

ACTION PLAN FOR INDUSTRY 4.0 IMPLEMENTATION IN PARTNER AREA UPPER AUSTRIA

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Final Action Plan for Upper Austria

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1. Introduction

1.1. ECOS4IN - Ecosystem for I4.0 - about the project

ECOS4IN project has connected the partners from CE countries which have a specific idea about expected impacts of Industry 4.0 implementation and want to involve the entities from other regions dealing with similar problems. There is a strong common intention of partners to find new creative ways how to use the opportunities of Industry 4.0 and technologies for advanced manufacturing systems while eliminating the risks. Different European Community and OECD studies show that most of countries in CE need to improve the innovation ecosystem and platforms for stakeholders to become involved into Industry 4.0. The 4th industrial revolution is inevitable and will affect all industrial sectors. The impacts of Industry 4.0 & digital transformation depend on readiness of regions to respond, accept and adopt the changes.

At the beginning of the project the information gained by **ECOS4IN analysis (WPT1) on the current situation of I4.0 implementation in CE** was used in the process of describing the Industry 4.0 ecosystem model, which defines the components and links among them. The ECOS4IN model supports the sustainable cooperation of actors of innovation systems to strengthen and prepare the regional innovation capacities in CE area for such changes.

The ecosystem model (WPT2) is built on six main pillars:

- Infrastructure - shared labs, open facilities
- Critical Interdependencies - different type of connections promoted by events, workshops, conferences
- Intermediaries like different business support organisations, clusters, digital innovation hubs, regional development agencies, usually with function of regional information hub
- Knowledge Agents - universities and R&D centres (public, private), knowledge databases etc.
- Financial Tools - public and private resources for bridging the gaps in digitization implementation.
- Job Tools - different tools for skills identification, HR motivation and matchmaking

Central Europe is a very heterogeneous area consisting of developed regions with well performing innovation systems characterized by strong links among its actors as well as of mostly rural and peripheral regions characterized by low level of research and development and weak linkages within the innovation system. We have recognized that there are some differences in focus/target which is conditioned by innovation performance/digital ecosystem maturity.

- Well-developed regions focus on strengthening collaboration between local and international players and „fine tuning” of regional network. Important is also to focus on the segment of SME and micro companies.
- Middle developed regions focus on awareness actions and support tools development. Main target groups seem to be midcaps and SME. Important is also increasing the number of knowledge agents.
- Less developed regions focus on strengthening the role of intermediators, awareness actions and promotion of successful pilots (early adopters’ actions).

In a **third step (WPT3) ECOS4IN partners identified some pilot actions** to bridge the gaps between the situation in the region and the “ideal ecosystem model”.

The final task (WPT4) focused on development of action plans for digitization support. Each partner has a different role in ecosystem development (knowledge agents, ecosystem orchestrators, business support organisation). Therefore, they developed action plans in accordance with their regional roles in ecosystem. There are different gaps and actions needed to overcome, but it seems that some approaches are the same for the regions.

- Open Innovations environment - sharing knowledge and infrastructure between regions.
- Life-long learning - not only universities but also vocational and non-formal learning
- Technology acceptance especially in micro companies and SME - tailor-made tools for this target group
- Support from public government is welcome especially for SME/micro companies and R&D/intermediaries' sector

1.2. Aim of the action plan

Overall aim of the action plan is to improve the innovation ecosystem for I4.0 implementation and digitalisation in Upper Austria.

Further the regional action plan counts on the sustainable use and application of the project learnings and results. Purpose of this document is to define the actions to be further developed and implemented in regional context. Therefor the action plan is approved by Business Upper Austria - the business and location agency of the Upper Austrian governance - and is used when regional innovation strategies will be revised.

The action plan is in line with the Upper Austrian economic and research strategy #upperVISION2030. The learnings in frame of the project (ecosystem, gap, pilots) have been already used for defining the focus of the #upperVISION2030 programme book 2022 in the activity field "Digital Transformation".

After analysing the current situation of Industry 4.0 implementation the transnational cooperation designed the 'ideal' ecosystem model for Industry 4.0. The transnational concept was adapted to the regional context and the regional SWOT and GAP analyses reveal needs for improvement of the Upper Austrian ecosystem especially. The actions contribute the implementation of industry 4.0 in the region and to strengthen the role of Business Upper Austria in supporting SME in their digitization intents.

The action plan contains description of concrete activities for regional innovation capacity building after project end, timeline, (financial) resources and responsible stakeholders.

2. Background for the regional action plan (rationality for the activities)

Setting the focus for Upper Austria's action plan considers:

- conclusions and recommendations from desk research analysis on European studies (annex I)
- #upperVISION2030 the Upper Austrian business and research strategy (S3)
- GAP Analysis between actual innovation ecosystem and the 'ideal' I4.0 ecosystem model as well as SWOT analyses
- Learnings from the pilot actions performed within ECOS4IN

- Recommendations based on an SME survey executed by an external institute for market and social analysis.

Furthermore, the project process, findings and developments were discussed with the regional stakeholder group. The need for actions and the evolving focus on SME support was adjusted with the coordination office of #upperVISION2030 and integrated in the yearly updated priorities for the field of actions, namely the action field “Digital Transformation”.

2.1. Basic assumptions for setting the focus for Upper Austria’s action plan - “Digi Guide” digital transformation for Upper Austria

In General

Industry 4.0 calls for digitization and offers many new opportunities. Using these requires entrepreneurial courage and the will to innovate.

Core competencies such as innovation capacity and fast implementation are crucial for the future, ensuring societal prosperity through sustainable and real value. An answer to this changed environment offers the fusion of information technologies with other technology fields such as mechanical engineering, automotive, etc. as defined by the German language term “Industrie 4.0”. Enterprises which refuse to address these new developments cannot remain competitive in the long term in the face of competitive pressures.

Therefore, it is necessary to support enterprises in identifying their own Industry 4.0 approaches and solutions.

#upperVISION2030 - Upper Austria’s Business and Research Strategy (S3)

Digital transformation stands as an enabler for all business sectors in the Upper Austrian business and research strategy. Digital transformation influences all areas, such as education, work processes and development of new technologies. Digitization changes existing value chains and this results in new business models. Especially in companies the data-based decisions and servitization are becoming more important. Applying digitization is merely one important point, however it is more important to consider the staff who has to work with it. Regarding digitization not only technical issues have to be addressed, but also ethical themes and user acceptance have to be considered.

ECOS4IN in Upper Austria - GAPs & Need for Actions

Upper Austria has a well-developed innovation ecosystem nevertheless the GAP analyses performed in regard to the ideal ECOS4IN - model identified topics and needs for improvement. Those targeting the digital transformation of SME were considered to be most important. They were further processed in order to strengthen Upper Austria’s ecosystem for I4.0 transformation. These are:

- Transfer of scientific results to SME: Many of Upper Austria’s scientific institutions have excellent competences in the context of I4.0, but cooperate mainly with large companies. This is critical insofar as around 80 % of the companies in Upper Austria are SME.
- Practical and application-oriented formats: Companies must be given the opportunity to try out and test I4.0 technologies. There are many possibilities in Upper Austria, like robotic workshops, AI user seminars, factory visits, Open Labs etc., but SME often don’t know about the offers and the advantage of taking part.

- Consider I4.0 aspects in all training areas and sectors: I4.0 know-how must not be restricted to classical technical oriented professions and branches.
- Missing single point of information/I4.0 contact point: Due to the fact that Upper Austria has a large number of facilities, institutes and initiatives in the field of I4.0 and possesses corresponding competencies and capacities the ecosystem should have a contact point which tackles adjustment and networking between all players in order to increase capacities a coordinated way without building double structures.

The pilot activities performed on basis of the GAP analysis showed as well that the target group of actions needs to be SME.

2.2. Basic assumptions underpinned by a SME survey for evidence-based actions

The important question is to identify how SME can be supported on their digitization journey. What helps them to transform their business models and in general the way they do and think business so that they can adapt to changing or new needs of customers that emerge because of an ongoing digitization process in many aspects of society.

What is preventing SME from digital transformation? - SME survey for evidence-based actions

Therefor the International Institute for market and social analysis (IMAS International) was commissioned to conduct a SME survey on what SME prevent from starting their digitization journey. 300 Upper Austrian companies were asked about their opinion on "Digitization: importance, engagement, knowledge/use of support offers, contact with service providers and expectations".

The study provides insights on the current situation and is the basis for evidence-based actions.

- ✓ **An important and positive finding is that a majority of the asked SME believe that the impact of digitization on the company in the next three to four years will be very strong.**
 - The most important obstacles that prevent SME to take up supporting services in the field of digitization are:
 - The actual business model of the company works well, so they don't think there is a need to make changes
 - There is simply no time to deal with digitization or
 - The costs are too high to afford dealing with digitization in the company
- ✓ **The majority believes further that it is important for their financial success to think about and implement digitization in their company.**
 - Most SME tend to focus on monetary incentives rather than cooperation with scientific institutions or the use of existing knowledge provided by other companies/ institutions.
- ✓ **The relative majority awarded the highest score when it comes to assessing the importance of digital change for the economic success of their own company.**
 - But the majority of the SME is not very well informed about the services and offers in the area of digitization.
 - The most important reasons why SME did not have contact with services and offers in the area of digitization are that there was no necessity or need for them to deal with this topic.

- The other main reason is that there is an information deficit. They simply don't know that there are supporting offers and services for activities towards digital transformation of their company.

Concluding the above mentioned, the Upper Austrian actions plan will focus mainly on increasing visibility of support and tools for digital transformation of SME, sustainable running of online platform digitalregion.at as a single point of information, networking activities and exchange. These measures comply with general (desk research) observation, are in line with the Upper Austrian business and research strategy #upperVISION2030, based on the findings of the GAP analyses of the regional ecosystem and the experiences of the pilot activities and further more they are underpinned with a comprehensive SME survey and evidence based external recommendations.

3. Description of the activities

ECOS4IN: Regional Action Plan for I4.0 Implementation
(Concrete Activities for Regional Innovation Capacity Building after Project End, to be implemented in frame of S3)

Business & Research Strategy #upperVISION2030,
Field of Activity "Digital Transformation":
Development of Formats/Tools for Digital Transformation of SME

Single Point of Information for I4.0 (Digitization) in SME
(Technology, New Business Models and Human Resources)

Pilot Actions

- Transforming the coordination office of the Flagship Initiative Digitization (LID)
- Reshaping of the website www.digitalregion.at into a single point of information for Upper Austria Industry 4.0
- Upgrading, adapting and promoting the Industry 4.0 Maturity Model
- Networking, collection and transfer of I4.0 information

Action Plan for an Upper Austrian digitization package „Digi Guide“ - Digital Transformation for Upper Austria

SME survey

- What is preventing SME from digital transformation? (conducted by IMAS - International Institute for market and social analysis)
- to underpin basic assumptions
- Evidence-based actions

Evidence-based actions for

- Awareness raising (Information and Networking)
- Qualification
- Service package for I4.0 Transformation / Digitization
- Communication

The activities set important main actions to get started the implementation of measure „Digi Guide“ - Digital Transformation for Upper Austria. Goal: Increased visibility and stronger positioning of existing activities and consolidation of content on www.digitalregion.at. Establish www.digitalregion.at as the single point of information for digital transformation at SME in Upper Austria.

Name of activity	Description	Timing/ duration	(Financial) resources	Related engaged stakeholders
digitalregion.at	Sustainable website maintenance by a dedicated content manager Further update and optimization of the website towards single point of information for I4.0 & digitization	Ongoing	Content Manager Business Upper Austria: content manager, Mechatronic Cluster, News Room	Business-Upper Austria, Cluster & Cooperation R&D representatives Intermediaries
Best practice catalogue on digital transformation of SME	Pointing out realized examples in the entrepreneurial practice of all industries (branches), showing the benefit for SME Communication: website, PR, press releases, newsletter	Ongoing Update at least every 6 months	Content Manager / Newsroom together with different clusters at Business Upper Austria	Business Upper Austria, esp. Clusters R&D representatives Intermediaries (Best practice-) Companies

Name of activity	Description	Timing/ duration	(Financial) resources	Related engaged stakeholders
Service Package for I4.0 Transformation	<p>Visibility at digitalregion.at of:</p> <p>Services & support tools within biz-up and Upper Austria for SME</p> <p>Support (consulting) for the application of the services</p> <p>Goal: pooling of existing service, raise visibility, show specific commercial benefit, increase application</p>	<p>Ongoing</p> <p>Update at least every 6 months</p>	Business Upper Austria, digitalregion.at content manager, news room and service provider	<p>Business-Upper Austria, Cluster & Cooperation</p> <p>R&D representatives</p> <p>Intermediaries</p>
Maturity Model Industry 4.0	<p>Spread of the further developed Maturity Model 4.0 via workshops, trainings and publication of best practices</p> <p>Cooperation with the national platform industry 4.0 - publication of the Maturity Model Industry 4.0</p>	ongoing	Project Managers of different clusters within Business Upper Austria	<p>Mechatronics Cluster / Business Upper Austria;</p> <p>National Platform Industry 4.0</p>
CRM - topic and target groups related approach	Optimizing internal supporting system - CRM - for improved servitization of SME	End 2022	Business Upper Austria	Business Upper Austria, all departments
Qualification / Education	<p>Updating and application for continuation of these 2 initiatives:</p> <p>Qualification & Trainings in the frame of "Qualifizierungsverbund" (Qualification Network)</p> <p>IT Rocks - initiative to make the digital training options and professions in Upper Austria more visible</p>	E 2022	Business Upper Austria, HCM _ Human Capital Management dept.	<p>Business-Upper Austria, esp. dept.: HCM, Clusters, New Room, Mechatronics and IT Cluster</p> <p>R&D representatives</p> <p>Intermediaries</p> <p>Entrepreneurs</p>
Awareness raising & Qualification	<p>Organization of regional conferences showing the benefits of industry 4.0 in different sectors</p> <p>Raising the awareness for qualification & training as well as already established research facilities (e.g. Pilot Factory 4.0 at the Johannes Kepler University - LIT Factory)</p>	19. May 2022	LIT Factory Symposium, Plastics-Cluster	Plastics Cluster / Business Upper Austria together with Johannes Kepler University



Name of activity	Description	Timing/ duration	(Financial) resources	Related engaged stakeholders
Regional/national networking	<p>Sustainable expansion of the regional stakeholder group</p> <p>Facilitating exchange: e.g. I4.0 round table, workshops,</p> <p>Goal: exchange of information, mutual support, derivation of possible joint projects.</p>	ongoing	<p>Project Managers of different clusters</p> <p>Biz-up & UAR meetings</p> <p>Austrian I4.0 Platform meetings</p> <p>Topic related advisory board meetings</p> <p>NCP - National Cluster Platform</p>	<p>Especially industry related clusters like Mechatronics Cluster, Automotive Cluster, Plastics Cluster etc. UAR -Upper Austrian Research Ltd.</p> <p>National Cluster Platform members</p>
Awareness raising for TWIN TRANSFORMATION: Green & Digital Transformation	<p>Increased focus on TWIN TRANSFORMATION as economic chance to overcome new challenges (climate, lack of workforce...) and need for future business sustainability</p> <p>I4.0 for SDG (sustainable development goals & green deal)</p>	ongoing	<p>Business Upper Austria, Cluster & Cooperation, dept. Policy and Location Strategy, News Room</p> <p>Topic related advisory board meetings</p>	<p>Business-Upper Austria, Cluster & Cooperation</p> <p>R&D representatives</p> <p>Intermediaries</p> <p>National Cluster Platform members</p>
European Networking	<p>Offer B2B matchmaking meetings</p> <p>Strengthen coop with EEN</p> <p>Engage in European platforms, EU coop. projects</p> <p>Improve exchange with EIT-Manufacturing</p> <p>Goal: European visibility of R&D and cooperation project</p>	<p>Sep 2022</p> <p>Nov 2022</p>	<p>IFM- International Forum Mechatronic</p> <p>ISM - International Conference on Industry 4.0 and Smart Manufacturing</p>	
Digi Guide - a common consultancy approach for the benefit of SME	<p>Development of a consultancy approach for the first information meeting and further accompaniment of SME by biz-up</p> <p>Implementation of consulting approach developed in Interreg CE project: Boost4BSO</p> <p>Goal: provision of uniform 'question catalogue' and full set of services/offers available for company visits</p>	End 2022	<p>Business Upper Austria, Mechatronics Cluster, News Room for communication</p>	<p>Business-Upper Austria, Cluster & Cooperation, Mechatronics Cluster</p>

4. Declaration of intent

On behalf of Business Upper Austria - OÖ Wirtschaftsagentur, the undersigned, hereby declares, that this Action Plan designed in the frame of the ECOS4IN project for implementation of I4.0 and digital transformation in Upper Austria will be considered in frame of #upperVISION2030 implementation respectively when regional innovation strategies like RIS3 strategy will be revised in forthcoming years.

Werner Pampering, CEO

Christian Altmann, Head of Clusters & Cooperation

Stamp of the organization:

Linz, March 30th, 2022



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ACTION PLAN

ANNEX

Background Analysis and recommendations for Industry4.0:
Digitization/Industry 4.0 in Small and Medium Enterprises (SME's)
Recommendations for action in the Upper Austrian economic area





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1. Current Situation regarding Digitization/Industry 4.0

Industry 4.0 offers many new opportunities. Using these requires entrepreneurial courage and the will to innovate.

Core competencies such as innovation capacity and fast implementation are crucial for the future, ensuring societal prosperity through sustainable and real value. An answer to this changed environment offers the fusion of information technologies with other technology fields such as mechanical engineering, automotive, etc. as defined by the German language term “Industrie 4.0”. Enterprises which refuse to address these new developments cannot remain competitive in the long term in the face of competitive pressures.

Therefore, it is necessary to support enterprises in identifying their own Industry 4.0 approaches and solutions. Moreover, it is important to provide implementation examples in the form of concrete and specific applications and use cases.

Despite the enormous economic potential of Industry 4.0 SMEs in industry remain relatively cautious about it. For example, around 5 per cent of SMEs are thoroughly networked and a third of them are taking the first steps in that direction or at least have concrete plans to do so. The spread of Industry 4.0 depends on company size. The level of dissemination among large companies is higher and they are more likely to deploy the relevant Industry 4.0 technologies than small and Medium-sized enterprises. The leading sectors with regard to Industry 4.0 include manufacturers of rubber and plastics and of machinery and plant engineering.

1.1. Use of Cloud Services

With regard to individual Industry 4.0 processes and technologies, however, it appears that across the board, regardless of company size and branch, little use is made of the evaluation of large data streams to optimise processes or for downstream services. Accordingly, little use is made also of higher-level cloud services that are useful for that purpose.

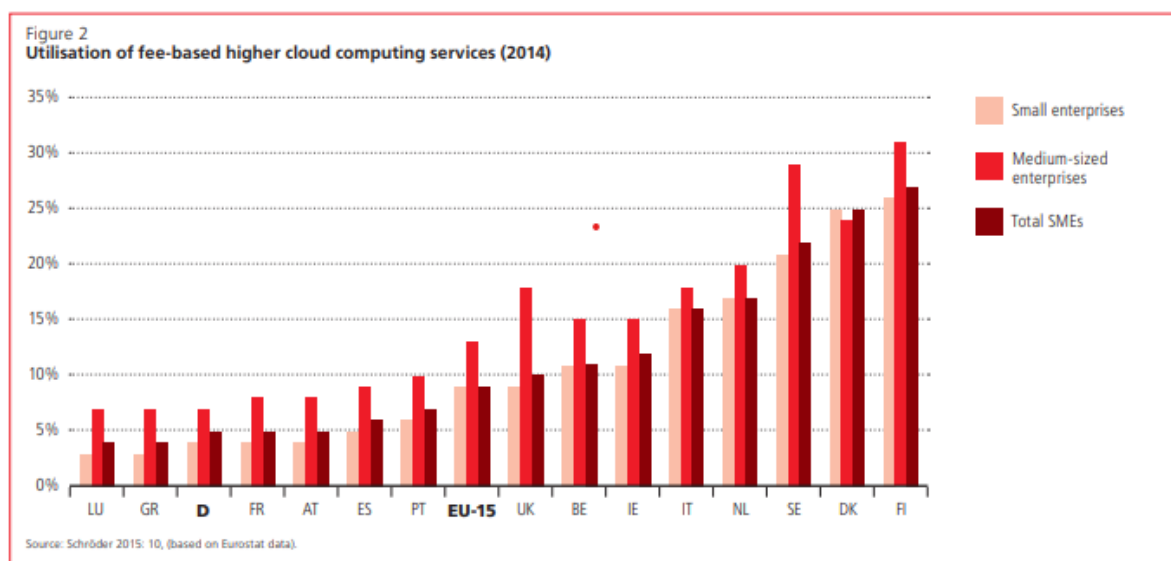


Illustration 1: Use of higher-level Cloud Services in Companies ([The challenges of industry 4.0 for small and medium-sized enterprises \(fes.de\)](#))



The integration of the data generated in the value creation process requires the networking of various IT systems both within and beyond the company. In this way functional areas such as procurement, production and sales can exchange their data in real time. It is not easy for small and Medium-sized enterprises, due to lack of resources, to assess the technological maturity of the relevant solutions and their business uses. Management lacks a methodical approach to implementation. Thus, four out of ten SMEs do not have a comprehensive Industry 4.0 strategy compared with two out of ten among large companies.

In manufacturing industry, which represents the largest part of production, around 10 per cent of companies are currently operating intensively with Industry 4.0. In machinery and plant engineering, as suppliers of Industry 4.0, the proportion is double that. At present 5.6 per cent of machinery and plant engineering companies are in a state of advanced implementation, just under 18 per cent are engaged with Industry 4.0 concepts and implementing the first measures to put them into practice. A fifth of machinery and plant engineering companies, as well as a quarter of companies in manufacturing industry as a whole indicate that Industry 4.0 is unknown or unimportant to them. There is a significant relationship between company size and implementation of Industry 4.0. Large companies are substantially more advanced in the integration of their production plants in higher-level IT systems than medium-sized companies and the latter are much more advanced than small companies.

1.2. IoT (Internet of Things):

Another important step regarding digital transformation and industry 4.0 in general is the consideration of the IoT (internet of things). The Internet of things (IoT) describes physical objects (or groups of such objects) that are embedded with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.

In Industry the internet of things is also known as IIoT (Industrial Internet of Things), industrial IoT devices acquire and analyse data from connected equipment, operational technology (OT), locations, and people. Combined with operational technology (OT) monitoring devices, IIoT helps regulate and monitor industrial systems. Also, the same implementation can be carried out for automated record updates of asset placement in industrial storage units as the size of the assets can vary from a small screw to the whole motor spare part, and misplacement of such assets can cause a percentile loss of manpower time and money.

So, we see that the IoT plays an important role in digital transformation and needs to be considered as well if we want an overview of industry 4.0 implementing actions in any enterprise but especially SME's often lack expertise and information regarding technological possibilities and the technological state of the art.

The following picture shows how the IoT technology evolved rapidly over the last years and which specific topics are today included if we talk about IoT.

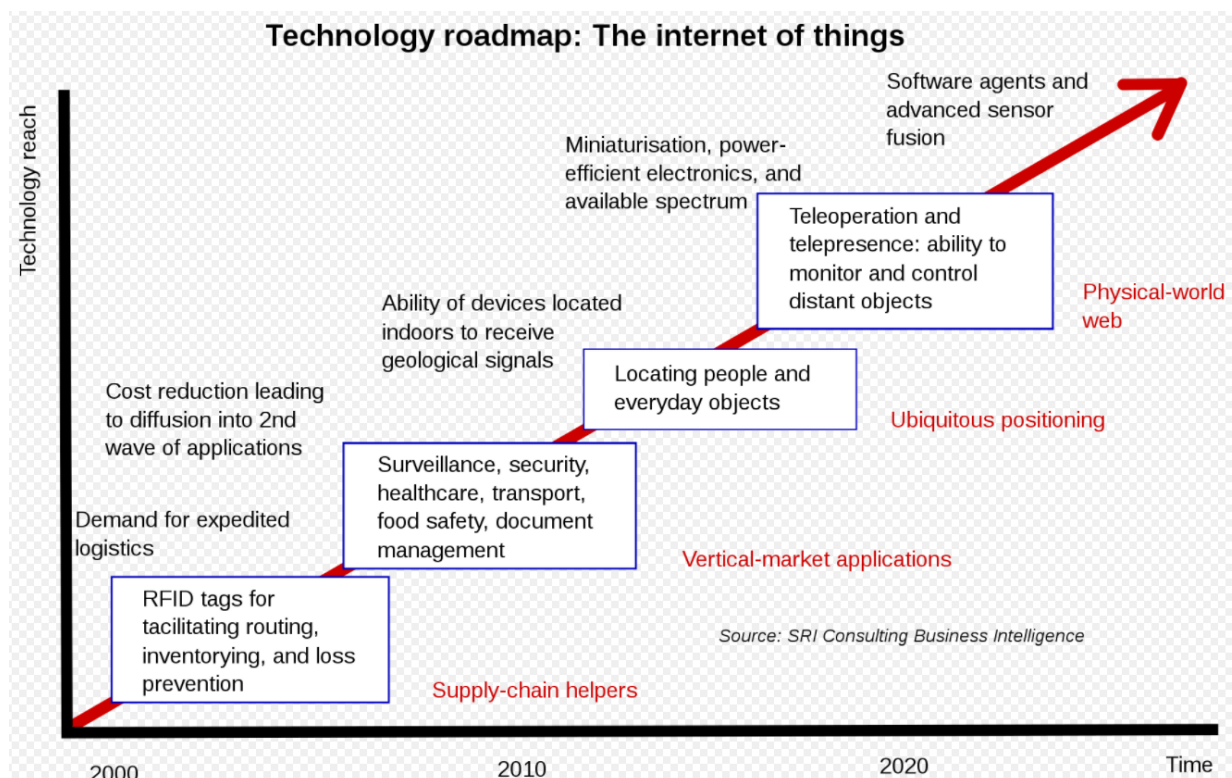


Illustration 2: IoT technology roadmap ([Internet der Dinge - Wikipedia](https://en.wikipedia.org/wiki/Internet_of_things))

1.3. Regional Perspective (Austria)

If we look at the topic from a regional perspective of Austria we can summarize the following.

A survey regarding the importance for the future of industry 4.0 where 63 small and medium enterprises in Lower Austria were contacted came to the following results:

- 44 % said industry 4.0 is not very important for them.
- 18% said industry 4.0 is very important for them
- 39% claimed that industry 4.0 is important for them.

So, we can say that industry 4.0 plays an important role in the future development for more than half of the SME's in lower Austria. We assume that the situation regarding the needs of SMEs in Upper Austria is very similar to the situation in Lower Austria so we can use these findings for further recommendations for action in Upper Austria. Small and Medium enterprises assume the topic of industry 4.0 as important for their development in the future and many studies showed that industry 4.0 opens up potentials to increase revenues, reduce costs and work smarter in general. This Action Plan lays out how SME's can implement digitization processes and industry 4.0 applications. In general, it states how SMEs in Upper Austria can deal with the topics of digitization and industry 4.0.

Before we show specific recommendations for action regarding digitization and the implementation of industry 4.0 in SME's we want to summarize factors for success in the location of Austria.

The development of the general conditions for Upper Austrian SME is important to assure economic success in the future. Velocity and circumference of digitization and industry 4.0 measures needs to be accelerated. Furthermore, we need to create awareness on these topics and encourage SME's to take full responsibility regarding their handling of new technologies and future developments by themselves.

Therefore we need to foster information campaigns and clearly position supporting measures and ensure easy and almost free access for SME's on those measures.

The most important factor although the topic is highly technological and a lot about processes and data are human beings. This means that we cannot forget the importance of education and developing new qualifications as fast as they emerge.

Infrastructure also plays an important role. The infrastructure needs to be developed and adjusted within technological changes to assure that all enterprises can rely on an infrastructure that supports their aspirations to implement new technologies and adapt to change.

It is also important that all actors in an economic area such as Upper Austria work together and foster cooperation to close the gap between needs of people, enterprises to be successful and politics to work for a greater good. To assure this cluster initiatives have proved to be helpful in the past. Driving innovation and creating competitive advantages was often enforced by cluster Initiatives. This happens through the implementation of services that support SME's in recognizing and dealing with future chances and risks. Therefore, cluster initiatives can also play an important role regarding the topics of digitization and industry 4.0 in SME's. Their influence is limited and depends on the willingness of SME's to use information and services regarding new technologies but undoubtedly, they can bring together different actors and provide useful services and information that foster technological implementations and development. Within this action plan we try to give information on the topic of digitization and industry 4.0 and offer good practices for SME's within the Upper Austrian economic area.

To summarize this, there are four specific target fields which cluster initiatives can address and focus on to help SME's in their digital transformation efforts and in implementing industry 4.0 applications.

- Information and networking
- Education / Qualification
- Research / Infrastructure
- Framework conditions of the specific location / Regional strategy (RIS3)

How to address these specific targets will be discussed in the following recommendations for action for the Upper Austrian economic area.

2. Recommendations for Action

2.1. Implementing a business process management:

Many studies suggest that it is effective to see the digital transformation and the implementation of industry 4.0 in SMEs as a process that evolves and to use project management to deal with digital transformation topics and industry 4.0 applications. Defining a process and going through the different steps with project management methods can help SME's to actually make progress in order to adapt technologically.

As a concrete example an enterprise can implement a business process management with the goal to implement industry 4.0 applications in the company over 12 to 20 months. A project manager will be responsible for reaching the project goals. The problem SME's have to face here is the lack of qualified experts that can lead successfully through such a digital transformation/industry 4.0 process. These experts are most of the time expensive and often not available in SME's.



Illustration 3: Business Process Management ([business process management - Bing images](#))

So, we can say that it could be useful for SME's to encourage them to implement a business process management with the focus on digital transformation and industry 4.0 applications. To make sure that a high number of SMEs has access to the needed resources to implement a business process management we should focus on the following specific target fields in Upper Austria.

2.2. From the point of view of Business Model Innovation

Digital transformation is changing how small- and medium-sized enterprises (SMEs) create and capture their products or services. (Digital transformation is defined as the process that is used to restructure economies, institutions, and society on a system level). For instance, social media are changing how companies interact with customers, deliver their services, and integrate their IT systems. Big data is not only relevant for marketing and customer relationship management, but also for new data-driven revenue models and preventive maintenance. Digital transformation is not about optimizing internal processes or incorporating new technologies, but fundamentally changing SMEs' business models. Therefore, strategic decisions on digital transformation do not automatically improve performance, because it requires SMEs to rethink and change their business model.

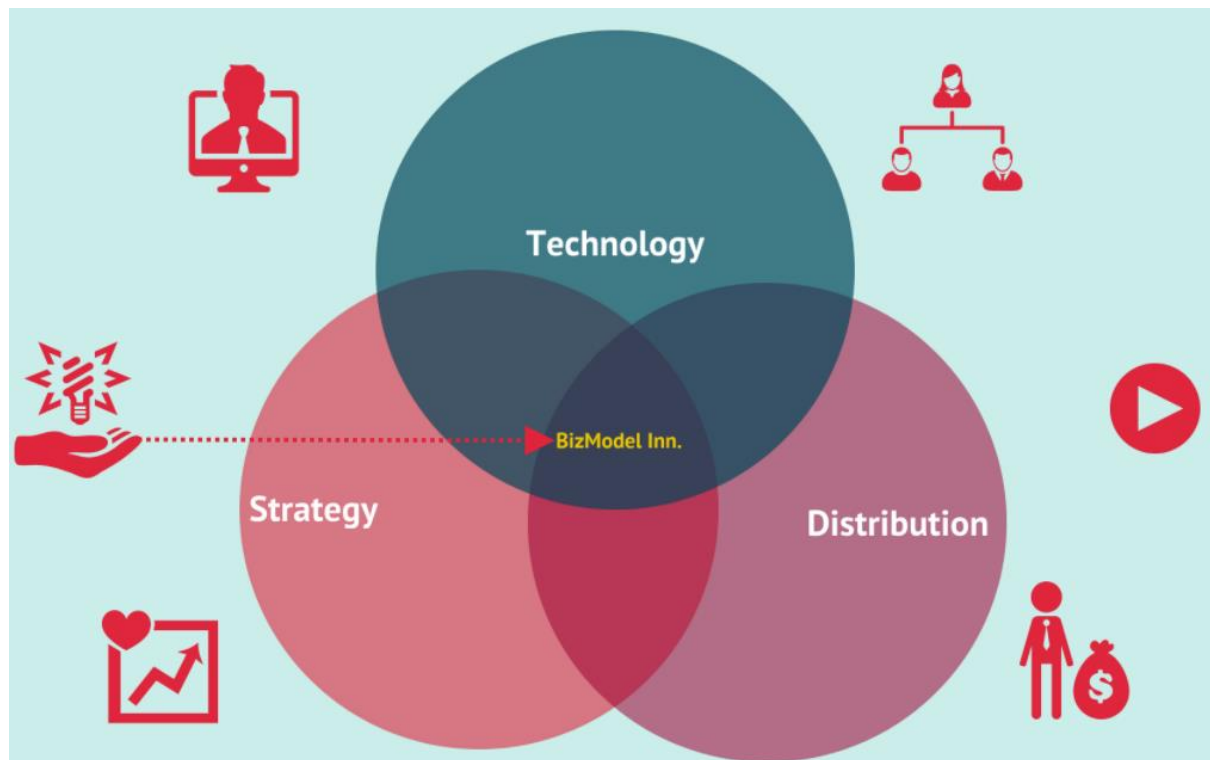


Illustration 4: Business Model Innovation ([business model innovation - Bing images](#))

As we can see in illustration 4, technology is thought to be a big indicator for the need of innovation of a business model. This tells us, that SME's need to also adapt their existing business models if they implement change processes regarding digital transformation and industry 4.0. If SME's use Business Process Management to guide their effort of adapting technologically they will also need to rethink their business models and adjust them if necessary.

If we think about digital transformation and industry 4.0 in SMEs and ways to implement new technologies within every enterprise we cannot forget to talk about IT security. The more data is stored and used within an organisation IT security gets more and more important to avoid data leaks, data loss and to prevent possible cyber-attacks before they even happen. Cyber-attacks got a bigger issue over the last years also in SME's. In most cases it is not about company size but about stored data and its value. So, if enterprises adapt technologically they should not forget about securing their new technological sources of competitiveness.

2.3. General Recommendations for Upper Austria

At first it is important to understand that when considering Industry 4.0-technologies in discussions it became clear that there is not a generally accepted Industry 4.0 solution for all businesses. First, the company must define its own Industry 4.0 goals. Although we can outline general recommendations to make this complex topic easier to understand and probably see the bigger picture of it.

2.3.1. Recommendations for information and networking

It is important to create and deepen awareness on digital transformation and industry 4.0 topics in Upper Austrian SME's. Therefor the creation and nurturing of networks and network initiatives can help to reach a better understanding and awareness of these topics. Supporting services and offers should be visible and easy to use for SME's.

2.3.2. Recommendations for education

Competencies in all areas of digital transformation and industry 4.0 applications should be forced in all types of trainings and at all educational levels. Specific trainings in the field of industry 4.0 should be continually developed and re- adjusted to meet technological needs in the region of Upper Austria. An investment in further education regarding industry 4.0 is recommended.

Training

A second important area is training. In order to adapt workers to the requirements of Industry 4.0 an interdisciplinary linking of curricula is needed in the relevant subjects. A tried and tested dual training system, with its linking of theoretical learning content and timely practical application in companies can support the transformation to networked production in an appropriate manner. However, the new requirements mean that modifications are needed in training regulations to link content from IT and industry. It may even be that new training occupations will emerge. Against the background of Industry 4.0 the extent to which state support for further training can be expanded has to be assessed. Financial incentives could contribute to encouraging workers to upgrade their qualifications to meet new requirements on their own initiative.

2.3.3. Recommendations for research

Upper Austrian programs regarding digitization and industry 4.0 should be further developed and spotlighted. The cooperation in digital transformation research and industry 4.0 research should be fostered and promoted.

2.3.4. Recommendations for framework conditions of the upper Austrian economic area

Fostering the cooperation with key actors in the area of Upper Austria and the state of Austria and addressing the topics of digital transformation and industry 4.0. The focus should be to create competitive circumstances regarding the IT infrastructure in Upper Austria and so on.

3. Challenges by Industry 4.0

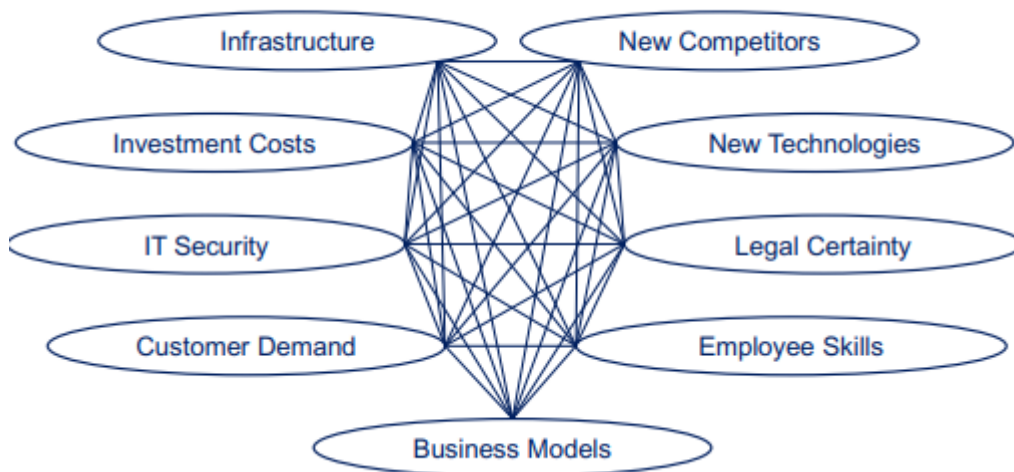


Illustration 5: Challenges by Industry 4.0 ([Advanced Complexity Management Strategic Recommendations of Handling the “Industrie 4.0” Complexity for Small and Medium Enterprises \(sciencedirectassets.com\)](https://www.sciencedirect.com/science/article/pii/S0926184118300000))

Challenges associated with Industry 4.0 can be handled by small and Medium-sized enterprises only to a limited extent. Although they have taken into account if the enterprise wants to implement industry 4.0 applications in an effective way and tried to be addressed in the best possible way regarding limited resources, knowledge and expertise.

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5. Illustrations:

- Illustration 1: Use of higher-level Cloud Services in Companies
- Illustration 2: IoT technology roadmap
- Illustration 3: Business Process Management
- Illustration 4: Business Model Innovation
- Illustration 5: Challenges by Industry 4.0