DigiTeRRI

DigiTeRRI Booklet
Roadmaps

DigiTeRRI Booklet – Introduction

DigiTeRRI has interlinked a roadmapping process with an approach for Responsible Research and Innovation (RRI) to support the transition of traditional industry regions into digitalized industrial innovation ecosystems. The engaged territories in DigiTeRRI are Värmland in Sweden, Grand Est in France, and Styria in Austria. DigiTeRRI has brought together the innovation ecosystem actors in each of the three territories to (a) co-create a common future, a common strategy, and pathways for transforming into a digitalised region, (b) become attractive for industry and business for increasing the live ability of locals and especially highly educated people, (c) strengthen the networks between actors from policy, industry & business, universities, colleges, & schools, as well as students, and NGOs.

An innovation ecosystem consists of actors who are doing innovation activities and the interaction of these actors. The entirety of private and public organizations and individuals, which contribute by their activities and interactions to the creation and diffusion of new technologies, new products, or new knowledge, build an innovation system. A smooth interplay between the actors is fundamental for a successful industry and business in a region. The composition of the following aspects and forces are the basis for flourishing innovation ecosystems, the conditions from policy makers, the knowledge and technology creation in a region on universities or research organizations, the collaboration between research and industry, the highly educated employees, either from the region or also attracted from the best education places in the world, the infrastructure in the region. The success of a region (which is the summary of the economy and the wellbeing of the people there) depends on the constructive interplay and collaboration between these elements. Therefore, industry & business have a big interest to co-create the future together with all other actors in a region.

The RRI approach applied in DigiTeRRI combines forward looking methodologies (i.e., roadmapping) with stakeholder engagement to develop possible futures for the transition into digitalisation. This approach should strengthen the innovation ecosystem in the territory (including all stakeholders). RRI is operationalised twice: implicitly by combing forward

looking methodologies and stakeholder engagement, and explicitly by addressing the RRI keys (ethics, science education, open access, gender equality, public engagement) in the development of the roadmaps' goals and objectives. By following the DigiTeRRI process, each territory has (i) mapped the current situation of the innovation ecosystem with data from science publications, EU projects, and patents, and collected best practices on digitalisation and RRI at the beginning of the project, (ii) drawn up a vision statement that – similar to a star – leads the way for the roadmap, (iii) developed goals, objectives, and actions necessary to reach these objectives, (iv) and implemented first actions already.

A roadmap process requires roadmap domains, especially when working with the innovation ecosystem for a region. Therefore, seven domains have been defined, namely (1) knowledge & skills, (2) technology, (3) networks & collaboration, (4) infrastructure, (5) culture & values, (6) leadership, business & market, (7)communication. The three territories have considered these domains differently, based on their current situation as a starting point.

The activities in DigiTeRRI reached more than 1000 people in Europe, especially, in the three engaged industry regions, namely in Värmland in Sweden, Grand Est in France, and Styria in Austria.

The initiatives in these roadmaps were developed as part of the EU funded project DigiTeRRI (GA 873010).

Further information on the project can be found at **www.DigiTeRRI.eu.**

Värmland

DigiTeRRI

Popular Public
Roadmap Värmland

The Context in Värmland

The roadmap in your hand is a strategic developmental plan for the next five years, allowing Värmland to further its digital transformation. This roadmap was created together with stakeholders from the region, including representatives from business, academy, the public sector, and the wider society. In order to observe the development trajectory from different points of view, due care was taken throughout the process of creating the roadmap to, for example, inclusiveness from various perspectives, in order to systematically support the approach of responsible research and innovation (RRI).

The participating regional actors in Värmland are the cluster organisations Paper Province and Compare, Region Värmland, and Karlstad University.

Find information about the Värmland territory at **https://DigiTeRRI.eu/varmland/**

Where are we today?

The Profile

The Värmland industry is concentrated to a few dominant sectors. The biggest industries are found in pulp and paper, steel and engineering, IT and tourism, which employ approximately 19,000 people. One other big employer in Värmland is the public sector, accounting for around 22,600 people employed in 2018 within both health and social care as well as social services. Research and innovation are evolving within these economic areas, often in collaboration with Karlstad University, as included in the various regional strategy documents such as the Värmlandsstrategin 2040[1] and Värmlands Smart Specialisation Strategi[2], which the DigiTeRRI Roadmap is a vital part of.
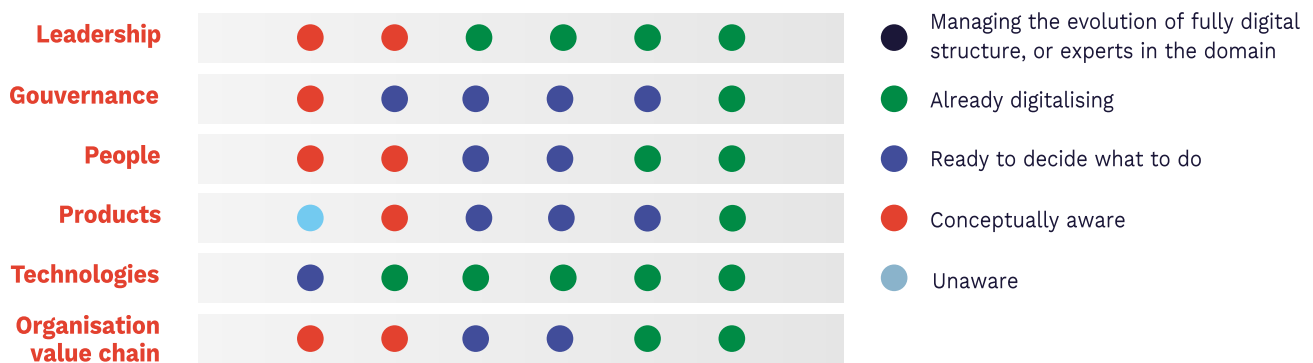

Leadership ● ● ● ● ● ● ● Managing the evolution of fully digital structure, or experts in the domain

Gouvernance ● ● ● ● ● ● ● Already digitalising

People ● ● ● ● ● ● ● Ready to decide what to do

Products ● ● ● ● ● ● ● Conceptually aware

Technologies ● ● ● ● ● ● ● Unaware

Organisation value chain ● ● ● ● ● ●

Figure 1: Status of the digitalisation maturity in individual fields

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[1] Värmlandsstrategin 2040
https://varmlandsstrategin.se/app/uploads/2021/06/Varmlandsstrategin_rev_2021-05-17.pdf

[2] Värmland's Research and Innovation Strategy for Smart Specialisation 2015-2020
https://www.regionvarmland.se/globalassets/global/utveckling-och-tillvaxt/naringsliv-forskning-innovation/vris3.pdf

Where do we want to be in 5 years?
A DigiTeRRI Vision for Värmland

The history of co-creation and collaboration within Värmland when it comes to strategies for how Värmland can keep its attractiveness as well as enhance itself for both current and future citizens of Värmland is why we – the DigiTeRRI team in Värmland – believe that the goals and outcomes of the DigiTeRRI Roadmap will be achieved. The joined up approaches are also illustrated in the between activities and goals outlined in the DigiTeRRI Roadmap and how these correlates with the Regional Development Plan Värmlandsstrategin 2040, Värmland's Smart Specialisation Strategy, the Academy for Smart Specialisation[3] and collaboration with clusters within the territory.

Figure 2: Vision map Värmland

The roadmap process delivered some very interesting and productive discussions across the many participating actors, organisations and businesses.

The vision for Värmland is that the territory shall be an attractive and sustainable region, in which all citizens are part of the digital society and possess digital competences so they can participate both in daily life as well as be part of an attractive workforce. A Värmland that does have a flexible infrastructure as we are furthering the digital transformation process in order to be able to operate on the global stage as well as grow locally. The vision is that citizens living in Värmland will have a quality of life attracting new citizens and employment opportunities but have the world as their workplace.

The goals outlined in the DigiTeRRI Roadmap should be a clear and concise set of targets that, if achieved, will result in the desired outcome. A goal can be experienced as somewhat abstract and as such it provides a bigger picture of what is aimed to be achieved. This leads to the Värmland Roadmap's objectives where the main difference between objectives and goals is that objectives cover precise activities individuals and groups participate in order to move closer to realise the goal. These activities are specific targets that typically have a time-bound schedule or timeline for completion. The DigiTeRRI roadmap timeframe is defined for 5 years, therefore there should also be implementation actions during the project period.

Where do we want to be in 5 years?
DigiTeRRI Activities for Värmland

During the roadmap there were seven guiding domains and initiatives that were developed within each of these domains. The domains that guided the Värmland DigiTeRRI Roadmap were:

• Knowledge and Skills

• Network and Collaboration

• Technology

• Infrastructure

Together with the stakeholders from the region around 67 activities have been identified within the defined domains and outlined above in order to reach the goals outlined in the DigiTeRRI Roadmap for Värmland. These activities should be realised within the coming 5-year period.
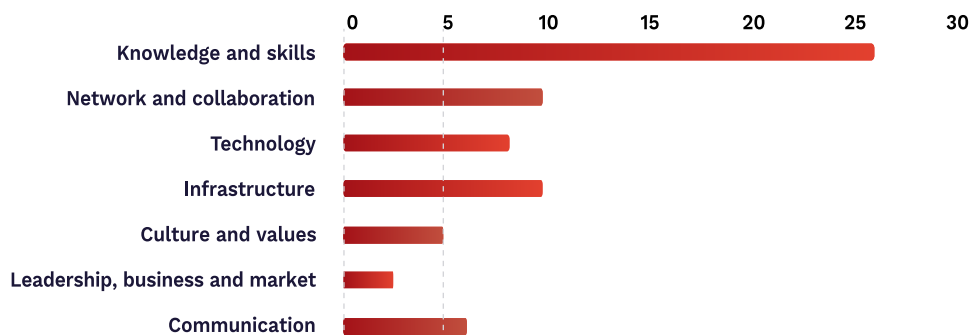
Figure 3: Number of activities in each domain, DigiTeRRI Roadmap for Värmland

The activities have been worked out together with stakeholders and the aim is to realise them within the coming 5-year period, thus 'living' past the project-time of DigiTeRRI. In the domain of knowledge and skill there are 26 activities, in network and communication 10 activities, technology 8 activities, infrastructure 5 activities, culture and values 5 activities, leadership, business and market 2 activities, and in the domain of communication 6 activities.

It was within the Knowledge and Skills domain that the stakeholders in Värmland identified where the opportunity for a successful implementation of activities was most prevalent in order to enable the digitalisation maturity process in the territory. There is also a slight overlap of some activities and a choice had to be made within which domain it should be placed.

Knowledge and Skills

Under the Knowledge and Skills domain falls acquiring the competences to be able to use devices and tools in order to be able to use the digital services and actions in today's digital society. These skills should be provided to all generations within society, and part of the domain is also to create awareness for the digital transformation that society is currently undergoing.

One such activity is that of 1) applying the Competence-wheel/Compare methodology, 2) using the competence-wheel to investigate the needs of open data and data science within companies as well as relay it to the need for open data from the public sector, 3) by further conducting a survey to validate needs more broadly, which 4) will survey the education providers, and 5) to conduct a dialogue with educational actors, that will 6) design educational/training modules, which will further allow a 7) dialogue with public educational financiers.

Network and Collaboration

Within the domain of Network and Collaboration falls both the formal and informal exchanges in networking as well as the maintaining of networks, especially in relation to innovation. Collaboration is here viewed as the result of interactions between companies, academia, public sector, and civil society producing new knowledge, innovations, and/or products.

An example of activity under this domain is a deepened dialogue with the cluster organisations to start form a business plan for DIGI-Värmland 2022-2027, and further utilisation of the Academy for Smart Specialisation.

Technology

The Technology domain also covers the development of specific solutions as well as having access to develop such solutions being, for example, specific industrial solutions in which there is a lot of potential for development.

One such activity is to further develop the VINNVÄXT-initiative Digital Well Arena to expand it to include more public services.

Infrastructure

The infrastructure domain is key for success within a territory, it refers to the basic physical and organisational structures and facilities. It comprises the infrastructure, for example, buildings, roads, trains, motorways, airplane connections, and energy supplies. The infrastructure is needed for the operation of a society as well as business and public sector services. Infrastructure emerging in importance in relation to digitalisation is access to broadband and the introduction of 5G technologies.

An activity under this domain is the identification of business opportunities and needs regarding hard and soft infrastructures as well as identifying collaborative actions with the University and public sectors.

Culture and Values

Culture can be described as the collective of traditions and ways of life, where the essential core attached to the culture is traditional ideas and values. Culture, ideas, and value differ from organisation, to organisation as well as from community to community. Part of this domain is also ethics, the

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[4] https://www.compare.se/uploads/2020/02/Kompetenshjulet.pdf

DigiTeRRI Booklet – Värmland Roadmap

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foundation of values, norms, customs and morality. By being open for adapting to change reflects part of the culture, and this also includes the positive and negative aspects around digitalisation processes. One such challenge that organisations, companies and the wider society can face is the challenge of how to manage the transition into a digitalised environment.

An example of an activity that will take place in the territory of Värmland is to explore RRI and the current approaches, to identify the commonalities in current practices and to develop the thinking and the ability to communicate the benefits of the RRI approach.

Leadership, business and market

When it comes to Leadership the key is if there is a stakeholder that either has or can take the leadership within the digital transformation process. This domain thus, includes how organisations within business, academia, public sector, and civil society can take and/or share the leadership within the territory. Traditionally the leadership responsibility falls upon one of the larger sectors and/or organisations within a territory. Thus, a key challenge can be to get a joined-up approach between stakeholders in the digitalisation transformation process.

One activity is to carry out a more detailed audit of how the territorial leadership, that is to say the political level, business community, research and science sectors, and public bodies, can maximise the potential of digitalisation for the whole of the territory.

Communication

Communication is about exchanging information, and in this case, around the transformation of society that digitalisation will have.

Here, examples of activities are to hold TechTalks by Karlstad Science Park in collaboration with clusters such as Compare and Paper Province, and by having communication campaigns about the possibilities of digitalisation to various audiences.

DigiTeRRI – Digitalisation and Territorial Responsible Research Innovation

The process of producing a DigiTeRRI Vision for Värmland has been governed by RRI. This means that the process has covered the RRI principles and practices related to gender equality, science education, public engagement, governance, ethics, and open access. What is key for the DigiTeRRI Vision and its outlined activities is that these are inclusive, anticipative, reflexive, and responsive to the needs of the citizens and the territory.

RRI brings to fore the need for collaboration of actors within society such as business, academia, public sector, civil society, and citizens coming together and working alongside each other during the research and innovation process in order to provide both aligned processes and outcomes with the needs, expectations, and values within society.

Steps for achieving the Goals outlined in the Värmland DigiTeRRI Roadmap

The goals of the Värmland DigiTerri Roadmap have been further operationalised into 67 different activities. Some of these activities are presented below.

The overall aim – goal – for each dimension in the Värmland DigiTeRRI Roadmap is:

• Knowledge and Skills: allow for collaborative approaches for the development, sharing, and utilisation of knowledge and skills.

• Network and Collaboration: explore the purpose of networks and connecting them across traditional boundaries to disrupt silo thinking and approaches.

• Technology: develop methods and tools for instructions and manuals with digital technics, and make new technology available for citizens.

• Infrastructure: Common standard for open data usage and an Internet exchange point (IX or IXP) is the physical infrastructure through which ISPs and CDNs exchange internet traffic among their networks and together.

• Culture and Values: provide the opportunities for more engagement with civil society and ensuring that their perspective is embedded in policy and strategy at the regional level. Raising the RRI perspective in the working and thinking of the sectors that have potential for the development and transformation of a traditional industrial region into a digitalised region.

• Leadership, business, and market: provide opportunities from research and the business sector to collaborate in developing leadership training that incorporate RRI and digitalisation. This alongside the potential to further engage with global markets as a result.

• Communication: create awareness within the wider society of RRI and digitalisation as well as the promotion of the attractiveness of the region.

Illustrated
The main Goals outlined in the Värmland DigiTeRRI Roadmap

Utilisation of research and developing a common language
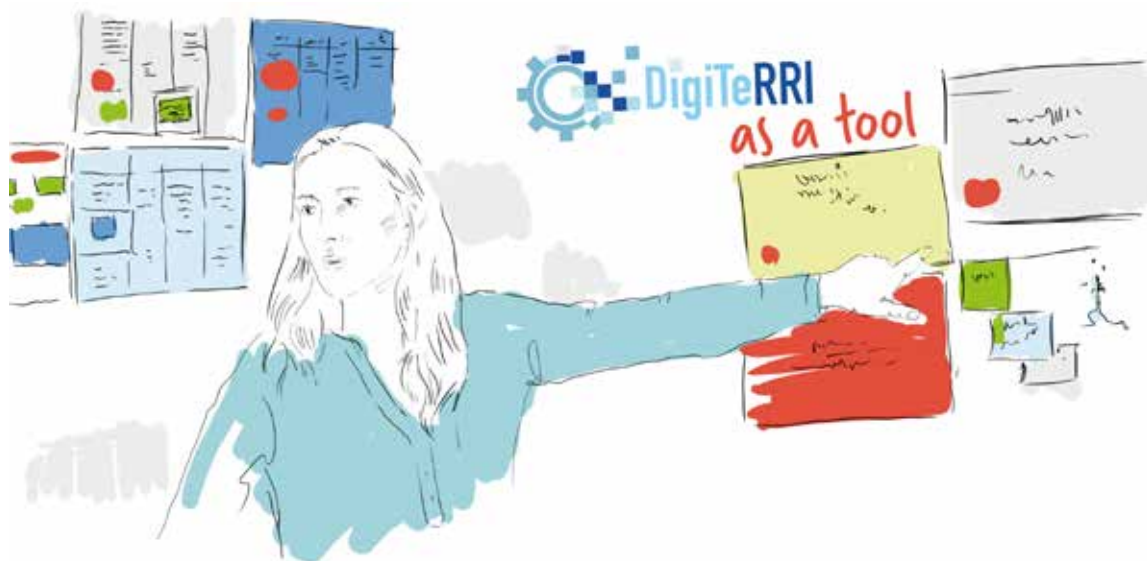
engagement

DigiTeRRI as a tool

Think and act in a quadruple helix perspective and ensuring that equity, respect for diversity and interdependence is acknowledged

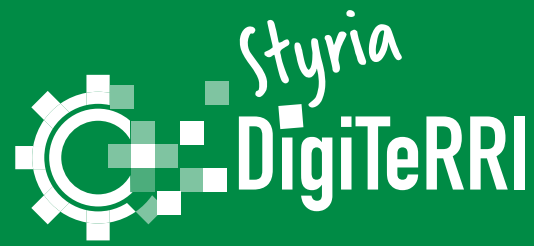Business and University

Joining up networks and cross connecting networks to maximise collaboration and joint actions

Networking & collaboration

Embedding cultural change in the territory organisations to highlight the impact and possibilities digitalisation delivers for all

organization culture

Popular Public
Roadmap Styria

The Context in Styria

The roadmap at hand is a strategic developmental plan for the next five years, letting the Upper Styria region be able to undergo transformation to become a digital region. This roadmap was created together with stakeholders already operating in the region or those who are seeking to operate in the region. Among the groups of stakeholders are representatives active in the fields of science, research, professional training, the economy, the public sector and society. In order to observe the development trajectory from different points of view, care was taken during the entire roadmap process to pay attention to topics such as diversity, and consider forward-looking, responsible principles. In addition to that, the current situation in the region was taken into consideration. In order systematically support this approach, the concept of "Responsible Research & Innovation" (RRI) favoured by the European Commission was factored into all of the steps. In the roadmap at hand, issues relating to general and scientific professional training, communication with members of the public and equality issues emerged. These issues mentioned are the core elements of RRI. The Montanuniversitaet Leoben, the Zentrum for angewandte Technologie and the Standort and Marketing Bruck an der Mur GesmbH are involved on a regional level.

Where are we today?

The Profile

Each roadmap starts by taking stock of the region. Current documents already accessible, professional literature and initiatives were screened; information on the activities and competencies of those based in the region were collected and an analysis of the stakeholders was carried out. All of the information was compiled and a profile with regard to the digitalisation status in the region was created.
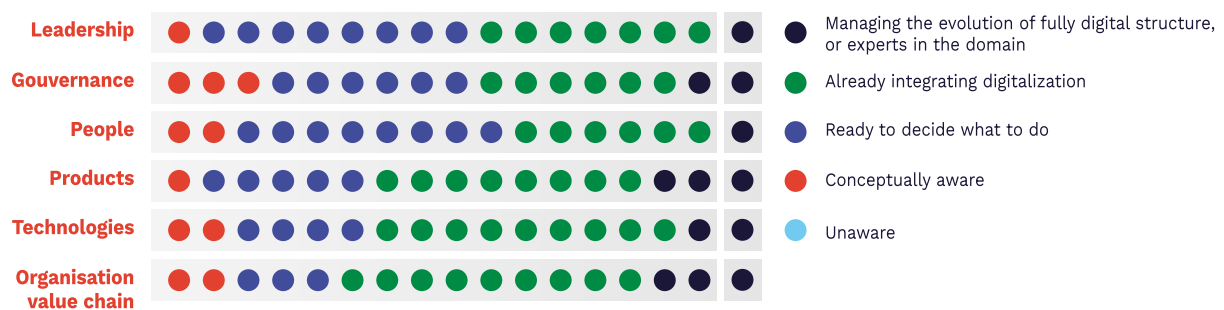

Leadership / **Gouvernance** / **People** / **Products** / **Technologies** / **Organisation value chain**

- ● Managing the evolution of fully digital structure, or experts in the domain
- ● Already integrating digitalization
- ● Ready to decide what to do
- ● Conceptually aware
- ● Unaware

Figure 4: Status of the digitalisation in individual fields

Figure 4 attests to the region already having good conditions for a transformation to digitalisation. The assessment was made on the basis of the analysis of 16 initiatives in the region. The green fields stand for a high level in relation to digitalisation. Approx. 50% of the initiatives analysed demonstrate that digital solutions have already been well established. Approx. 30% of the initiatives are currently at the introductory stage and a minority of initiatives are only in the early stages. Patent analyses and publication analyses have already shown there to be an emphasis in the fields of mechanical engineering and automation. The current strategy for economic affairs up to 2025 has declared digitalisation to be a strategic field of action for Styria. Plans for introducing broadband fibre glass cabling to the public domain have nearly been completed and their implementation is being accelerated. What is less noticeable are promotional offers for members of the public in the fields of professional training and the digital services in public spaces. Many of the initiatives currently being promoted are largely unknown to the stakeholders. Lighthouse projects are lacking and the demand for further applications for digital solutions persists. The manufacturing industry has thus already begun implementing digitalisation solutions.

Small and mid-sized companies show a tremendous need to catch up in the field of digitalisation, yet they are endeavouring to make progress. They are on the lookout for experts who can support them on this journey. The job market is lacking in specialized personnel to accelerate the move to digitalisation in companies.

The Upper Styria region is not attracting many digital natives to establish their living and working spaces here. In contrast, many young people continue to choose to leave the region. The demographic shift towards an ageing population among the regional population remains at a constant.

Where do we want to be in 10 years?

A Vision for the Upper Styria Region

After taking stock, creating a vision is the second step in developing a roadmap. The vision is the framework for the future of the region which is to continue beyond the roadmap phase. The vision was prepared working together with select stakeholder representatives in a core group and with other representatives in the region. **Figure 5** shows the visualisation of the vision that was worked out.

Figure 5: Vision Styria

The fundamentals of the vision pick up on the strengths and weaknesses shown and present the potential for development. A generational exchange, which simultaneously includes all generations, is meant to help realise the transformation. More attractive living and working spaces for everyone are meant to be established by opening up the region. There should continue to be a focus set on industry and innovation, economic sectors already in existence today should be boosted by digitalisation to remain competitive. With digitalisation the synergies in already existing fields should promote using new approaches and generating innovation. Research and modern infrastructure coupled with a continued willingness to promote itself as a knowledge region and to continue to develop as such are the pillars of the future. Networking and cooperation are among the regional strengths that will help the region to forge ahead with growth.

DigiTeRRI Booklet –
Styria Roadmap

Transformation look like?

Some main fields emerged from the vision and have been consolidated into so-called domains.

The following domains were generated for the DigiTeRRI Roadmap:

• Knowledge and skills

• Networks & collaboration

• Technology

• Infrastructure

• Culture and values

• Leadership, business & market

• Communication

Representatives from all of the groups of stakeholders were involved within the scope of defining goals.

Together with the stakeholders in the region, more than 35 sub-goals were worked out within the domains defined. These goals should be realised within the next 5 years. They were then analysed and consolidated into thematic groups. The objectives that were developed are to be achieved throughout the entire period and thus require a consistent target tracking of initiatives by defining milestones.
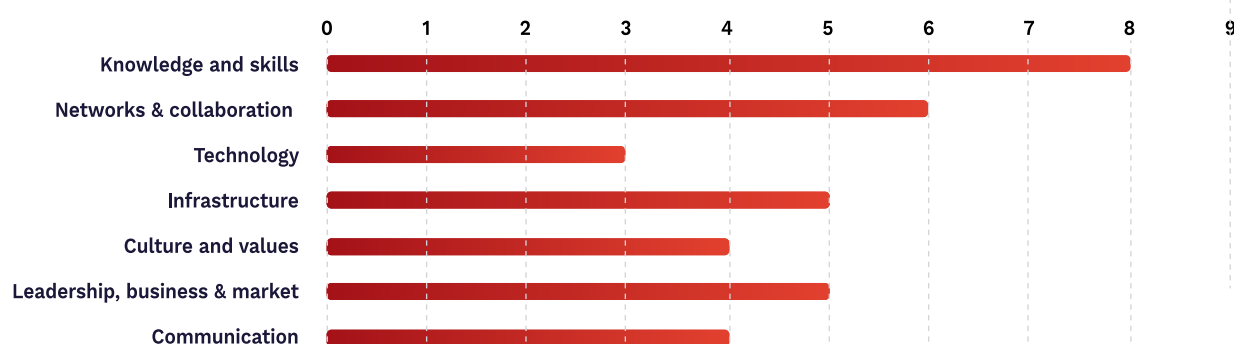
Figure 6: The number of goals in each respective domai

Taking the core topic / domain **Knowledge & skills** into consideration, Figure 3 shows that eight goals have been defined. The domain **Networks & collaboration** has six goals. Five goals were defined for both core topics **Leadership, business & market** and **Infrastructure.** Four goals each were defined for **Culture and values** and for **Communication** Three goals were worked out for the core topic of **Technology.**

DigiTeRRI Booklet –
Styria Roadmap

The most number of goals have been defined in the domain **Knowledge & skills**. The objectives are: developing proposals, extending knowledge and acquiring skills on digitalisation topics, applying digital solutions and using digital devices. The accessibility of new needs-oriented professional training programmes that will be offered in line with the requirements of respective stakeholders – from an elementary level up to mid-career professional training – is to be viewed as a general objective. Further development of the proficiency level of working with digital solutions has been advancing rapidly; adapting the training opportunities throughout the entire period of the next five years seems to be necessary. There is a need for training at all age and qualification levels. The professional training programmes created are to correspond to the profile of requirements that has been created for competencies required (as role models) for the region. The job profiles to be created are meant to offer incentive for young people and provide transparency on future career opportunities. Gender aspects are to be integrated when creating new job profiles; incentives and optimum working conditions are to be created particularly with women in mind.

Networks & collaboration is the second most important domain for expediting regional transformation. This domain is comprised of forming networks, establishing a promotion of cooperation initiatives and exchange up to the joint realization of measures. Quite often these goals of this domain are in interaction with other domains such as knowledge and skills, science and the economy. The results of this collaborative work are summed up in creating a comprehensive platform. This platform combines all of the digital proposals and competencies in the region and operates as a central hub that will keep emphasis on the topic of digitalisation in the region at a constant. In addition, the development of projects and initiatives from and with members of the public will be intensified through this platform and realised with the support of the public authorities. The goals mentioned in the values and culture or communication and regional marketing domains also show evidence of close cooperation with the objectives in networks, cooperation and collaborative work.

In general, the domain **Infrastructure** has an effect on all of the other domains, since any progress in digitalisation is only able to be achieved with the help of a modern and well-developed infrastructure. The success of any of the measures carried out within the scope of realisation depends on the infrastructure available. The goals in the field of infrastructure consist of the large-scale expansion of the terrestrial fibre glass cabling network and the related connections to a 5G high performance network and the implementation of applications for companies as well as those in the private and public sectors. The goal is basically to utilise digital solutions and to boost a product range in public space.

A further objective in the **Infrastructure** domain is the provision of regional and supra-regional resources from the public and private authorities so that the measures that are developed are effective and are able to be realised swiftly.

Interface with other domains is not only found within the accessible networks, but also in the data available (open data) with a higher quality and in business models that utilise this data commercially for the benefit of society. Initial concrete ideas on how to implement this might be found in a warning system for severe weather and environmental catastrophes as particularly are found in the Alpine locations in the region.

The target definitions in the domain of **Leadership, business & market** and **Infrastructure** serve in the region as a motor for growth, value creation and boosting the regional level of awareness. One of the central elements is the economy, and companies that have demonstrated a great commitment to the implementation of digital solutions. They stand for innovation and advanced development, surviving on the global market. A manifold and thriving economy makes the region attractive for those moving to the region, as an appealing workplace environment is able to be offered. The leadership role in the field of digital solutions applications has to be recognisable outside of the region as well. No company may be excluded from accessing digital solutions. Commercial enterprises also have to be fit for digital solutions and such business approaches. All of the core topics extend to the entire time period for observing the progress of the roadmaps.

The target domain **Culture and values** is equivalent in importance than communication and regional management. Even if the domain culture and values only has few objectives to be taken into consideration, it is the key for implementing all objectives of the other domains. If the goals developed are not found within the scope of regional values, achieving those objectives is doomed to failure. The change in culture and values brought about by digitalisation means that all of the stakeholders and everyone in the region will face a great challenge. It will interfere with our lives and will shape a large part of our social interactions, privately as well as professionally. Since the digital world represents the Great Unknown for many people, we tend to approach it with caution. Any geographic barriers that already exist in collaborative work will vanish, allowing the chances found in supra-regional collaborative work to come to light. This, however, requires being open to other cultures and ways of working in a very short time. Women will have to experience a much greater sense of equal opportunity. Professional training programmes in MINT subjects will initiate new and manifold opportunities and will have to be designed to be attractive for women and families. Continuous advanced development and tapping into new fields with knowledge and learning has to be classified in the region as a valuable commodity and has to be strengthened.

All of the efforts and activities in the region in the field of digitalisation have to be accompanied by a regional marketing scheme to ensure perceptibility and visibility. The domain **Communication** has to reflect the values, the culture, the strengths and development potential, needs and opportunities in the region in every aspect. In order to put emphasis on the appeal of a digitalised region, supplementary initiatives need to be introduced to highlight the desired image. One central goal is the creation of a comprehensive interactive platform for the region, meant for stakeholders from outside the region, which places the region's self-image in the best possible light.

The five main goals
for achieving the objectives

Digital Transformation in the Field of Education

The purpose of education and training is to be clearly defined and communicated to all those involved. Digital competencies are to be built upon, starting in kindergarten and continuing through to the university level. Some projects have already been initiated utilising labs designed for pupils and to support teaching staff. Interdisciplinary work among the various subject areas is to be intensified. Professional training is to be designed to meet the needs of new job profiles. Networking amongst the training facilities and an exchange of knowledge with all those affected are essential objectives here. A transnational exchange in online training is to be boosted throughout the region. The educational opportunities and initiatives are to be communicated widely and made known throughout the region as well.
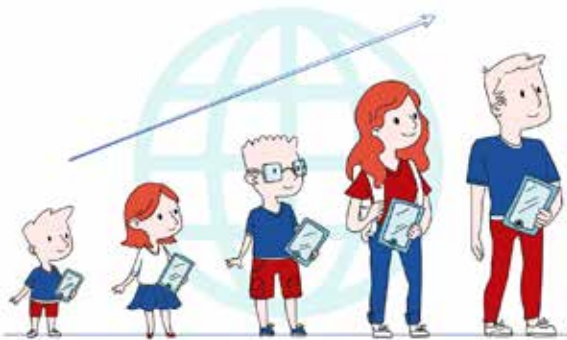
Cities, Municipalities, the Public Sector

Cooperation among cities, municipalities and rural regions with regard to digitalised solutions is to be intensified. A regular exchange on the current state of the art, best practises and project ideas is to take place. Realising standardised, user-friendly leading projects in the region is something to strive for. Comprehensive consulting services with respect to financial assistance and access to what is needed are to be offered to members of the public, start-ups and companies in the region. Financial assistance for digitalisation projects has to be made available.

# Technology and Knowledge Transfer

Private individuals, companies and the public sector should have access to e-services and be able to utilise them accordingly. New business models will be generated with the help of new technology such as artificial intelligence Research-oriented lighthouse projects will be implemented in the region and will contribute to progress being made throughout.

Creating Work-environments and countering the Lack of skilled Labour

The needs of those in the workforce, and the state of the art as well, have been subject to constant change. Employers and the public sector need to react to this accordingly and place a well-functioning digital infrastructure at everyone's disposal. The parameters for all of this need to be set in order to encourage much needed highly qualified experts in the field of digitalisation to settle and stay in the region. New digital job profiles have to take gender needs and society's urgency for work-life-balance into consideration. Thus, girls and women will be empowered into gaining a foothold in technical professions.

A universal Platform for Networking
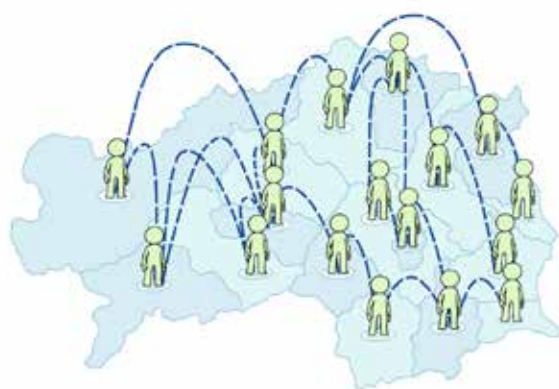
A new multi-functional platform for exchange is to be established for all of the stakeholders involved. The platform is to serve as a visualisation of the present situation in various fields and is to counteract any bottlenecks in the job market or in the training sector by providing the information needed. Deriving from that, the individual stakeholders will be able to gain access to various initiatives. Some of the activities might be the presentation of events or projects relevant to citizens. Data already available should be linked with real-time information. It might be conceivable for those living and working in the region to be given the latest information on avalanche, storm or flood warnings. Any e-services the region might need have to be developed and be made available to those living and working in the region.

Grand Est

DigiTeRRI

Popular Public
Roadmap Grand Est

Issues of the DigiTeRRI project

The DigiTeRRI roadmapping process in Grand Est was performed by the actors of the innovation ecosystem by taking into account the common framework for all three DigiTeRRI regions (Värmland in Sweden, Styria in Austria, and Grand Est in France). The whole project is embedded into a road-map process, where a vision statement, goals, objectives, and actions are developed together with the stakeholders / actors in the regions. The Responsible Research and Innovation (RRI) approach was applied in this work. RRI is defined as an inclusive approach to achieve R&I results that are in line with society's values, needs and expectations. These values are reflected in 6 key concepts and 4 transversal axes:

- Six key concepts: gender equality, science education, open access to data and knowledge, public engagement, ethics, and governance.

- Four transversal axes: diversity and inclusion, openness and transparency, anticipatory and reflective, reactive and agile.

Thus, the RRI approach must be considered as a tool for socio-economic performance and sustainable growth.

On the scale of the Grand Est region, 4 collaborative work sessions have brought together nearly a hundred actors in order to
- Raise awareness of RRI
- Co-construct a vision and a roadmap for the Grand Est

The context

The roadmap was based on a general diagnosis of the digitalisation process in the Grand Est region. This study sought to identify resources available in terms of skills:

● universities, technical centres etc.)

● equipment (technical platforms, FabLabs, Living Labs and others …

● Infrastructure.

Furthermore, different actors in this digital evolution have been identified for instance, SME's applying the principles of Industry 4.0, IT service companies, clusters as well as associations working to support citizens, public institutions…

Flagship actions have been identified as well, as a matter of fact, actors in the Grand Est region are increasingly aware of the issue of digitalisation and are ready to accelerate the process to increase both their economic and societal performance.
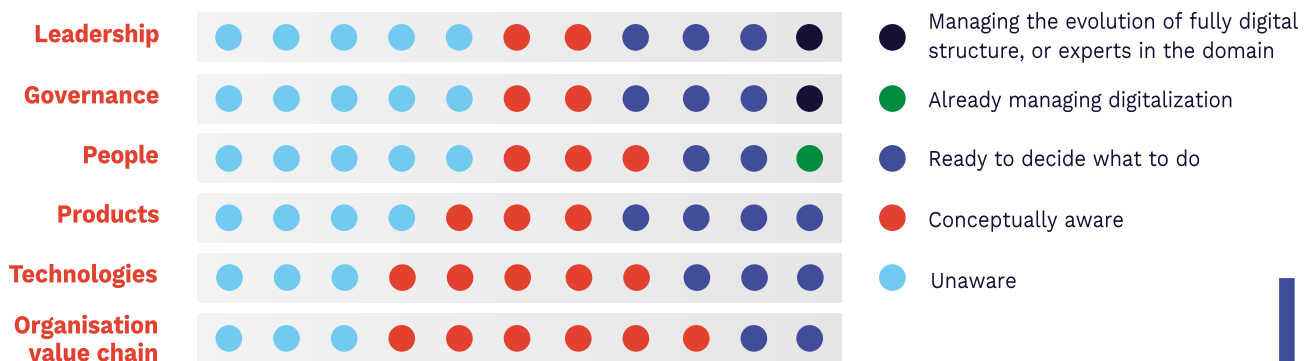

Field											Legend
Leadership	●	●	●	●	●	●	●	●	●	●	● Managing the evolution of fully digital structure, or experts in the domain
Governance	●	●	●	●	●	●	●	●	●	●	● Already managing digitalization
People	●	●	●	●	●	●	●	●	●	●	● Ready to decide what to do
Products	●	●	●	●	●	●	●	●	●	●	● Conceptually aware
Technologies	●	●	●	●	●	●	●	●	●	●	● Unaware
Organisation value chain	●	●	●	●	●	●	●	●	●	●	

Figure 7: Status of the digitalisation in individual fields

The Grand Est region, the second largest industrial region in France in respect of employment, is fully aware of the importance of the digital transition, which, along with energy, environmental and industrial transitions, are powerful drivers of change. For instance, in 2017 the Region launched, a plan called "Industry of the Future 4.0" which aims at supporting the competitiveness of SMEs /ETI wishing to identify the actions to be made for a transition to Industry 4.0. it aims both in terms of their production apparatus and their economic model.

This approach was quickly extended to the fields of agriculture and crafts. The ongoing COVID19 pandemic has made people even conscious of the need of accelerating the digital transition, particularly in the industry sector. An ambitious recovery plan on the subject has been designed and integrated into the regional recovery plan: the Business Act Grand Est (BAGE 2020). It has been prepared and co-constructed with the various key players from the quadruple helix: SMEs, local and regional authorities, universities, and research centres.

In terms of digital strategy, the Grand Est Region built an initial roadmap in 2019. Which one of the main goals was to stimulate the competitiveness of SMEs using artificial intelligence, to promote academic and great industrial development as well as encouraging the promotion of research work and safeguarding the use of AI as an ethical and inclusive tool. This roadmap has been extended to the more general subject of digital technology while keeping the same general objectives.

The strategy of the Grand Est Region also considers its geographical position like an asset as it shares more than 700 km of borders with 4 European states (Luxembourg, Belgium, Germany, Switzerland). This makes the Grand-Est not only a region at the heart of Europe, but also a remarkable cross-border cooperation area. Therefore, the regional strategy uses the tools implemented by the European Commission, which main aims are accelerating the digitalisation of industries.

Consequently, there is a great investment flow going into creation of the EDIH (European Digital Innovation Hub) Grand Est, seeking to structure a digital community that would meet SME's needs (testing before investing, training, finding the right partners), while respecting the major objectives of the RRI.

Finally, the region is updating its "Smart Specialization Strategy" 2021-2027 (S3), which is closely linked to the implementation of the operational plan of the European structural funds (ERDF, EAFRD, ESF, etc.). As a further matter, digital technology and responsible innovation are two elements of the future S3.

The vision statement of the Grand Est region

Obtaining a vision is a crucial step in the development of a roadmap, since it shows us the major steps towards the outcome.

A collaborative workshop allowed us to take stock of the ecosystem, the characteristics of the economic and industrial fabric, the actions launched in relation to digital technology as well as a presentation of the RRI to address the orientations that we thought were pivotal to accelerate the digitisation of our SME's and our territory. We tackled this subject with the perspective of identifying opportunities and threats for which digitalisation acts within companies and citizens in terms of influence, taking into account the aspects of the RRI. And lastly, regarding the axes of progress applicable to the Grand Est region a visual presentation can be found here below:

The vision helped us to identify the aspects of RRI that would play a central role in the digital transition of the Grand Est:

Gender equality
Digitalisation offers new opportunities for gender equality through the multiplicity of the industry's large recruitment needs and new training programmes.

The creation of scientific and technical training for the society
The Grand Est has 5 universities and more than 20 engineering schools active in digital education/training. Private initiatives (Ecole 42, Simplon, ...) make it possible to broaden the offer to people outside the traditional education system. The combination of these two approaches will open up more opportunities for citizens.

Open access to knowledge/data

Access to digital equipment, such as computers, laboratories, free access to software, knowledge and research results should be generalised. The Grand Est Region is investing massively to set up a high-speed internet network for all citizens (regional investment with the support of the European Recovery Plan, the so-called Juncker Plan) to reduce the digital divide. The access, use and control of more and more data has become a real challenge for industries and the territory.

Ethics

Ethics should be integrated in actions related to the use of artificial intelligence and cybersecurity in industry. For example, ethics can also serve as a bridge between social and economic expectations of this technology and avoid a conceivable clash.

A high quality of life

A high quality of life in a region that is fully integrated into the heart of Europe: The Grand Est shares 700 km of borders with Switzerland, Germany, Luxembourg and Belgium and there are strong economic and cultural links between all these regions (all of them are industrial). To maintain this high standard of living, digitalisation appears to be a way of increasing the competitiveness of industry and services and generating added value and jobs.

Social engagement

Stakeholder exchange, or a social environment composed of organisations representing science, citizens, and industry, could be the key to building a strong cooperation network without detours and encouraging participatory design projects.

The ecosystem

The Grand Est ecosystem offers a wide variety of skills, and the challenge will be to strengthen the relationships between the stakeholders of the quadruple helix in a region that is almost twice the size of Belgium. (The Grand Est Region was created in 2015 by the merger of three former regions: Alsace, Champagne-Ardenne, Lorraine). The stakeholders involved in the vision process are convinced that increased cooperation and the integration of RRI in public policies will generate more added value and better life quality in our region.

The Context in Grand Est

The DigiTeRRI project roadmap is a 5-year strategic development plan built with various stakeholders to enable our territory to strengthen its strategic orientations towards a more responsible digital transition. It was produced under the impetus of the three project partners from the Grand Est Region: Grand Enov+ (territorial coordinator), Materalia and Université de Lorraine.

Despite the pandemic, the consortium succeeded in bringing together nearly fifty actors representing the quadruple helix (education & research, SMEs to large groups, associations-civil society, and public administration). Despite the remote format, the exchanges were dynamic and allowed us to gather many ideas and suggestions. We were able to see that many stakeholders were already involved in inclusive approaches that fully integrate a responsible digital approach, in the fields of economy, science, research, professional training, the public sector and society.

The two workshops identified more than 30 responsible objectives and devised more than 40 ideas of action based on them.
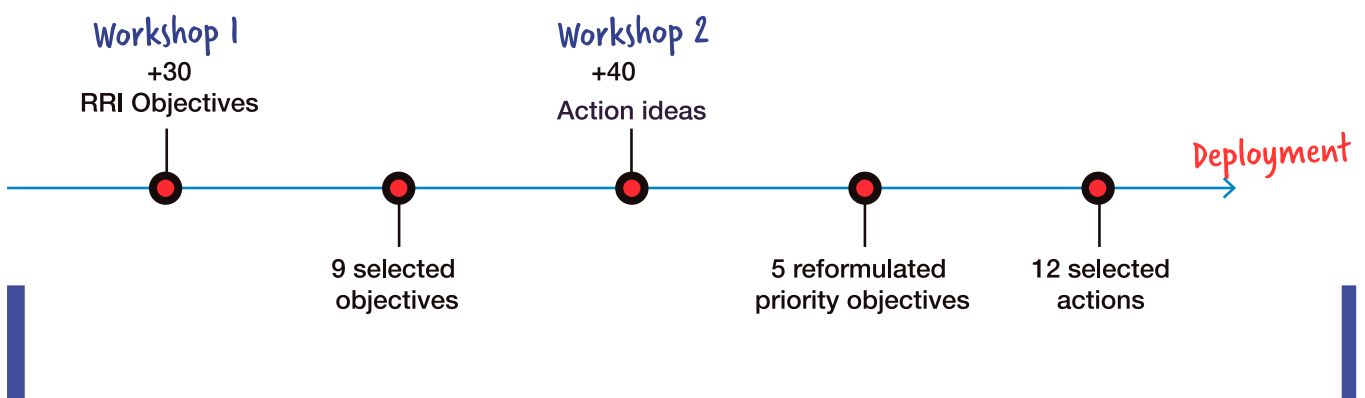

Figure 9 Action formulation process

Both workshops are available for replay on Youtube:

Session of April 1st: https://youtu.be/RjryohppxuI

Session of April 2nd: https://youtu.be/zBP80LyePEs

The development of the goals and objectives for the transition

The construction of the exchanges was based on the following roadmap domains:

- Knowledge and skills
- Technology
- Networks and collaboration
- Culture and value
- Leadership, business, and market
- Communication
- Infrastructure

6 out of 7 fields were considered.

The first domain, **"knowledge and skills"**, is essential for the Grand Est Region which, even if it benefits from a strong school and university heritage, must be able to offer access to: expertise in cutting-edge fields (AI, robotics, code development, etc.), assistance in using professional digital tools, and support in the daily use of digital technology, regardless of age, origin, socio-professional category, gender, etc.

The second field refers to **"technology"**. The aim is to create SMEs, technical centres and laboratories in the Grand Est Region that can master digital tools but also of creating them. Although certain regional technological priorities have already been established (AI, among others), the work of defining the roadmap aimed at establishing development axes in the very vast horizon of digital technologies having an impact on RRI.

The notion of **"network and collaboration"** is a key point for the digitalisation of the Grand Est Region. Thus, the participants in the development of the roadmap were invited to place themselves in a context of participatory development (collaboration between SMEs, companies-academia, universities, institutions, etc.).

Regarding the fourth field, the Grand Est Region defends humanist values because of its **culture**, history, and geographical position. Hence, the participants in the DigiTeRRI workshops have considered the roadmap on digitalisation.

Digitalisation corresponds to a clear desire to increase the territory's competitiveness, which led to the consideration of the fifth area: **"leadership, business and market"**. This raises the question of creating sustainable financial value through responsible digitalisation.

The sixth field refers to communication, with the strong issue of the messages to be disseminated to increase the adoption of digital according to the principles of RRI. This area also concerns the media to be mobilised.

Finally, the field of **"infrastructure"** has not been placed as important in the reflection, brainstorming, as investments of this nature are widely implemented, whether at the political or business level.

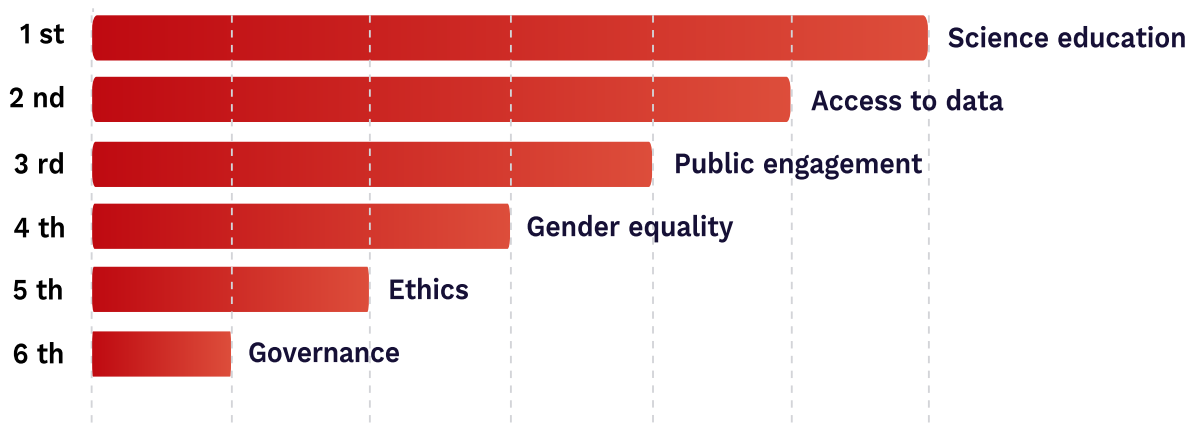*To act in the area of "Knowledge and Skills", what are the most useful RRI concepts?*

1 st	Science education
2 nd	Access to data
3 rd	Public engagement
4 th	Gender equality
5 th	Ethics
6 th	Governance

Figure 10: Extract from one of our workshops, where participants were asked to rank RRI concepts in order of importance and urgency

Following a series of collaborative workshops, stakeholders were asked to place themselves in a participatory development context under the spectrum of RRI.
This resulted in 5 objectives in which actions will be taken.

The 5 goals we set for ourselves

Enable all talents in the Grand Est to seize opportunities provided by the digital sector

Digital technology allows a great number of people to make use of it, regardless of their level of education, socio-professional category, gender, or nationality. The actions to be carried out will vastly help people to be aware that they can consider digital technology as an accessible tool for professional and personal development.
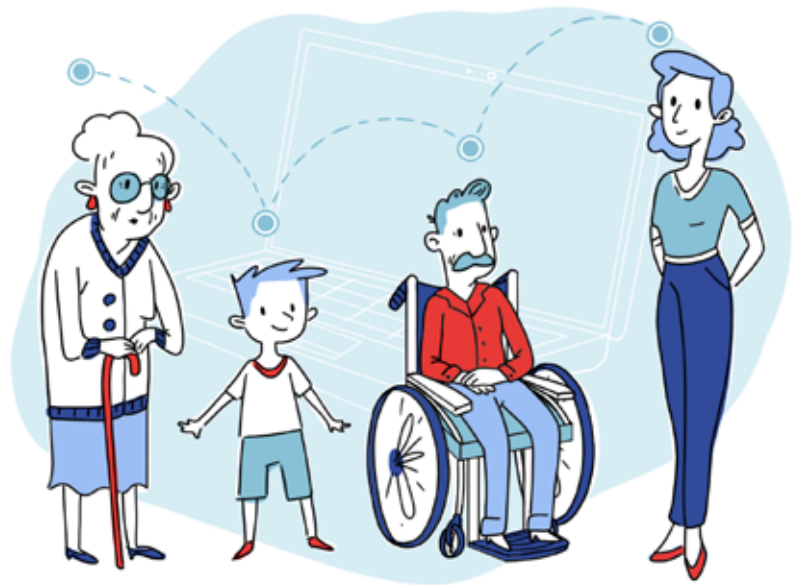
Creating the conditions for the development of 'responsible' digital services and products

It has become a necessity to make sense of science and innovation to ensure a more sustainable and responsible world for society. The stakeholders involved in the development of new digital services are at the forefront of efforts this process. Our objective is to provide this audience with adequate tools and methods.

Developing new forms of collaboration

We believe that digital technology cannot be seen solely in terms of technology. This vision may result in a form of compartmentalisation between professions, uses and generations. Our ambition is to overcome "silos" to facilitate meetings and create links between different communities to create added value.

Increasing social responsibility as part of a digital transformation process

Assist public decision-makers and project support organisations in taking RRI into account in the strategic decision-making phases.

Giving as many people as possible the opportunity to discover digital technologies

New digital technologies can seem unclear and distant for some people, leading to fears and misconceptions. We intend to transform these fears into hopes to allow vocations, ambitions, and new projects to emerge. A willingness to open the innovation ecosystem to the public.
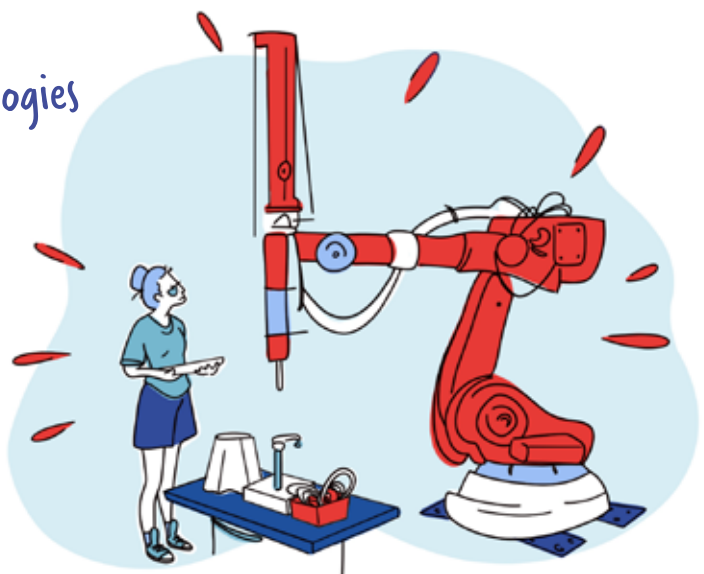
DigiTeRRI
roadmap comparison
(summary)

DigiTeRRI roadmap comparison (summary)

The DigiTeRRI project has developed roadmaps for transforming into digitalised region in Värmland, Grand Est, and Styria. To understand how regional characteristics influence the roadmap results, we conduct a comparison study between three regions to understand the key differences between them, and then to understand whether the differences in regional characteristics will lead to different roadmap results. Our findings show that the DigiTeRRI roadmap methodology (involving mapping, visioning, roadmap creation, and action plan formulation) was used successfully in all three DigiTeRRI pilot territories. Although the methodology used was the same in every territory, the resulting roadmaps show significant inter-regional differences. By understanding how different regional characteristics result in different roadmap plans, other European regions can learn from DigiTeRRI territories and find the practices that are relevant to them.

The three regions in DigiTeRRI exhibit different characteristics which lead to differences in in their action plans even if they follow the same methodology:

- In Upper Styria, regional planning is largely a top-down process in which the regional strategy and policy are developed by public authorities without much collaboration with other key actors such as business, universities, or citizens. To enable an RRI approach in which inclusiveness is an important principle, the Upper Styria core team in DigiTeRRI has done two important activities: (i) initiative change in regional digital transformation from below, i.e., enabling change from the bottom up, and (ii) this bottom-up change was created by quadruple-helix stakeholders, and citizens are the crucial group of actors in this change process. This is reflected in their action plan in which the majority of actions lead to a direct change impact in networking which will help enable the joint collaboration to grow and reach a critical mass. This critical mass will help them reach the public authorities and consequently will change the regional planning from a closed process to a process that is open to all regional actors.

- Värmland's regional planning process is transparent with high levels of democracy and trust from regional actors. Regional digital transformation has

a strong back-up from all actors, therefore, the main focus is on enhancing human competence and expertise. When creating a roadmap and action plan for Värmland, the key focus is to increase digital competence for the region, which can be achieved through activities that provide new knowledge and skills for all actors. This is where the RRI approach contributes. New knowledge creation is the result of collaboration and co-creation of all relevant stakeholders and requires breaking the traditional siloed way of working to enable the conditions for knowledge creation and transfer. As a result, the majority of activities in Värmland's action plan focus on the direct change impact of competence (i.e. knowledge and skills).

- The unique regional characteristic of Grand Est that makes it different from the other territories is their diversity and complexity of sub-regions, culture, and sectors. As a result, they need to find a way to utilize the diversity but also unite the sub-regions into one mega-region with the same agenda and roadmap. Therefore, finding a shared vision and shared approach to unite people and balance different groups of actions to utilize the diversity is crucial for Grand Est. An RRI approach with the ultimate goal of aligning innovation activities with social needs and values is an important element that can act as a "unifier" for the Grand Est regional strategy. Therefore, activities in Grand Est's action plan are distributed nearly equally among four groups of direct change impact (policy, competence, networking, awareness).

We conclude that the DigiTeRRI roadmapping methodology is flexible enough to be used across regions with different characteristics. Each pilot territory in DigiTeRRI has used the methodology to design a roadmap that addresses the core challenges of the region while taking into account the characteristics and interrelationships of the agents and institutions that are involved in creating and implementing the roadmap. Regardless of the starting point of each of the territories in undertaking the DigiTeRRI process, participation in the project has strengthened and deepened the understanding of their sub-territorial "current state". Consequently, the territories have been enabled to use this sound knowledge base as a platform to develop more robust pathways to success in digitalising that they might otherwise have missed. For example, identifying the key actors involved in strategic leadership, identifying key change agents and their roles in this project, understanding the complexity of responsible and sustainable regional digitalisation and development, developing local and 'fit for purpose'

delivery mechanisms, and the importance of external (historical and ongoing) activities to the project, e.g., technology infrastructure development activities.

Territories who want to transition themselves to digitalisation are recommended to start with a good analysis of their regional characteristics, including regional assets and how their key actors modify these assets for digital transformation, as well as a good understanding that technology needs to be developed based on region-specific needs. They should ask important questions such as, "What are we trying to achieve for the regions? Why are we trying to achieve this? How are we going to achieve this?" (anticipative) and figure out the answers together with regional stakeholders (inclusive). Based on that, they can co-create the roadmap for regional transitioning for digitalisation with concrete actions that respond to the challenges and needs of society (responsive). These actions should be co-implemented by regional key stakeholders to create change impact across different areas such as policy and culture, technical capacity, human capacity, creating networks, and building awareness for the best change effect. During the transition process, it is important to have reflecting moments to assess, identify and review if the roadmap and action plan are progressing towards the desired outcome (reflexive). By doing so, they integrate the RRI approach (anticipative, inclusive, responsive, reflexive) into regional development and thus build a self-sustaining research and innovation ecosystem.

The Grand Est
Digitalisation Transition Journey

DigiTeRRI

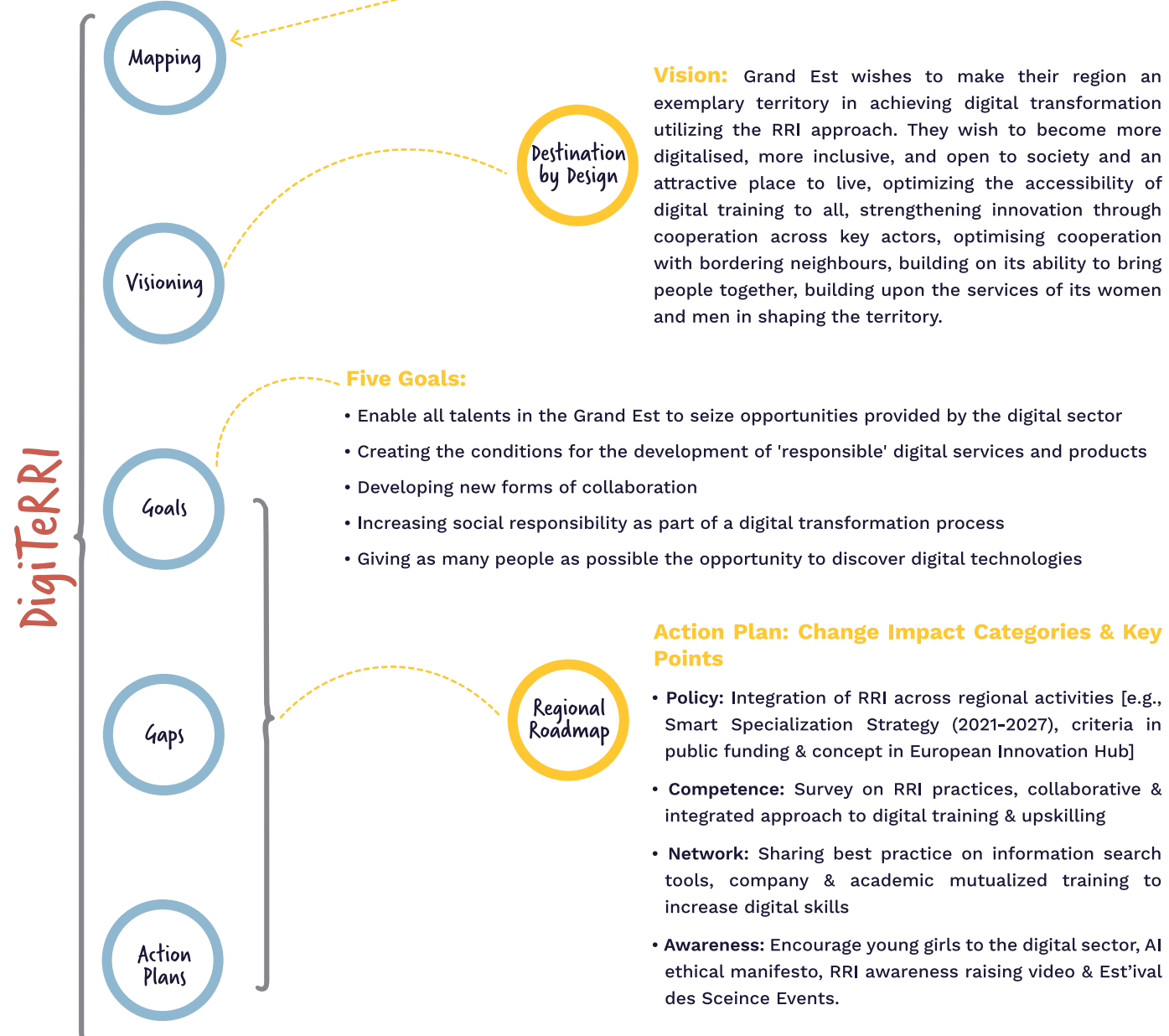## Grand Est Regional Change Profile

Inherent Regional Challenges:

- Significant industrial region experiencing negative annual growth rates in industrial based employment
- New Mega-Region (5-6yrs) with ongoing sub regional adjustments
- As a consequence, a need for new regional identity & specialist area
- Heavy reliance on materials & processing sectors who are struggling to digitalise.
- Differing multi-level sectorial strengths & needs (sector, city & hub levels)
- Ability to address varying sub regional diversity & needs
- Greater societal inclusivity & digital upskilling is required
- Recognition of the value of formal & tacit knowledge and skills for jobs

Inherent Characteristics and Assets:

- National central governance system & policy decision making
- Strong collaboration attributes and regional development led by strong regional partners (Alsace)
- Strong Higher Education collaboration with good cross border ties
- Strong industrial ties to traditional industries
- Natural resource base
- Good infrastructure, but requires further digital upgrading
- Societal gap between highly educated and under educated
- Gap between high and low skilled (under) employment

Mapping

Visioning

Goals

Gaps

Action Plans

Destination by Design

Vision: Grand Est wishes to make their region an exemplary territory in achieving digital transformation utilizing the RRI approach. They wish to become more digitalised, more inclusive, and open to society and an attractive place to live, optimizing the accessibility of digital training to all, strengthening innovation through cooperation across key actors, optimising cooperation with bordering neighbours, building on its ability to bring people together, building upon the services of its women and men in shaping the territory.

Five Goals:

- Enable all talents in the Grand Est to seize opportunities provided by the digital sector
- Creating the conditions for the development of 'responsible' digital services and products
- Developing new forms of collaboration
- Increasing social responsibility as part of a digital transformation process
- Giving as many people as possible the opportunity to discover digital technologies

Regional Roadmap

Action Plan: Change Impact Categories & Key Points

- **Policy:** Integration of RRI across regional activities [e.g., Smart Specialization Strategy (2021-2027), criteria in public funding & concept in European Innovation Hub]
- **Competence:** Survey on RRI practices, collaborative & integrated approach to digital training & upskilling
- **Network:** Sharing best practice on information search tools, company & academic mutualized training to increase digital skills
- **Awareness:** Encourage young girls to the digital sector, AI ethical manifesto, RRI awareness raising video & Est'ival des Sceince Events.

Grand Est Journey

DigiTeRRI

The Värmland
Digitalisation Transition Journey

DigiTeRRI

Challenges:

- Slow population growth, low level of education, low wages & low degree of employment compared to rest of Sweden.
- Rural populace and business base
- Rural digital connectivity needs addressing
- Education is slightly lower than national average.
- R&D: Seen as a follower region within Sweden due to low outputs but strong regional player.
- Low ability to retain higher education (local & migrants) students in local employment
- Reliance on traditional sectors which have been slow to digitalise.
- Significant gaps between leaders from strong digitalised (large) industry players and digital practices in SMEs
- Peripheral territory with significant pressure on services (e.g., health)
- Gender divisions apparent in employment type and associated wages

Värmland Regional Change Profile

Inherent Characteristics and Assets:

- Natural resource rich region (e.g., timber, paper, tourism)
- Strong cultural base in collaboration characteristics based on trust and social agility.
- Strong and well-connected public and University sectors with good industrial ties
- Strong collaboration networks in key sectors and research areas
- Key sectors: Public, Manufacturing and trade [pulp & paper/ Steel & engineering, corporate services].

- Very high-capacity connectivity & associated digital infrastructure
- Strong regional digitalisation Strategy & sector clusters
- Public sector seen as a pioneer in gender equality mapping & policy

Mapping

Destination by Design

"**The vision for Värmland** is that the territory shall be an attractive and sustainable region, in which all citizens are part of the digital society and possess digital competences so they can participate both in daily life as well as be part of an attractive workforce."

Visioning

Goals

Five Goals:

- Utilisation of research and developing a common language
- DigiTeRRI can strengthen and maximise policy, strategy and cultural change at organisational and territorial levels
- Think and act in a quadruple helix perspective and ensuring that equity, respect for diversity and interdependence is acknowledged
- Joining up networks and cross connecting networks to maximise collaboration and joint actions
- Embedding cultural change in the territory organisations to highlight the impact and possibilities digitalisation delivers for all

Gaps

Regional Roadmap

Action Plan: Change Impact Categories & Key Points

- **Policy:** Digitalisation is part of regional smart specialization strategy, Expansion of digitalisation and S3 to Dalarna
- **Competence:** Apply & use competence wheel to investigate needs for open data & data science within companies, mapping of current solutions, survey of future needs & solutions, availability of cross company design offers & services, Training & courses [Digital Data Stewardship, Digitalisation & RRI in Leadership], compilation of analytical studies & reports, Hire a digital co ordinator
- **Network:** Interaction and exchange with other student Unions, Incubator exchange for fostering entrepreneurship in digitalisation.
- **Awareness:** Territorial attractiveness of Värmland

Action Plans

The Värmland Journey

The Upper Styria
Digitalisation Transition Journey

DigiTeRRI

Upper Styria
Regional Change Profile

Regional Challenges:

- Decline in jobs in the traditional economic segments of iron and steel production.
- Emigration of young people
- Lack of skilled workers and academics who are well trained in the topics of the future.
- Involving citizen in the planning process.
- Training SMEs to utilize digital technologies

Inherent Characteristics and Assets:

- Bottom-up approach to regional development
- Strong anticipative, adaption & entrepreneurial characteristics to change.
- Traditional strong research & industries in material production, metallurgy, production, industrial logistics, environmental engineering & paper.
- Strong implementation of digitalisation in industry & teaching.
- Strong collaborative networks with industry, public & academic sectors

- Good vocational training (inl. Robotics & informatics).
- Some courses in IT for females.
- Since 2014 Styria has followed a Smart Specialisation Strategy – economic focused & includes digitalisation.
- Strong academic & SME involvement in EU digitalisation projects

DigiTeRRI

The Upper Styria Journey

Mapping

Visioning

Goals

Gaps

Action Plans

Destination by Design

Vision: To develop 'Upper Styria as an attractive and open living space for all generations. Digitisation accelerates learning in the region and opens up new perspectives in traditional & new fields. It is knowledge & business orientated. The pillars of international competitiveness and a high quality of life are excellent research & innovation; modern infrastructure & cooperation

Five Goals:

- Digital Transformation in the Field of Education
- Cities, Municipalities, the Public Sector
- Technology and Knowledge Transfer
- Creating Work-environments and countering the Lack of skilled Labour
- A universal Platform for Networking

Regional Roadmap

Action Plan: Change Impact Categories & Key Points

- **Policy:** Fit4Min, municipality job platform for coworkers (digital competency profile
- **Competence:** Digi@Lab, Training on digital marketing in social media.
- **Network:** Knowledge exchange on digitalisation, MINTinternational, Student Union collaborations with other DigiTeRRI territories , In cubator exchange in fostering entrepreneurship in digitalisation, B2B networking event on digitalisation & industry, Scan & Shop onl ine portal to explore regional economy & important facilities
- **Awareness:** Blackout precautions, females fit for digitalisation, awareness of the St y rian Roadmap & initiate resilient transformation, Concept development 'Styria Universal platfrom' & Local level cultural exchange

Responsible Research and Innovation Approach for Transitioning the Traditional Industry Regions into Digitalised Industry Territories (DigiTeRRI) project

This **DigiTeRRI** booklet of roadmaps is the outcome of the co-creating efforts of the whole DigiTeRRI Team. For more information about project partners, visit **digiterri.eu/partners/**

DigiTeRRI roadmap comparison – Implemented by Nhien Nguyen, Megan Palmer-Abbs, Suyash Jolly, and Jens Ørding Hansen (Nordland Research Institute)

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