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An analytical framework to assess the governance of universities and their involvement in Smart Specialisation Strategies

Eskarne Arregui-Pabollet
Mathieu Doussineau
Markus Dettenhofer

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Contact information

Name: Eskarne Arregui-Pabollet
Address: Edificio EXPO, C/ Inca Garcilaso, 3, E-41092 Seville/Spain
Email: Eskarne.ARREGUI-PABOLLET@ec.europa.eu
Tel.: +34 954488206

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An analytical framework to assess the governance of universities and their involvement in Smart specialisation strategies

Eskarne Arregui Pabollet*, Mathieu Doussineau*, Markus Dettenhofer**

*European Commission, Joint Research Centre, Seville, Spain

**CEITEC - Central European Institute of Technology, c/o Masarykova University, Brno, Czech Republic

Abstract:

The renewed EU agenda for higher education (European Commission, 2017) has emphasized that higher education institutions are not contributing as much as they should to innovation in their regions and countries. The engagement of universities in S3 has shown to be particularly important in countries and regions with weaker regional innovation systems and sub-critical public institutional capacity. The ability of universities to bring together education, research and innovation, places them as particularly important stakeholders to contribute to the research and innovation system.

Nevertheless, becoming more engaged in regional innovation policies and S3 requires an important strategic vision and institutional change by HEIs to be able to engage in co-creation dynamics with quadruple helix actors. Moreover, the ability of universities to adjust their working agenda could require some change in their common practices. How they can manage this, mandates a governance framework which can allow for agility from institutes steeped in tradition.

The issue of governance is complex, multi-dimensional, and often involves changes in policy, behaviour and outreach for a successful implementation of set objectives. Institutional governance in general and for universities in particular, implies setting in motion or overseeing various institutional processes and regulatory provisions to allow for the planned targets and outcomes to be achieved.

The current report proposes an analytical framework for university governance allowing the comparison and benchmarking of governance systems across EU member states, which could serve as guidance for university managers and policy makers to design the institutional incentives and funding programmes for increased engagement in S3. This analytical framework is experimented through a survey involving 74 European universities, the analysis of country annual reports of the Research and innovation observatory (RIO) and the knowledge generated in S2E project covering particularly EU13 countries and the higher education for Smart specialisation initiative (HESS). The main results and limits are commented and discussed with some recommendations.

Keywords: UNIVERSITY GOVERNANCE, UNIVERSITY THIRD-MISSION, SMART SPECIALISATION STRATEGIES (S3), REGIONAL GROWTH, QUADRUPLE HELIX, UNIVERSITY-BUSINESS COLLABORATIONS, REGIONAL ENGAGEMENT, UNIVERSITY INTERNAL GOVERNANCE

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1 Introduction

Why does governance of higher education institutions matter? The issue of governance is complex, multi-dimensional, and often involves changes in policy, behaviour and outreach for a successful implementation of set objectives. Institutional governance in general and for universities in particular, implies setting in motion or overseeing various institutional processes and regulatory provisions to allow for the planned targets and outcomes to be achieved. As the strength of democratic institutions is based on trust in the institutional process and their members, steering institutional missions is vital, as individual actors within institutions may pursue agendas rooted in self-interest. Alignment and transparency of individual actors' roles within an organisation towards a collective institutional mission becomes thus critical to the efficiency and success of institutional objectives. Governance tools are intended to strengthen universities' performance and enable ambitious goals to be realized. At the same time, effective governance is also considered to enhance universities' involvement in Smart Specialisation Strategies (S3) at national and regional levels. Therefore, the correlation between university governance dimensions, performance and its involvement in regional or national policies (eg. the design and implementation of S3) emerges as an issue of high research interest.

The S3 policy context of the European Commission has introduced new demands for universities to become active actors of the continuous Entrepreneurial Discovery process to identify priority areas and projects in which concentrate R&I funds from ESIF. Universities being particularly well placed actors in the R&I system are asked to take a new role as policy makers. The European Commission calls for stronger efforts from higher education institutions to contribute to innovation in their regions and countries (European Commission, 2017), however the increasing demands on universities raises two key questions for policy makers and universities: 1) Which governance dimensions are more relevant to become regionally engaged? 2) Which type of organisational incentives and funding programmes could strengthen HEIs engagement?

The current work is proposed in the context of the support provided by the Stairway to Excellence project¹ (S2E) to EU regional and national authorities in strengthening their capacities to implement Smart specialisation strategies and promote synergies between EU funding, in which the international position of universities is of importance. The implementation of the entrepreneurial discovery process (EDP) and the assistance to European lagging regions to close the innovation gap with the most advanced regions through an improvement of university governance constitutes the background of this analysis.

This report proposes an analytical framework for university governance allowing the comparison and benchmarking of governance systems across EU member states, which could serve as guidance for university managers and policy makers to design the institutional incentives and funding programmes for increased engagement in S3. This analytical framework is experimented through a survey involving 74 European universities, the analysis of country annual reports of the Research and innovation observatory (RIO) and the knowledge generated in S2E project covering particularly EU13 countries and the higher education for Smart specialisation initiative² (HESS). The main results and limits are commented and discussed with some recommendations.

¹ <http://s3platform.jrc.ec.europa.eu/stairway-to-excellence>

² <http://s3platform.jrc.ec.europa.eu/hess>

2 Higher education institutions in regional innovation policies

The role of higher education institutions (HEI) in regional innovation policies has been attracting greater attention³, particularly on the increased demands by governments for universities to become more responsive to regional needs and challenges to unleash the full potential of the knowledge-based economy. The way in which universities bring together research, education and engagement missions can as well facilitate the smart specialisation process. In fact, universities can have a very important role in terms of governance of the S3 (Kempton et al., 2013), particularly in regions with incipient regional innovation systems, low institutional capacity and leadership to coordinate the different actors' capacities.

HEIs are particularly well placed actors to contribute to S3, facilitating connections between academics, business, public sector and citizens to identify the priority areas in which the region can excel and develop an entrepreneurial mind-set of regional actors to develop a real co-creation space for innovative ideas. In order to understand the role of higher education institutions the European Commission launched in 2014 the Higher Education for Smart Specialisation (HESS) project jointly managed by the Joint Research Centre and Directorate General for Education and Culture. The case studies focused in understanding the key drivers of universities to engage in S3 have shown that there is a need to understand institutions' specificities and unique ways to contribute to territorial development, avoiding the one-size fits all approach.

The renewed EU agenda for higher education (European Commission, 2017) has emphasized that higher education institutions are not contributing as much as they should to innovation in their regions and countries. They could facilitate connections between academics, business, public sector and citizens to identify the priority areas in which the region can excel and develop an entrepreneurial mind-set of regional actors to develop a real co-creation space for innovative ideas.

The engagement of universities in S3 has shown to be particularly important in countries and regions with weaker regional innovation systems and sub-critical public institutional capacity. The ability of universities to bring together education, research and innovation, places them as particularly important stakeholders to contribute to the research and innovation system. As an example, the capacity to map regional capacities or monitor key indicators, connect actors along the value chain or connect to society can be especially relevant for the successful achievement of S3 objectives. The Stairway to Excellence⁴ project, managed by the DG Joint Research Centre in close collaboration with DG Regio and upon initiative of the European Parliament, is supporting capacity building, particularly in countries with insufficient institutional capacities to exploit the full potential of establishing synergies between European Structural and Investment Funds (ESIF) and other centrally managed EU programmes (H2020, Erasmus+, Interreg, EFSI, etc.). The project pays special attention to countries with low H2020 participation and high ESIF in which synergies can be particularly interesting. The project has identified the lower participation to be multiple-fold, but is associated

³ Some of the examples of ongoing initiatives: Higher Education for Smart Specialisation (HESS project jointly developed by DG JRC and DG EAC of the European Commission (<http://s3platform.jrc.ec.europa.eu/hess>). H2020 RUNIN- The Role of Universities in Innovation and Regional Development project (http://cordis.europa.eu/project/rcn/205516_en.html). H2020 SMARTSPEC- Smart Specialisation for Regional Growth (http://cordis.europa.eu/project/rcn/109041_en.html). OECD Roundtable on Higher Education in Regional and City Development "Universities for skills, entrepreneurship, innovation and growth" that took place on 19-20 Sept 2012 (<https://www.oecd.org/edu/imhe/oecdroundtableuniversitiesforskillsentrepreneurshipinnovationgrowth-preliminaryagenda.htm>)

⁴ <http://s3platform.jrc.ec.europa.eu/stairway-to-excellence>

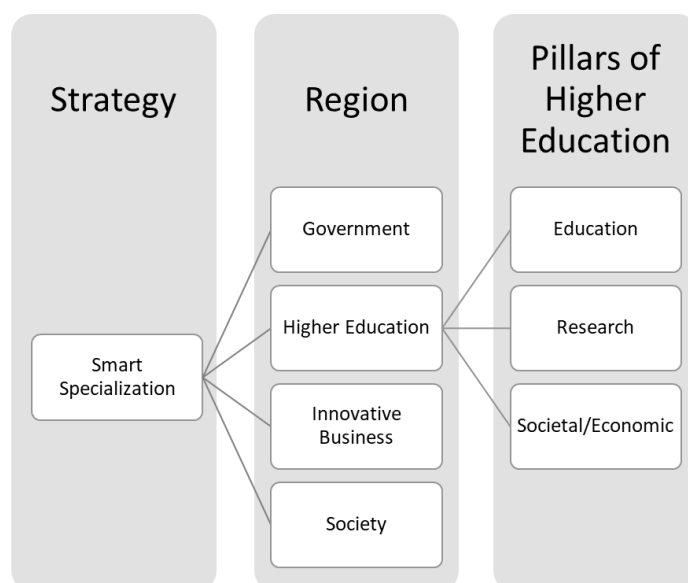
with under developed international networks and connections between R&I actors. Certain actors, such as universities, are particularly well placed to contribute to improvement in these aspects.

Nevertheless, becoming more engaged in regional innovation policies and S3 requires an important strategic vision and institutional change from HEIs to be able to engage in co-creation dynamics with quadruple helix actors. The cultural change required for this to happen entails HEI to become entrepreneurial actors (Chatterton & Goddard 2000) (Goddard, 2009) increasing their engagement with regional actors and society at large to contribute to regional development. As such, the European Commission communication on ‘The role of the universities in the Europe of knowledge’ (European Commission, 2003) underlined the importance of the university contribution to regional development strategies and the generation of regional networks and collaborations with industry and other actors.

The higher education policy reforms at the European level have moved towards broadening the university-industry collaborations and the link of education and research with innovation, particularly strengthening collaborations between research, education and innovation (European Commission, 2006). Nevertheless, some tensions have emerged from the more economically oriented governance in contrast to traditional university vision, in which universities are viewed as politically more relevant as main contributor to the European knowledge-based economy (Maassen and Stensaker, 2011).

The involvement of universities during the formulation of these strategies is of high importance, since they would play a key role in feeding the pipeline of frontier research for the future innovative solutions. This posed a number of challenges, including the misalignment of university activities with the local innovative business strengths, which was especially the case where the division in public and private activity was large. Additionally, the absence of innovative strength within a given region, urged the formulation of new innovative strongholds, and investment to support this new activity. Moreover, as was mentioned above, the misunderstanding of terminologies is not uncommon, of which, “innovation”, is included among this list. Many of these challenges from the university perspective will demand adjustments or additions of programmes to align with the new strategy.

Figure 1 Higher education within Smart Specialisation Strategies



Research intensive academic organisations must be astute in asserting the guidelines of their relationship with the application sphere. Many will define their mission in terms of performing a public good through their three main pillars, education, research, and social/economic activities (see Figure 1).

For universities to align with a new S3 they will need to address many adjustments in their programmatic approach as it relates to their overall mission, with respect to the three pillars of higher education. Moreover, the ability of universities to adjust their working agenda could require some change in their common practices. How they can manage this, mandates a governance framework which can allow for agility from institutes steeped in tradition.

3 An approach to set a university governance framework

3.1 Challenges related to University governance

Good governance can be understood as a series of conditions to generate a space that "strives to preserve the integrity of the academic value system while at the same time positioning universities vis-à-vis their larger environment to make them receptive and answerable to external messages, demands and expectations" (Fried, 2006). But which are the relevant HEI governance factors that can influence research performance and regional engagement? And how do they interrelate with one another? Governance arrangements can take many forms, and at times include many tactical changes, along with introduced processes organisation, making it difficult to disentangle which aspects matter in good governance of universities.

Taking a closer look at the governance of European universities, many countries have introduced reforms to increase organisational autonomy, usually offering greater freedom from the state and with increased participation of external members on the university governing bodies (Bennetot and Estermann, 2017). However, the economic crisis and the plummeting of public funds has introduced additional pressures on universities to look for additional private funding, increasing their dependence on external funding sources, which threatens to undermine their real autonomy (Christensen, 2011). One of the most important aspects in which governance has evolved is in the arrangements for a better management, strategy definition and decision-making within institutions. The efforts of governments to strengthen universities boards with other economic stakeholders, which intends to provide responsiveness to regional challenges, have been focused in increasing the influence of external stakeholders in the academic world (Amaral and Magalhaes, 2002), trying to challenge the "Ivory Tower" model. Examples of how university governance bodies have introduced external representatives can be found in different EU countries, such as the Social Council in Spain or the Board of Social Institutions in Italy.

However, the composition of governance bodies differs widely across EU research institutions, with multiple arrangements in terms of the configuration of the members of governing boards, the balance of internal vs external members, the avoidance of conflicts of interest of the members or transparency in decision-making processes (Hénard and Mitterle, 2010). The impact of the participation of external stakeholders in university governance is under debate, as even the permeability to business environment ideas and engagement in different forms of collaborations is desirable, the lack of independence, short-term and economically driven vision might end up affecting or undermining the longer-term social mission of universities and core academic values.

3.2 Proposed dimensions for governance of Higher Education Institutions

This section aims to understand factors influencing effective governance of institutions of higher learning, such that sustained progress towards the desired goals of the institution may be achieved. From a practical perspective, we understand that effective engagement with stakeholders in the processes of forming policies, procedures, and outcomes builds and maintains trust for the common good of the institution. Policies such as on research integrity, human resources, relations of HEI to industry, are important components to governance practices generally, but unless comprehensive, an integrated and overarching approach cannot be systematized. The Constructive Technology

Assessment has attempted to integrate these concepts, which includes HEI, however more from the perspective of technology development (Rip et al., 1995). Further, recognition that HEI are located within nation-states and influenced by the laws and governance policies of their countries, as well as the cultural norms of the people within the locality, brings us to the multi-scalar elements which impact governance within a given institution (Fisher and Rip, 2013). Within the domain of responsible research and innovation, it has been argued that transparent and interactive processes of engagement with actors of the quadruple helix through collective stewardship would enable embedding of scientific and technological advances into societies (von Schomberg, 2011). A framework to steer stakeholder involvement was further elaborated which included the four dimensions: anticipation, reflexivity, inclusion, and responsiveness (Stilgoe et al., 2013).

Although there have been several models put forward to guide governance practices which have the underlying conditions of democratized legitimacy to institutional norms, putting these to practice, have been a challenge. For this study, we designed a survey to first understand the state of practice or which governance dimensions are currently in place in HEI across Europe. There was the realization, that at present, there has been no catalogue of current governance practices within HEI, which would serve as a basis to gauge both future progresses, as well correlate governance dimensions with impact. Although the current survey is not exhaustive to the extent of questions which could be addressed, the considerable large cohort of HEI is one of the strengths of this study. Additionally, we do not attempt to determine the process to which institutes formed their policies nor do we fully understand the extent to which they are implemented, but we attempt to establish a first-level knowledge of governance dimensions in the form of demonstrable practices within HEI across the EU. This survey is designed to examine this from a practitioner's perspective, which takes stock of the current status of governance dimensions, compared to their peers within each country, each region, and across the EU. Thus, this survey allows for the exploration of commonalities within and across geographic and political regions, and to understand the relationship of governance policies and stewardship of HEI in S3.

The determination of the survey questions were inspired by other reviews of governance practice (Privot & Estermann, 2017; Hénard & Mitterle, 2010). Here we have differentiated governance survey questions into 6 internal dimensions, and one external dimension. The internal dimensions focus on the practices internal to the institutions themselves, but also include practices related to support for the innovative processes, while the external dimension examines practices for engagement with RIS3 relevant stakeholders (summarized in the following Table 1).

Table 1 Dimensions of governance of Higher Education Institutions

	Dimensions of Governance	Description of the Dimension
	Internal governance dimensions	
A	Mission attainment (whole university, faculties, institutes)	Characterize, measure and display organisational activities, processes, and achievements to encourage improvement
B	Scientific (Specialization/Technical) Advisory Board	Advise and implementation of suggestions from independent scientific/technical experts
C	Human Resources	Defined, documented, and incentivize career path for scientists
D	Financial distribution	Transparent conditions and incentive-driven financial distribution for scientists
E	Operational feedback processes	Mechanism to assure quality control through integrity of established processes
F	Innovation potential	Institutional support for processes, incentives, and training to promote innovative activities
	External governance dimensions linked to the implementation of RIS3	
G	S3 and regional involvement	The participation of the university in the design and the implementation of the smart specialisation strategy RIS3 are requested + The alignment of smart specialisation areas chosen in the S3 and the participation in Horizon 2020 programme

The HEIs governance dimensions selected to construct and validate the analytical framework presented in this report have been based on the challenges and tensions identified by scholars as being more commonly faced by universities when asked to contribute to regional growth, mainly through the articulation of their third mission activities. This is combined with evidence and knowledge generated by stakeholders in the S3 implementation and collected in S2E and HESS projects.

a) Mission attainment (whole university, faculties, institutes)

This dimension attempts to take stock of HEI related to their organisation of major achievements and documented activities to be presented both internally and externally. Moreover, the establishment of annual goals and tracking achievements helps an HEI progress towards its vision. As first assessment an annual report should be published is published by the organisation. The annual report serves several purposes, to document what is regarded as significant achievement, to as a basis for types of data being collection, and also to display these accomplishments to both the internal and external stakeholders. The absence of an annual report does not allow both individuals inside and outside of the organisation know what is important in steering towards future goals.

The next aspect of this governance dimension is the existence of qualitative measures of the organisation to assessment performance. As the annual report is a documentation tool for an organisation, the existence of means to measure or assess progress is critical for the organisation to achieve its mission. Thus, both annual baseline assessments and the projection of future goals based on qualitative assessments helps steer the organisation. Without the process of assessing performance in place, and is difficult for an organisation to know it is successful at achieving its goals.

b) Scientific (Specialization/Technical) Advisory Board

External expert scientific feed-back is one means to help guide a research-oriented HEI. In many cases the SAB acts as an advisory group, nevertheless the follow-through includes an HEI's ability to implement suggestions, and document the process to the organisation. Within this dimension is an assessment if the organization firstly has a specialized/technical advisory board, and secondly the degree of independent the members of this board are from the host organisation. The absence of such a board would indicate an inadequate feedback or advisory function for the organisation. The value in external advice can be a significant asset to an organisation; moreover the strength of the members of this board brings credibility and stature to the organisation. The degree to which the board is independent of the organisation it serves is also critical to avoid behaviour driven by self-interest. If members of an advisory board are also members of the management for organisation, they could not provide advice from an external perspective. The degree of autonomy of the members of the board allows for transparency in advising. Although the detail in the functioning of boards is difficult to assess in a brief survey, another measure of transparent processes is the distribution of decisions/advice taken by the board in the form of minutes. Within this survey we address the availability of minutes to members of the organisation, to enable disclosure of key advice by the board in steering the mission of the organisation.

c) Human Resources

Recruitment and retention of talented scientists is a major factor in the success of research intensive HEI. Thus, transparency in career progression, with motivational incentives allows employees to anticipate and plan for their career futures. Policies which are re-enforced by demonstrable actions aid to underpin the employees' alignment with the mission of the HEI. Within this dimension a key driving principle is if personnel are appointed and retained based on a fair assessment of merit. Nepotism and other practices of favouritism which are independent of merit undermine performance and lead to distrust within an organisation. This dimension attempts to assess the presence of meritocratic policies within HEI. Beyond transparent hiring practices, the outlining of target goals and a policy of assessing these achievements need to be in place to steer performance. If direction towards a common mission is not given, nor assessed, there will be misunderstanding, and again loss of trust between the employee and the management. To enforce the achievement of goals, clear incentives and guidelines should be established for the organisation as a whole. A reward structure benefits from documented policies, with adherence to set policies being of high importance. Finally, within this dimension rewards such as promotions or rewards need to be in response to goals achieved. Have policies for directing behaviour of personnel with allow for the alignment of individual members of the organisation with the mission of the organisation.

d) Financial distribution

Financial resources to perform scientific research and a team of individuals are necessary to be successful. Scientific research at a high-level may require the able to have long-term (several years) financing, thus allowing of the scientific team to plan and anticipate changes in resources, and to be motivated. Within this dimension we link the meritocratic principles with financial incentives. The financial incentives could be at multiples levels, including the overall salary, but also the access to personnel, instrumentation, and physical space. All of these factors can have

an impact on the success of scientific personnel within an organisation. The absence of personnel or means to pursue a particular line of scientific investigation can undermine the success of a talented individual. As resources are always in limit, the distribution of funds through non-transparent practices demotivates otherwise talented personnel. The unfair distribution of resources can lead to a furtherance of favouritism within an institution, with the aim of buying loyalty at the expense of mission driven objectives. Here we aim to understand if the HEI has a merit-based financial distribution policy, and moreover if those policies are available to the organisation members.

e) Operational feedback processes

Guidance policies for HEI are one of the tools which direct behaviour within an organisation. The establishment of rules help management to guide operations, and also allows for grievances to be addressed in an orderly and fair process. Within this dimension we assess if the HEI have mechanisms in place to both uphold rules, and a means to have the community to self-correct behaviour which would challenge acceptable practice of the organisation. Here we assess if the organisation has a set of rules to steer and address integrity, as well as a committee to address matters related to potential breaches in ethical practice. As this survey is limited in number questions, we were unable to examine the detailed composition of such grievance committees for their level of independence, but rather to we determined if one is instated for each organisation examined. The independence and good decision-making of such a body does help to build the trust of the members within the organisation, as it is one means to challenge potential unjustifiable actions. Further, the outcomes of the committee on ethics should be available to members of the community where it is relevant. Without the distribution or accessibility the outcomes, it could not effectively deter future breaches of conduct. Although most organisations have the good intention of establishing such grievance bodies, some may not follow through with enacting a process of corrective measures and the dissemination of its outcomes.

f) Innovation potential

An HEI's ability to address the third pillar of high education, society and economic (Figure 2), is dependence on capacity, guidance documents, and expertise available to realize the goals necessary for the university to interface with the private sector. Not only is the framework for 'technology transfer' needed, but also the incentives and the mind-set of scientists need to be primed for these activities. This dimension could be regarded as a key enabling practice to connect the internal policies of HEI with the private sector, and thus steering innovation. Here we assess if intellectual property and its protection is facilitated at the HEI. Not only is the filing of patents is important, but is there a means to enable contractual and licensing agreements between the HEI and outside companies. In order to go beyond written procedures, the organisation must have personnel professionally trained to handle this type of activity. Although, the survey is designed have a self-assessment of such operations, the question of how functional these activities are, would need a much deeper assessment. From the scientists' perspective, they would need to have their performance assessment goals incorporated to commercialization activities, which was additionally determined in this survey. It was further determined if the mission of the organisation also included connectivity with the society outside,

which would include innovative activities as a goal for the HEI. The projection outward of such aims sends the signal to external, as well as internal stakeholders, the intension of the organisation. Finally, the organisation could be served by exposing the students and those in training to the activities of private companies through workshop on innovation and entrepreneurship.

g) External governance dimension

The selected governance dimensions and how these directly or indirectly impact S3 are examined in this section of the survey. There are, of course, several factors which HEI could use to engage with external stakeholders, but here those chosen are intended to examine the involvement of universities in S3 and their capacity to become more engaged with territorial actors. Specifically, understanding if the organization is, or was, involved in S3 priorities formulation. In order to go beyond the strategy formulation, it is important to consult with the Managing Authorities in the design of funding instruments, to bring the strategy to action. Also, it would be important to understand if the HEI is able to adjust its own research strategy to better align with the proposed S3. To complement this dimension of the survey, the alignment of research activities of HEI in Horizon 2020 with regional specialisation areas is examined. This would then give insight to ability of the organisations to match the S3 with actual research activities through grants received from the European Framework Programme.

Table 2 Grounding principles for the formulation of the governance dimensions

HEIs Governance dimensions	University challenges to engage in regional- Relevance for S3	Scientific background
A. Mission attainment	S3 governance requires new modes/roles of HEIs of interacting with R&I system stakeholders and participation in policy making	<ul style="list-style-type: none"> • S3 requires an important strategic vision and institutional change from HEIs becoming entrepreneurial actors (Chatterton & Goddard 2000) (Goddard, 2009) • The complexity of the S3 mostly lies in the need to generate a consensus governance space (Ranga and Etzkowitz, 2013) • HEIs can have important role as facilitators in S3 challenges related to the multi-level governance of different government levels (national, regional, sub-regional, European) that interact in the process. (Estensoro et al, 2018) • Low position in international rankings of EU universities could be explained by poor governance, insufficient autonomy in terms of budget management and perverse incentives (Aghion et al., 2008) or talent attraction capacity, availability of funding, and appropriate governance (Salmi, 2009)
B. Scientific Advisory Board (SAB)	<p>The connectivity of universities to business is key for universities to contribute to regional growth, not only in form of innovation but also in terms of education that responds to the skills and competences needed by companies</p> <p>The participation of external stakeholders in</p>	<ul style="list-style-type: none"> • The balance of internal vs external members, the avoidance of conflicts of interest of the members or transparency in decision-making processes (Hénard and Mitterle, 2010) • Social and political pressures on HEIs to better respond to societal challenges has entailed new

	<p>university governance is under debate, as permeability to business environment ideas and engagement in different forms of collaborations is desirable, it can undermine the longer-term social mission of universities and core academic values</p>	<p>modes of inter- and transdisciplinary collaborations of knowledge production have emerged (Gibbons et al, 1994) as well as changing network relationships within the triple helix autonomous but increasingly interdependent institutions (Leydesdorff and Etzkowitz, 2001).</p>
C. Human Resources	<p>HEIs contributing to policy making requires specific co-creation and collaboration skills as well as a change of mind-set by stakeholders that sometimes are not used to interact in such collaborative environments and do need to overcome existing rivalries and lack of strategic vision.</p> <p>Low incentives of HEIs researchers to engage in S3, due to the characteristics of the merit criteria rewarding publication in top-ranked publications</p>	<ul style="list-style-type: none"> • Role of universities as major economic agent within a territory as employer and attractor to the region (Laredo, 2007) • Importance of defining research-career paths it is important to acknowledge that researchers' interests are not always in line with universities' priorities (Elena-Pérez, S and Marinelli, E., 2018)
D. Financial Distribution	<p>HEIs to engage in S3 it is key to understand how they are funded and the characteristics of funding instruments that can incentivise their engagement.</p> <p>The way in which HEIs balance their different funding sources might give them more autonomy. The block or competitive funding from public authorities funding can be an important instrument to incentivise HEIs to contribute to regional growth</p>	<ul style="list-style-type: none"> • HEIs autonomy seems to be influenced by the composition of their budget, with institutions that declare to be completely autonomous being the ones with most diversified budget (De Dominicis et al, 2011). • National and institutional settings are key in allowing HEIs to organise in a fully financially autonomous way to produce a real change (De Dominicis et al, 2011). • Research-funding instruments are often non-exclusive with the same instrument being employed for several purposes. Different purposes may also be clustered. • The efficiency of a funding schemes strive in their capacity to match policy objectives with HEIs needs (Chavel et al, 2018) • Performance-based research funding systems are based on 1) university research that is shaped by university governance and policy making, and 2) HEIs research is a substantial element of every national innovation system, and so is concern for governments seeking to enhance the innovativeness of their economies (Hicks, 2012).
E. Operational feedback processes	<p>The contribution of HEIs to generated impact in their territories, answering to the most pressing societal challenges is in the core of S3</p>	<ul style="list-style-type: none"> • The debates or responsible research and innovation rethink the linear model of science and innovation policy underlining the need of HEIs to contribute to the social contract for science to respond to socially beneficial impacts (Owen et al, 2012). • Increasing importance in EU policy arena on the impact of mission-oriented research and innovation policy , integrating impact assessment in the policy discourse (Mejlgaard et al. pp. 741–50) , and moving gradually towards framework programmes integrating socio-ethical and

		stakeholder aspects (Rodriguez et al, 2013).
F. Innovation potential	S3 is deeply rooted in the competitive advantage theory that considers crucial for competitiveness identifying the specific local competitive factors by the quadruple helix actors. The capacity of universities to transform research and knowledge generated into new products and services is key for competitiveness.	<ul style="list-style-type: none"> • Proximity facilitates coordination and interactions between R&I actors, but it can create a lock in effect creating adverse effects in innovation and knowledge (Boschma, 2005). • The regional scale of European Structural and Investment Funds (ESIF) has proved to be a good geographical scale for policy reflection and progressive decentralization of research and innovation policy (Lagendijk 2011, Bachtler et al. 2003)

4 A comparative analysis of university governance and their involvement in Regional policies

4.1 Methodological approach

In order to examine the universities governance framework as described in the previous section, 74 universities form the current sample representing, to the extent possible, the European university landscape. Out of 28, 20 EU member states are represented in the sample, with 37 universities based in EU15 countries and 37 others in EU13 countries (countries who joined the EU after 2004). Universities have been selected⁵ by a pool of national experts contracted by the JRC Research and innovation observatory⁶.

The governance of university and its link with regional policies is scrutinized with a threefold approach:

- *The survey containing 19 questions spread into 6 blocks corresponding to the 6 dimensions of the governance (see questionnaire in annex 1), to help understand which governance principles have been widely implemented. All universities are assigned with a governance index score serving as information to address improvement challenges and as a comparison framework (see scoring table in annex 2). Questions considered within the overall survey are intended to be not so much conceptual or answerable based on interpretation, but rather concrete and implementable.*
- *To complement the survey and assess the regional dimension of the University, we measured the alignment of universities activities in the EU Horizon 2020 programme and the Smart specialisation areas chosen by the region where the university is based. A specialisation alignment index score⁷ is assigned to each university.*
- *More qualitative information derived from the RIO annual country reports extracting key aspects related to higher education reforms and progress in the implementation of RIS3 activities.*

4.2 Main findings

The 74 universities are ranked according to their total governance index score and distributed among 5 groups⁷. The S3 alignment dimension and the link with regional and national policies is not taken into account in the ranking in order to verify whether the external dimension is correlated the 'quality of governance'. Universities are voluntarily kept anonymous. The objective of assigning scores is not to assess the individual performance or the quality of governance of universities but rather to be able to compare them through the same analytical framework. Accumulative governance index scores are ordered according to overall score, and displayed in Table 3, with the annotated university identity, the overall governance score, and the S3 governance scores indicated.

The question of correlation of the quality of governance and the link with local innovation policies appears to be crucial in the period of implementation of S3 across EU regions. The core of this

⁵ The institution must have a legal entity, it must have been established for more than 5 years, it or its faculties must be charged with financial and human resource responsibilities of its organisation, it must be actively engaged in scientific research,

⁶ <https://rio.jrc.ec.europa.eu/>

⁷ 10 universities (AT1,SE3,SE1,FI4,HR4,HR2,IE2,SE2,RO4,SE4) are absent of the ranking due to missing information regarding the internal governance characteristics

implementation as explained previously in this document lies in the continuous dialogue and interaction between local stakeholders among them, of course, universities.

Table 3 Governance index ranking distributed in 5 groups

Group A Very High Governance index score [55-60]			Group B high governance index score [50-55]			Group C Moderate governance index score [45-50]			Group D Low governance index score [40-45]			Group E Very low governance index score [0-40]		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
BE4	60	3	CZ2	54.7	4.5	DE2	49.2	2	DE4	40.9	5	HR3	38.2	1
PT3	60	1.5	LT4	54.3	6	DE1	48.4	1.5	DK5	40.5	7	RO3	37.3	2
UK3	60	3	LT3	54	8	NL4	48.3	7	SK4	40.2	2	BG3	36.2	4
DK2	58	8	LT2	54	7	NL3	48.3	7	SK3	40.2	3.5	ES3	34.8	9
UK1	58	8.5	LT1	54	9	ES2	47.8	5	IT2	40.2	3	BG2	34.5	5
DK4	58	8	IT4	53.8	3	EE1	47.5	1	SK2	40.2	7	SI4	33.8	10
CZ3	58	3	BE1	53	5	HU6	47.3	5	ES1	40	5	RO1	31.7	3
LV4	58	0	DE3	53	4	HU2	47.3	5				RO2	20.9	3
CZ4	58	3	DK3	52.2	8	CZ5	47.2	3						
UK4	58	3	PL4	51.5	3	FI1	47.2	5						
FI3	56.7	5	PL2	50.5	4	IT3	46.8	9						
UK2	56.3	9	PL1	50.5	2	EE2	46.7	4						
BE3	56	0	NL2	50	8	LV1	46.5	4						
IE1	56	9	IE3	50	9	DK1	46.3	8						
LU1	56	5				IT1	46.3	5						
PT2	55.8	4				IE4	45	9						
PL3	55.5	2.5												
LV2	55.5	3												

(1) The 2 first letters indicates the country where the university is based

(2) Governance Index Scores covers the 6 internal governance dimensions with a maximum of 60

(3) S3 scores are listed according to the symbol for the university, with a maximum of 10

Observation 1: Human resources, followed by the financial distribution dimension, show the widest variance among universities surveyed.

The individual governance dimensions are considered of varying importance by different universities, which is reflected in the overall governance index scores. Based the responses to the survey questions, the human resources dimension had the most significant impact on the overall governance scores across universities, followed by the financial distribution dimension (Figure 2). When the governance dimension scores are analysed by calculated standard deviations, across the 5 dimension groups, the two most important discriminating dimensions are, Human Resources and Financial Distribution (Dimension C and D, respectively). In contrast, only small standard deviations can be observed regarding S3 alignment and the Innovation potential.

The S3 alignment dimension (0.544), followed by the innovative potential dimension (0.705) displayed the lowest standard deviations in scoring (Table 4, Dimension F and G, respectively).

Figure 2 The governance dimension scores in the 5 ranking groups

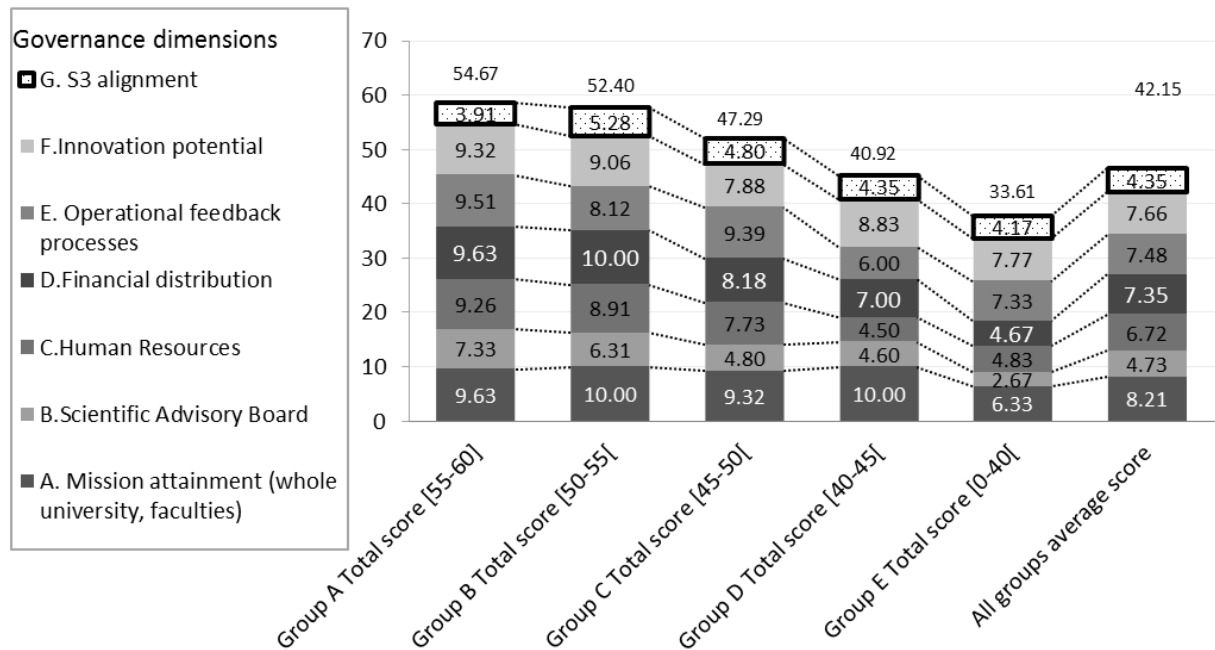


Table 4 Standard deviation of scoring among the governance dimensions

	A. Mission attainment	B. Scientific Advisory Board	C. Human Resources	D. Financial distribution	E. Operational feedback processes	F. Innov potential	G. S3 align.
Std dev Ranking Goup	1.549	1.783	2.247	2.165	1.472	0.705	0.544
Average score	8.208	4.729	6.723	7.353	7.483	7.661	4.377

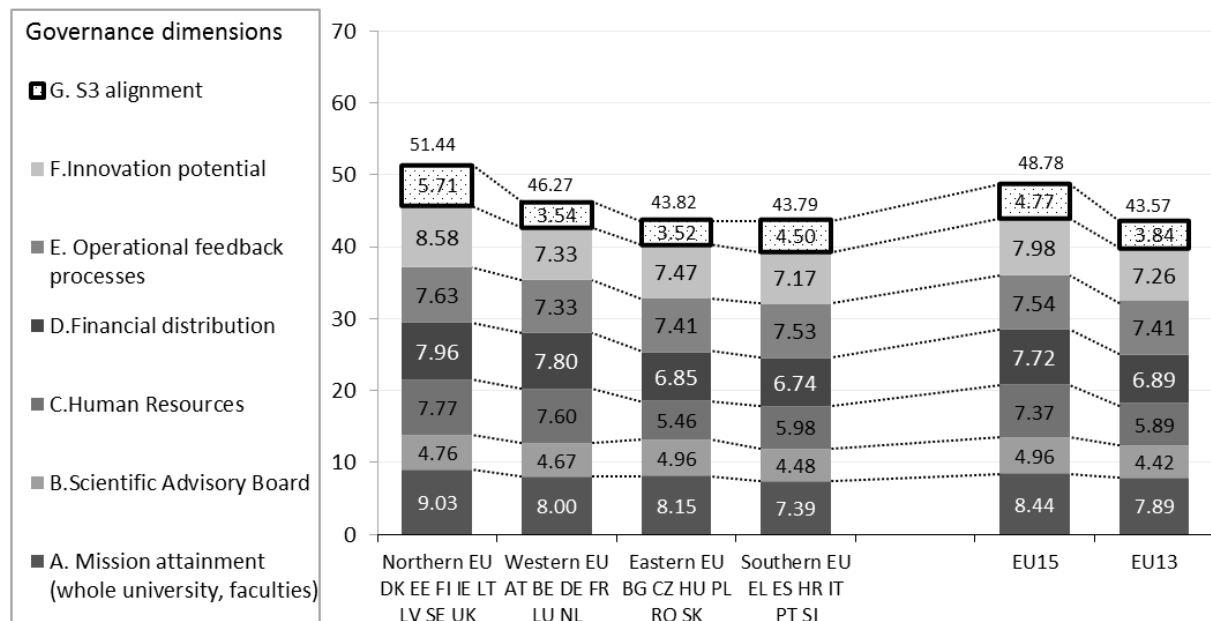
Policy implication: The Mission attainment dimension reflected mostly by the publication of annual report is implemented by most of the universities in Europe, however the dimensions related to human resources and management of financial resources are differentiating factors within the overall governance systems. These two dimensions are in many cases, strongly linked to the national legal framework, allowing universities little flexibility to act directly on these governance aspects.

Potential action: National governments could act to modify the legal framework in order to give more flexibility in terms of human resource management (recruitment and motivation of researchers in their career progression) and financial distribution (eg. incentives, rewarding processes).

Observation 2: Governance index score for universities segregate according to geographic location: Northern and Western European Universities score higher than Eastern and Southern European universities.

After examining the quality of governance in ranking universities, the governance scores were analysed according to micro-regional geographical location. Two different regional distributions were considered: the first, comparing "old EU members States" (EU15 countries) with the "new EU member States" (EU13 countries), and second, dividing the EU in 4 geographical zones, northern, southern, eastern and western EU.

Figure 3. The governance dimension scores in the 4 geographical areas and in the EU15/EU13 groups



Both approaches could be further tuned and contain disparities among countries due to different political and historical heritage, different sizes of countries, and various levels of economic development. It is also important to mention that not all EU countries are represented in the sample due to lack of availability or enough reliable information.

Standard deviations show the spread among groups of countries. It reveals significant differences according to governance dimensions. The governance dimension on organisation order (annual report and qualitative measures to assess the organisation) is the dimension where the differences between groups of countries are the lowest with a high average (Table 5). It suggests that universities of most of the countries covered by the analysis have annual reports available. On the contrary standard deviation on the dimension concerning independent scientific advisory board (SAB) shows homogeneity between groups of countries but with a low average score. It suggests that many universities independent of their geographical localization are not equipped with independent SAB.

Table 5 Standard deviations of governance score by dimensions according to geographical groupings

	A. Mission attainment	B. Scientific Advisory Board	C. Human Resources	D. Financial distribution	E. Operational feedback processes	F. Innov potential	G. S3 align.
<i>Std dev Geo Area</i>	0.677	0.201	1.155	0.632	0.134	0.640	1.035
<i>Std dev EU13/EU15</i>	0.392	0.379	1.048	0.587	0.094	0.511	0.655
Average score	8.208	4.729	6.723	7.353	7.483	7.661	4.377

*Higher standard deviation are highlighted to help the understanding of the table

When looking at geographical areas, it is not surprising to see northern and western geographical groups having the highest governance scores. It is also expected that the EU13 countries group, corresponds more to the southern and eastern country areas, and the EU15 countries group to the northern and western areas. Nevertheless, due to the limited number of universities per countries it is difficult to make any overly generalized conclusions at national levels. For instance, within the southern EU group, Slovenia, Portugal and Italy are above the group average, whereas Croatia and Spain are below their group average.

Policy implication:

- a) *Southern and Eastern European universities are lagging behind their counterparts from Northern and Western Europe due mainly to lower autonomy in terms of human resources and financial distribution.*
- b) *Northern European universities seem to be better equipped for innovation (IPR, internal support such as Grant office etc.)*

Potential actions:

- a) *Enlargement autonomy of universities in terms of HR and finance allocation could be taken at national level.*
- b) *Better support inside universities should be provided to researchers to enable the transfer of good practices from northern EU universities to their EU counterparts.*

Observation 3: The involvement of universities in the implementation of S3 seems not to be directly linked to quality of governance

There is an interest in analysing correlation between the quality of university governance and their involvement in S3. The initial assumption would be that universities scoring higher within this governance index would have a higher involvement in S3, as the participation in regional policy would require a more strategic approach of the university role in its research and innovation ecosystem, and presumably more advanced governance system in practice. The link between universities strategies and their involvement in regional policies is seen is assumed to be vital. Moreover, according to experts' feedback, universities which are well established with high international reputations feel less need to connect with their local territories and regional S3 strategies than the other less regarded universities.

Some recent research on the universities' involvement in S3 has shown that in an increasingly global scenario, the influence of universities transcends their geographical area, but that should as well balance their global perspective and regional engagement (Campillo et al, 2017). However the data

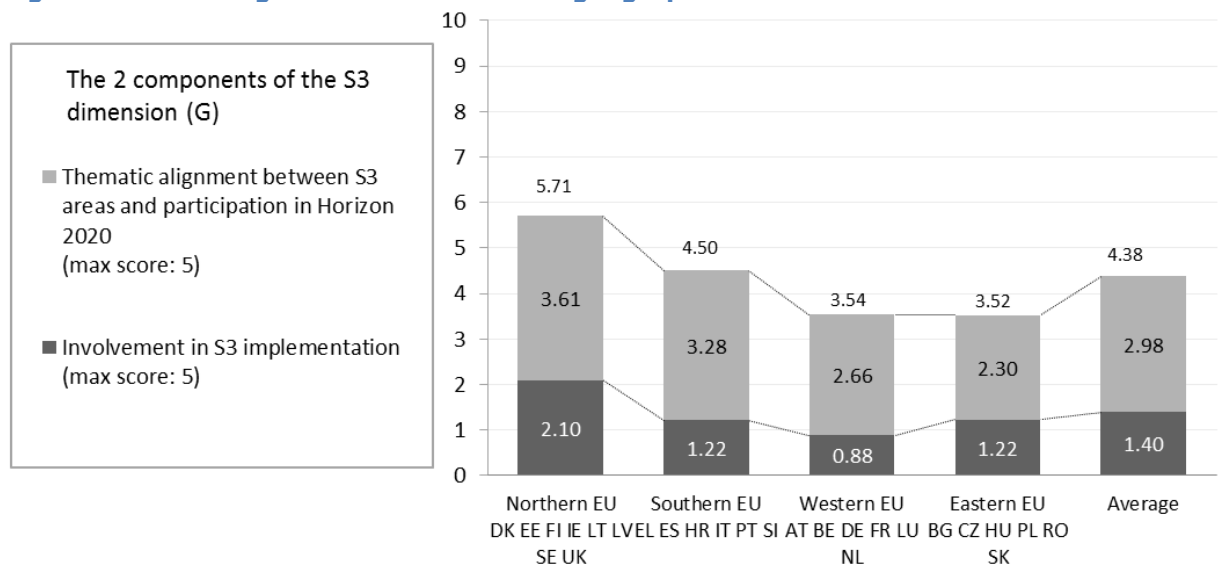
collected for the universities participating in this analysis diverge from this initial assumption. This could be potentially related to the fact that universities with stronger governance scores are better positioned internationally, and feel less concerned by their regional context and challenges. The fact that the higher ranked universities on governance are the ones less connected to their territorial R&I priorities could potentially indicate that those universities depend less on local funding and more on international attraction of researchers and students. Their strategy is more internationally oriented and thus responding to regional needs and connecting their activities to the local research and innovation ecosystem is less of a priority. However, we should be cautious about the interpretation of these preliminary and non-conclusive results.

Policy implication: The presence of standardised governance tools are not correlated with the commitment to regional policies. When observing the origins of universities, other factors are involved in the link between the universities and regions (international reputation, geographical origin, and, national R&I strategies pushing universities to commit to S3 governance mechanisms).

Potential action: The entrepreneurial discovery process (EDP) is not always reflected in the governance system. Ad hoc committee acting as an interface between the university itself and territorial level could be part of the governance system and should appear consequently more clearly in the governance.

Observation 4: When looking at the origins of universities, northern and southern European universities seem to be more involved in S3 implementation than western and eastern ones.

Figure 4 The S3 alignment scores in the 4 geographical areas



A more detailed look to the S3 alignment of universities, disaggregating the two factors considered within the chosen external dimension related to S3, and by geographical zones can provide us with some further insights. The disaggregated data across zones on the thematic alignment between S3 and participation in H2020 and the university involvement in S3 shows (Figure 4) that EU Northern area has the greater thematic alignment between S3 areas and H2020 participation. Even if there

are important differences across the countries within the Northern EU zone, we find among them some of the most mature research and innovation systems, as well as high scoring on university governance. This could explain the high involvement of universities in the S3.

The Western EU zone is characterised by the lowest involvement of universities in S3 as well as low alignment of S3 priorities with H2020 (Figure 4). This result is quite unexpected considering some recent policy developments in the countries within this group. For example, in the case of Belgium the key role in the S3 played by the strategic research centres (SRC's) in Flanders bridging fundamental and applied research in four key areas. However, even if the SRC link with universities is crucial for the Flemish innovation system and these are well integrated in the R&I system (Kelchtermans et al), this doesn't seem to be reflected in the universities being part of the S3 governance bodies. In the case of France, the universities play a role in this process as shown by the "politiques de site" implemented at regional level that aim to encourage scientific partnership and cross-fertilization between universities, research institutions and other innovation operators in a given area (Levratto et al, 2018). The ongoing Pacts for Research and Innovation and Pact for Higher Education and Excellence Strategy in Germany show the commitments of both Federal and Länder governments to excellent science and research (Sofka et al, 2018). In the case of The Netherlands, "universities play an important role in S3 on both the program level and project level. They partake in steering committees, advisory groups and governing bodies in the regions but are also important players in many projects financed by ESIF and Horizon2020. In many consortia, they take a leading and coordinating role and function as drivers of the developments"(Van den Broek et al, 2018).

Policy implication: S3 governance mechanisms are better embedded in Universities with strong governance tradition but the absence of formal link between universities and S3 does not mean that no link exists.

Potential action: S3 strategy as a component of territorial policy should appear in the University governance mechanism. This recommendation is particularly valid considering that S3 approach will be maintained and emphasized during the new financial framework 2021-2027.

Observation 5: Eastern European universities are not particularly connected to S3 strategies, although these regions (and countries) are the primary beneficiaries of ESIF.

The Eastern EU zone is the lowest scoring in thematic alignment between S3 areas and H2020 participation, probably indicating the lack of experience in H2020 programme and difficulties to access international research networks (Conte and Ozbolat, 2016) . This could indicate a high dependence of universities on national funding, lack of positioning at international level and therefore the need to have a progressive good alignment with S3 areas in order to ensure the absorption of ESI funding. The governance score is particularly low in this group of countries. Nevertheless most of them have identified university governance reforms as a key aspect to progress on the evolution of their research and innovation system. Good examples can be identified in Bulgaria, where there has been a gradual progress on HEI differentiation and changes in the model for financing public research organizations (PROs), but the differentiation needs to be improved, so that HEI and PROs are rewarded for R&D performance. Recent policy developments are moving towards the financing for scientific research dependent on the results from the

application of scientific performance indicators (e.g. publications) and could reach positive evolution in the future (Todorova and Slavcheva, 2018).

The Czech Republic has addressed several attempts to reform the HE system, with the availability of qualified human resources in the labour market being one of the major bottlenecks for the success of the new research centres and infrastructure projects (Shrolec and Sanchez-Martinez, 2018). Hungary has increased public support to cooperation between business and academia as a high priority of STI policy in Hungary that resulted in a number of positive developments. The update of the higher education strategy in 2017 foresees important changes in the third mission activities of the HEIs and puts more emphasis on the socio-economic role of HEIs (Dóry et al, 2018). This might have a direct impact on the involvement in RIS3 governance system and the SAB integration.

A further issue in addressing the low level of alignment of S3 in the Eastern EU group, include the inability to address the multi-scalar actors needed to implement the S3 strategies. On the one hand, the notion of address regional authorities in policy discussions is of key importance, however the main sources of programmatic financing is with the national authorities. Thus, an understanding of the national-regional dynamics is crucial. Additionally, the HEI would be one of main implementers of S3 actions, however their input has not been guaranteed. Moreover, the divide between university or institutional authorities and the support staff within these institutions, would need to be bridged in order for S3 strategies to be executed. Effective S3 governance would need to address the multi-scalar aspects, even within a region where trust is not insured.

Policy implication: S3 strategies should play a role of synergy facilitator between ESIF and Horizon 2020 and Universities. Recognition of the divide between the multi-scalar actors within the Eastern EU region is paramount. Engagement of representatives of national, as well as regional authorities, in addition to HEI and their implementation actors would be necessary. As this study shows, some HEI have a low level of governance practices and the ability to implement activities throughout the organisation is a challenge without governance safe-guards in place.

Observation 6: Presence of governance tools does not always mean implementation

"Usual suspects" can be easily identified in the highest part of the ranking list (see Table 3 Governance index ranking distributed in 5 groups) such as UK, Danish, Finnish or Belgian universities but some others are not really expected to be so high in the ranking list (eg. some Latvian, Polish, Czech and Portuguese universities). It is nevertheless important to highlight that index scores may not fully correspond to the reality. Index scores are based on estimated values, or proxies that reflect a governance system, for example, the embedding of various governance tools such as scientific advisory boards, and ethics committees which may be in place, but are not really implemented. This distinction of the presence of key committees, and their actual functionality may explain the high governance scores of some 'unusual suspects'.

The quality of governance system does not mean an automatic link between the university strategy and local regional policies such as S3. A first observation of governance scores shows that other factors obviously need to be taken into consideration.

Policy implication: Having in place governance tools does not mean automatically real implementation according to experts' feedback.

Potential actions: The real implementation should be checked and embedded in the overall assessment of quality of governance in order to control whether some governance tools exist, and are indeed implemented.

5 Concluding remarks

The HEI governance framework proposed addresses some of the key challenges and tensions faced by universities in respect to their involvement in S3. The proposed framework could be used as guidance both for policy makers and universities. On the one hand, policy makers could consider how the framework contracts between government and university, as well as ESIF calls could be shaped and monitored to incentivise universities steering governance changes driven towards a more decisive engagement in territorial development. On the other hand, universities could consider the way in which S3 and territorial issues could be better embedded into the three university missions (see [Figure 1](#), education, research, societal/economic), as a way to become more active contributors to R&I policymaking.

Governance practices are thought to be one of key tools to steer HEI and thus, performing a preliminary survey of governance dimensions, coupled with RIS3 alignment, has provided a significant set of data from across EU member-states.

It would have been expected that the S3 strategies design and implementation as defined in the EU guidelines would be more reflected in universities governance. However, our analysis shows that universities with the best governance system are not always involved in local Regional innovation policies. Universities face well known tensions as they are located within the context of a city, region or country driving to certain autonomy in terms of governance but they depend on national funding and regulations. The source and conditions of university financing for education, research, and societal and economic engagement activities can greatly influence the outcomes of activities. Many of the guidelines which govern university policies are influenced by the national context, however the programmes financed by regions and cities can help focus activities, as long as the demands on outputs are not misaligned.

Policy recommendation 1- Global/International orientation of universities could be balanced with local engagement, through adequate ESIF/nationally funded programmes, i.e. collaborative university-business projects, Industrial PhDs, etc.

Universities could better integrate S3 and territorial engagement dimensions in their governance system, not only in their third mission but also in the education pillar, better responding to the skills and competences needed in the region.

Policy recommendation 2- Universities can be key actors in feeding the pipeline of projects to be funded under S3 with excellence and internationally driven projects, that helps reinforce the R&I system and integrate in international value chains

The survey aiming to test the analytical framework has provided expected but also unexpected results, showing a map of European universities that closely resembles the European innovation divide. As expected, Northern and Western European universities are doing better in the five governance dimensions (eg. transparency, ethic, openness on the societal challenge, innovation). In contrast, Southern and Eastern European universities seem lagging behind due mainly to two interlinked governance components: Human resources and financial distribution. In most of the cases, those two dimensions are strongly dependent on the national legal framework ruling for

instance the civil servant career, the allocation of funding or type of contracts allowing little room for the flexibility of universities to reform their own governance systems.

Policy recommendation 3- Addressing the pending national HE reforms and regulatory frameworks in EU 13 countries could help address the observed innovation divide in university governance,. The reforms could address researchers' incentives and reward systems leading to stronger university contribution to regional growth and increased integration in EU networks.

On the other hand, even if governance components related to first "Mission attainment"(eg. publication of annual reports), the existence of independent scientific advisory boards and ethical committees seem to have a large acceptance among most universities. Nevertheless, the statement of introducing governance changes does not necessarily entail their implementation. In some cases governance tools have been put in place with the main purpose of reaching international standards, tough without ensuring the implementation in practice.

Policy recommendation 4- Introducing stronger monitoring system and result-oriented financial frameworks for universities could help to better evaluate the fulfilment of governance requirements. In addition specific recommendations to universities for progressive adoption and strengthening of governance dimensions could be beneficial.

Another important outcome of the analysis is related to the apparent disconnection of university governance with the territorial (or national) innovation policies, more precisely Smart Specialisation Strategies. This disconnection may have various explanations. The first one could be the novelty and experimental approach of the S3 concept, with no certainty whether this approach would be renewed or not in the next the programming period 2021-2027. A second explanation could be the territorial level at which the S3 is implemented. Except Poland, the S3 are implemented at national level in EU13 countries, becoming challenging the implementation of an entrepreneurial discovery process (EDP) at regional level involving universities despite being among the main beneficiaries of ESIF.

Policy recommendation 5- The consideration of S3 multi-level governance coordination aspects and particularly the setting up of the governance system could help addressing such challenges of different geographical levels involved in R&I policy making

University is a key player in the local R&I system, particularly when looking into the multi-level coordination of research and innovation policies (EU, national, regional, local). Better embedding S3 in universities governance systems could be crucial in strengthening the strategic access to funding and in emphasizing synergies between ESIF and Horizon 2020. Making the most out of the university researchers international networks and importance of international recognition, could be particularly relevant for Eastern EU countries (New member States mainly), which are finding challenges to access Horizon 2020 programme funding, frequently under-used and not considered as an important funding source to increase R&I system capacities.

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Annexes

Table 3 Overall survey questions and response modalities

Internal governance dimensions	
A. Mission attainment (whole university, faculties, institutes)	Response A
1. Is an annual report published?	Yes/No
2. Are qualitative measures used for target assessments for the organisation?	Yes/No
B. Scientific (Specialization/Technical) Advisory Board (ie. SAB)	Response B
3. What percentage of the SAB is independent of the management of the organisation in which they serve?	>90%, >50%, >10%, 10-0%
4. Are there processes for implementing decisions taken by the SAB outlined?	Yes/No
5. Are the minutes of Boards proceedings made available to the members of the organisation?	Yes/No
C. Human Resources	Response C
6. Is there a merit-based career path for scientists?	Yes/No
7. Are individual performance goals determined regularly?	Yes/No
8. Are performance incentives established and documented?	Yes/No
9. Is the performance assessment connected to a transparent reward structure?	Yes/No
D. Financial distribution	Response D
10. Are the financial allocation rules established and available to the organisation members?	Yes/No
11. Are financial allocations based on merit-based criteria?	Yes/No
E. Operational	Response E
12. Is there a body addressing rules grievance (ethics committee)?	Yes/No
13. Are the outcomes of ethics committee meeting available to the organisation members?	Yes/No
F. Innovation potential	Response F
14. Does the university have a policy on Intellectual Property ownership?	Yes/No
15. Does the university have a policy on licensing of its intellectual property?	Yes/No
16. Are innovative activities (ie. patenting, commercialization, spin-offs) taken into account in the scientific merit-based review?	Yes/No
17. Does the university have access to professionally trained personnel to manage its commercialization activities?	Yes/No
18. Does the university have as part of its stated mission collaboration with innovative companies within the private sector?	Yes/No
19. Is there a framework to introduce science students to the activities of the innovative companies within the private sector?	Yes/No
External governance dimensions linked to the implementation of RIS3	
G. RIS3 and regional involvement	Response G
20. Is the university involved in the RIS3 governance mechanism (steering committee, working groups, etc)?	Yes/No
21. Does the university implement specific measures or adapt its own research strategy to better stick to RIS3 strategy?	Yes/No
22. H2020 alignment with RIS3 areas. Does the university activities in Horizon 2020 correspond to the thematic areas chosen in the RIS3 strategy?	See alignment calculation, Table 3 Section G'

Scoring of dimensions A-F were adjusted to equal weigh to each of the 6 dimensions. A maximum score of 10 is given for each dimension with a maximum of 60 for the total of "internal" governance score. The "external governance score is composed of questions in the survey regarding the

involvement of universities in RIS3 governance mechanism and an "in-house" indicator to estimate the degree of alignment of university research activities in Horizon 2020 with the smart specialisation areas chosen by the Region.

Table 4 Scoring methodological approaches

Dimensions	Scoring Methodological approach
A. Mission attainment (whole university, faculties, institutes); Score A	For each "yes" answer to a question a score of 5 is received. Each "no" a score of 0 is received. A score of 10 is maximum.
B. Scientific (Specialization/Technical) Advisory Board (ie. SAB); Score B	For question #3, >90% receives a score of 3, >50% receives a score of 2, >10% receives a score of 1, and 10-0% receives a score of 0. For each "yes" answer to question #4 and #5 a score of 2,5 is received for each question. Each "no" a score of 0 is received. A score of 10 is maximum.
C. Human Resources; Score C	For each "yes" answer to a question a score of 2,5 is received. Each "no" a score of 0 is received. A score of 10 is maximum.
D. Financial distribution; Score D	For each "yes" answer to a question a score of 5 is received. Each "no" a score of 0 is received. A score of 10 is maximum.
E. Operational; Score E	For each "yes" answer to question #12 a score of 6,66 is received. For each "yes" answer to question #13 a score of 3,33 is received. Each "no" a score of 0 is received. A score of 10 is maximum.
F. Innovation potential; Score F	For each "yes" answer to a question a score of 1,66 is received. Each "no" a score of 0 is received. A score of 10 is maximum.
<u>Overall internal governance Score</u>	This score covers the internal governance characteristics of Universities. It is the sum of Scores A, B, C, D, E and F, The maximum Score is 60
G. RIS3 and regional involvement; Score G	For a "yes" to question #21 a score 3 is received, and a score of 2 is received for a "yes" to the question #22. Each "no" a score of 0 is received. A score of 5 is maximum. The activity of the university in thematic areas of Horizon 2020 ⁸ is compared to the specialisation areas chosen in RIS3 strategies ⁹ by regional and/or national authorities. The score assigned corresponds to the % of coverage of H2020 university activity with the RIS3 implemented on their territories.
G'. H2020 alignment with RIS3 areas; Score H	0%<=x<20%-> score= 1 20%<=x<40%->score= 2 40%<=x<60%->score= 3 60%<=x<80%->score= 4 80%<=x<=100%->score= 5 In case of Regional and National RIS3 strategies, an average of Regional and national score is assigned. A score of 5 is maximum.
<u>Overall External University-RIS3 governance Score</u>	<i>This score covers the external governance characteristics of Universities. It is the sum of Scores G and G'. The maximum Score is 10</i>

⁸ H2020 grant database May 2017 version. H2020 thematic areas considered: EU211 Information and Communication Technologies, EU212 Nanotechnologies, Advanced Materials and Production, EU213 Advanced materials, EU214 Biotechnology, EU216 Space, EU31 Health, demographic change and wellbeing, EU32 Food security, sustainable agriculture and forestry, marine and maritime and inland water research, EU33 Secure, clean and efficient energy, EU34 Smart, green and integrated transport, EU35 Climate action, environment, resource efficiency and raw materials, EU36 Europe in a changing world - inclusive, innovative and reflective Societies, EU37 Secure societies - Protecting freedom and security of Europe and its citizens

⁹ Regional and national specialisation areas are extracted from Eye@RIS3 web platform: <http://s3platform.jrc.ec.europa.eu/eye-ris3>

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