



Guidelines for DigiTeRRI Roadmapping

*Marianne Hörlesberger, AIT
Vincent Boly, UL
Stephanie Toussaint, GEN
Mario Magaña & Ángel Honrado, WeDo*



A guideline is a statement to be used to establish a course of action. A guideline aims to streamline certain processes according to an established routine or best practice. A guideline is an information, which intended to advise people on how something should be done or what something should be.

The whole DigiTeRRI project is roadmapping linked with integrated RRI approach.

Background

When considering a roadmap from a general point of view, a roadmap is an itinerary of paths or routes that leads to some geographical space. A roadmap serves as a tool for travelers, which provides essential understanding, proximity, direction, and some degree of certainty in travel planning. A roadmap guides the driver of the vehicle to the destination.

In management literature, a roadmap is a metaphor for strategic planning. It shows the step by step evolution of a company, meaning its sequence of technology and knowledge acquisition to achieve the desired technological profile. Roadmapping is a bridge between strategic and operational innovation management. Roadmapping describes the process of roadmap development. Since the 1980ies roadmapping has become a standard methodology of future-oriented studies.

DigiTeRRI developed roadmaps for innovation ecosystems. 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 DigiTeRRI roadmapping process

The DigiTeRRI roadmapping is based on a classical roadmap process by integrating the Responsible Research and Innovation (RRI) approach. It is a five phase process, composed by the phases of stocktaking and mapping, the phase of visioning, the phase of working out the roadmap with goals, objectives, gaps, the phase of the development of the action plan, and the phase of implementation and improvement.

The development of strategic roadmaps for a region, for an innovation ecosystem, can only be successful when the stakeholders affected are engaged into this process. Therefore, the identification of the stakeholders is a crucial activity that should start at the early beginning. DigiTeRRI has worked with representatives from organizations in an innovation ecosystem, namely with science & research organizations, with organization for education (schools, colleges, universities), with industry & business, with public authorities and governmental organizations, and with NGOs. Moreover, digital transformation

at territorial scale relates to different domains (education, infrastructure, technology devices...) and requires a systemic approach. Roadmapping fits with this context as it allows the confrontation of different expertise and the building of a common vision of the future. Thus, multidisciplinary stakeholders have been identified by DigiTeRRI members in their territories upstream the process.

A further important task is the management of the engaged stakeholders. This addresses the planning of the co-creation workshops with them and the communication with these stakeholders. The added values of this are dual:

- The process itself helps the diffusion of knowledge about RRI and digitalization. Hence, roadmapping is based on meetings and reflexion workshops where people consider the specific problematics of others people, where they look at solutions adopted in other fields and finally try to identify new options. In a way roadmapping is also a learning and a communication process,
- The outcomes of the process give a strong basis for action. Co-elaborated texts and figures represent the physical models of the commonly adopted path from the present to the future (short and middle term). They are key elements when contacting structures to be involved in the action plan especially those not having participate to the first step of roadmapping.



Figure 1: The five phases of roadmapping in DigiTeRRI.

The five phases

Phase A: Stocktaking / Mapping

The mapping of innovation ecosystems constitutes the basis for obtaining a comprehensive structural picture of the research and innovation landscapes of the regions under consideration. The main outcome of this step is (1) a structural view of the actor-topic landscape in a region, (2) identification of existing development policies and planning tools to enhance the innovation ecosystems, and (3) identification of key actors and stakeholders to support appropriate engaging strategies. The mapping is presented in the form of descriptive measures, but most importantly in the form of comparable network visualisations.

Input: data coming from science literature, EU research projects, and patents, and interviews for collecting practices, and data structure identification and strategic papers of the region.

Output: description of the current situation, maps about the thematic orientation, the strength and collaboration networks (in the case of DigiTeRRI in digitalisation), common understanding inside the engaged stakeholders. A list of important stakeholders is also produced to prepare Phase B.

Phase B: Developing a vision statement

The implementation of the RRI approach for transitioning traditional industry regions into digitalized industry ones requires a vision statement. The stakeholders affected by this endeavour develop their common vision statement together in a very structured workshop, openly and transparent.

A vision is a representation of the desired future, which is both rational and intuitive, encompassing and prospective. It is a formalization of an ambition people wish to achieve. It involves the driving forces of the community. The vision statement works as the star in the sky and gives the direction of the roadmapping in the next steps.

Input: output of phase A, stakeholder identification and engagement for the workshops, workshop design and programme. The stakeholder engagement requires a well organised management so that they really like the work, can bring in their expertise, and get benefit from this work. Well designed workshop schedule is necessary.

Output: formulated vision statement and graphical presentation of it.

Phase C: Working out the roadmap goals, objectives

This phase is structured into the following two steps:

Step C1: Defining the main goals relating to the previously defined vision statement, because the vision statement works as the star in the sky. It is the direction, the foundation for the development of the main goals. A goal is an achievable outcome. A goal considers a longer time period and is formulated generally broadly.

Step C2: Working out the details of objectives including analyzing the gaps. Once a main goal is set, defining objectives is the next step towards fostering a clear understanding of how to reach the desired outcome. The defined objectives compared with the current situation unveils the gaps, which have to be explicitly identified as a basis for the next step, the action plan.

Input for these two steps: **(a)** the stocktaking and mapping results as foundation of the current situation, **(b)** the vision statement as giving the direction where to go, **(c)** the stakeholders engaged for working out the goals and objectives, **(d)** templates for collecting the workshop discussions.

Output of these two steps: a structured documentation of goals, objectives, gaps, timelines. The following information might support the preparation.

Roadmap logic

The development of the goals and objectives is based on the following logic.

Logic Items	Description
Goals	The goals are a clear and concise set of targets that, if achieved, will result in the desired outcome. In management literature, sometimes, there is a distinction between a “goal” and an “objective”. A goal can be somewhat abstract and provides a big picture. A goal defines the general intentions and ambitions, however, can be difficult to measure.
Objectives	Once a core goal is set, defining objectives is the next step towards fostering a clear understanding of how to reach the desired outcome. The main difference between objectives and goals is that objectives cover precise actions including measurable steps individuals and groups take to move closer to the goal. They are specific targets that typically have a time-bound schedule or timeline for completion. (For example, a company may have a goal of becoming the most profitable advertising agency in the country. Objectives related to this goal might include increasing their new business sales by five percent each quarter, growing their market share by a set time frame, improving client retention rates by 10 percent each month or adding two new products to their product line by the end of the fiscal year.)
Milestones	Milestones are interim performance targets for achieving the goals with specific dates (e.g., “50% of the municipalities will have built the hardware for high-speed internet by Oct. 2021”).
Gaps and barriers	The roadmapping process detects a list of potential gaps in knowledge, technology limitations, market, structural barriers, regulatory limitations, public acceptance, or other barriers to achieving the goals and milestones.
Action Items	The actions are developed to overcome any gaps or barriers. Actions are measures to overcome obstacles, to pave the way for achieving the goals. Typical solution actions include technology development, development of regulations and standards, policy agendas, creation of financing mechanisms, and public engagement.
Priorities and timelines	The actions will be prioritised with timelines. The most important actions that need to be taken in order to achieve the goals and the time frames will be specified. There will be interconnections among those actions. These interconnections have to be carefully considered with regard to the affected stakeholder roles and relationships.

Figure 2: Roadmap logic.

¹ <https://www.samewave.com/posts/the-difference-between-goals-and-objectives-create-an-actionable-business-planning-process>

Roadmap domains

The development of the goals and objectives (based on the vision statement) needs an additional structure, the so-called roadmap domains in which the goals and objectives are defined.

The structural characteristics should cover all action fields necessary for the transition into a digitalized region / innovation ecosystem. The challenge is, however, to describe them at the same level of consideration. Based on this reflection and several workshops inside the DigiTeRRI consortium for defining these domains, DigiTeRRI came up with the following seven domains as a proposal for the action fields: (1) Knowledge & skills; (2) Technology; (3) Networks & collaboration, (4) Infrastructure; (5) Culture & values; (6) Leadership, business & market; (7) Communication. These domains were adapted to the needs of DigiTeRRI for a regional consideration based on Bumann and Peter², who considered the digitalization of companies.

Actors in the innovation ecosystem

All actors affected by this development are the stakeholders in the innovation ecosystem, which is given by organisations coming from science & research, education, industry & business incl. SMEs, government & public authorities, and civil society organisations. DigiTeRRI cross linked the roadmap domains with the actors in the innovation ecosystem, as presented in the next figure.

	Science & research	Education	Industry & business	Government & public administration	Civil society
1. Knowledge & skills (KS)					
2. Technology (T)					
3. Networks & collaboration (NC)					
4. Infrastructure (I)					
5. Culture and values (CV)					
6. Leadership, business & market (LBM)					
7. Communication (C)					

Figure 3: Table for linking roadmap domains with actor in the innovation ecosystem.

² Bumann, Jimmy & Peter, Marc. (2019). Action Fields of Digital Transformation – A Review and Comparative Analysis of Digital Transformation Maturity Models and Frameworks.

The linkage between stakeholders and the seven roadmap domains are dynamic. The following figure presents this linkage.

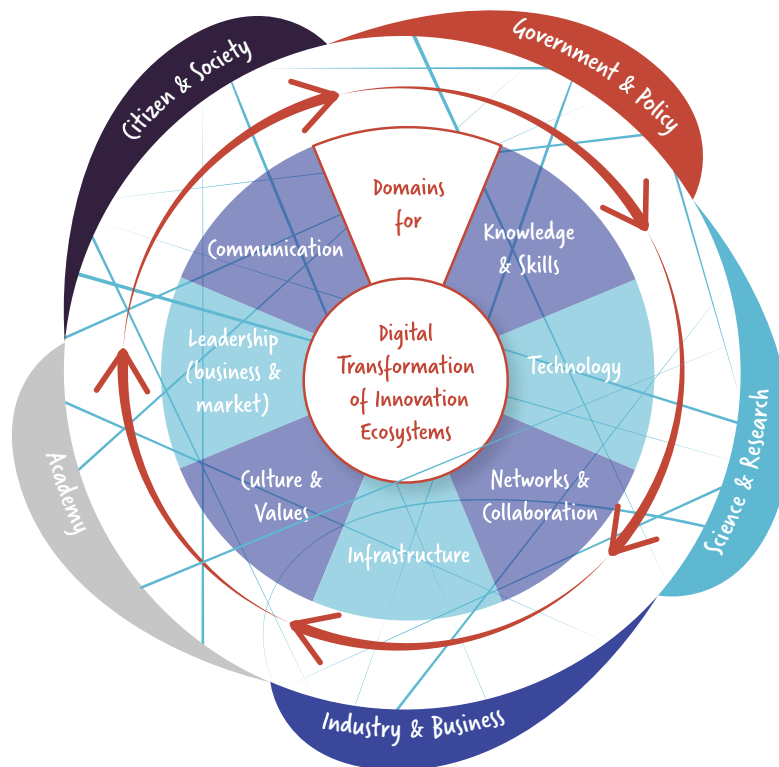


Figure 4: Linkage between stakeholders and the seven roadmap domains.

Phase D: Developing the action plan

The action plan is needed to close the gap of the current situation to the objective. The action plan is the basis for implementing measures. The example in figure 5 (an action plan as example) represents the various aspects which has to be considered. It names the person of charge, the timeline, etc.

Input: the output of phase C with the defined goals, objectives, and gaps

Output: action plan with timelines, person in charge (as an example, see fig 5).

Action No 10: RRI awareness-raising video

November 2022

Web

In order to raise awareness of the importance of RRI to a wide range of stakeholders of the Quadruple Helix, a video/ series of videos will be developed. The objective is demonstrating different stakeholders the added value represented by RRI and how they can embrace it.

Who is responsible for that the performance of that action	Materialia, Lucia Gonzalez
Name Target group(s) within quadruple helix according to groups in D3.1 the action will address	Education research, policy, business, society
If stakeholders are involved give the name and type of their organisation	WeDo, Mario Magaña mario@wedo-projects.com
Action belongs to which objects/goal in the territorial roadmap	Creating the conditions for the development of 'responsible' digital services and products
Name the group of measure to which the action contributes	Acculturating the citizens to RRI
Timeline for action preparation (when should the action be performed beginning of preparation)	Event date: November 2022 Preparation from mid-September 2022
Describe the impact of action – which gap will be closed according to the territorial roadmap	Impact: stakeholders need to appropriate RRI terms and methodology and be aware of the positive repercussions when adopting RRI practices.
Does that action support other goals?	Increasing social responsibility as part of a digital transformation process
Does that action support the realisation of other measures?	No
Which RRI dimension/key/process are addressed?	Inclusive, responsive process Science education, giving open access
Is that a cross territorial action?	No
Is it a single action or multiple actions	Single action

Figure 5: Example of an action plan from Grand Est.

Phase E: Implementation and improvement

The structure and description of the action plan is the basis for the implementation. The implementation of the actions can be controlled for instance with a Smart Sheet system, or Excel, or similar tools, to make this work transparent for all persons in charge. Regularly meetings where the progress is reviewed, support the implementation process. The Smart Sheet Dashboard makes visible the implementation progress, as the next figure shows.

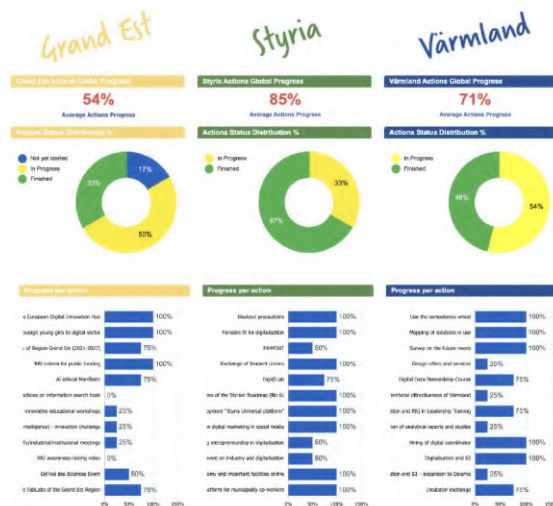


Figure 6: Dashboard progress summary of actions in all three territories.

Input: the output of phase D, namely the action plan, the stakeholders in charge of the action, schedule for regular meetings for monitoring the implementation, a tool such as SmartSheet.

Output: the implemented actions, the applied measures, reports, posters, videos, etc. about the implementation.

Examples how DigiTeRRI presented the results five phases

Mapping and Stocktaking

Scientific profile of Grand Est, 2018-20

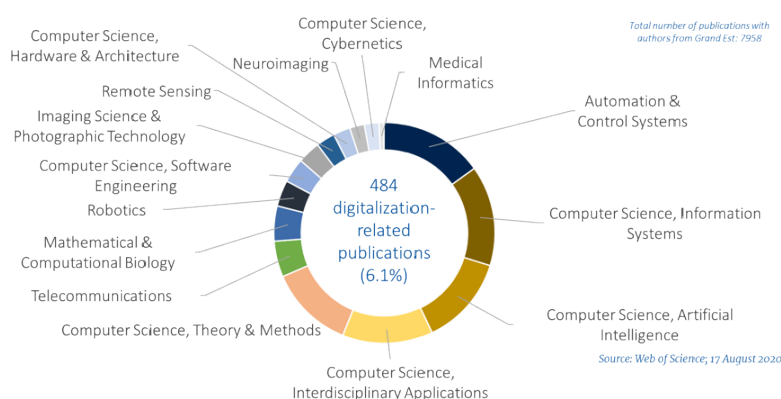
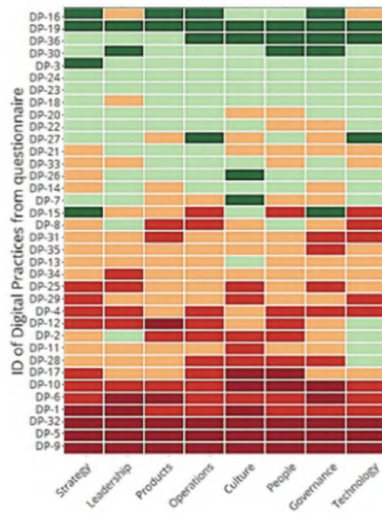


Figure 7: Example of a scientific profile (Grand Est).

From current situation...



...to a formalized ambition



Figure 8: Digitalization practices in the territory.

Vision Statement

Värmland

Värmland ska vara en attraktiv och hållbar region
Värmland shall be an attractive and sustainable region

där alla är en del av det digitala samhället
where everyone is part of the digital society

Med digital kompetens och flexibel infrastruktur
with digital competence and flexible infrastructure

tar vi oss an en framtid i snabb förändring
we are embarking on a future of rapid change

Vi verkar globalt och växer lokalt, livskvalitet i Värmland med världen som arbetsplats.
We operate globally and grow locally, fostering a quality of life in Värmland with the world as a workplace.

Värmland DigiTeRRI

If you want to know more about our roadmap, check the whole document here!

Styria

Die obersteiermark ist ein attraktiver und offener Lebensraum für alle Generationen.
Upper Styria is an attractive and open living space for all generations

Die Digitalisierung beschleunigt das Lernen in der Region und eröffnet neue Perspektiven in traditionellen und neuen Feldern.
Digitalization accelerates learning in the region and opens up new perspectives in traditional and new fields.

Die Region ist wissens- und wirtschaftsorientiert.
It is knowledge and business oriented.

Die Säulen für internationale Wettbewerbsfähigkeit und hohe Lebensqualität
The pillars for international competitiveness and a high quality of life

sind exzellente Forschung und Innovation moderne Infrastruktur Kooperationen.
are excellent research and innovation modern infrastructure cooperation.

Styria DigiTeRRI

If you want to know more about our roadmap, check the whole document here!

Grand Est

Faire du Grand Est un territoire exemplaire de réussite de la transformation numérique en y associant l'ensemble des citoyens, entreprises, associations, chercheurs et enseignants
To make Grand Est region an exemplary territory for the success of the digital transformation by involving all citizens, business, associations, researchers and teachers

Cela se traduit par un territoire :
This translates into a territory:

industriel plus digitalisé, plus inclusif et ouvert sur la société, attractif où il fait bon vivre, où les formations dans le domaine du numérique sont accessibles au plus grand nombre,
more digitalized, more inclusive and open to society, an attractive place to live, where trainings in the digital field are accessible to the greatest possible number of people,

innovant, où la coopération entre chercheurs, entreprises, écoles et territoire est renforcée
innovative, where cooperation between researchers, business, schools and local authorities is strengthened

ouvert sur la coopération européenne notamment avec ses voisins frontaliers et fédérateur sur sa capacité à rassembler les personnes progressistes,
open to European cooperations, particularly with its border neighbours, and federating on its ability to bring people together

au service des femmes et hommes qui façonnent notre territoire
at the service of the women and men who shape our territory.

Grand Est DigiTeRRI

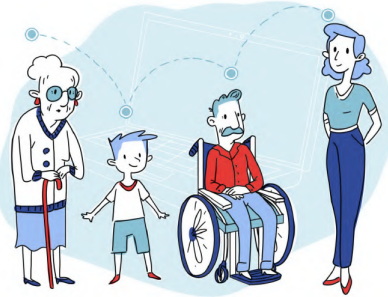
If you want to know more about our roadmap, check the whole document here!

Figure 9: Illustrated vision of the three territories.

Goals and objectives

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.

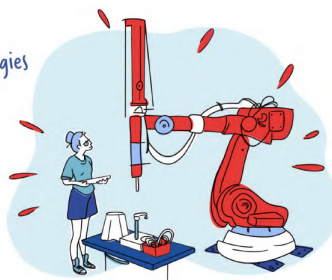


Figure 10: Here are the five main goals for Grand Est as an example.

Objective 1	
Title of objective	Excellent competences for digital processes, platforms and tools to connect the population
Description of objective	The whole innovation ecosystem and all citizens there are confronted with digitalisation of the everyday life, with job requirements for digital processes, with digital processes in education, in science. Therefore, the overall level of knowledge and skill has to be increased and offered in a barrierfree platform
Gaps	The development of technologies for digitalisation is very fast. For coming along with this trend skills and knowledge acquirement is necessary continuously.
Addressed roadmap domains	Knowledge & skills, network & collaboration, infrastructure, culture and values, communication
Stakeholders affected	Science & research, education, industry & business, public administration, civil society.
Necessary activities	<ul style="list-style-type: none"> • Interaction and cooperation, joint education programmes will bridge the primery, secondary, tertiary, and academic segments, but also offer new trainings for lifelong learning. • Digi@school: developing a comprehensive programme for digital skills for pubils, for all groups in the society.
Timeline	Mid term, continuous action.
Initiated by whom	Montanuniversitaet Leoben, Industry & Business with Centre for Applied Technology

Figure 11: An example of a description of an objective (from Styria).

Action plan

Each action is described and planned. One example of all action is presented here.

Action No 1: Apply the competence wheel (compare methodology)

October 2021

Digitally - (Teams/Zoom)

A well proven methodology called Competence Wheel will be used to identify the competence gap as well as the future needs from the industry and the possibilities that are coming with new technology.

<https://www.compare.se/uploads/2020/02/Kompetenshjulet.pdf>

Who is responsible for that the performance of that action (name, organisation, contact mail)	Per Myhrén, Paper Province and Mikael Holmgren, Compare
Name Target group(s) within quadruple helix according to groups in D3.1 the action will address	Industry and business
If stakeholders are involved give the name and type of their organisation	No
Action belongs to which objects/goal in the territorial roadmap	Knowledge and Skills / high level data management courses
Name the group of measure to which the action contributes	Competence mapping, gaps identification, future needs
Timeline for action preparation (when should the action be performed beginning of preparation)	Preparation Q3 2021 and performed during October 1st – 31st.
Describe the impact of action – which gap will be closed according to the territorial roadmap	Low data management capabilities and capacities on high level data science management currently.
Does that action support other goals?	No
Does that action support the realisation of other measures?	Investigate companies' needs for data science. Investigate companies' and public sector's needs for open data
Which RRI dimension/key/process are addressed?	Anticipative initiative, Science Education
Is that a cross territorial action?	No
Is it a single action or multiple actions	Single

Figure 12: Example of an action plan (Värmland).

Implementation

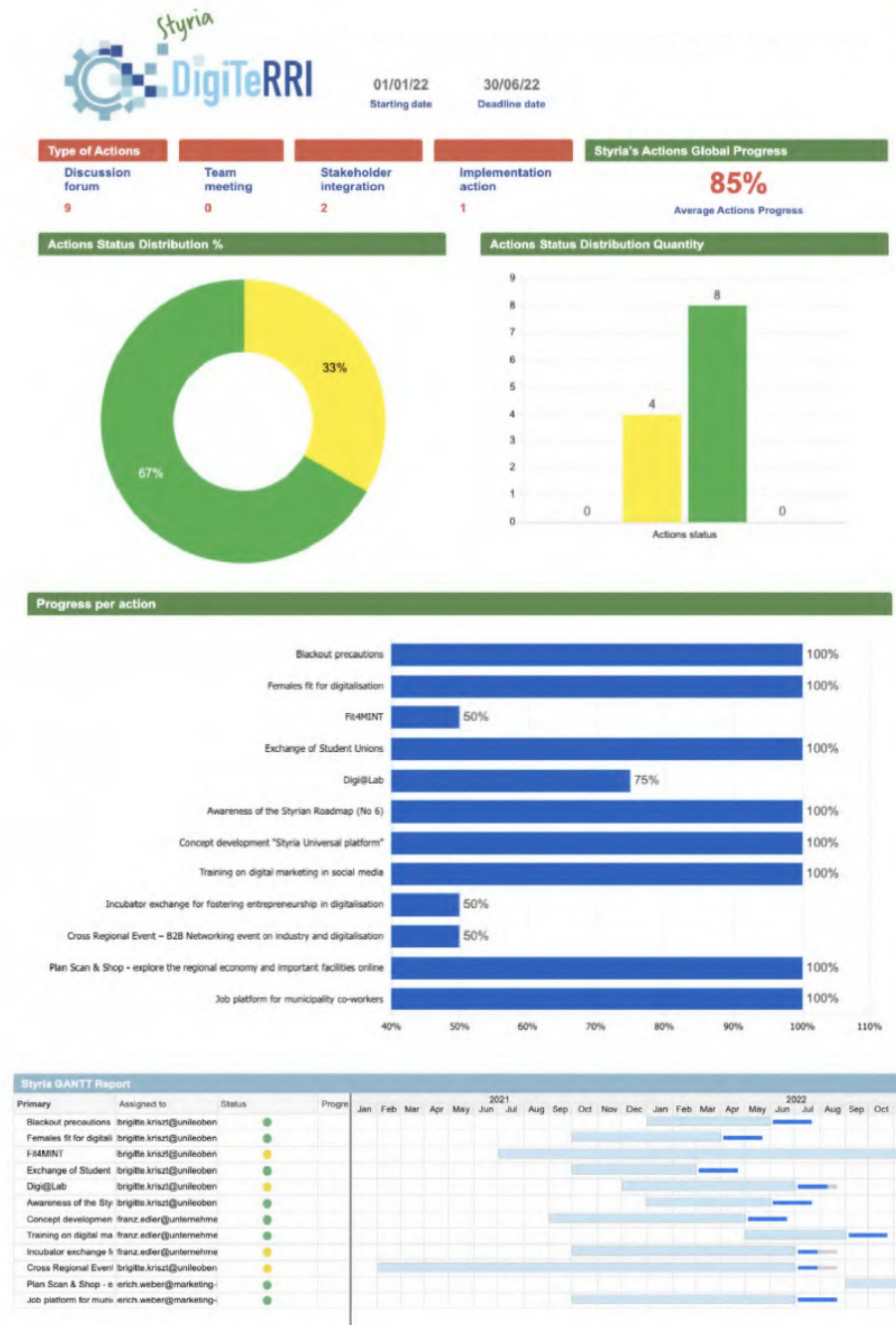


Figure 13: Dashboard progress summary of actions in T5.1 (Styria).

Posters on Implemented Actions

A presentation of the implemented actions during a workshop or conference highlights the achievements and underlines the implementation process.

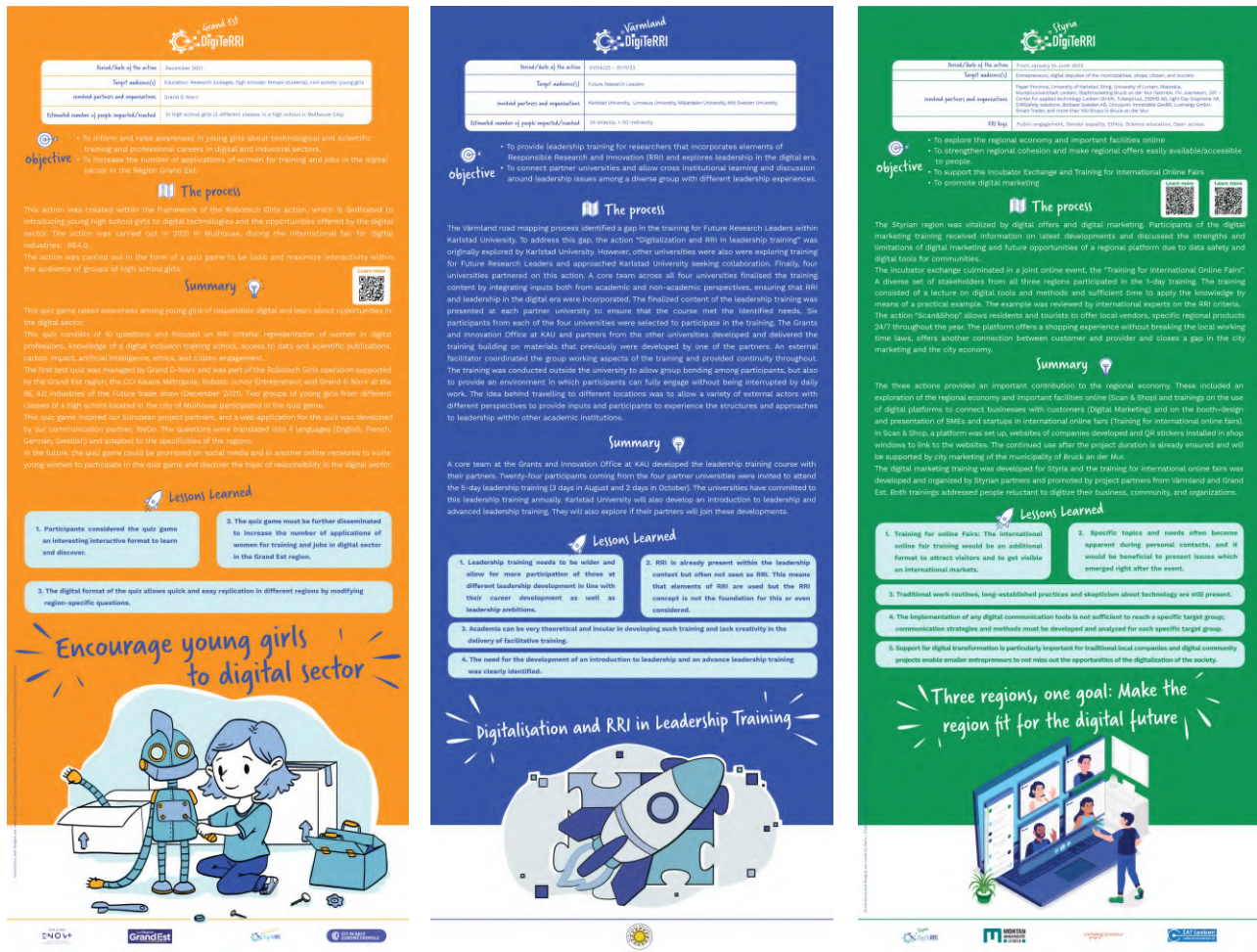


Figure 14: Example of a poster of each territory.

Final remark

DigiTeRRI interlinked a forward-looking methodology, namely roadmapping, with the RRI approach, which highlights a stakeholder engagement approach. Stakeholders of the innovation ecosystem in each region developed together their future. Based on the common DigiTeRRI approach each territory developed its roadmap on transition into a digitalized territory in the frame of DigiTeRRI EU Project. This methodological approach ensures the convergence of all the actions developed in each territory. It avoids dispersion and helps projects' monitoring with a common understanding of the evolution of DigiTeRRI projects all along the program.

Stakeholders

- The DigiTeRRI approach works well when you have managed to engage stakeholders which have the power, the legitimacy, and the urgency for changing, for solving, for further developing the topic, the problem. Stakeholder engagement requires intensive work of the operators regarding the framework, formulating the topic, designing and organizing very structured workshops.
- Implementing a stakeholder management task / process is crucial and an important success factor. The engagement of stakeholders needs resources, needs effort for persuading, needs adequate contacts and networks. Regular meetings with the stakeholders raise interest and creates support for the project progress.
- Use also already existing collaboration networks, because this makes it easier to attract stakeholders from e.g., the business sector.
- The workshops (approximately 3 to 6) should be scheduled inside 6 months. If workshops are scheduled too far from each other, the stakeholders might lose the red line. If the workshops are too close scheduled the stakeholders might not have enough time resources for participating.
- Stakeholders need visual representation to better participate to the collective building of the vision, goals and objectives.

Roadmapping

- The DigiTeRRI roadmap process is designed for digital transformation of a regional innovation ecosystem by RRI design, which means co-creation of the future by the stakeholders affected and considering the impact of technology development, digitalisation on societal and environmental implication. Roadmapping processes have their roots in business and companies. Thus, this classical roadmap process was adapted to “digital transformation of the region” combined with the RRI approach. Thus, this roadmap process is a good foundation also for other thematic topics of regions.
- The roadmapping process has to be very clearly planned regarding the timeline the structure and the stakeholder engagement.

Implementation

The implementation of actions and measures depends essentially on stakeholders and project partners. Some stakeholder groups are perfect for idea generation and new impulses in a roadmap process. For implementation more powerful and dedicated partners are needed in most cases, this refers to power, legitimation, ability to implement, and financial - and human resources. The implementation of actions works well in case people / or organisations are responsible for the implementation equipped with enough resources.

Visuals

- The process for creating the visual presentation of the vision statements and roadmaps have been an iterative mutually enriching exercise. Having a local team member coordinating the inputs from the various participating stakeholders has been a key success factor. The process may go slower, but the legitimacy and acceptance of the outcome are very high.
- Visual presentations of the results are quite a strong tool for bringing complex terms down to earth. Including illustrations, pictures and visualizations as part of the process may help unblocking biases and increase acceptance. Extra care has to be put in order to come up with clear, inclusive, ethic, and respectful visual concepts in line with the RRI principles.