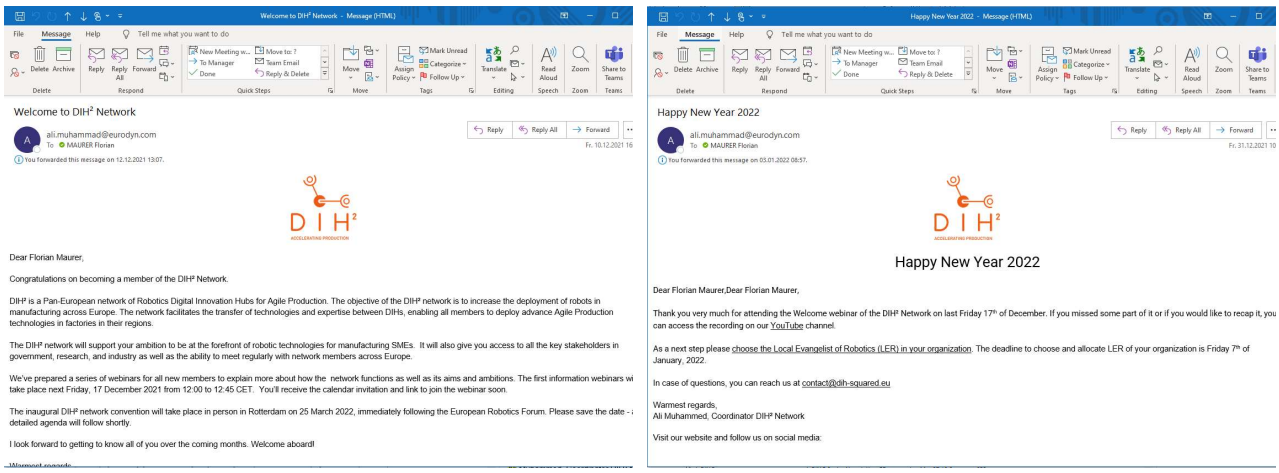
Within the 4Steps project lifetime, members of the Digital Innovation Hub on Business Intelligence & Innovation created valuable networks with international organizations and institutes.

4.1. European networks

Within this section, the European networks established within the project lifetime are presented.

4.1.1. DIH²

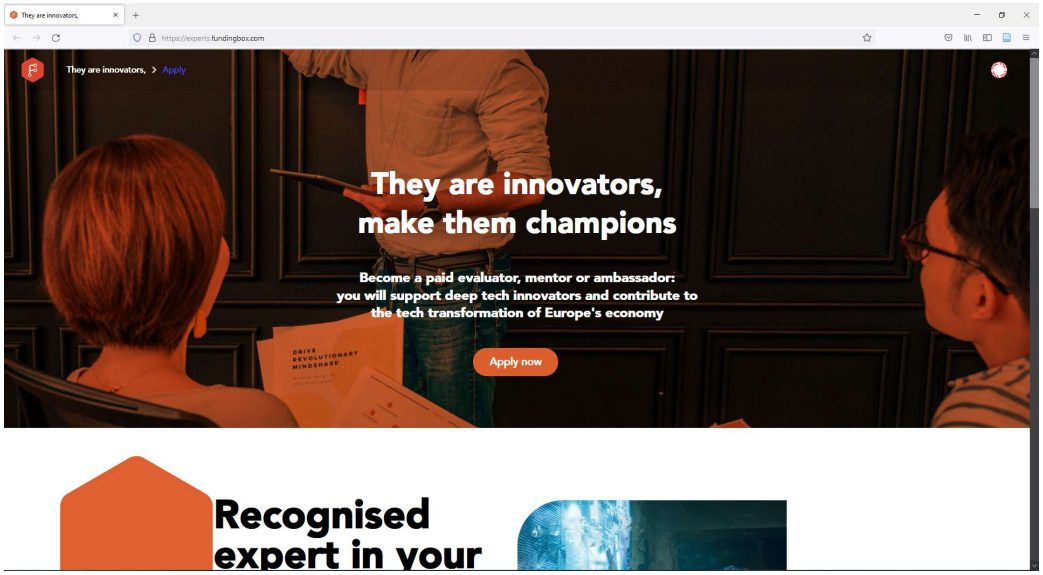
At the end of 2021, DIH2 decided to include the Digital Innovation Hub on Business Intelligence & Innovation in its international network.



Pic 91-92: Snapshot ICE/IEEE conference

4.1.2. Funding Box

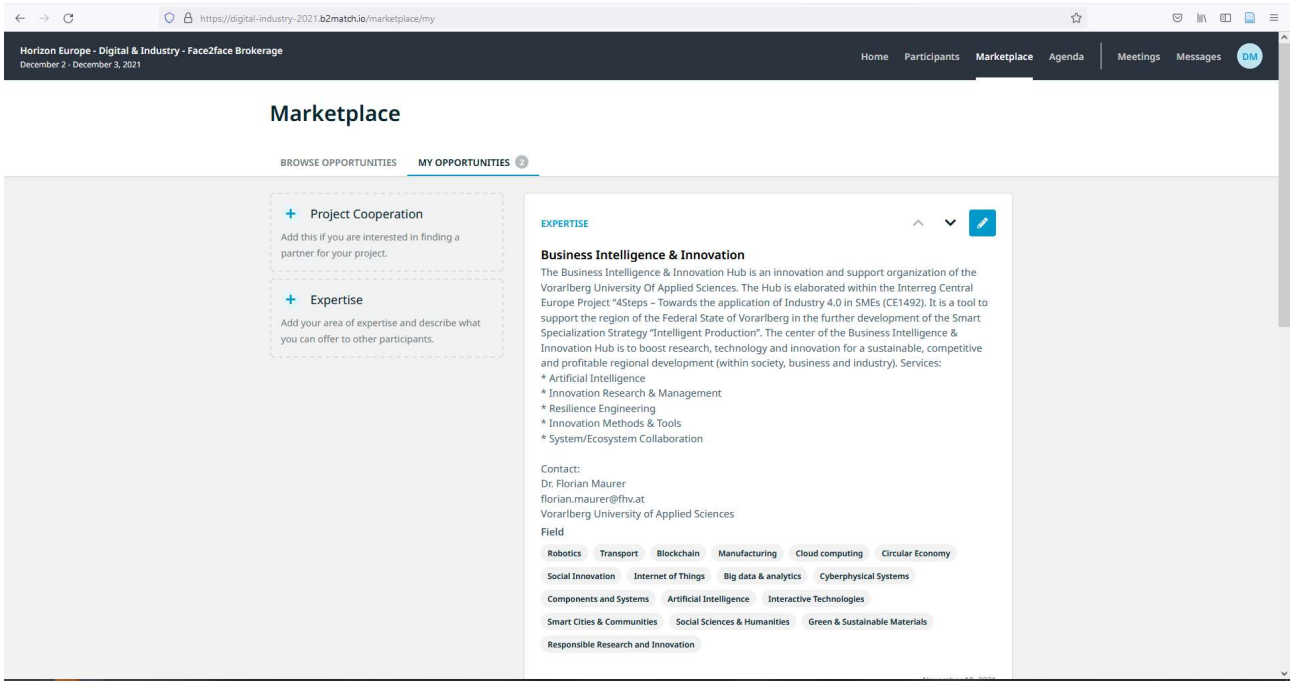
On a continuous basis, members of the Digital Innovation Hub on Business Intelligence & Innovation cooperated with the Funding Box – a platform for call for projects and call for participations.



Pic 93: Snapshot Funding Box

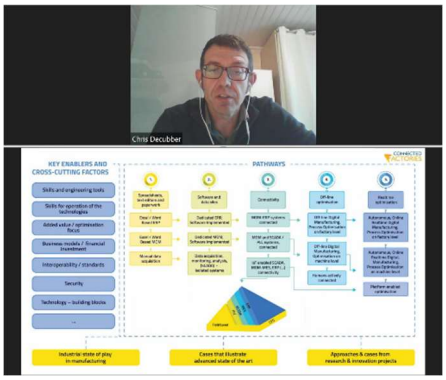
4.1.3. Digital Industries & Horizon Europe

Members of the Digital Innovation Hub on Business Intelligence & Innovation participated at the Kick-Off conferences of the European Commission. Aim was to establish cooperation and collaboration opportunities with international organizations. The efforts and activities were successful, and the members were able to get in touch with managers and decision makers from other organizations and disseminate the Hub.



Pic 94: Snapshot Horizon Europe

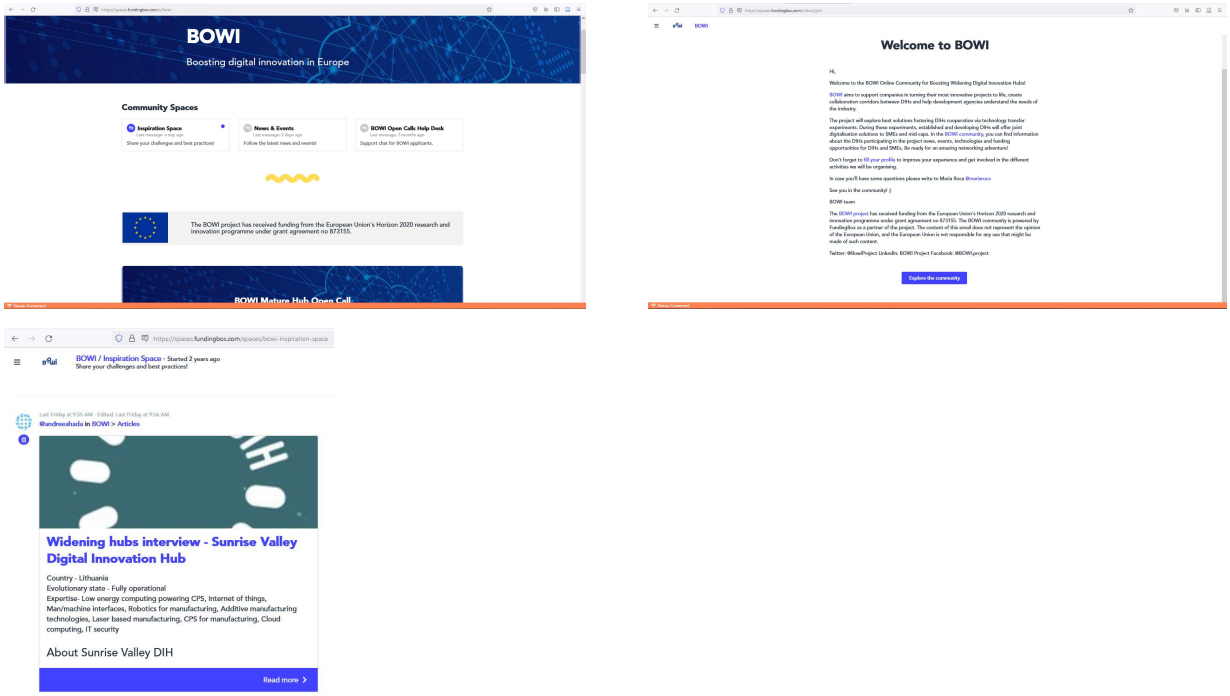
Furthermore, members of the Digital Innovation Hub on Business Intelligence & Innovation took place in several meetings and workshops, organized by the European Commission.



Pic 95-97: Snapshot Horizon Europe

4.1.4. Boosting digital innovation in Europe (BOWI)

A further collaboration and cooperation opportunity is the BOWI network. In autumn 2021, the FHV joined the BOWI network – Boosting digital innovation network.



Pic 98-100: Snapshot Boosting digital innovation in Europe

4.2. European Digital Innovation Hub – Digital Innovation Hub West

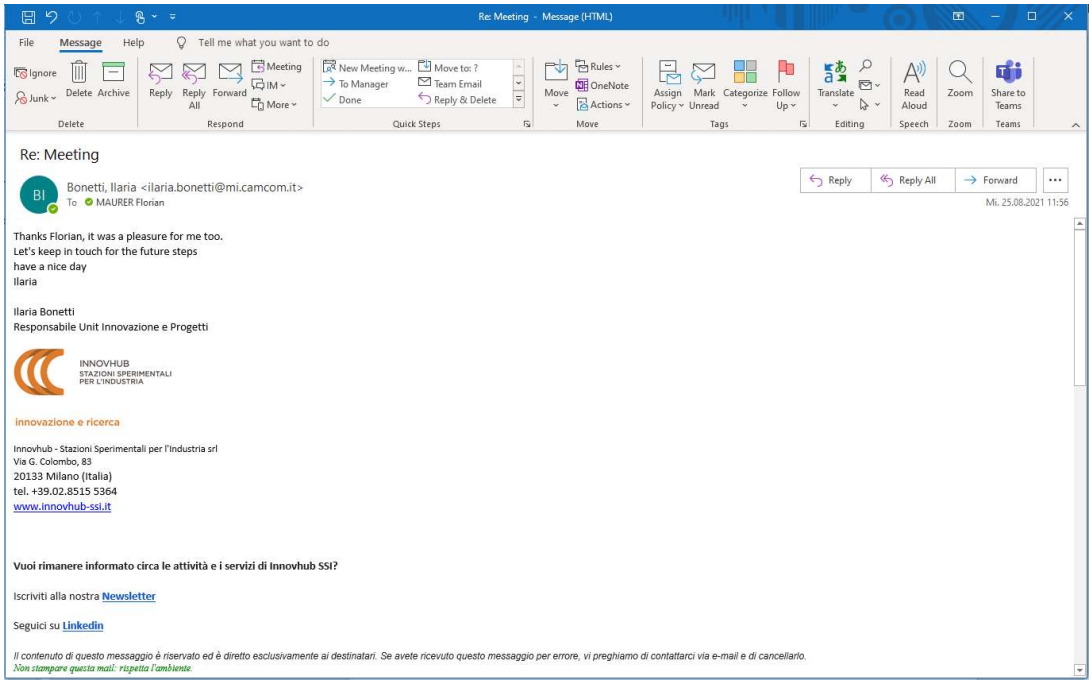
Members of the Digital Innovation Hub on Business Intelligence & Innovation actively connects with the Austrian, national-funded Digital Innovation Hub West to cooperate on various digitalization and data science topics. The Digital Innovation Hub West provides different services, from workshops to various working groups for different topics within tourism and production. Associates of the BIIH will participate in future common activities.

In doing so, the Digital Innovation Hub on Business Intelligence & Innovation can emerge from a (trans)regional Digital Innovation Hub to an European Digital Innovation Hub (Digital Europe).

4.3. Regional Digital Innovation Hubs

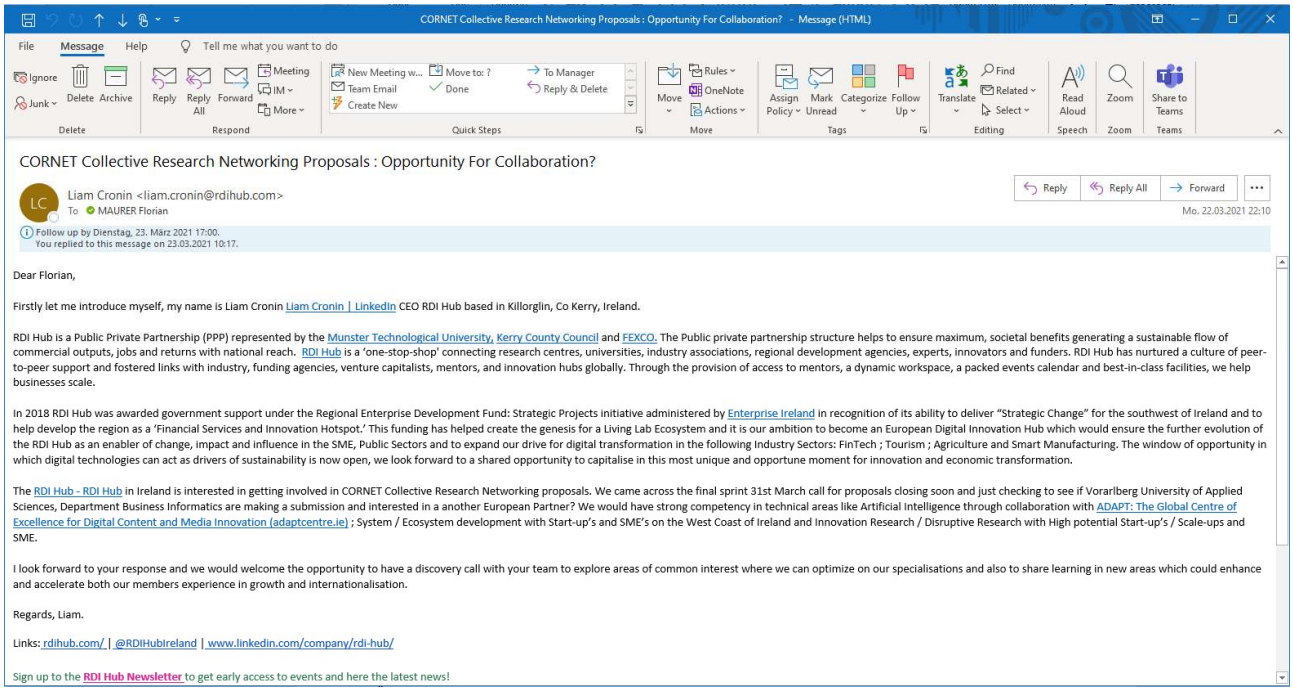
On a continuous basis, members of the Digital Innovation Hub on Business Intelligence & Innovation exchanged ideas with several Digital Innovation Hubs – such as the Innovhub SSI srl, RDI Hub Ireland and Innovation Lab Germany.

4.3.1. Innovhub SSI srl, Milan, Italy



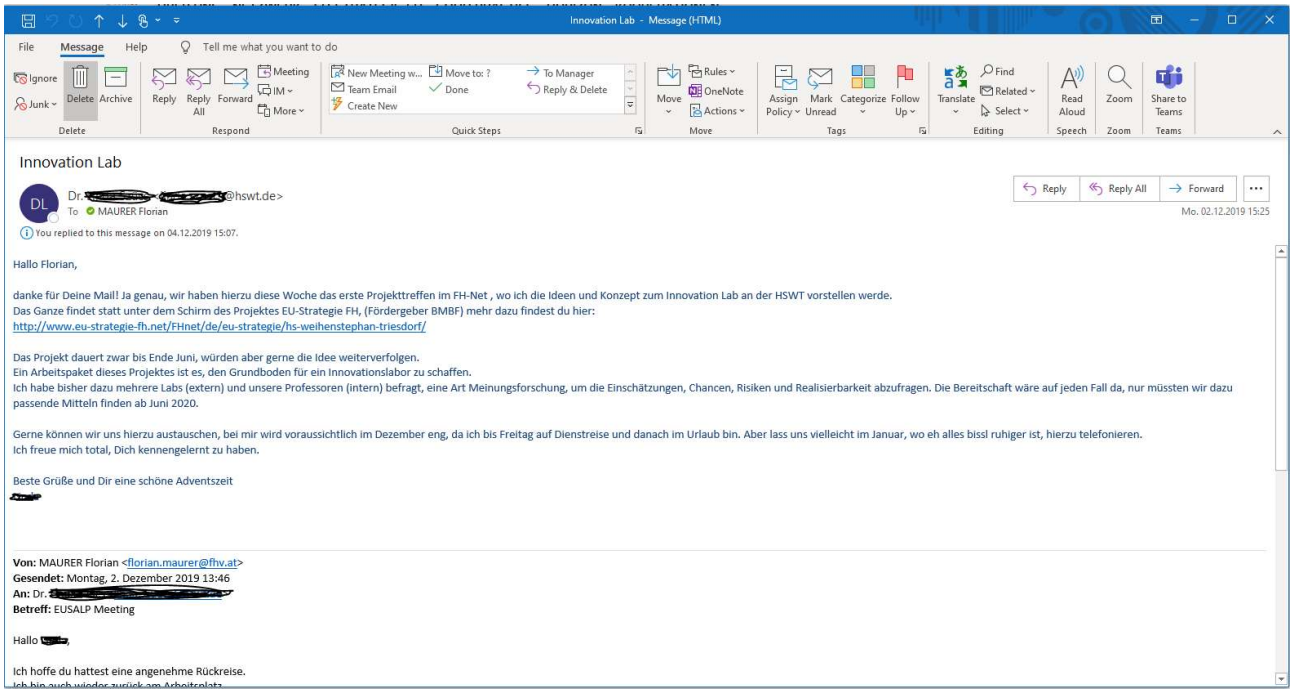
Pic 101: Snapshot Innovhub SSI srl

4.3.2. RDI Hub Ireland



Pic 102: Snapshot RDI Hub Ireland

4.3.3. Innovation Lab Germany

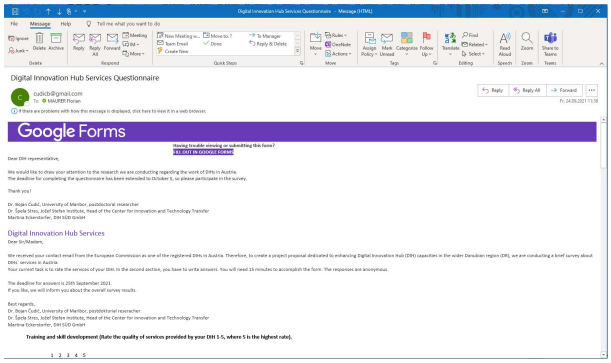


Pic 103: Snapshot Innovation Lab Germany

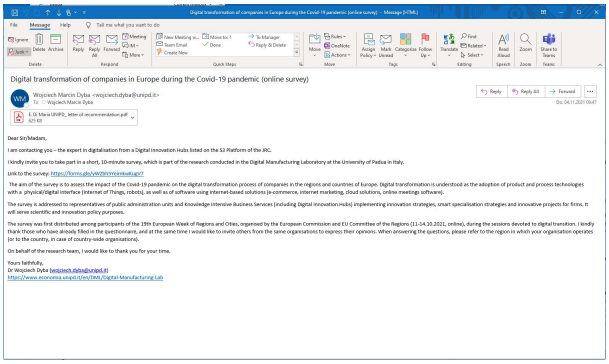
4.4. Expert interviews and surveys

The members of the Digital Innovation Hub on Business Intelligence & Innovation, specialized experts within the field of Artificial Intelligence, Innovation Research & Management, Resilience Engineering, Innovation Methods and System Collaboration were invited to participate in international studies, questionnaires, and interviews. As presented below, these are, for example, the Digital Innovation Hub Questionnaire, Digital transformation of companies in Europe during the Covid-19 pandemic (online survey), FTI Strategie Mobilität, etc.

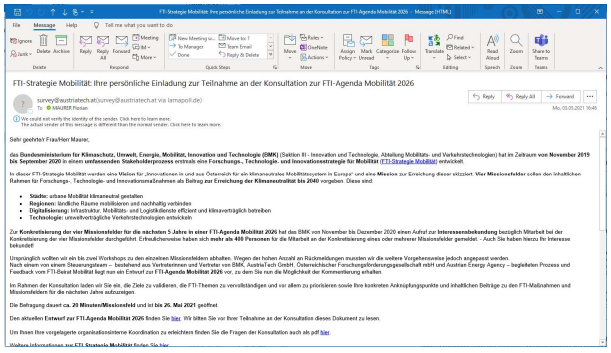
Digital Innovation Hub Services Questionnaire



Digital transformation of companies in Europe during the Covid-19 pandemic (online survey)



FTI Strategie Mobilität



Pic 104-106: Snapshot Surveys and Interviews

5. International collaboration

During the project lifetime, the members of the 4Steps Digital Innovation Hub on Business Intelligence & Innovation developed concrete project ideas with local and regional businesses and industry and submitted the project proposals to international funding authorities. These are, for example, the European Commission (Horizon 2020 & Horizon Europe), Erasmus+, etc.

5.1. Horizon 2020

As part of industrial cooperation (participation with regional business and industry), the members of the Digital Innovation Hub on Business Intelligence & Innovation submitted project proposals to the last calls of EC Horizon 2020.

5.1.1. More disaster-Resilient Society 4.0 in Europe (e-More, SU-DRS01-2018-2019-2020)

Abstract: With the aim to strengthen society resilience, it is critical to anticipate, plan for and reduce disaster risk in order to more effectively protect persons, communities and countries. It is necessary to continue strengthening official government disaster strategies, preparedness and coordinated responses, rehabilitation and reconstruction, and to use post-disaster recovery and reconstruction to "Build Back Better".

While progress in building resilience has been achieved, a more explicit emphasis on people and their health and livelihoods and regular follow-up should be performed according to The Sendai Framework for Disaster Reduction 2015-2030. It underlines the promotion of the public awareness as well as the resilience of new and existing critical infrastructure to ensure that they remain safe, effective and operational during and after disasters in order to provide live-saving and essential services.

However, there is a relevant gap between the real knowledge of possible responses from society and the expected or accepted responses that should be performed in case of certain type of disasters. This gap hinders the action of first responders and common strategies to be followed. In addition, the widespread development and use of new technologies and social media should be assessed on how to decrease the mentioned gap with the ultimate purpose of building society resilience.

5.1.2. Rescuetwins (SU-DRS02-2018-2019-2020)

Abstract: The overall goal of RESCUETWINS is to address the challenge of societal resilience, i.e., readiness of the society to act in varying circumstances. As highlighted by the recent COVID-19 outbreak, first responders are humanity's first – and in some cases only – resources when it comes to responding to natural, or human-induced disasters. If that line breaks, the cost will be measured in injuries, loss of property, wrecked lives, and in ultimate cases in a death toll. In the light of ongoing climate change, the frequency of natural disasters will likely only increase, and this will also have secondary effects such as higher frequency of refugee migrations, human-induced wildfires, etc. Adding to that criminal and terrorist activities, it is clear that in order to cope with the increasing strain, and to reinforce societal resilience, the strategic capacity and performance of first responders has to be improved. It also calls for increasing individual and organisational resilience.

5.2. Erasmus+

In the funding scheme of Erasmus+, two project ideas were submitted. Smarter – to transfer project results to academy (students, part time students, etc.) and Emeralds – to transfer 4Steps project results to vocational organizations.

5.2.1. Higher education and training: SMARTER

Field of action – international and open environment challenges the European business community to uphold sustainable actions digitalisation and technological opportunities develop on a fast pace, the nature of work and the conduct of work changes, citizens' engagement and participation increases. Young entrepreneurs are a special focus point within trade policy programmes. The collaboration between the education sector and businesses – to ensure the transfer of knowledge and innovation from education to the entrepreneurs versatile entrepreneurship in the rural area for sustainable growth – modernization and smart solutions to enhance competitiveness embrace change – strengthen the ability to modify work patterns and mindset entrepreneurs apply smart management tools provided by data science, Internet of Things and Artificial Intelligence Digitalisation is introduced in production and communication (digital marketing channels, storytelling) Taking active roles in international networks Apply product innovation and new technology in their business Efficiency of resources – collaborating in networks to ensure access to skilful labour and platform economy

5.2.2. Vocational education and training: EMERALDS

Field of action – System collaboration/ecosystem collaboration: circular and bioeconomy policies have strong thematic links, both having, for example, food waste, biomass and bio-based products as areas of intervention. The Circular Economy Policy Package aims to close material loops through the recycling and reuse of products, effectively reducing virgin raw material use and associated environmental pressures.

5.3. EU Green Deal

In the European Commission's Green Deal call, the members of the Digital Innovation Hub on Business Intelligence & Innovation co-elaborated two project proposals with national and international organizations and institutes. As presented in the following chapters, these are Fireproof and ICE-PEAC.

5.3.1. Fireproof (H2020-LC-GD-2020)

Abstract: FIREPROOF aims to develop a holistic and robust approach towards an essential paradigm shift, in short, "A global wildFIRE prevention and mitigation system by understanding the past, managing the present and PROOFing the future". Full understanding of past wildfire events, learning from limitations and specific assessments of associated risks and impacts, together with novel approaches and technologies, will enhance early detection, swift pre-positioning and effective mean deployment for land and air combat. Well devised forest

management and fire attack strategies, coupled with monitoring systems and cutting-edge simulation models, will facilitate a rapid initial attack on fires, to get full control of the events and minimize mortality and damage. Thorough assessments, support the selection of adequate ecosystem-based restoration plans to ensure rich and resilient forest environments. The FIREPROOF consortium leverages 37 diverse partners and a complementary solution aimed towards pre-emptive defence, direct attack and cohesive recovery against extreme wildfires. The solution goes beyond the state of the art in delivering working technologies, methods and in-situ demonstrations. For first responders it will entail information, decision support systems, connected smart wearable as well as modular, compact tools and machinery, in order to sustain safe and coordinated wildfire attack. For delivering both people and cargo, as well as for avoiding human casualties, novel air transportation pods will be developed, securing autonomous tactical last-mile mobility. We will perform all-inclusive cost-effectiveness analyses, considering risk prevention technologies against burnt areas (soil, building) and other economic losses, in view of 2019 rates and subsequent impacts of wildfires, as well as the 2030 EU targets. The demo sites are located in Portugal, Spain, Greece, Hungary, Poland and Finland, incorporating Australian, African and American know-how on wildfire.

5.3.2. Integrated Circular Economy Approach in the Alpine Ecosystem (ICE-PEAC)

Abstract: The ICE-PEAC project consists of demonstrating systemic solutions for the territorial deployment of the circular economy in the French Alps. Mountain territories have their own characteristics regarding their relation to nature, accessibility and infrastructures. These territories are protected by their inhabitants who adopt different life and consumption styles. Mountain territories are challenged by the rise of tourism and increased frequentation, which tends to modify the inhabitant's lifestyle towards urban-like higher consumption patterns and short-term planning.

The current project aims at developing a circular economy adapted to the mountain specificity to address the challenges faced by the environment, whilst accepting the cultural shifts operating in mountains areas.

5.4. Horizon Europe

In the European Commission's Horizon Europe call, the members of the Digital Innovation Hub on Business Intelligence & Innovation co-elaborated two project proposals with national and international organizations and institutes. As presented in the following chapters, these are Increase, JIDEP, Lets Care and ICE-PEAC (re-submission).

5.4.1. Industrial Cyber-Resilience by AI-Strengthened Solutions (Increase, HORIZON-CL3-2021-CS-01)

Abstract: The sole intent behind cybersecurity is to protect digital assets from cyber threats. However, such attacks are impossible to fully prevent, and certain means to remediate the short, medium, and long-term aftereffects are needed. The optimally orchestrated incident response (IR), disaster recovery (DR), and business continuity (BC) require substantial efforts from organizations, and are a never-ending commitment. The INCREASE solution brings

Artificial Intelligence for offloading the immense planning, testing, and execution activities from the human actors. It is a multi-dimensional tool explicitly targeting essential service operators and is aimed at overall reduction of incident resolution time, recovery duration, as well as mitigation of cascading negative effects on critical business functions. INCREASE will be executed in three layers of abstraction. The 1st layer will tailor AI methods to analyse and optimize vast amounts of organization plans bearing upon IR, DR, and BC. The 2nd layer will employ AI for investigating the human behaviour within the organization to optimize communication and information flow for a more agile decision-making. The 3rd layer will deal with AI-orchestrated technological processes for achieving fault-tolerant and error-free service continuation. The new organization resilience framework will be developed by INCREASE, tailored for the three essential services operators, and tested in three integration cycles, each subject to the growing maturity of AI methods researched – the human-assisted machine learning of organizational processes, the partial AI-optimized automation of critical communication chains, and fully AI-Industrial Cyber-Resilience. The main goal of the INCREASE is to effortlessly mitigate the effects of the cyber-attacks against the European Essential Services Operators, by instantaneously managing cyber risks, rapidly recovering from disastrous situations, and more effectively resuming business operations by AI-Strengthened Solutions.

5.4.2. Joint Industrial Data Exchange Pipeline (JIDEP, HORIZON-CL4-2021-RESILIENCE-01-26)

Abstract: Currently, economies worldwide are pursuing mostly a linear model of production which leads to massive material losses, dependency on geopolitically instable states and volatile markets for primary resources. A circular economy, on the contrary, seeks to counter this approach to preserve the value of utilized resources and materials as long as possible, to use them as frequently as possible, and to produce as little waste as possible. European industry needs solutions to mitigate the barriers for industrial data reusability and facilitate the unlocking of value from data. Joint Industrial Data Exchange Platform is a place where industrial data is fused for interconnecting seemingly different sectors into the collaboration pipeline. It builds upon the principles of Industry 4.0, by adopting a coherent approach for the semantic communication between diverse actors aimed towards direct or indirect contribution to the EU's climate neutrality goals of 2050. JIDEP is a landing place to any organization which has any kind of data obstacle to be addressed, on its paths towards delivering more sustainable material, product, service, or solution. Within JIDEP, built-in tools are made available for unlocking the value of the data, which can lead to the development of more sustainable solutions, technologies, and materials. JIDEP is also an optimizing continuum, covering the entire product lifecycle and steering it towards circular standards implementation at technological and regulatory levels. Finally, JIDEP is a tool equipped with resilience frameworks for growing organizational and industrial capacities to withstand supply chain disruptions in short-, medium- and long-term clauses. As such, JIDEP ingests industrial data and produces sustainability, resilience, and circularity artifacts for its participants.

5.4.3. Lets Care (HORIZON-CL2-2021-TRANSFORMATIONS-01)

Abstract: Secure attachment relationships play an important protective role against the intergenerational transmission of social exclusion, not only at early stages, but at all school levels. LETS CARE aims to comprehensively understand and improve the caring dimension of educational inclusion and school success. The project's main objective is to identify determinants affecting student security as a root cause of underachievement, disengagement and school dropout, at 4 different ecological levels: individual, relational, community and political. LETS CARE will create a theoretical and practical framework to foster Safe Learning, Safe Teaching, Safe Schools and Safe Education in each level as an approach to break the chain of transgenerational transmission of educational and social exclusion. This approach will generate lower rates of school failure, poor learning outcomes and early school leaving. The main proposal breakthrough is based on considering a relational response to educational exclusion and inequality, resulting in a model for understanding the importance of security to address underachievement and early drop out, and a relational approach to inclusive practices at school that will be translated into tools, recommendations and guidelines for action, from ECEC to secondary and Second Chance schools. A multilevel, multistage and intersectional research, exploring different European educational contexts, will be implemented, including 120 schools, 18,000 students, and 2,400 teachers from 6 European countries in 4 school stages, with special attention to multi-disadvantaged learners. LETS CARE, supported by an expert consortium, will implement a holistic methodological approach, including cocreation mechanisms, and will translate research findings into political approaches, through formulation of novel evidence-based policy recommendations, raising awareness on safe/caring schools, combating social exclusion of disadvantaged learners.

5.4.4. ICE PEAC (HORIZON-CL6-2021-CIRCBIO-01)

Abstract: Because they are highly impacted by climate change and pollution, mountain areas are priority places to implement circular solutions and protect the mountain environment, create local jobs and support new industries. ICE-PEAC, coordinated by the Auvergne-Rhone-Alpes regional council, gathers 26 partners from the entire Alpine Space (AS), aims at demonstrating circular systemic solutions across this territory and supports the delivery of the Circular Cities and Regions Initiatives and Green Deal objectives in this region. It will support the co-creation of an Alpine Circular Economy Action Plan (ACEAP), proposing a systemic governance scheme and regional circular economy solutions. Stakeholders from the quadruple helix will be involved at all stages of the project through a set of participative methodologies, from the organisation of physical and online workshops and interviews to the organisation of events and notably a travelling exhibition targeted mostly citizens. ICE-PEAC will especially focus on polymer waste. They are in fact one of Europe's most persistent waste materials and are an essential component of most mountain technical equipment and infrastructures. They have become a major source of pollution in fragile Alpine environments, because of overconsumption, illegal tipping, lack of recycling and poor reuse or repair strategies. ICE-PEAC circular solutions will focus on a 5R strategy for circular economy: Refuse, Reduce, Reuse, Repurpose and Recycle, and will address the issue of polymer waste within the Alps. Technological focus will be made on polymer recycling technologies, focusing both on fossil-based and bio-based materials, with the ambition to create new circular value chains and bring

industrial opportunities to the territories. To support the ICE-PEAC use cases and ensure solutions' replicability and transferability across Europe, a set of tools and methodologies will be developed, adapted to the needs of each stakeholder group.

6. Closing remarks

This deliverable at hand is about the "Smart service factory development" (deliverable WP3, D.T3.3.2) and presents the actions and activities undertaken towards the design and development of the Digital Innovation Hub on Business Intelligence & Innovation. It is the second out of three process and implementation steps. The Digital Innovation Hub is the Vorarlberg University of Applied Science's (FHV) main result from the Interreg Central Europe project 4Steps: Towards the application of Industry 4.0 in SMEs.