D4.3.1 White paper with policy recommendations

The role of HEIs in a Quadruple Helix collaboration for RIS3

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RE-ACT

Self-reflection Tools for Smart Universities Acting Regionally

Content

Introduction 4

The role of HEIs in a Quadruple Helix collaboration for RIS3: a European perspective 5

Policy context 7

Methodological Approach 9

Conclusions 15

References 16

Table 1 - Policy context, place-based characteristics and institutional characteristics of the RE-ACT university partners. 8

Figure 1- "RE-ACT framework for regional collaboration" – authors' elaboration 9

Introduction

This White Paper presents a series of policy recommendations based on the results of the numerous stakeholder engagement and participatory activities forming part of the *RE-ACT process and framework for regional collaboration*. This was promoted during 2020-2022 within the Erasmus+ Forward Looking Cooperation Project "RE-ACT - *Self-reflection tools for smart universities acting regionally*" in the partner countries/regions involved and beyond (Portugal, Hungary, Slovakia, Romania, Italy). During the various steps, the process involved HEInnovate experts and Regional Authorities responsible for the smart specialisation strategies (RIS3) in their Regions (also from other regions than the ones to which the partners belong), HEI representatives (including professors and scholars, PhD students, HE students, administrative staff…), public authorities from the local level, businesses (including SMEs and university spin-offs) involved in the regional innovation ecosystem, and NGOs. During the activities provided by the partners, all these actors, based on their direct experiences, expressed their vision and presented their perspective about the role of HEIs in RIS3 and the functioning of the Quadruple Helix (QH) Collaboration. These views have been collected and reported in the several reports of the RE-ACT activities, then summarised in the Report on "Lessons Learned" and presented in this document as policy recommendations, finally commented in close connection with the contents of the most recent communications and policy documents from the European Commission about the societal and innovative role of HEIs (mainly European Commission, 2021a, 2022; Woolford & Boden, 2021; Tijssen, Edwards, Jonkers, 2021).

The first section presents an overview about the role of HEIs in the context of the QH collaboration for RIS3. It is followed by the Policy context and Methodological approach, in which we provide a short description of the project, the institutional and policy context characteristics of the HEIs involved in RE-ACT and the factors influencing their regional commitment. Finally, Policy recommendations are presented and commented on in line with the policy documents mentioned in the first paragraph.

The role of HEIs in a Quadruple Helix collaboration for RIS3: a European perspective

In the current global context in which, at all levels, there is a striving attempt to turn this world in a fairer and more just one in economic, social and environmental terms, Higher Education Institutions (HEIs) are expected to play a role in boosting regional growth and green and digital transitions (Woolford & Boden, 2021).

This is also confirmed by the Communication of the European Commission on the European Strategy for the Universities (European Commission, 2021a) and by its accompanying document (European Commission, 2022). The Communication, among the other objectives, stresses the role of European universities in providing quality and relevant future-proof skills and the importance of empowering their role as actors of change in the twin green and digital transitions, by developing the related skills for young and for life-long learners and by undertaking solutions to these challenges through technological and social innovations (European Commission, 2021a).

By being more embedded in their regional contexts, HEIs can support regional development through the integration of local, regional and societal issues into their curricula and by including the processes and results of their cooperation with other QH actors (Carayannis and Campbell 2006, 2009) such as businesses, regional, local authorities, the local community and other HEIs, in their teaching, research and lifelong learning activities.

In this perspective, Smart Specialisation (S3) represents a way to integrate higher educational institutions, as regional stakeholders, into the design and implementation of innovation-driven regional development policies, through the *entrepreneurial discovery process* (EDP): a continuous bottom-up, place-based participatory process which, through a knowledge-based exchange among regional actors, supports the identification of innovation priorities towards which R&I investments specific to Cohesion Policy will be addressed. The EDP is also relevant for the S3 implementation phase, as well as for the monitoring and evaluation ones. The presence and contribution of HEIs is requested in all these phases (Edwards et al., 2017; Woolford & Boden, 2021).

The Research and Innovation Strategies for Smart Specialisation (RIS3) concept was introduced under the Cohesion Policy in the 2014-2020 programming period as an ex-ante conditionality. For the 2021-2027, which increasingly focuses on sustainable and inclusive industrial transitions, a new European Regional Development Fund (ERDF) specific objective - “Skills for smart specialisation, industrial transition and entrepreneurship” - has been identified, as human capital has been recognised as a key driver of RIS3 (Tijssen, Edwards, Jonkers, 2021). This specific objective is part of Policy Objective 1 for which RIS3s represent an enabling condition. There is a renewed perception of the role of HEIs in providing such skills in collaboration with regional authorities, businesses and local community representatives involved in the regional innovation ecosystem and in the EDPs. These skills for innovation need to be built and organised according to the specific regional settings and strategic objectives (Woolford & Boden, 2021). Through their teaching and training activities HEIs can contribute to social and cultural development, foster citizenship development and enable the preparation of human resources (highly qualified workers) and the spread of high-quality knowledge for knowledge-based economies, thus contributing to the municipal, regional or national societies (Tijssen, Edwards, Jonkers, 2021).

Through their three main missions (education, research, outreach/local engagement) HEIs can contribute to this new challenging objective in EDP. Different disciplines, besides the ones more related to digital and technological knowledge - including social sciences, arts and humanities - should be involved. The latter may also support the shaping of new tools, profiles and methods of engagement relevant for social innovation. Moreover, students should be considered as resources to prepare for and be involved in the EDP (Woolford & Boden, 2021).

By being “multi-mission” and by becoming more intertwined with their host societies and embedded in local economies these institutions may be considered as “research active universities”: they work to create a sustainable and responsive environment for productive interactions between students, staff, civil society and the business sector (Tijssen, Edwards, Jonkers, 2021).
These interactions may also bring to the implementation of knowledge-based market-driven innovations in which the Universities can both launch their own innovation or be partners in innovation projects and support the co-development of such kinds of proposals (Tijssen, Edwards, Jonkers, 2021).
More efforts need to be put on these aspects. Indeed, more recently, referring to the EU CoVEs initiative, a focus has been done on the importance of giving VET (Vocational Education and Training) the same recognition as academic education, as it can support regional innovation by promoting the “thinking hands” approach, namely the combination

of cognitive and experiential knowledge and an entrepreneurial mindset (Edwards, Redford, Paiva, 2021). VET increasingly addresses digitalisation, new technologies, and sustainability and includes them in innovative pedagogical methods in order to prepare workers and young people to meet nowadays challenges of industry and society through the development of key competences (CEDOFOP, 2020).

Also HEIs can play a role in providing such kinds of entrepreneurial skills. Entrepreneurship is more than learning how to run a business: it is about the capacity to turn ideas and opportunities into actions that can generate social, economic, and cultural value (Tijssen, Edwards, Jonkers, 2021). When it comes to entrepreneurship, knowledge and skills come from multiple fields of knowledge. HEIs are required to take interdisciplinary and cross-sectoral approaches, also in line with the European Strategy for Universities (European Commission, 2021a): these allow student-centred learning and challenge-based processes including tailored innovative pedagogies and digital tools towards the creation of forward-looking skills and competences. Such approaches support HEIs' contribution to RIS3: the human capital to be trained should be able to contribute to the regional economic development and green and digital transitions. As a consequence, education and training should be aligned on the most needed specialisations and skills. To have a greater regional impact through the design of new solutions to economic, social and environmental challenges, HEIs should create useful knowledge, intellectual and human capital assets by integrating research, teaching and external engagement (Woolford & Boden, 2021). This commitment would also help to overcome specific challenges and obstacles to regional innovation systems "including brain drain, low levels of lifelong learning and entrepreneurial skills, and few intermediaries to facilitate cooperation" (Woolford & Boden, 2021, p. 63).

As for the latter, Tijssen, Edwards, Jonkers (2021) stress that universities may play as an interface between public and private sector partners at regional level, by incentivising the creation of infrastructures that may contribute to innovation-driven public–private networks. HEIs act as neutral facilitators, namely by creating a setting for activating and maintaining interaction between different parties. This role has been underlined in a feasibility study by the European Commission about Industry–Academia knowledge exchange based on companies' needs (European Commission, 2021b), which pointed out the several tasks of the facilitators: (1) create a framework for interaction; (2) build a knowledge-sharing attitude; (3) establish ambidextrous thinking (Laukkanen, 2012), namely the capacity of an organisation to find a balance between exploitation (to respond to today's organisations' demands) and experimentation (as an adaptive response to changes in the environment): ambidexterity leads to developing explorative and experimental innovation capabilities; (4) enable creation of trust; (5) promote diversity management (European Commission, 2021b). Moreover, especially linked to the continuous EDP, this facilitating role can foster the creation of a common vocabulary with other stakeholders and a common understanding of the policy process (European Commission, 2022).

This is in line with the civil role and social responsibility of HEIs, especially in the RIS3 process: through the cooperation within this environment based on regional cohesion and collaboration and that fosters social innovation and knowledge transfer, HEIs can value scientific methods and research processes by communicating them while generating knowledge and building public trust in the credibility and value of science (European Commission, 2022).

Moreover, as regional innovation systems should not be considered in isolation, the presence of HEIs in the RIS3 environment can foster fruitful exchanges and spill-over effects. HEIs, by taking part in inter-regional and international research and innovations networks and by identifying transnational common research themes, can directly contribute to the S3, at regional level, and, in the meanwhile, bring an outward-looking perspective by sharing the capacity to face the most compelling European challenges (Woolford & Boden, 2021). This transnational cooperation approach has been also underlined as a key objective of the Communication on the European Strategy for Universities (European Commission, 2021a).

Finally, as underlined by (Woolford & Boden, 2021), in order for all the stakeholders to be on the same page in the RIS3 process, including the monitoring phase, an important activity, particularly useful to regional authorities, consists in mapping the innovation ecosystem: it means identifying current and emerging themes, actors, networks, structures and collaborative communities. To trace networks' patterns and collaborations is possible and important (e.g.: through co-publications, competitive projects…) and it may also support the identification of emerging priority areas and actors to be involved. On the HEI's side, the map can be based on a series of sources informing about institutional and education-related aspects (e.g.: number and type of students, education portfolio, info about students' careers…), research project's results and outputs, also market-driven (e.g.: number of EU, national, regional projects involving the HEI; spin-offs and start-ups; patents, labels…), the presence at the HEI of intermediary infrastructure (e.g.: innovation hubs, science and technology parks and clusters). The resulting map would consist of a list of HEIs - and, more specifically,

of departments/faculties, units and individuals - including those focused on social sciences, arts and humanities, to be mobilised at the regional level. These, thanks to the coherence between their work and capabilities and the smart specialisation priorities can give a contribution to the regional innovation ecosystem, through their teaching, research and technology transfer activities.

Policy context

The RE-ACT project[1] had the main objective to develop a self-assessment tool targeted to HEIs and inspired by *HEInnovate*[2] aiming to support them in assessing and identifying areas of improvement related to their contribution to RIS3. To make an effective use of this tool, the partners implemented a series of co-creation and collaboration activities: these were meant to raise awareness about RIS3 and HEInnovate concepts and to reflect and find a common view about the current and potential role of HEIs in the RIS3 processes and phases.

The university partners from Porto Business School (PBS - PT), Technical University of Košice (TUKE - SK), Babeș-Bolyai University of Cluj-Napoca (BBU - RO), Corvinus University of Budapest (CUB - HU) and the University of Macerata (UNIMC - IT) worked at regional level to foster the collaboration between Higher Education Institutions (HEIs) and other key regional actors, endorsing their civic mission.

These institutions are characterised by different policy contexts, place-based characteristics and institutional profiles influencing their regional commitment, summarised in the following table (Table 1).

HEI (locality)	Policy context and place-based characteristics				Institutional characteristics		
	Region - NUTS II	**Category under Cohesion Policy**	**RIS3 2014-2020**	**Regional Innovation Index 2021**	**HEI's territorial positioning based on aims, mission and values**	**Main educational and research profile**	**RIS3 involvement**
CUB - Budapest, Székesfehérvár (HU)	Budapest (HU11)	More developed	National	Moderate innovator	Becoming a leading HEI in Central Europe in its own field and turning into an international university	Social sciences (especially business and economics, and to some extent sociology, political science), mathematics	RIS3-related research project in Central Transdanubia (enhancing the role of HEIs in sub-national S3)
	Central Transdanubia (HU21)	Less developed	National	Emerging innovator			
UNIMC – Macerata (IT)	Marche (IT13)	Transition	National and regional	Moderate innovator	Generating and disseminating knowledge through education and research Contributing to the development of individuals and society through cooperation with local, regional, national and international organisations	Social sciences and humanities	Active engagement in Marche Region RIS3 2021-2027 revision process (provision of participatory approaches in the new priority areas discussion tables and reporting)
PBS - Porto (PT)	Norte (PT11)	Less developed	National and regional	Moderate innovator	Equipping business leaders with skills and knowledge to improve the quality of management in enterprises Becoming a top business school at national and European level.	Business, management *(only postgraduate)*	Active involvement in the regional innovation ecosystem in Norte Region and horizontal support to the region's priority areas

[1] The RE-ACT project: www.ris3heinnovate.eu

[2] HEInnovate is a European Commission and OECD initiative from 2013, developed by Technopolis Group. It is a self-assessment tool for HEIs aiming at assessing their entrepreneurial and innovovative nature by rating from N/A to 5 a series of statements under 8 areas: Leadership and Governance, Organisational Capacity: Funding, People and Incentives, Entrepreneurial Teaching and Learning, Preparing and Supporting Entrepreneurs, Digital Transformation and Capability, Knowledge Exchange and Collaboration, The Internationalised Institution, Measuring Impact.

BBU - Cluj-Napoca (BBU)	Nord-Vest (RO11)	Less developed	National and regional	Emerging innovator	Generating and transferring knowledge through education and research, becoming a world class university in the fields of competitive advantage Contributing to local, regional and national development according to societal needs, which includes the development of services.	Arts, humanities, social sciences, theology, life sciences, engineering, technology	Direct involvement in regional RIS3 at higher governance level Participation in the EDP and in project proposals related to RIS3 Participation in RIS3-related events by the EC dedicated to lagging regions
TUKE - Košice (SK)	Východné Slovensko (SK04)	Less developed	National	Emerging innovator	Providing excellent education and original research results and services according to the needs of industry, region and society in general Affirming its role at national and international level.	Engineering, technology, social sciences (economics)	Direct involvement in development policies at the regional level Involvement in the development of the regional voluntary RIS3 for 2021-2027 as well as for the preparation of major R&I investment projects

TABLE 1 - POLICY CONTEXT, PLACE-BASED CHARACTERISTICS AND INSTITUTIONAL CHARACTERISTICS OF THE RE-ACT UNIVERSITY PARTNERS (EUROPEAN STRUCTURAL AND INVESTMENT FUNDS DATA, 2021; REGIONAL INNOVATION SCOREBOARD, 2021; INTERNAL DATA FROM THE INVOLVED HEIS).

The data collected to elaborate this White Paper on policy recommendations derive from the engagement activities proposed by the partners throughout the whole project. In some cases, these data have been collected thanks to the already existing collaborations with the actors from the Quadruple Helix in the regions in which the partner HEIs are embedded and that took part in the project activities. In some other cases, as an added value of the RE-ACT project, new contacts and networks have arisen and the HEIs involved could increase the number and quality of relationships at regional level.

Moreover, it is worth to mention that the data from Table 1 has been collected to be included in the following contribution: Tomasi, S., Szávics, P., Aleffi, C., Ferrara, C., Márton, A., Urbančíková, N., dos Santos, P., Ribeiro, A., Cavicchi, A., Hudec, O. (in press). Drivers and challenges of RIS3-related University engagement. Insights from five European regions. Regional Science, Policy and Practice, doi: 10.1111/rsp3.12567. This contribution represents a project outcome.

Methodological Approach

The policy recommendations presented in this White Paper represent the result of the participatory approaches implemented during the RE-ACT project. To give the reader an overview about the whole process and the related outputs and outcomes, in the following Figure 1 the "RE-ACT framework for regional collaboration" is presented.

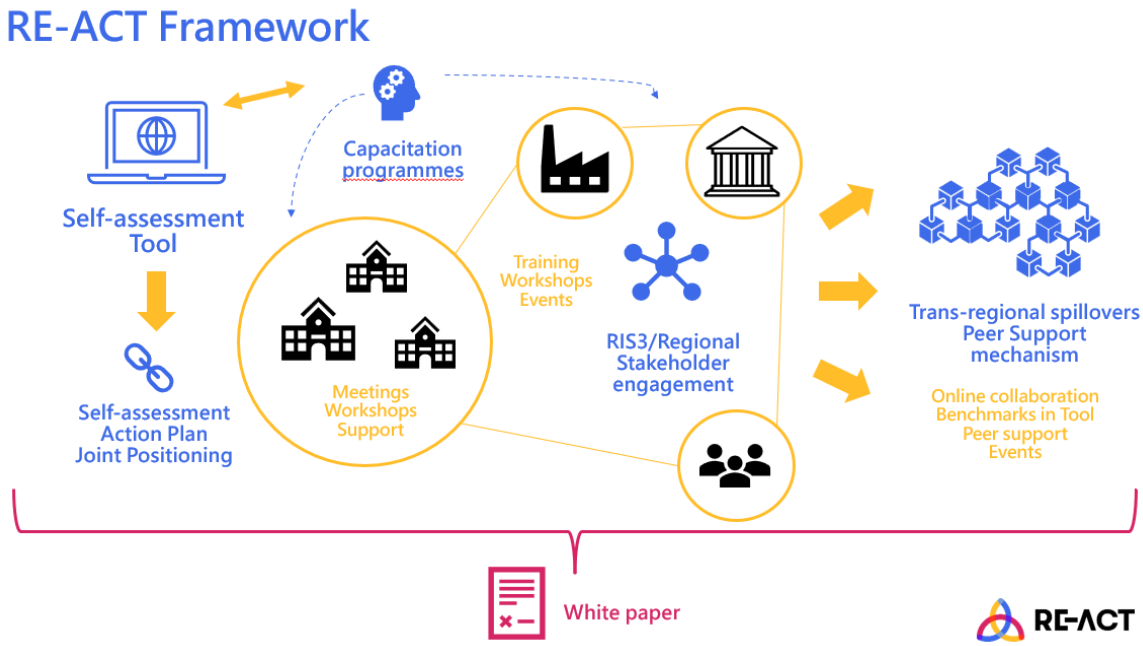

FIGURE 1- " RE-ACT FRAMEWORK FOR REGIONAL COLLABORATION" – AUTHORS' ELABORATION

In the Framework, the main output is certainly the self-assessment tool, which enables HEIs to look at themselves from the perspective of RIS3 related regional collaboration. The process starts from the self assessment and goes on with the development of the HEI's action plans, based on the results of the self-assessment and on the identification of areas of improvement for each one of the tool's dimensions. The joint positioning phase aims at understanding what is the commonly perceived (by the HEIs themselves and from the perspective of other key regional stakeholders) role of HEIs in their regional innovation ecosystems and, particularly, in the context of RIS3 design/revision, implementation, monitoring/evaluation phases. During this joint positioning process HEIs engage with the other regional stakeholders and debate with them about this matter. The capacitation programmes support the raise of awareness about RIS3-related dynamics and concepts and about the potential role of each one of the QH stakeholders in that context. In the Framework, these capacitation programmes refer to participatory tools such as training, ignition events or multi-actor events, peer workshops, mentoring sessions. As for the training, one is to be provided to HEIs (HEIs' members from several levels/offices) and another one is addressed to Regional/Local authorities and other key stakeholders (e.g.: businesses, NGOs/civil society). The capacity building process is another way to promote RIS3-related regional stakeholders engagement and participation. As an example, the training materials provided by the RE-ACT consortium contain a series of exercises that foster the debate among HEIs and/or among HEIs and other QH actors and support this collaboration among regional stakeholders. The tool and the related activities, as well as the capacitation programmes, can be shared especially with HEIs from other regions and, through them, can be extended to the regional stakeholders. This can lead to trans-regional spillovers and to activate a peer support mechanism. This process has already been initiated as the RE-ACT partners started spreading the methodology and the approaches to other regions. In the future, the tool and the project website and materials produced will remain available. This will allow other HEIs and regional contexts to replicate the peer support mechanism in their areas. The conclusions emerging from the process underneath the Framework will converge in this White Paper.

During all these processes the project partners had to produce a separate report for each activity or group of activities as a deliverable. These, besides the organisational details, reported the contents emerging from the debates and the collaboration exercises among the stakeholders involved.
For the purpose of this document, the partners, which during the whole project were able to mobilise about 800 stakeholders in total (among HEIs and other key actors) analysed the contents of these reports through a qualitative approach by undertaking a coding that could enable the extrapolation of those statements and comments that could serve as policy recommendations about the enhancement of the role of HEIs in RIS3 and, more in general, about the improvement of the QH collaboration at a regional innovation ecosystem level.
The contents have been retrieved from:

- the interviews with experts and RIS3 responsible regional authorities from several regions during the initial research phase of the project;
- the HEIs'representatives participants' inputs from the training and the peer support mechanism process;
- the regional stakeholders (businesses, regional/local authorities, NGOs/civil society) participants' inputs from the training and the peer support mechanism process;
- the HEIs'representatives/regional stakeholders participants' from the training and the peer support mechanism process in other regions;
- the inputs based on the reflection by the RE-ACT partners upon the experience, both overall and related to punctual activities;
- the inputs and reflections collected during the Final Conference and commented by the partners during the last transnational partners' meeting.

In the following section the policy recommendations derived from the RE-ACT project's aforementioned activities will be presented.

Policy recommendations

This section presents the results from the analysis of the reports of the RE-ACT activities. They contain inputs that, extrapolated and commented on according to the most recent policy communications and documents from the European Commission about the role of HEIs in a Quadruple Helix (QH) collaboration for RIS3, may serve as policy recommendations. They have been collected and then synthesised from about 800 stakeholders involved in the RE-ACT participatory activities from the academic, public, business and civil society environments of 5 European countries (Portugal, Hungary, Slovakia, Romania, Italy).

These recommendations mainly refer to the role of HEIs in RIS3 and in the QH. To better organise the text these have been divided according to HEIs 3 main missions: research, education, outreach. These missions are strongly interlinked. As a consequence, several times there would be some cross-references from one section to another.

HEIs as "research active universities" towards collaboration for regional innovation

One of the main aspects emerging from the RE-ACT participatory activities is the recognition of one of HEIs' main missions: research. When it comes to RIS3, **action research** is frequently mentioned. HEIs, through their research mission, play a relevant role as vehicles of scientific content. They have been defined as capable of **shaping new visions or new scenarios for regional innovation**: research can enable the identification of new potential areas of specialisation.

In line with the Communication of the European Commission on the European Strategy for the Universities (European Commission, 2021a), such research should follow an **interdisciplinary and cross-sectoral approach** in order to foster cross-fertilisation among several disciplines but also beyond academia. The links with industry and the cross-sectoral approaches are different when it comes to universities or polytechnic institutions. Anyway, in order to make the scientific contents produced concretely applicable for the benefits of companies and of other regional stakeholders, more departments/sectors should be involved. This aspect was both mentioned by representatives of the public sector, the businesses and also by the HEIs' representatives.

To concretely fulfil their mission and commit in action research paths, RE-ACT stakeholders proposed that HEIs could make available their **research infrastructure** to businesses and to other regional actors in order **to co-design entrepreneurial solutions**: the data available could serve as a basis for new collaborative research projects or to enhance already existing research networks. This could also be done by improving the connection to the R&D ecosystem through the technology transfer collaboration infrastructure at HEIs' level. As underlined by Tijssen, Edwards, Jonkers (2021), knowledge-based market-driven innovations can be co-developed, with the university playing as a key partner. Moreover, more emphasis should be put on the collaboration between universities and businesses involved in the regional innovation ecosystems in order to concretely transfer HEIs' research results in the production processes. This also concerns education, as **young researchers** (e.g.: PhD students/research fellows) could be employed at the companies (through scholarships and/or innovative industrial PhDs). Indeed, there is an increasing interest for the **"thinking hands" approach** and for the development of entrepreneurial mindsets to prepare trained and skilled human capital that is able to respond to the regional innovation challenges (Edwards, Redford, Paiva, 2021). HEIs can be active promoters and providers of skills for innovation and entrepreneurship (Woolford & Boden, 2021). These processes could be easier to implement if there was less bureaucracy at academic level.

As confirmed in the Communication on the European Strategy for Universities (European Commission 2021; 2022) **HEIs could play as "hot spots" by linking the local to the global level**. By increasing their research capacity to solve regional needs and, as a pre-condition, by collecting the regional stakeholders' needs, they can gain insights that may support their research work also in transnational contexts: through their international research networks and through their participation in international projects they may bring the best experiences and potential solutions from abroad and adapt and implement them locally while, in the meantime, contributing to face the most compelling challenges at a global level (Woolford & Boden, 2021). Such projects should also focus on the design of efficient methodological approaches and tools for activating and maintaining the quadruple helix collaboration and on methods for measuring HEIs effective contribution to RIS3.

Fostering HEIs' role in providing prepared and skilled human capital for present and future challenges

Education and training are perceived pivotal by the stakeholders involved in the RE-ACT project for fostering regional innovation. From the inputs received there is both a strong focus on the improvement and update of the education methods, topics and approaches aligned to the needs of regional innovation and of the ecological and digital transitions,

but also on the expected results of such education. More specifically, a certain focus has been done on **the role students** - also PhD students and young researchers - **can play** both during their education path **in the context of RIS3**, especially in the EDP (Woolford & Boden, 2021) **due to their openness to innovation**. This was especially stressed by scholars and representatives from HEIs but also from those businesses and organisations which had direct experiences of collaboration with HEIs through students' engagement (at all levels). Moreover, they can play an important role for RIS3 also after their graduation, when they already represent that **human capital** that successfully acquired the requested **knowledge and innovation skills to support the process**, in line with the 2021-2027 ERDF PO1 specific objective "Skills for smart specialisation, industrial transition and entrepreneurship". Indeed, from an educational perspective, the role recognised to HEIs is that of trainers of students and young researchers to prepare them to play as facilitators in the QH collaboration, as also highlighted by Tijssen, Edwards, Jonkers (2021). What was also highlighted is that this type of **training should contain tools and methods to develop the capacity to collect needs and the ability to use, adapt and differentiate the language according to the different stakeholders** to foster effective communication, common understanding and the sharing of information (European Commission, 2021b; European Commission, 2022). In this process, the role of humanities and social sciences has been fully recognised: scholars, researchers and trained students in these fields are those able to interpret the societal needs and the changes going on in the context of specific innovation sectors (Woolford & Boden, 2021). Moreover, these training should be rooted on the understanding and investigation of the regional resources and assets, which is also essential for the definition of regional priority domains (Woolford & Boden, 2021) and, at the same time, should include an international perspective of the regional innovation (European Commission 2021a; 2022). As a consequence, **the contents of the curricula should reflect regional stakeholders' needs and RIS3 priorities** and, thus, include, transversally in all degrees some **technical knowledge** relevant to all kinds of firms and to other key actors. Some examples may be legal and financial elements, cyber security and traceability, marketing and communication, digital technologies, project design and management, sustainability, innovation & entrepreneurship, Intellectual Property (IP) management, etc. In terms of **skills**, some examples are: managerial skills, capacity of identification of potential innovations, capacity to elaborate and manage projects, also through the application of digital technologies and the adoption of design techniques. Another emerging point is that **HEIs should provide dedicated education to accompany the digital and green transitions**, in line with Woolford & Boden (2021) and the European Strategy for Universities (European Commission, 2021a). To make this kind of training more effective, co-design and collaboration in the implementation phase of the training between HEIs and other actors, especially businesses, could be incentivised, to promote the matching between skills and knowledge supply and demand. This responds to the major need of both cognitive and experiential knowledge together with the development of entrepreneurial mindsets (Edwards, Redford, Paiva, 2021) and could be applied not only to academic degree courses but also to PhD and postdoc courses and to re- and up-skilling programmes for employees from smart specialisation priority areas. The European Strategy for Universities (European Commission, 2021a) suggests to uptake student-centred learning and challenge-based processes including tailored innovative pedagogies and digital tools towards the creation of forward-looking skills and competences to undertake solutions to local and global challenges based on technological and social innovations.

HEIs as innovation brokers for technological and social innovation throughout the RIS3 process

As also underlined in the previous sections, it is commonly recognised that **HEIs can play as innovation brokers** in the context of RIS3:

- by combining knowledge and innovation provision and exchange and by transferring them into concrete projects through the interaction with businesses and other regional key actors (Tijssen, Edwards, Jonkers, 2021; European Commission, 2021a);
- by creating interlinks between the local and international level (Woolford & Boden, 2021; European Commission, 2021a).

In concrete, HEIs should create a common ground for innovation, **by facilitating the encounter of the different interests of the stakeholders involved in the regional innovation ecosystem**, also to overcome the existing fragmentation in terms of objectives, approaches and initiatives. Again, the creation of a **common vocabulary** and the role as **interface between public-private networks** has been underlined (Tijssen, Edwards, Jonkers, 2021; European Commission, 2021b; 2022). They should develop tools and methods for fostering cooperation among the QH actors and play as intermediaries in this collaboration, by acting in a transparent way and by sharing the results obtained through the related processes (European Commission, 2021b).

This has to do with both the research and education domains: on the one side, scholars and researchers can run research in response to innovation needs that can be translated into projects and, on the other one, together with

students (to be trained to this purpose) they can act as innovation brokers to concretely participate in and contribute to the EDP (Woolford & Boden, 2021). Referring to the first aspect, according to the perception of business' stakeholders, HEIs should undertake internal institutional change in terms of mentality and procedures towards a more market-oriented behaviour and better promote the commercialisation of research. This could be done through the establishment of spin-off companies; through the creation of incentives for researchers (R&I) to develop bankable cost-efficient projects requested by the market, also able to attract private sources of financing. These projects can concern the analysis of market needs or be oriented to the development of technology transfer services or to the establishment/further development of Technology Transfer Offices, to elaborate and present an HEI's own R&I offer. In this context **HEIs can be both launchers of their own innovation or be partners in such innovation projects with other stakeholders from the regional business sphere** (Tijssen, Edwards, Jonkers, 2021). As for the second aspect, namely the facilitating or innovation brokerage role, HEIs should be able to identify the cultural aspects and backgrounds behind the adoption of technology and innovation at regional level, in line with their civic role and social responsibility (European Commission, 2022). By fostering cooperation in the RIS3 environment **they can stimulate social innovation and knowledge transfer and give value, credibility and public trust to their scientific approach** (European Commission, 2022). More specifically, the stakeholders from the RE-ACT project - mainly those from the business sphere - stressed that HEIs should better communicate goals, strategies, ideas, results of their research activities and make stakeholders aware of their usefulness to regional development. Again, by applying their capacity as facilitators, **they should also understand how to communicate and translate innovation to regional stakeholders**, especially those technical information underneath the RIS3 policy process (European Commission, 2021b; 2022). This aspect could be also capitalised on through their participation in international projects that would allow them to learn new approaches and methods to foster the QH collaboration at regional level (European Commission, 2021a; Woolford & Boden, 2021). As neutral facilitators HEIs can be involved in the creation of a setting for the interaction which also includes diversity management, in the promotion of knowledge sharing and creative thinking, and in the **establishment of relationships of trust among participants** (European Commission, 2021b). According to some regional authorities participating in the RE-ACT project, HEIs would need to develop emotional intelligence and empathy-related skills of their employees (academia, researchers and administrative staff).

As underlined by Edwards *et al.* (2017) and then confirmed by Woolford & Boden (2021), as well as according to the RE-ACT stakeholders (from the whole QH) HEIs should participate in all the RIS3 phases: as for the design phase, they can play a role in the identification of RIS3 priorities and in their translation into projects, but can support the process through the elaboration of analysis, as well or the provision of data and information. To provide continuity, **they should improve and systematise their participation in the EDP and in the RIS3 monitoring and evaluation phases**. Moreover, they should contribute to the governance model to foster RIS3 internationalisation, by always giving value to R&D and education based on regional resources and assets. This continuity should also be guaranteed through the improvement of the measurement of HEIs' contribution to RIS3. From a transparency and accountability perspective, to allow accessibility to information and data and to raise awareness among stakeholders and shareholders, **HEIs should better communicate their regional engagement** both internally – within the academic community and to students - and externally – **by sharing and disseminating the results of their activities with other key actors**. As a way to facilitate this process, according to RE-ACT's stakeholders - this was particularly underlined by business' stakeholders but also by RIS3 responsible authorities and by some HEIs' representatives, the latter especially referring to these solutions as a way to avoid overlapping in projects and research - **a regional map** would be necessary. This **would contain**, on the one hand, **a list of RIS3-related research interests, capacities and competences from each regional university and**, consequently it would allow to make the results of the research projects - relevant in terms of regional development and innovation - accessible to regional stakeholders. On the other hand, this map should contain the competences and R&D interests and projects **from the regional businesses and other key stakeholders**, as also social innovation would be considered. This would create a match between the different interests and approaches, enabling potential collaborations in the context of RIS3 between HEIs and other stakeholders, mainly businesses. This important task has been also mentioned by Woolford & Boden, 2021, referring to it as a map of the innovation ecosystem, aiming at identifying current and emerging themes, actors, networks, structures and collaborative communities.

As for the **involvement of civil society in the RIS3 processes**, even though desirable, it is still neglected, according to the stakeholders involved in the RE-ACT activities, on this matter **HEIs could have a role: by increasing and systematising their engagement with citizens they can sensitise them about and simplify the concepts of RIS3 to help them understanding and be aware about the reasons why their participation in the context of regional innovation is required and fundamental.** Additionally, cooperation with civil society representatives could foster their

involvement in solving societal needs and challenges. This process of inclusion has been presented as a shared responsibility between HEIs and regional authorities. To do so, HEIs should foster the development of an entrepreneurial mindset, also within the civil society: humanities and social sciences are pivotal in this sense (Tijssen, Edwards, Jonkers, 2021; Woolford & Boden, 2021; European Commission, 2021a; 2022). To promote the effective involvement of the civic society as part of the quadruple helix, specific tools and processes should be identified (Woolford & Boden, 2021).

Quadruple Helix Collaboration: a process of co-responsibility

The capacitation programmes that promoted the stakeholder engagement process during the RE-ACT project were important not only as a focus on HEIs but also to make all the other QH stakeholders reflect about their own role in the regional innovation ecosystem. Being part of the QH of innovation, **each node from the helix should activate its own resources to contribute to regional innovation and development and cooperate with others in order to achieve common objectives by "visioning among visions"** (Carayannis and Campbell 2006, 2009). To this purpose, RE-ACT stakeholders stressed that it is necessary for all the other regional key actors to build capacities and capabilities that enable them to cooperate especially with HEIs and, most importantly, to understand why they should cooperate with HEIs and what are the practical benefits of this type of collaboration in the context of regional innovation. This would nurture an approach to regional collaboration that, to be efficient, should take a long-term perspective, by envisioning durable partnerships.

As for the **business sphere**, their contribution to RIS3 is about sharing innovation-related needs from a market oriented perspective and increasing their **availability to apply for joint/collaborative research-innovation projects** in collaboration with other actors (e.g.: HEIs). Those companies that provide innovative solutions could also be of support to others from the regional innovation ecosystem and provide them with technological support and innovative - sometimes digital - services based on the other's needs. In this collaborative environment - beyond competition - **companies can provide "best practice" and share the results of their successful innovation projects to foster the involvement of other actors** and their sensibilisation on the importance of undertaking such kinds of innovation implementation initiatives. Similarly to HEIs, also companies, being embedded in their regional economic and social context, can inform other stakeholders about tools and opportunities for regional innovation and support others' participation in RIS3 (e.g.: stimulating the participation of networks of companies or at value chain level). The EDP is a fundamental phase in which businesses should take part as this allows them to communicate and share market related information with both researchers and innovation providers and, at the same time, with the public authorities that manage the public funding related to innovation. As RIS3 processes are not only open to big innovative companies, **SMEs or even bigger but more traditional companies should** also **take part in the EDP** and become more aware about their potential contribution to innovation processes and about the concrete benefits of their participation.

During the stakeholder engagement phases several companies that had experience in the RIS3 processes or that had undertaken collaborations with HEIs to run research projects or to host students and PhD students underlined that this allowed them to increase their trust in the opportunities coming from the investments in innovation and from this kind of collaborations and underlined the benefits in terms of competitiveness. According to other regional stakeholders involved in the RE-ACT project, **social innovation**, besides the market perspective, is also something at which businesses should look into, especially in this time of transition towards a more digital and green economy and society. **Businesses can be promoters of initiatives with social value**.

Public authorities have also been addressed in the discussion, both from the regional and local level. As mentioned in the previous session, **regional authorities responsible for RIS3 share with HEIs the responsibility to foster collaboration** mainly by deploying methods for **assuring a permanent dialogue between HEIs and other quadruple helix stakeholders** during the continuous EDP process.

The local input is also required to better shape RIS3 planning. For this reason, the intervention of municipalities and other local public authorities is pivotal, being at the bottom and having a clear and concrete understanding of the local context. **They are** recognised as being **important in the creation of local scale focal points for the articulation and implementation of the RIS3** and for this reason they should be more involved in the smart specialisation processes and should also strengthen inter-municipal cooperation towards innovation processes. Moreover, rather than stimulating cooperation at local level **they should facilitate voluntary participation from local stakeholders** by avoiding top-down solutions that could be uneffective.

Finally, **civil society**, after receiving proper information about the RIS3 concepts and about the modalities to enable its contribution to the related processes, should work towards **active citizenship by taking part in projects with transversal exchange opportunities and directly "touch" the benefits coming from RIS3 actions**. The citizens'

direct involvement in the RIS3 design, implementation and monitoring process is still a work in progress. The QH collaboration should also serve to include this node that is still not completely integrated in the regional innovation processes.

Conclusions

This White Paper presented a series of policy recommendations based on the result of the numerous stakeholder engagement and participatory activities being part of the process and framework within the RE-ACT project in the partner countries/regions involved (Portugal, Hungary, Slovakia, Romania, Italy) and beyond. The results mainly highlight the direction that, at policy level, could be taken to improve the role of HEIs in the RIS3 and, more in general, to enhance the QH collaboration in order to contribute to regional innovation. Summarising, HEIs can play a major role in their regional innovation ecosystems, by aligning their multiple traditional missions to the RIS3 and global challenges, especially in this moment of digital and green transition, social and economic transformation. Among these roles, both as researches and as regionally-engaged organisations, especially in the RIS3 processes, they can play as *neutral facilitators* to foster QH collaboration and as *innovation brokers* to translate research-based innovation to all stakeholders and to produce it and turn it into concrete co-designed projects; as *educators to innovation* they can improve their capacity to train and provide innovation, entrepreneurial and relational skills and knowledge to students from all HE levels and to life-long learners to prepare them as the human capital able to face the most compelling challenges both at local and global level. Indeed, transversally, as multi-mission organisations, they can enhance their potential to play as *hot-spots*, an interlink *between the regional and the international levels*, by fostering trans-regional and trans-national cooperation within international research networks and projects: this would also provide the RIS3 of a wider inspiration and perspective. To conclude, more in general, each of the parties involved in the regional innovation ecosystem should give their own contribution in terms of QH collaboration. HEIs, by their own, without the engagement of other nodes from the helix, cannot fulfil their roles. Especially in relation to civil society, a lot still needs to be done to effectively include this category in the process.

All these aspects have been discussed compared to the most recent communication and documents by the European Commission on HEIs, RIS3 and QH collaboration. It resulted that the inputs emerging from the project are coherent with the recent policy trends from the European level.

To verify the results from the RE-ACT project and to make them eventually more robust, it would be interesting to widen the scope of this project and to have a look at the regional innovation ecosystems of other European regions and countries with different policy-contexts, place-based characteristics and HEIs' institutional characteristics. By investigating the perceived potential role of HEIs and of the QH collaboration in their environments, it would be possible to understand whether or not similar conclusions, as in the present White Paper, could be reached.

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