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RESEARCH ARTICLE



Organizational patterns of RRI: how organizational properties relate to RRI implementation

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ABSTRACT

In this article, we explore the connectedness of Responsible Research and Innovation (RRI) profiles and organizational properties of 188 European higher education institutions (HEIs). Empirically we identify three distinct clusters of HEIs in terms of their RRI profile. One cluster is characterized by low RRI uptake, while the other two employ a range of RRI policies and procedures related to gender equality, ethics and public engagement. We find that the RRI active clusters were organizationally very alike, characterized by a rather high degree of research intensity and impact, multi-disciplinary orientation, active participation in Horizon 2020, and by being larger than the RRI passive cluster. We discuss how insights from established theory about change in organizations can be used to explore these similarities and differences.

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Responsible research and innovation; institutional change; higher education institutions; RRI profiles

Introduction

Over the last decade, the notion of Responsible Research and Innovation (RRI) has emerged as a powerful agenda for change of research structures and practices. Championed by the European Commission (EC) and funded through its funding programme for research and innovation, Horizon 2020 (H2020), numerous projects have been launched to support the conceptual development of RRI, to examine the means and measures to foster RRI and to identify indicators and metrics to capture processes of change towards RRI (Zwart, Landeweerd, and van Rooij 2014; Burget, Bardone, and Pedaste 2016). A significant number of projects have fielded practical experiments to enhance RRI across organizations in Europe and beyond (Delaney et al. 2020).

The important role of organizations in driving processes of change is recognized, e.g. in the 2014 Rome Declaration on Responsible Research and Innovation in Europe, produced under the auspices of the Italian EU presidency. Dynamics within organizations are decisive for institutionalizing responsible practices in research and innovation (Rip 2016). In order to foster a new kind of research practice in which inclusion of societal stakeholders invokes a much more serious commitment to societal values and needs,

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organizations need to change their governance arrangements. Policies and procedures to promote interaction should be in place, incentive structures should be aligned with the objectives, and hindrances should be identified and reverted. The focus on organizational change is captured well in the EC key performance indicator for the Science with and for Society programme, which counts the ‘percentage of research organizations funded implementing actions to promote Responsible Research and Innovation, and number of institutional change measures adopted as a result’ (Delaney and Iagher 2020).

The RRI ‘community’ of researchers and practitioners has come a long way in facilitating organizational change and establishing a knowledge base about institutional change processes. ‘Remarkable change processes have been initiated; signalling a potential deeper institutionalisation of RRI principles and practices into organisations and national level policies’, as noted in the recent Joint Declaration on Mainstreaming RRI across Europe (Gerber et al. 2020). A considerable part of this effort has been concerned with the micro-level, i.e. studies or implementation projects at the level of individual organizations, releasing important insights about the dynamics of RRI uptake and prioritization in local contexts.

There are, however, underexploited potentials both theoretically and empirically for moving studies of RRI implementation within organizations further onwards. First, as noted recently by Owen et al. (2021), efforts to connect with institutional theory have been surprisingly modest. Second, on the empirical level, few studies have had sufficient scale to enable analyses across organizations. Lack of quantitative studies reduces the ability to assess general patterns in how organizational properties tend to shape the propensity for engaging with the idea of RRI or how organizational profiles relate to the choice of policies and implementation schemes for promoting responsible practices in research and innovation.

For the continued efforts to mainstream institutional commitment to responsible research practices across Europe, we believe it to be important to open up the ‘black-box’ of factors that influence the way in which organizations capture and translate ideas of RRI into practice. Deep qualitative studies of specific cases are required, but there is also a need for examining these issues through quantitative approaches. In a context where the EC seems to be adjusting its focus towards a somewhat different transformative agenda of ‘Open Science’ (Shelley-Egan, Gjefsen, and Nydal 2020), hence leaving the future (budget) of its RRI efforts uncertain (Simone 2018), understanding how organizational properties relate to RRI uptake and implementation might offer a better platform for targeted, effective actions.

In this paper, we aim to contribute to the exploration of patterns of organizational implementation of RRI in two ways. Theoretically, we will connect the work on RRI and implementation of this policy idea with insights from the literature on changing higher education institutions. When studying higher education institutions (HEIs), new institutional theory has for decades been a vital theoretical framework. Within this framework, HEIs are most often described as the quintessence of highly institutionalized organizations, meaning that their structures, norms and belief systems are so stable and set, that they are almost idealized. Concepts such as *isomorphism* (DiMaggio and Powell 1983), *decoupling* (Meyer and Rowan 1977) and *organized hypocrisy* (Bruns-son 1986) have allowed for analyses of how universities and other HEIs resist change efforts, e.g. by detaching strategy from practice. Newer theoretical developments have

explored why change nonetheless do occur in HEIs, by examining how they cope with work to translate new policy ideas into their existing institutional setup (Czarniawska and Joerges 1996; Czarniawska 2009). In this paper, we specifically use the concept of isomorphism to catalyze the general assumption that HEIs operating within the same organizational field would tend to become similar, and thus would also integrate the idea of RRI in similar ways in order to remain legitimate within their field.

Empirically, we will combine selected datasets to construct the RRI profiles, i.e. distinct combinations of organizational policies and procedures supporting RRI, of 188 HEIs and relate these profiles to organizational properties such as size, research-intensity, and funding-base. Following the argument of isomorphic adoption among similar organizations, our expectation is that similarity in terms of organizational properties like size, research-intensity, and funding-base on the one hand will correspond with similar RRI-profile, i.e. the organizational implementation of policies and procedures supporting RRI, on the other hand. The analysis offers an early, descriptive attempt to detect patterns based on available secondary data, which can pave the way for fine-tuned future studies.

In the following section, the theoretical perspective and the central concepts are further described, and we present our approach to capturing both general organizational differences and RRI profiles specifically. The following section outlines the concrete methods and data employed in the analysis. Results are subsequently presented and discussed. The overall goal of the paper is to contribute to understanding how organizational properties relate to RRI implementation.

Concepts and approach

The conundrum of stability versus change has long been the focus of interest in mainstream organizational theory, particularly the branches concerned with highly institutionalized organizations, such as higher education institutions and universities in particular.

Proponents of institutional theory, which represents a specific branch within the broader landscape of organizational theory, has often had HEIs as their focus, e.g. Cohen, March and Olsen's (1972) seminal work on the garbage-can model of organizational choice, or Meyer and Rowans conceptualization of formal structures as myth and ceremony (1977). To many scholars of institutional theory, HEIs are seen as the quintessence of institutionalized organizations, e.g. organizations that operate in strong institutional environments, thus needing to respond to demands for legitimacy and 'rationalized myths'. One of the key contributions of (new) institutional theory was to provide alternative explanations to organizational behaviour than the rational models of the time.

Organizational change has within this theoretical approach been conceptualized as processes of adaption to unstable environments through isomorphic processes. Isomorphism describes the process wherein organizations within the same field adopts similar structures or processes, as a result of coercive, mimetic or normative pressures (DiMaggio and Powell 1983). Coercive isomorphism takes place when organizations change in response to e.g. governmental requirements or mandates, but also emerges in more subtle ways through:

formal and informal pressures exerted on organizations by other organizations upon which they are dependent and by cultural expectations in the society within which organizations function. Such pressures may be felt as force, as persuasion, or as invitations to join in collusion. (DiMaggio and Powell 1983)

Mimetic isomorphism occurs in situations of uncertainty, where an organization tends towards imitating seemingly successful or powerful organizations within the field. DiMaggio and Powell mentioned for instance the speed of technological development as a vital source of uncertainty, and indeed stated that the *ubiquity of certain kinds of structural arrangements can more likely be credited to the universality of mimetic processes than to any concrete evidence that the adopted models enhance efficiency* (1983), again pointing to legitimacy being a more vital explanatory factor than rationality.

Normative isomorphism is the final version, and one which is assumed to stem from professionalization. Increasing professionalization is assumed to drive isomorphism as professionals e.g. form networks *that span organizations and across which new models diffuse rapidly* (1983). These professionals thus bring organizational models or processes with them as they move across organizational borders; models that they through their formal education and academic knowledge base have come to view as legitimate and appropriate.

In practice, these types of isomorphism are intertwined and rarely occur in one pure form. The common denominator, however, between these three forms of isomorphism is that they are institutional – and therefore concerned with legitimacy. The common assumption is that organizations are occupied with legitimacy, rather than driven by rationality. As DiMaggio and Powell point out: *Organizations compete not just for resources and customers, but for political power and institutional legitimacy, for social as well as economic fitness* (1983).

Following this, another key insight is that isomorphic tendencies are most often only seen in the formal structures and not in the actual processes of the organizations; a phenomenon described as ‘ceremonial implementation’. Isomorphism may, however, provide an initial frame of reference, which would give rise to an assumption that HEIs operating within an organizational field would tend to become more and more similar, and thus also integrate the same ideas on RRI in order to remain legitimate within their field.

To explore this, we have analysed the organizational properties of a sample of European HEIs and how they relate to their specific RRI-profiles. As stated in the introduction, we take the concept of RRI-profiles to denote the distinct organizational combination of policies and procedures supporting RRI. It should be noted in this regard that our approach to delineating profiles is data-driven. Rather than offering a theoretically based profile of organizations’ RRI policies and procedures, we derive an empirical typology from our dataset. We also note that while a number of influential conceptualizations of RRI currently coexist (cf. Ribeiro, Smith, and Millar 2017), the notion of RRI applied here aligns with the EC’s operational approach to RRI, due to the character of the data we rely on. The EC highlights gender equality, science literacy, public engagement, ethics, and open access as key areas of concern related to RRI (European Union 2012), but does not, e.g. capture recognized process dimensions (cf. Stilgoe, Owen, and Macnaghten 2013).

We compare RRI profiles with other organizational properties to examine the theoretical expectation that organizations with similar RRI policies and procedures are indeed also similar on other characteristics. These ‘general’ properties include size, research intensity (balance of research and teaching), research orientation (mono- or multidisciplinary), research impact, and funding base (specifically H2020 funding). These are organizational properties that are often used to describe and differentiate HEIs and could be related to the uptake of RRI ideas. In the context of the ‘RRI Practice’ project (Wittrock et al. 2021a), in which 24 research performing and funding organizations were cross-analysed to examine RRI implementation, such properties as size, research orientation, and funding were demonstrated to be of relevance towards the dynamics of embedding RRI in organizations (Wittrock et al. 2021b).

Methods and data

We took a two-step approach to exploring the relatedness between institutional adoption and implementation of RRI on the one hand and other organizational properties on the other hand. First, we performed a cluster analysis with the aim of identifying groups of HEIs with similar RRI profiles on the basis of their responses to the 2015 ‘Monitoring the Evolution and Benefits of Responsible Research and Innovation’ (MoRRI) survey, and second we analysed the extent to which specific RRI profiles relate to the organizational size, research characteristics and degree of funding from H2020. The analyses include a set of 188 HEIs that completed the MoRRI survey and involved data from three complementary sources: the European Tertiary Education Register (ETER), an enhanced version of Web of Science, and the EC’s Community Research and Development Information Service (CORDIS).

The MoRRI survey

Created with the purpose of monitoring RRI at the European Member state level, the MoRRI project (Peter, Mejlgaard, and Bloch 2018) used a survey administered to high-level representatives of HEIs to examine the policies and procedures related to the key areas of RRI emphasized in the EC operationalization: gender equality, open access, public engagement, science education and ethics. In the context of the MoRRI project, only results aggregated to the national level were reported (e.g. Mejlgaard, Bloch, and Madsen 2019). Here, we use the initial, meso-level data from the organizational level.

For the purposes of this specific study, 12 questions from the original survey instrument were selected. These relate to specific policies and procedures put in place by organizations and relating to the key areas of RRI. The selection of questions applied for our analysis was based on two main criteria. The first criterion was about specificity: does the question relate to concrete policies and procedures that the respondent can expectedly be able to answer with a high degree of precision? Hence, questions relating to the respondents’ subjective evaluation of strategic emphasis on the one hand and complicated questions about specific actions that would have required that activities had been meticulously documented on the other hand were left out. The second criterion related to the proportion of non-responses and ‘do not know’ answers, under the

assumption that when organizations choose not to answer or respond that they do not know, it is because they do not have the knowledge or adequate records to respond. We opted to include only items with high response rates. The survey was sent to 1479 *European higher education institutions*, 259 respondents initiated the survey while 188 organizations completed the survey to an extent that could be used for the present analysis. The low response rate means that care should be taken in drawing hard population inferences. The country level response rate varied considerably and we cannot exclude the possibility that certain types of HEIs were more prone to either non-responses or non-completion. We argue, however, that for the explorative purposes of this paper the composition of the sample has only a minor influence on the analysis as we do not attempt to draw inferences about group sizes.

The resulting list of 12 questions do not fully exhaust the six EC key areas. They cover gender equality, open access, ethics, and public engagement, while no questions directly addressed the issue of science education. The 12 questionnaire items that were used for the cluster analysis to determine empirical RRI profiles dealt with the existence of concrete policies and procedures for promoting gender equality (e.g. an organizational gender equality plan), the presence of organizational bodies dealing with research ethics and integrity, specific policies and incentive schemes for enhancing public engagement activities, and dedication of resources and facilities to open access and open data. The exact wording of the survey questions is provided in [Table A1](#) in the Appendix.

The ETER database

ETER is an effort funded by the EC. It is a database collating information on HEIs in Europe, concerning their basic characteristics and geographical position, educational activities, staff, finances and research activities. In this database, the 188 HEIs that had answered the selected questions in the MoRRI survey were manually identified and the organizational data was downloaded.

Due to gaps in time-series data, we used the latest available data in the period 2011–2015 for a subset of the available variables contained in the database. The variables used for this study is full time equivalent employees, total number of students in the International Standard Classification of Education (ISCED) categories 5–7, and number of students in eleven different subject categories. Variables derived from ETER and used for this study are included in [Table A3](#) in the Appendix.

Web of Science

For each of the 188 HEIs, all articles with an author institution in Web of Science for 2013 and 2016 were identified. Using the CWTS in-house enhanced version of Web of Science, we collected two aggregate citation indicators: mean normalized citation score of all publications (MNCS) and proportion of publications in the top 10% most cited (pp_top10). These variables also figure in [Table A3](#) in the Appendix.

CORDIS

We downloaded information about funding from the H2020 programme and identified all funding obtained for each of the 188 HEIs. Data was obtained from CORDIS, which is

the EC's primary source of results from the projects funded under the successive framework programmes for research and innovation. One variable was created on the basis of the data: the total amount of funding received in H2020 for each of the organizations in euros. It is included in [Table A3](#) in the Appendix.

Results

Cluster analysis

To examine the prevalent RRI profiles of the 188 HEIs, we performed a cluster analysis, which aimed to group HEIs based on their responses to the 12 selected questions from the 2015 MoRRI survey. As illustrated in [Table A1](#) in the Appendix, the responses to the selected questions were coded as 12 binary variables. Two variables relate to the key area of gender equality, four relate to public engagement, two relate to ethics and finally four relate to open access. A principal component analysis was performed on the 12 variables with the aim of data reduction, as some variables correlate highly. We used the principal component analysis method available in Stata with varimax rotation, which identified three components using the Kaiser criterion. The three components are very similar to the EC keys, however, variables related to ethics and gender equality load on one component, implying that having ethics committees and gender equality plans and procedures are highly related in the empirical material. The two other components represent variables related to public engagement and open access respectively. The principal component loadings of the twelve variables are presented in [Table A2](#) in the Appendix.

The cluster analysis is based on three indices that emulate the three components. Using the Wards linkage method (Hair et al. 2010) and the Duda/Hart and Calinski/Harabasz stopping rules (Duda, Hart, and Stork 2001; Calinski and Harabasz 1974), we arrived at three distinct clusters of HEIs illustrated in [Figure 1](#).

Cluster 1, a group of 46 HEIs, is characterized by generally having few policies and procedures relating to RRI. We name this cluster 'RRI-', indicating a relatively low focus on RRI among the HEIs within this cluster.

Cluster 2, consisting of 82 HEIs, is characterized by HEIs that have implemented gender equality & ethics plans and procedures within the organization, have some architecture in place for open access, and relatively low activity when it comes to policies and procedures for public engagement. We name this cluster 'GEE' representing a relatively high focus on Gender Equality and Ethics.

Cluster 3, the last cluster, consisting of 60 HEIs, is characterized by a relatively high level of organizational commitment to both gender equality, ethics and moderate open access commitment relative to the sample in general, but distinguishes itself from clusters 1 and 2 by also having policies and procedures for public engagement in place. We name this cluster 'GEEPE', representing a relatively high focus on Gender Equality, Ethics and Public Engagement.

[Figure 1](#) illustrates the RRI profile for each of the clusters. The values are the average of each index: gender equality and ethics, open access and public engagement.

While the GEE and GEEPE clusters have high scores on the gender equality and ethics index, and GEEPE also on the public engagement index, it is noticeable that all three

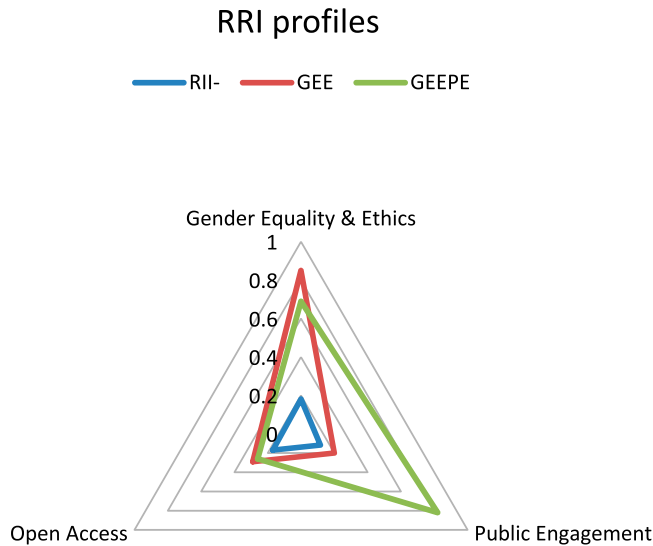


Figure 1. RRI profiles of three-cluster solution.

clusters have rather low scores on the open access index. Particularly, only a very small minority of HEIs have a specific budget reserved for open access publishing and implementation of open data sharing, and less than half of the HEIs covered in this study provide repositories and support for publication and data sharing practices. The RRI- cluster has the lowest level of open access commitment, but the accomplishments are rather modest across the board.

Organizational properties and cluster profiles

In the second part of the analysis, we examine whether and to what extent specific RRI profiles, as defined by the three clusters, relate to general organizational properties of the HEIs. Specifically, we compare the size, research intensity in terms of balance between teaching and research, research impact in terms of citations, research orientation in terms of mono- or multidisciplinary, and H2020 funding base of organizations across the three clusters. We attempt to capture these overall concepts with the best possible indicators. As we know that single indicators have specific limitations we use multiple indicators of a concept when possible.

Arguably, an array of organizational characteristics and logics may influence the way in which the organization works and reacts to external ideas, pressures and policies (Pavie 2019). In this analysis, we choose to look at variables, which are often used to characterize HEIs and have been shown to potentially relate to the uptake of RRI ideas (Wittrock et al. 2021b). In terms of the size of organizations, smaller organizations may be more agile and easier to change on the one hand, but HEIs may on the other hand also require a certain level of capacity and infrastructure to be able to translate and integrate RRI ideas in the organization (Wittrock et al. 2021b). In terms of research intensity, impact and orientation, issues of responsibility in research may overall be considered more salient when there is a strong research component in the organizational

mission, hence leading to increased efforts to adopt organizational policies and procedures fostering RRI. Diversity in research orientation could possibly lead to increased receptiveness to ideas about integration and inclusivity embedded in RRI and provide a more fertile context for engaging with core RRI aspirations for linking research to complex societal challenges. In terms of funding base, H2020 participation could conceivably influence the degree to which organizations adhere to and are exposed to RRI ideas. We use the measure of H2020 funding as an indicator for HEIs' exposure to and potential reliance on European framework programme funding. While the measure counts the total funding in the specific H2020 programme, we argue that it can indicate HEIs' exposure to RRI ideals more generally. While we do not have elaborate hypotheses of causal relationships between RRI profiles and the separate variables capturing organizational properties, our overall expectation, as framed by the notion of isomorphism, is that similar organizations will implement RRI in similar ways to maintain legitimacy within their field. Hence, we expect to find patterns in the relation between RRI profiles and organizational properties concerned with funding base, size, research intensity, impact and orientation.

We measure size by the number of enrolled students in ISCED 5–7 (Students) and the number of full-time equivalent staff (Staff (FTE)). Research intensity is the balance between teaching and research as measured by the ratio between students and staff (Student/staff ratio) and the number of Web of Science indexed publications per full time equivalent staff. Both the ratio between student and staff and publication per staff may depend on the dominant fields and subjects in the HEIs. Thus, the precision of the indicators is moderate with regard to capturing the concept of research intensity. Each indicator has its weaknesses; hence, we use both in order to capture the concept most efficiently. The research orientation or disciplinary focus of HEIs is measured by the standardized deviation from an assumed equal distribution of students in each subject category in ETER (Student dispersion) and the standardized deviation from an assumed equal distribution of publications in each Web of Science category (Research mix). A value close to one in both variables indicate a high deviation from an equal distribution of students or publications between subjects or categories, thus indicating a mono-disciplinary focus. A value close to zero indicates a low deviation from an equal distribution, thus indicating a multidisciplinary focus. We measure the degree of funding from H2020 in terms of amount in 1000 euros (H2020 1000 EURO) and in terms of 1000 euros per staff (FTE) (H2020 1000 EURO per staff). Research impact is measured by mean normalized citation score (MNCS) and proportion of publications in top 10% most cited (PPtop10%). For MNCS, a value above one indicates an above average impact of publications that involve an author from the HEI. For PPtop10% a value above 0.1 indicates an above average research impact.

Figure 2 illustrates the key differences and similarities between the three RRI clusters using standardized measures for each of the aspects of interest. In Table A4 in the Appendix, we provide a detailed overview of differences between clusters on all variables.

On average HEIs in the GEE and GEEPE clusters are very similar in terms of their organizational properties. HEIs in the GEE cluster are slightly larger in terms of staff, smaller in terms of students, have a slightly higher scientific impact and receive slightly more funding from H2020 compared to the GEEPE cluster. The differences are however not statistically significant and therefore, the HEIs in the clusters are virtually similar

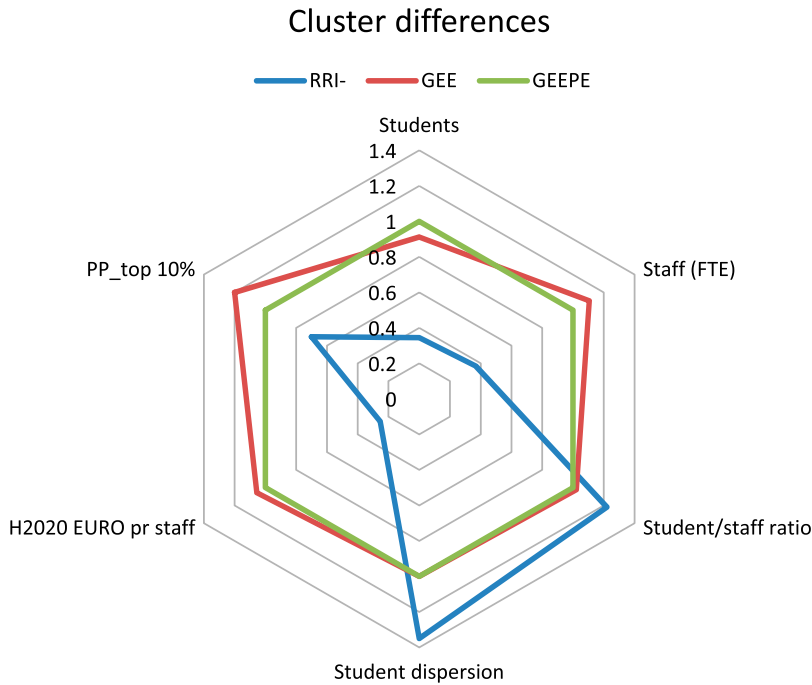


Figure 2. Relative differences in organizational characteristics across RRI clusters.

Notes: Values are calculated as relative average scores to HEIs in cluster GEEPE. Differences are interpreted as percentage differences to the GEEPE cluster. For example, average PPTop10% is 20% higher for GEE compared to GEEPE. See [Table A4](#) in the Appendix for all descriptive statistics with details on mean, standard deviation, and 95% confidence intervals.

based on the variables explored (see [Table A5](#)). In essence, the two clusters only differ in terms of their commitment to public engagement activities. Compared to the GEE and GEEPE clusters, HEIs in the RRI- cluster are very different. HEIs in the RRI- cluster are considerably smaller in terms of both students and staff. The average number of students for HEIs in the RRI- cluster is 7,074 compared to 18,713 and 20,530 for HEIs in the GEE and GEEPE clusters respectively. Organizations in the RRI- cluster have a higher number of students relative to staff, and publish considerably less per staff, which indicates a stronger emphasis on teaching. Furthermore, they tend to be more mono-disciplinary as measured by student dispersion and research mix. HEIs in the RRI- cluster have a lower research impact as measured by MNCS and PPTop10%. In terms of H2020 funding, HEIs in the RRI- cluster receive considerably less than HEIs in the two remaining clusters. The spider chart in [Figure 2](#) illustrates how the RRI- cluster is substantially different from the two almost identical clusters.

These results suggest that the two clusters of organizations that tend to have a high uptake of RRI-ideas as measured by the policies and procedures in place concerning key areas of RRI, share a number of organizational characteristics. They tend to receive a high share of funding from the EC and they are the largest in terms of number of staff, students and publications. Conversely, organizations with a low level of RRI-policy adoption tend to be smaller organizations with a strong teaching mission, and where research production is below average. The comparison of the RRI-cluster and the two RRI intensive clusters indicates that relatively small and teaching

focused HEIs are less likely to have a high uptake of RRI. This could relate to the aspects of RRI that are explored in the survey items and the way the questions are framed. If questions are framed and centred mainly around research practices, it could be argued that this could explain why HEIs with less emphasis on research activities may have lower measured RRI uptake. However, when examining the items more in-depth, the HEIs in the RRI- cluster differ from their counterparts on both the items that could be argued to be closely related and relevant to research activities (research ethics committees (ethics_com) and open access data repositories (oa_storage, oa_pub_budget)), as well as items which arguably are more universally relevant (gender equality plans (ge-plan) and public engagement activities (pe-plan, PE_promote)).

As suggested earlier this lack in uptake can relate to the size and capacity of the organizations, or the lack of dependence on and exposure to funding from sources that promote specific RRI values. Still, public engagement and gender equality values exist outside the realm of H2020 funding, and it is therefore surprising that a large group of HEIs do not engage in such activities.

Discussion

The empirical analysis revealed three distinct clusters of HEIs in terms of their RRI profile. One cluster was characterized by low RRI uptake. Both of the remaining clusters had a range of RRI policies and procedures in place related to gender equality and ethics, but one cluster was more committed to public engagement on top. Looking at the organizational properties of the clusters, we found that the RRI active clusters were very alike, characterized by having a rather high degree of research intensity and impact, multi-disciplinary orientation, active participation in H2020 funding schemes, and were larger than the RRI passive cluster.

We thereby see both similarity and variation in the emerging patterns. Regarding the similarities, the results suggest that organizations need some degree of organizational capacity / volume to absorb new policy ideas that may be considered peripheral to the core operations of the organization. Having a strong research orientation makes institutions more prone to actually consider and implement policies intended to increase responsibility in its research activities. And being actively involved in the funding schemes of the main promoter of RRI also relates positively to implementing policies and procedures for RRI within organizations.

Isomorphism may here provide us with at least a partial explanation to this relative *similarity of RRI-uptake*. Coercive isomorphism is assumed to be driven forward not only by regulatory frameworks and demands, but also through formal and informal pressures from other organizations that the changing organization is dependent on. In the case of RRI, the EC has over the past decade worked as a powerful driver of the idea, which could also be seen as a partly explanation of our results from the empirical analysis. We find a stronger uptake in organizations with a higher focus on research and active participation in H2020, and thereby a stronger dependence on funders like the EC.

Legitimacy also seems to be a relevant driver. RRI has to some extent been promoted as a normative change programme, which has also gained traction in the public debate. Particularly issues such as gender equality and to some extent ethics have become part of the public discourse, not only in relation to HEIs, but also all other modern organizations.

Regarding the relative *difference* in uptake, i.e. the fact that we find a cluster of HEIs that do not seem to have taken up the idea of RR, the institutional perspective would point to the possibility that we are actually observing two distinct organizational fields, and that the demands for legitimacy do not apply to all the HEIs in a similar way. The RRI- cluster of HEIs does stand out considerably, when it comes to research intensity, impact and orientation, size, and involvement with the EC funding schemes.

An organizational field is defined as a group of organizations, that share e.g. products, suppliers, customers, and resources, and whose ‘members’ interact more with each other than with actors outside the field (Scott 1995; DiMaggio and Powell 1983). At face value, we seem to be observing similar organizations, i.e. a field, but the results suggest a more complex picture. This again highlights the need to look for patterns at the organizational level in order to gain a more fine-tuned picture of the uptake and workings of the RRI idea. One particular question that arises, is why being research intensive seems to be associated with having a more general gender and diversity policy?

Another result that merits discussion is the subtle difference between the GEE and GEEPE clusters in terms of RRI profile which does not seem to connect with any noticeable difference in organizational properties. We can use similarities in organizational characteristics to grasp why these two clusters may be considered part of the same field and hence prone to imitate and adopt similar policy ideas, such as RRI. But we cannot easily explain based on our empirical material why organizations in the GEEPE cluster (in contrast to the GEE cluster) give special priority to public engagement policies and procedures. These more subtle differences may be explained or at least usefully explored by other factors such as geography, history, and culture. A cursory inspection of the organizations in each of the clusters however does not reveal a clear division between HEIs in the GEE and GEEPE across countries, thus indicating that we need to look deeper into what influences institutionalization of policy ideas in HEIs. Clearly, supplementary data, including more qualitative information on priority-setting and policy-making within the organizations would be necessary for further disentangling the two clusters.

Considering the current supportive climate for Open Science approaches and policies among both research performing and research funding organizations, it was noticeable and somewhat surprising that all of the three HEIs clusters received modest scores on the open access index, even if the GEE and GEEPE clusters appeared to have slightly higher levels of open access policy preparedness than the RRI- cluster. The low scores across the board can be partly explained by the lack of a dedicated budget for open access publishing and open data sharing, which were two of the four indicators included in the index. The fact that our data points are from 2015 may also mean that recent organizational adjustments to demands and incentives from funders might not have been captured in this analysis.

Our study contributes to mapping differences in RRI implementation across organizations with different types of characteristics. Our approach is in line with previous work by Christensen et al. (2020) that demonstrated considerable differences in RRI perception and implementation priorities across main types of organizations: universities, research funders, research-intensive companies and civil society organizations. We have focused on just one type of actor (HEIs) and shown that properties such as size, research orientation, and funding base can be helpful in further exploring differentiated approaches to

RRI implementation. However, as the analysis and discussion have shown, such quantitative examination of patterns of RRI implementation does not adequately capture what happens inside the organizations. The analyses presented in this article are based on manifestations of RRI ideas in form of policies and formal governance arrangements. We know less about how such policies and procedures come to be developed – and indeed how they are received and made sense of at the various levels of the organizations. As mentioned in the introduction to institutional theory, a central point is that isomorphism takes place at the institutional level, thus leaving room for decoupling within organizations. Such decoupling can e.g. be seen in recent studies which have demonstrated that policies, specifically concerning research integrity, have limited uptake inside HEIs, even among leaders (Degn 2020), suggesting that this might also be the case in at least some of the organizations studied here. Newer developments within institutional theory nuances this view on decoupling and suggests that institutional logics, understood as values, beliefs and normative expectations, may be a vital framework for understanding change in HEIs (Lepori 2016). Wittrock et al. have also studied this within the realm of RRI and suggested that particular cultural and structural barriers within the organizations are vital factors when studying RRI implementation (Wittrock et al. 2021c). We have invoked the concept of isomorphism for the purposes of this paper, but as mentioned in the introduction, there is a need and a potential for more theoretically informed studies to arrive at a more nuanced and comparable picture of what happens to the RRI-idea when it travels into and through an organization, e.g. emphasizing competing institutional logics and translation.

Conclusion

In this article, we set out to explore the connection between organizational characteristics and the uptake or receptiveness towards RRI. We combined multiple datasets to construct distinct RRI-profiles of 188 HEIs and linked these profiles with organizational characteristics and found that RRI active clusters were organizationally very alike, characterized by a rather high degree of research intensity and impact, multi-disciplinary orientation, active participation in Horizon 2020, and by being larger than the RRI passive cluster. These similarities and differences may be partially explained by isomorphism in the organizational field, but the findings also highlight the need for a more fine-grained exploration of the potential explanations for variation and decoupling. We have argued that the future of RRI-research could benefit from more quantitative explorations of broader patterns of RRI-uptake in order to provide a better platform for targeted, effective actions, but also a more in-depth, theoretically informed perspective on the organizational dynamics and logics that influence institutionalization.

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Appendix

Table A1. Selected questions from the MoRRI survey.

Variable name	Question	Coding	RRI key
ge_process	Based on your experience and knowledge, has your organization established processes for managing the following aspects: Gender Equality in Research and Innovation	Yes = 1; No/not applicable = 0	Gender Equality
ge_plan	Does your organization have a gender equality plan? – A gender equality plan is a consistent set of provisions and actions aimed at ensuring gender equality	Yes = 1; No/not applicable = 0	Gender Equality
pe_incentive	Which of the following mechanisms does your institution apply in order to interact with citizens and societal stakeholders?: Salary incentives for public outreach activities	Yes = 1; No/not applicable = 0	Public Engagement
pe_plan	Which of the following mechanisms does your institution apply in order to interact with citizens and societal stakeholders?: Implementation of specific action plans targeting Public Engagement at your institution	Yes = 1; No/not applicable = 0	Public Engagement
pe_promote	Which of the following mechanisms does your institution apply in order to interact with citizens and societal stakeholders? Public Engagement as a criterion for promotion	Yes = 1; No/not applicable = 0	Public Engagement
pe_activites	Which of the following mechanisms does your institution apply in order to interact with citizens and societal stakeholders? Organization of outreach incentives such as ‘open days’ ‘university festivals’ etc.	Yes = 1; No/not applicable = 0	Public Engagement
ethics_com	Did your organization have a Research Ethics Committee operating	Yes = 1; No/not applicable = 0	Ethics
ri_office	Did your institution have a Research Integrity Office operating during 2014, 2015, 2016?	Yes = 1; No/not applicable = 0	Ethics
oa_storage	Repositories are provided by your institution Repositories are provided by departments	If Yes to one or more of the questions = 1; No/not applicable = 0	Open Access
oa_pub_budget	Your institution has specific budget for Open Access publishing	Yes = 1; No/not applicable = 0	Open Access
oa_data_budget	Your institution has specific budget for the implementation of Open Data sharing	Yes = 1; No/not applicable = 0	Open Access
oa_support	Your institution provides support for on line communication (e.g. project websites) on publication and data sharing practices	Yes = 1; No/not applicable = 0	Open Access

Table A2. Rotated component loadings.

Variable	Component 1	Component 2	Component 3	Unexplained
ge_process		0.6084		.3198
ge_plan		0.5184		.4374
pe_plan			0.4130	.525
pe_incentive			0.5374	.4392
pe_promote			0.6095	.3099
pe_activites				.7726
oa_storage	0.4921			.3876
oa_data_budget	0.4821			.4746
oa_pub_budget	0.3837			.5095
oa_support	0.5561			.338
ethics_com		0.3871		.6701
ri_office				.7053

Note: Component loadings below 0.35 are left blank.

Table A3. Description of organizational variables.

Variable	Definition	Source (Data availability)
<i>Size</i>		
Students	Total number of students in ICSED categories 5-7.	ETER (173/188)
Staff (FTE)	Total number of full time equivalent staff	ETER (177/188)
<i>Research intensity</i>		
Student/staff ratio	Students/Staff (FTE)	ETER (168/188)
Publications pr staff	WoS publications/Staff (FTE)	WOS/ETER (177/188)
<i>Research orientation</i>		
Student dispersion	Square root of squared sum of differences between theoretical mean of each subject (assumed equal distribution) and empirical number of students in each subject. (Normalized)	ETER (188)
Research mix	Square root of squared sum of differences between theoretical mean of each WoS field category (assumed Equal distribution) and empirical number of publications in each category. (Normalized)	Web of science (188)
<i>Funding base</i>		
H2020 1000 EURO	Amount of funding received through Horizon 2020 funding programme in 1000 Euros	CORDIS (188)
H2020 EURO per staff	H2020 1000 Euro/staff (FTE)	ETER/CORDIS (177/188)
<i>Research impact</i>		
MNCS	Mean normalized citation score	Web of science (174/188)
PP_top 10%	Proportion of publications in top 10% most cited	Web of science (174/188)

Table A4. Descriptive statistics of organizational variables.

	RRI-				GEE				GEEPE			
	Mean	Std. Err.	95% CI		Mean	STD	95% CI		Mean	STD	95% CI	
<i>Size</i>												
Students	7074.4	1315.2	4478.3	6970.5	18713.7	1907.2	14949.1	22478.3	20530.6	2918.1	14770.7	26290.4
Staff (FTE)	829.6	153.5	526.7	1132.5	2488.5	289.1	1918.0	3059.0	2249.9	244.0	1768.4	2731.5
<i>Research intensity</i>												
Student/staff ratio	11.1	1.1	9.0	13.2	9.3	0.7	7.9	10.7	9.1	0.7	7.7	10.4
Publications pr staff	0.4	0.2	0.1	0.7	0.8	0.1	0.6	0.9	0.8	0.1	0.6	1.0
<i>Research orientation</i>												
Student dispersion	0.54	0.03	0.48	0.61	0.40	0.02	0.35	0.44	0.40	0.03	0.34	0.45
Research Mix	0.49	0.03	0.42	0.56	0.36	0.02	0.33	0.39	0.41	0.02	0.36	0.46
<i>Funding base</i>												
H2020 1000 EURO	1697.3	539.1	633.4	2761.2	26340.71	6074.8	14351.7	38329.7	24787.8	5167.2	14590.2	34985.5
H2020 1000 EURO pr staff	1.8	0.6	0.7	2.9	7.5	1.2	5.1	9.8	7.1	1.2	4.8	9.5
<i>Research impact</i>												
MNCS	0.78	0.07	0.64	0.91	1.23	0.05	1.13	1.32	1.03	0.07	0.90	1.17
PP_top 10%	0.07	0.01	0.05	0.08	0.12	0.01	0.10	0.13	0.10	0.01	0.09	0.12

Table A5. *P*-values from pairwise comparisons (*t*-test) test of equality.

	GEE = GEEPE	GEE = RRI-	GEEPE = RRI-
Students	0.5873	0.0002	0.0000
Staff (FTE)	0.5564	0.0001	0.0000
Student/staff ratio	0.8411	0.1471	0.1001
Publications pr staff	0.7721	0.0238	0.0397
Student dispersion	0.9469	0.0001	0.0007
Research Mix	0.0614	0.0002	0.0685
H2020 1000 EURO	0.7401	0.0028	0.0001
H2020 1000 EURO pr staff	0.8395	0.0014	0.0004
MNCS	0.0167	0.0000	0.0118
PP_top 10%	0.1972	0.0001	0.0027

Notes: The data is not derived from a random sample of the population and the assumption of normality of data distribution may be violated.

Caution should be taken in the interpretation of the test results.

For a more informative comparison of variables please refer confidence intervals in [table A4](#).

P-values should be compared to a significance level, traditionally 0.05 or 0.01.