What drives change? Dynamic institutionalizations of responsible research and innovation in organizations

reflections on the role of institutional entrepreneurship

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What drives change? Dynamic institutionalizations of responsible research and innovation in organizations: reflections on the role of institutional entrepreneurship

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ABSTRACT

While most innovations are developed in organizations, there is a wide-spread consensus that the organizational institutionalization of Responsible (Research and) Innovation is limited. This may partly be the case because we lack an understanding of what factors drive or impede the institutionalization of such responsibility-related changes and how they interact. In this paper, we draw from various institutional entrepreneurs' experiences, who worked within eight organizational change labs, to explore the dynamic institutionalization of Responsible (Research and) Innovation. Our study identifies 29 factors highlighting some of the intricate, dynamic, and 'messy' complexities found in organizations. We conclude by offering some reflections on the role of institutional entrepreneurship for Responsible (Research and) Innovation.

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Introduction

A large part of societal life is arranged via organizations, and debates on how to solve societal challenges by acting responsibly are urged to pay more attention to the organizational level (e.g. Kaufmann and Danner-Schröder 2022; Gümüsay et al. 2022). To achieve this, we may utilise over 10 years of experiences with Responsible Research and Innovation (RRI; e.g. Owen et al. 2013; Timmermans 2017; van de Poel et al. 2017; Paredes-Frigolett 2016; Blok 2022; Fisher et al. 2024), several decades of work on Technology Assessment (TA; e.g. Grunwald 2018; Yaghmaei et al. 2024) as well as Ethical, Legal, and Social Aspects of innovation (ELSA; e.g. Zwart, Landeweerd, and Rooij 2014).

A key challenge for many initiatives within RRI, TA, and ELSA is how to institutionalize their practices in organizations. This is important, because most innovative

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practices take place in organizational settings, which means that these organizations greatly affect society at large (Stahl et al. 2017). However, the organizational institutionalization of such, what we momentarily want to call responsibility-related practices, has been studied only scarcely (e.g. Dabars and Dwyer 2022; Owen et al. 2021a; Randles, Loconto, and Steen 2024; Steen et al. 2018; van de Poel et al. 2020; Wiarda et al. 2022). As a result, we still lack insights on the factors that drive or impede their institutionalization. Without these insights, it may be more difficult for organizations to innovate responsibly.

Based on these considerations, we ask the following research questions: Which drivers and barriers are important for the institutionalization of responsibility-related changes on the organizational level? How can we frame these factors conceptually and how do they interact? How do the empirical experiences with institutionalization described in this paper fit those reflected in the literature?

For many scholars, responsibility-related changes are both processual changes in practices, and goal and value-related changes in organizations (Stilgoe, Owen, and Macnaghten 2013; von Schomberg 2013). Stilgoe, Owen, and Macnaghten (2013) and von Schomberg (2013) have laid an important groundwork for debates on responsibility in research and innovation, concentrating their attention on research performing and research funding organizations. These are of specific interest because knowledge providing organizations have the potential to play an important role in solving societal challenges.

What is missing is a better conceptual and empirical understanding of institutionalization processes. We contend that institutional entrepreneurship provides both a framework and agency for creating the conditions necessary for responsibility-related innovation to flourish in organizations.

In this paper, seven European research funding and performing organizations as well as one standardization organization are explored in terms of drivers and barriers to responsibility-related change efforts, such as the development and institutionalization of responsibility and sustainability training programmes, ethics guidelines and gender equality plans. Through a survey and a workshop, we identify 29 drivers and barriers of institutional entrepreneurship, highlighting some of the intricate complexities of organizations. These empirical results provide the basis for extending the findings of the literature on institutional entrepreneurship regarding the institutionalization of responsibility-related innovations.

The paper proceeds as follows: first, we will discuss the theoretical background of this paper, followed by our methodological approach. Results and data analysis are subsequently presented comprising of drivers and barriers. Lastly, our findings are discussed, and conclusions are drawn reflecting the overall research questions.

Theoretical background

The topic of responsibility in research and innovation in both academia and practical domains has gained considerable attention over the past decade through the concepts of Responsible Research and Innovation (RRI) and Responsible Innovation (RI) (Burget, Bardone, and Pedaste 2016; Ribeiro, Smith, and Millar 2017; Fisher et al. 2024). The term RRI is generally understood as

> 'a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)' (von Schomberg 2013, 9).

RI, on the other hand, is viewed as 'taking care of the future through collective stewardship of science and innovation in the present' (Stilgoe, Owen, and Macnaghten 2013, 1570). While the former predominantly focusses on the so-called five[1] keys as normative anchor points (i.e. gender equality, science education, open access, public engagement, and ethics), the latter notion emphasises procedural forms of responsibility (i.e. anticipation, inclusion, reflexivity, and responsiveness). These concepts are often used interchangeably because they both represent inclusive and risk-mitigating institutional logics that aim to align research and innovation with societal values (Owen and Pansera 2019; Wiarda et al. 2021). In this paper, we follow recent academic work by referring to these cognates as *Responsible (Research and) Innovation* or (R(R)I) (c.f., Shanley 2021; Smolka 2020; Smolka and Böschen 2023).

Scholars argue that we need a better understanding of how to institutionalize R(R)I both on the policy and organizational levels (Cohen 2022). So far, the institutionalization of R(R)I has primarily been studied on the policy level (e.g. Tabarés et al. 2022; Griessler et al. 2023; Loeber, Bernstein, and Nieminen 2023; Daimer, Berghäuser, and Lindner 2023). The organizational institutionalization of R(R)I has only been explored in a few cases within and beyond Europe (e.g. Dabars and Dwyer 2022; Owen et al. 2021a; Steen et al. 2018; van de Poel et al. 2020; Wiarda et al. 2022). Despite these valuable contributions, we still lack a more comprehensive understanding of what factors drive or impede the institutionalization of R(R)I in organizations.

Generally, institutionalization can occur either through top-down guidance or bottom-up experimentation with novel *modus operandi* (Randles et al. 2016). The latter is often described in practice as *de facto R(R)I*, which consists of 'what actors already do, to embed institutionalized interpretations of what it means to be responsible; these interpretations are then translated into practices, processes and organizational structures, and outcomes of research and innovation' (Randles 2017, 20; Griessler et al. 2023). In this paper, R(R)I-related changes are broadly defined as efforts in *de facto R(R)I*, which aim to 'responsibilize' research and innovation processes in different ways (Shanley et al. 2022).

Among the strands of literature relevant to the institutionalization of changes on the organizational level, particularly that of *institutional entrepreneurship (IE)* and *institutional theory* in a broader sense, the concept of IE is important because it emphasizes how actors shape and transform institutions through visions of divergent change and by mobilizing allies to translate these visions of change into reality.

IE demonstrates how institutional change can be initiated and sustained from within an organization by change agents who utilize the available resources at hand with the aim of changing existing institutional arrangements or creating new institutions (Maguire, Hardy, and Lawrence 2004; Garud, Hardy, and Maguire 2007; Battilana, Leca, and Boxenbaum 2009; DiMaggio and Powell 1983; Owen et al. 2021a; Owen, von Schomberg, and Macnaghten 2021b).

Institutional entrepreneurship

As a concept, IE can be understood as the 'collective action by many people who jointly – via co-operation and competition – create conditions transforming institutions' (Aldrich 2012, 1240). It originates from the broader social science debates on 'structure versus agency' and 'hegemonic accommodation' that are concerned with studying how IEs operate within (power) structures to legitimize and drive change (Levy and Scully 2007). Indeed, the term IE consists of the juxtaposition of two seemingly contradictory concepts, institutions, and entrepreneurship, which can be perceived as representing both sides of the debate: while research on institutions traditionally emphasizes the structures arising from institutional continuity and conformity, the literature on entrepreneurship focuses on change through creative agency (Garud, Hardy, and Maguire 2007).

The literature on IE has sought to transcend the dichotomy between structure and agency by shedding light on the question of how novel practices become institutionalized (Garud, Hardy, and Maguire 2013). Instead of focusing on structural determinism and the role of exogenous shocks in institutional change (cp. with historical neo-institutionalism, Hall 1993; Biegelbauer 2000), the emphasis in IE has been on the role of 'embedded agency' (Garud, Hardy, and Maguire 2007). More specifically, the focus has been on the role of individual *institutional entrepreneurs* (IEs). These IEs can be defined as 'change agents' who, explicitly or implicitly, help to enable, catalyze, and conduct divergent change in an institutional setting (Battilana, Leca, and Boxenbaum 2009). In doing so, these change agents often try to break 'with existing rules and practices associated with the dominant institutional logic(s) and institutionalize the alternative rules, practices, or logics they are championing' (Garud, Hardy, and Maguire 2007, 962). The concept of IE provides a dynamic perspective on the role of individuals as change agents. Since organizational practices are shaped by actions of individuals, pioneering actors can enact institutional changes (Leca, Battilana, and Boxenbaum 2008). However, as Tiberius, Rietz, and Bouncken (2020) note, more often the literature on IE emphasizes that the scope of agency is not limited to individual actors but rather comprises of collective action in the form of various organizations, associations, and social movements (Hardy and Maguire 2008). In line with reflections of Levy & Sculley (2007), Weik (2011), and Hardy and Maguire (2017), we do not view IE as 'heroic individuals' driven by economic returns, but rather as peripheral agents or collectives, inducing multi-faceted and multi-level processes with the potential of promoting democratic principles. This is important because 'members of the field other than the champions of the institutional change project are [oftentimes] simply ignored' (Hardy and Maguire 2017, 29–30).

Indeed, since the creation of new types of institutional arrangements requires substantial resources, IEs need to be able to motivate and mobilize other actors primarily within, but also beyond their own organization, to join their cause to succeed (Battilana, Leca, and Boxenbaum 2009). Moreover, despite the central role of agency in IE, the change agents are also seen as a part of an institutional context, which both restricts and enables the possibility for action (Leca, Battilana, and Boxenbaum 2008). Therefore, agency is understood as 'embedded agency', or as a 'distributed quality', which means that institutional structures are not a mere constraint on agency but rather serve as the 'fabric' or 'platform' for entrepreneurial activities (Garud, Hardy, and Maguire

2013). For instance, Leišytė and Sigl (2018) report how some managers in German research performing organisations exercise limited agency because existing institutions limit their responsibility to drive change. Such anecdotal insights underline why IEs are often perceived as 'embedded actors' (Battilana 2006).

Battilana, Leca, and Boxenbaum (2009) conceptualized four different factors that affect the potential for IE in any given context: *field characteristics; actor's social position; creation of a vision for divergent change; and mobilization of allies behind the vision*. *Field characteristics* refer to contextual circumstances such as the maturity of an organizational field (negative correlation with the potential for IE). Similarly, the *actor's social position* influences the tendency of an actor to become an IE. For example, 'peripheral', 'low status' actors are more likely to become IEs because they have less to lose from the transformation of the existing order than 'high status' actors. IE is also important in understanding how actors strategize to achieve institutional change. According to Battilana, Leca, and Boxenbaum (2009), these entrepreneurial strategies can be analyzed as a process consisting of three stages: (i) articulating a vision; (ii) mobilization of allies to support the vision; and (iii) motivating allies to sustain the vision. When articulating a vision for divergent change, three different types of framing are typically employed (Battilana, Leca, and Boxenbaum 2009; Hoogstraaten, Frenken, and Boon 2020): diagnostic (which problem will the institutional change solve?), prognostic (does the change lead to better institutional arrangements?) and motivational (which motivations spur the institutional change?). Mobilization of allies to support the vision – mainly by use of discourse (storytelling, narratives) – mobilize resources to secure endorsement and support for the implementation of institutional changes. What has received less attention in the IE literature is institutionalization itself as a fifth dimension resulting from the process – and vision-oriented activities of IE as described above.

Institutionalization corresponds with forms of de-institutionalization, and both represent 'a critical *dynamic* of the embedding of normative orientations into organisations' (Randles and Laasch 2016, 58). Such dynamic forms of (de-)institutionalization draw attention to power shifts and how power both shapes and is shaped by negotiations for change (Tolbert and Arthur 1990). To remain effective as a motivational force, visions need to be followed up by practical actions, i.e. institutional change. R(R)I-related changes may be quick and radical, or slow and incremental (Owen et al., 2021). They are not static, plannable, and linear phenomena, but rather dynamic, unpredictable, and complex (Greenwood et al., 2002; Hardy and Maguire 2017) that take place intermittently (Weik 2011) and at different levels of analysis (Wright and Zammuto 2013). Subsequently, institutionalization both shapes, and is shaped by, 'external' field conditions. For example, Randles (2017) shows how the Arizona State University institutionalized R(R)I-related changes in response to social problems associated with US (Ivy League) universities. Similar to Owen et al. (2021), we refer to this aspect as 'institutionalization dynamics'.

Hardy & Maguire indicate that studying institutionalization dynamics yields a process-centric account of institutional entrepreneurship, which helps to conceptualize it as 'an emergent outcome of activities of diverse, spatially dispersed actors, who face considerable difficulty in achieving effective collective action' (Hardy and Maguire 2017, 27). Such processes can be characterised by failures, inertia, and repercussions (McGaughey 2013; Stål 2015). Schüssler, Rüling, and Wittneben (2014), for example,

show how changing complexities in field characteristics can compromise institutional changes and subsequently reinforce existing power and institutional structures. What is more, institutional logics may coexist, clash, or supersede one another (Meyer and Höllerer 2010), and it may therefore come as no surprise that institutionalization dynamics are marked by forms of oppression and/or resistance (Willmott 2015).

Going beyond the three vision-related stages described above, these dynamics can lead to the 'deep' institutionalization of R(R)I (Randles 2017), which refers to the actual firm embedding and sustaining of divergent changes in the organization's de-facto practices, norms, or values, in its structures, processes, or culture to maintain and cultivate them over time (Steen et al. 2018). More conceptually, deep institutionalization is a long-term and resilient maturation process of historically contingent institutional logics that extend across vertical/horizontal networks (Randles, Loconto, and Steen 2024). It represents a historically embedded maturation process in which institutions systemically 'overflow' and align at multiple levels of analysis (Randles 2017). Recent research indicates that such R(R)I-related changes can be 'anchored' in various ways and to various extents (e.g. capacity-building sessions, methodology booklets, etc.; Cohen et al. 2024).[2] However, we still lack insights into the 'messy' dynamic ways in which factors drive or impede R(R)I-related institutional changes, that in turn problematizes the organizational institutionalization of R(R)I.

Methodological approach

To understand how R(R)I-related changes can be institutionalized on the organizational level, we identified drivers and barriers experienced by IEs in their change labs. Our concept of change lab is inspired by the change laboratory method aiming at expansive learning and transformative agency (e.g. Virkkunen and Newnham 2013; Morselli 2019; Sannino, Engeström, and Lemos 2016) as well as the social lab approach (Marschalek et al. 2022) aiming at experimenting with possible solutions of societal challenges. In our case, we understand a change laboratory as a collaborative space, where change practitioners and key stakeholders come together to work on a specific responsibility related challenge(s) or initiative(s). The lab method involves multiple sessions, in which the change situation is analyzed, a spreading, and consolidating of the new practices. In the lab meetings various facilitation and small group methods can be used. Essential is, however, a shared understanding and co-created solutions towards institutional experimentation, where IEs collaborate with actors from their own organization and beyond, towards devising and employing R(R)I-related changes, with the goal to institutionalize them, i.e. to make the changes sustainable over time.

We draw insights from eight such labs (see Appendix: Table A3 for a description of each lab), which were recreated for the EU project Co-Change. These labs were coordinated by so-called lab managers, which worked together with their colleagues (lab participants) on the institutionalization of R(R)I through interventions.

While the labs are geographically, functionally, and organizationally diverse, we selected these labs because they have similar institutional logics that pertain to the narrative of science with/for society (c.f., Randles, Loconto, and Steen 2024). Similar to Randles, Loconto, and Steen (2024), van de Poel et al. (2020) and Cohen et al. (2024), we do not strive for a systematic comparative analysis but rather aim to derive

exploratory lessons and insights from their experiences in the context of such logics. After all, there is no 'best way' to institutionally embed R(R)I-related changes (Stahl et al. 2024).

This study collected data from the labs through a survey and a workshop in year four of the project. At this point in time, all labs had produced R(R)I-related changes, and we therefore understand both lab managers and participants as IEs. First, as a preparation for the workshop, an online survey with open-ended questions was sent to the IEs to gain a preliminary understanding of their experiences, consisting of an online whiteboard displaying the IE factors (see Appendix I for the survey – an online canvas). As such, we followed a purposive sampling strategy as we contacted all eight IEs that are part of the H2020 project, and who had already implemented institutional changes by the time they were contacted. Accordingly, questions related to the four aforementioned dimensions of the IE model (i.e. field characteristics, actors' social position, creation of a vision for divergent change, and the mobilisation of allies behind the vision) were developed. One aspect was added to capture the interrelated dynamics leading to actual implementation of institutional change (i.e. institutionalization dynamics), in addition to the dimensions laid out in the original IE model. The IEs leading the change labs were asked how these dimensions returned in their context.

Second, an online workshop was organized for the members of the change labs, involving 20 participants. This online format was necessary due to restrictions vis-à-vis the COVID-19 pandemic. To promote trust and data sharing, we organized this meeting at the end of the four-year project, during which strong relationships were build. Both, a data management plan, and informed consent forms were used to ensure responsibility. All eight labs were represented by IEs (lab managers and participants alike), who were asked to delineate and clarify their survey answers regarding their experiences. Additionally, a temporary assistant to one of the lab managers participated in the online workshop. After a brief plenary session, the participants were divided into three groups to further discuss perceived drivers and barriers when institutionalizing R(R)I-related change. The participants asked each other questions regarding the IE dimensions in an unstructured fashion. This approach was chosen to enhance the relevancy of answers for the labs while remaining within the scope of our theoretical framework. The workshop was recorded and transcribed in verbatim.

Both the survey answers and workshop transcripts were analyzed by means of a deductive thematic analysis at the sentence level. Thematic analysis is a systematic approach to obtain qualitative insights by translating text into coherent themes of information (Alhojailan 2012; Braun and Clarke 2006). Survey answers and transcripts were first 'openly coded' for perceived drivers (1) and barriers (2) regarding the dimensions of IE and R(R)I-related process dynamics. Our coding rule for drivers concerned: 'a factor which benefits an IE dimension, thus promoting R(R)I-related change'. For barriers, we chose: 'a factor which obstructs an IE dimension, thus hindering R(R)I-relating change'. All factors (codes) were aggregated to drivers and barriers (themes) by means of 'axial coding'. Themes were linked to each dimension of the IE model through 'selective coding'. The thematic analysis was performed by one author. After this, the remaining authors reviewed and discussed the results for any discrepancies, with the aim of enhancing the inter-coder reliability.

There were three validity-related decisions that require explicit consideration. First, a few themes relate to multiple IE dimensions. While we acknowledge that over-simplifications may obscure the complexity of the institutionalization process, these themes were categorized according to one dimension to enhance the comprehensibility of our results. Second, while themes may overlap and interact, all themes were included to mitigate selection bias. Third, the nature of drivers and barriers implies that themes can be framed as both drivers (e.g. when it benefits the mobilization of allies) and barriers (e.g. when it hinders the mobilization of allies). To avoid ambiguity, we constructed themes as either a barrier or a driver, in accordance with the framing of the respondents. In the following section, the identified themes per dimension are presented.

Results

The thematic analysis revealed various themes that fit the dimensions of the IE model and its institutionalization dynamics. These themes are referred to as *Dn* (drivers) and *Bn* (barriers), with *n* referring to the number of the respective theme (see Appendix: Table A1 for all identified themes, see Table A2 for an overview over themes recognized by each lab). In this section, the labs are referred to by numbers (see Appendix: Table A3 for lab names and descriptions).

To illustrate the interlinkages between the drivers and barriers, two cases are described in the following textboxes. Drivers and barriers will be explained in the following subsections.

The AIT AI Ethics Lab at the Austrian Institute of Technology (AIT) was (and still is) concerned with the social and ethical implications of Artificial Intelligence (AI). It consists of an interdisciplinary group of computer scientists and social scientists, which regularly discuss use cases about ethical concerns in software development.

In the beginning, there was not much demand for AI Ethics work from within AIT (lack of D4), which is a large organization with a hierarchical structure (B2). Some actors identified AI ethics related changes rather as potentially financial or time-consuming burden (B7) and some feared that it might lead to more bureaucratic procedures (B4) for conducting research projects.

Following a long-term vision of change (D12) of AIT as an organization at the cutting edge of ethical AI, the lab team took initiative in a bottom-up style. Coordinated by a proactive lab leader (D8), regular meetings were convened driving engagement efforts (D14) with other researchers from within and beyond the organization. The lab members' heterogenous scientific backgrounds (D2) facilitated useful interdisciplinary exchanges, which was a prime reason for its ability to interpret AI ethics in suitable and helpful ways for the organization. Interdisciplinarity at the same time was a hurdle to overcome in daily exchanges (B10), a source of inspiration for constructing rationales (D12), and a resource for reaching into different parts of the organization and mobilizing resources.

To orchestrate efforts, the team searched for synergies (D11) with already ongoing activities within the organization and in its ecosystem. For example, the lab team organized workshops and utilized a window of opportunity (D16) to collaborate with the national civil service on a project about AI ethics, producing practical guidelines for AI, a curriculum for civil servants and courses at the Federal Academy for Public Administration.

This was enabled by an awareness of many R(R)I topics (D3), such as gender issues or ethics concerns, by already existing allies (D13), such as other researchers and ministerial civil servants. At the same time, the lab team was careful to appropriately frame the R(R)I topics for different contexts (D10), such as adapting the vocabulary, and both learning from and inspiring other initiatives (D15), making headway towards the original goal of ethical AI as an organizational strength of AIT in small steps (D17).

The work with the ministries provided the lab with external legitimation by an authority (D7), which facilitated its recognition within the lab's own organization, where the lab is increasingly requested to participate in projects or to give presentations to various groups. The project with the public administration as well as others that followed since, but also the activities within the organization are fuelled by a demand (D4) for AI Ethics, amongst others, due to the EU AI Act (in force since summer 2024), which constitutes a window of opportunity (D16) on the societal level that will drive further developments in this area. This was also recognized by the organization's new leadership taking office in the summer of 2023. As a result, a new organisation-internal initiative was founded, pushing for a better utilization of AI. A lab member leads this initiative, with another member being part of its advisory board. The entire process described above took four years, indicating that change takes time (B12) despite the existence of windows of opportunity, and quick wins (D17) are important to sustain momentum – especially at the beginning of the lab.

Textbox AIT lab case (lab 1)

The lab in the Technical Research Centre of Finland (VTT) focused on co-designing and implementing a sustainability program. The work was a collaborative process involving VTT's designated Responsibility Task Force (D4) supported by internal scientific responsibility and sustainability experts (D2) and responsibility researchers with divergent backgrounds (D6).

The window of opportunity for the work was opened by the gradual increase of the importance of sustainability and responsibility in the operational environment (D16) including e.g. rising awareness of climate change (D3), growing importance of corporate social responsibility, and new reporting standards like GRI (D4), affecting the daily operations of the organization leading to increasing commitment to and adoption of sustainability and responsibility related practices (D8). Besides external stimuli, an essential tipping point in the institutionalization process was the full commitment of the leadership and the following introduction of the VTT's strategy for the years 2021–2025 including sustainability as one of the core elements (D1, D5, D12) emphasising the significance of commitment of actors having positions with organizational power as essential enabling condition for successful change and institutionalization process.

Following from this organization level strategic vision an operational sustainability program process was launched (D9, D10) aiming at the creation of operational vision ('lower-level strategy') and definition of potential pathways for change. Considering this as an opportunity the people responsible for the lab actions consciously sought collaboration with the organization's key actors. Consequently, the lab activities were integrated into the ongoing process to support the core management team (D5, D11, D7, D14) by integrating the existing ethics and responsibility research expertise into the program development (D6). As participating researchers had already known position in the organization as experts in sustainability and responsibility related topics, their integration was considered legitimate by the task force (D5, D13). From the perspective of IE dynamics this phase was characterized by mobilization of allies to create an operational strategy and planning of intervention strategies to orchestrate organizational change.

Besides bringing in the researchers´ expertise, the lab supported the task force concretely e.g. by organizing open workshops for discussion on VTT's sustainability roadmap, planning and facilitating various trainings on ethics, safety and responsibility and gender equality together with another project (D6, D9, D10, D12, D14, D17) thus adding and deepening the dimensions of change and constructing rationales for it. Alongside training the aim was to mobilize human resources and create new relationships by supporting open dialogues on sustainability and responsibility and integrating new actors to the process within the organization to support the change process (D14, D15).

While the formal process progressed relatively vigorously, there have been also challenges which have slowed down deep institutionalization of new practices (B3). They have related e.g. to strongly embedded norms to conduct technical research (B10) which has not usually included, excluding risk management (B5), integration of responsibility and sustainability aspects. Especially social impacts and responsibility have been difficult to understand, and how they relate to specific technological fields (B10). While this may mean, to a varying extent, reconstruction of self-understanding of technical research, the process has sometimes involved tensions between various interpretations and created needs to consciously build legitimation and shared understanding for changes, e.g. by using information sharing and discussions as means.

Textbox VTT lab case (lab 3)

Field characteristics

Field characteristics are the 'characteristics of the environments in which they [organizations] are embedded' (Battilana, Leca, and Boxenbaum 2009, 74). Each IE was asked which field characteristics they perceived as driving or impeding their R(R)I-related change.

Drivers

Organizational rules (D1) can enable institutional change because they shape the structure and performance indicators of an organization. In several change labs, the institutionalization of R(R)I-related changes was facilitated in a top-down manner through actions by the strategic levels of the organization.

Several IEs indicated that *institutional heterogeneity* (D2) in their ecosystems created a window of opportunity for change. For instance, D2 can refer to disciplinary

heterogeneity, offering diversity from which visions for divergent change may emerge. An example of disciplinary heterogeneity was found in the team composition of lab 1, which consists of experts having diverse backgrounds such as social and computer sciences, thus providing diverse sets of knowledge that can complement each other. In the case of lab 5, different values, opinions, and worldviews are brought in by 'different standardization committees across sectors and topics. This also brings together different cultures in the way they approach these negotiations'.

The internal or external *demand for R(R)I* (D4) was deemed beneficial for change. Lab 1 stated that 'there has been a[n R(R)I-related] void where the lab has grown into, and [over] time we've noticed that there is a demand and a hunger for [R(R)I]'.

Stakeholders' *awareness of R(R)I* (D3) was also perceived to bring advantages. Lab 3, for instance, mentioned that there is a basic knowledge of R(R)I in their field supporting their institutional change. Lab 7 explained that some of the R(R)I elements (e.g. gender equality) are easy to understand, which facilitates their implementation.

Barriers

Next to enabling factors, various barriers were identified. Some labs indicated that a large *size of organizations* (B1) obstructs institutional change. Lab 4 subsequently pointed out that their whole organization is composed of 13 organizationally separate units that are rather disconnected, which is complicating the communication on R(R)I. In contrast, lab 8 – a smaller organization – considered its flexible and adaptive structure as beneficial for change.

In some cases, strong organizational *hierarchies* (B2) were found to impede change. Lab 2 argued that this hindered collaborations between divisions, and by extension, hampered institutional change. B2 obstructs R(R)I-related change because it makes efforts 'procedure-centric rather than human-centric'. In lab 7, flat hierarchies enabled 'round-tables' where stakeholders can communicate and collaborate on the same level.

Lastly, *highly institutionalized structures* (B3), i.e. having strongly embedded norms, were deemed to hamper institutional change. Lab 5 and lab 3 described their organizations as highly institutionalized and experienced a resistance to novel institutions. Lab 6 similarly suggested that it is easier to implement change in younger organizations in which institutions and guidelines are still being developed.

Actors' social position

Battilana, Leca, and Boxenbaum (2009, 77) define the actors' social position as 'the status of the organization in which an individual actor is embedded as well as her hierarchical position and informal network position within an organization'. IEs were asked what aspects of their social position drove or obstructed their R(R)I-related change. Although no barriers were identified, various drivers for one's social position emerged.

Drivers

The main driver associated with the actors' social position is their *legitimacy* (D5). Lab 2 was working towards R(R)I before, but recently, they managed to establish an official working group because 'We are now known as the [lab 2], and we have a certain identity within our organization'. Similarly, lab 3 reported that gaining legitimacy through their

participation in R(R)I-related projects has helped them create the ethics lab within their organization, thus facilitating the connection between internal actors and the ongoing programmes.

Specialised *R(R)I-related expertise* (D6) of IEs (i.e. R(R)I experts) also strengthens their social position within and beyond the organization. Lab 2 stated that 'everyone has different capacities, different backgrounds. So, at the beginning we tried to organize around the RRI keys: some gender experts, some ethics experts, some other people with experience in governance and so on.' Lab 2 provided an example of the positive effect of D6 by stating that the actors in the organization know who to talk to for specific R(R)I-related issues. This increased their visibility and legitimacy.

Another key enabler is *support from authorities* (D7), which provides legitimacy, and yields trust from stakeholders. For example, lab 1 mentioned the European Commission's role in providing resources by funding R(R)I-related projects and in establishing requirements. Lab 2 mentioned that their management acted as a facilitator by giving their lab recognition, leaving room for changes, and funding new infrastructures within the organization. Lab 4 reported a similar example of managerial support: 'the management of the faculty said: '[…] please feel free come upstairs if you need any kind of support, permission or anything, you are free to experiment in change'.

Creation of a vision for divergent change

The vision for divergent change is commonly framed '(1) in terms of problems it helps to resolve; (2) as preferred to existing arrangements; and [or] (3) as motivated by compelling reasons' (Battilana, Leca, and Boxenbaum 2009, 79). IEs indicated what drivers and barriers they perceived in creating and communicating this vision.

Drivers

Being proactive (D8) was argued to help create a successful vision for divergent change. IEs demonstrated this through their promotion of new ideas, participation in R(R)I-related projects, inclusion of more stakeholders, learning new perspectives, and having a basic commitment to change. For example, lab 2 stated that they

> 'proposed different decision-making forums like citizen advisory reports, flexible working time for our employees to dedicate [time] to social issues. We proposed [that] citizens should be able to contact researchers from [lab 2] and invite them for coffee so that they can talk freely about different scientific topics'.

By being proactive, the IEs took active steps to substantiate and concretize their visions of change.

Clarity (D9) of the vision supports institutional change, such as in lab 3, where they highlighted that developing a clear vision can be facilitated by thinking about concrete steps, while lab 2 argued that having concrete ideas makes visions actionable.

Additionally, all labs perceived value in creating the most appropriate *framing* (D10) for the vision of change. Lab 6 highlighted that communicating the vision is central to gaining legitimacy and convincing internal and external stakeholders to join. D10 was deemed a highly iterative and context-dependent act. Diagnostic framing was considered the most straightforward framing and lab 2 used this framing in their solution-oriented

visions to solve specific problems. Lab 8, on the other hand, provided an example of prognostic formulation by rewriting guidelines to facilitate the implementation of R(R)I. Lastly, a number of IEs used motivational framing to encourage organizational actors to embrace the concept of responsibility.

Synergies (D11) with existing activities in the organization can take the form of horizontal and vertical synergies. The first refers to implementing R(R)I-related changes that resonate with efforts in adjacent projects. Lab 7 argued that

> 'you need to understand how these elements of RRI are connected to the work that you are [already] doing, why you should consider them in your project activities and what it means when you are writing and planning the project'.

D11 can also be found vertically, between bottom-up and top-down approaches. Lab 7 and lab 6 claimed that a combination of the two would bring the most successful outcomes.

Having *long-term goals* (D12) benefits institutional change. For example, lab 6 stated that their vision has a deadline already planned for 2030, meaning that efforts will follow planned out road maps.

Barriers

Bureaucracy (B4) was identified as a barrier to the creation of a vision for change. Lab 1, for example, stated that the lab's vision was challenged by the idea that the lab's work would complicate existing bureaucratic practices by inserting new ones. Additional bureaucracy is seen as a burden as this may come with additional paperwork and extra time investments. As an IE from the lab said, 'there's often the feeling if you look at data protection for example, that these decisions come across as complex forms that are an additional burden to people'.

Lastly, *conflicting understandings of* responsibility (B5) hamper the creation of the vision because it is difficult to convey what responsibility exactly means, while the notion itself is already contested. Lab 5 pointed out: 'in many of the [employees'] view[s], their only responsibility is to include actors. But if you also look at the RRI literature, we know that forms of anticipation, reflexivity, and responsiveness contribute to a forward-looking notion of responsibility'.

Mobilisation of allies behind the vision

The mobilisation of allies behind the vision means that 'defining and redefining identity is central to attracting others and building a sustainable coalition' (Battilana, Leca, and Boxenbaum 2009, 81). IEs indicated what drivers and barriers they perceived in mobilising allies behind their vision.

Drivers

Nearly all labs indicated that *social capital* (D13) helps gain new allies, e.g. by word of mouth. It refers to the use of internal and/or external actors to increase engagement and support for the vision of change. Lab 1 explained that 'when engaging beyond [lab 1's organization] with other researchers, organizations, ministries, etc., there is lots of potential for virtuous cycles'.

Engagement efforts (D14) are at the core of connecting with allies who support the same vision for change. Lab 2 and lab 3 stated that they gained allies by organizing trainings and engaging in conversations with external organizations. Lab 7 and lab 8 encouraged experts to discuss and exchange R(R)I-related notions. The labs reported that by creating a venue for open communication, the organization can gather motivated and like-minded allies.

The last driver associated with the mobilization of allies is being, and learning from, *role models* (D15). As an IE of lab 4 stated, being a role model helped the lab gain visibility and reduce the fragmentation of the field in which the organization is located. Various other labs stated that the inspiration from other best practices was helpful for them, such as lab 8 where 'having best practice examples equals to having evidence that it really makes sense, that it's working. It's always very important as a science foundation to have this evidence in place'.

Barriers

When *change* is *considered a burden* (B7), it impedes the mobilisation of allies because they are hesitant to take on an additional workload that may be required. This was the case for stakeholders in the context of lab 1 and lab 4.

A *lack of financial resources* (B8) impedes the mobilization of allies when changes require additional resources. Lab 8 stated that 'we don't have the resources as a small organization to [support the whole change] because it means fundamental change in all the processes and the expectation management about people.'

Having stakeholder *access issues* (B6) may also form a barrier and predominantly applies to external IEs, who are not part of the organization they are aiming to promote changes in. This was the case in lab 5, where the IEs were not able to directly reach out to stakeholders (i.e. standardisation committee members) who are protected for privacy reasons. However, 'what we can do, is talk to the employees [the standardisation organization] themselves. They are sort of the facilitators of the process that bring parties together, but we cannot reach the actual parties that negotiate [in standardisation committees]'.

A generational gap (B9) between younger and older people was also found to impede change. For example, lab 4 explained that '[it] is not easy for professors in their fifties and early sixties to communicate and influence students in their twenties regarding these [R(R)I-related] subjects'.

Disciplinary differences (B10) may obstruct change because gaps between, e.g. social, and technical sciences can cause misunderstandings. Lab 3 reported that

> 'we are talking about social impacts and social responsibilities, that is a little bit [further] away, many people over here don't quite understand [how this would apply to] their case, for instance. And then, if we are talking about social consequences of developing some technologies, it can be a little bit disturbing'.

Lab 4 pointed out that B10 contributes to the difficulty of motivating change because not everyone shares similar societal concerns. They were 'having trouble, especially with the industry and with politicians, in involving them to be part of something [in which] they don't see specific interest'.

Institutionalization dynamics

The final theme of analysis was the dynamic interplay of the factors leading to the institutionalization of R(R)I. We have added this aspect to the analysis of Battilana, Leca, and Boxenbaum (2009), following the path created by others (cp. Hardy and Maguire 2017; Randles 2017; Randles, Loconto, and Steen 2024) to capture the dynamics between the other dimensions leading up to the actual implementation of R(R)I-inspired changes in an organization (e.g. new practice or norm).

Whilst we did not add a large number of new factors within this category, the interplay of many of the aforementioned factors co-creates institutionalization dynamics. We found that besides the already aforementioned groups of factors such as field characteristics or actors' social position, also the devising of intervention strategies, orchestrating collective action, mobilizing resources, constructing rationales, and navigating tensions are of equal importance.

We will lay out these dynamics in Section 5 but first outline a few related drivers and barriers we found in our case studies.

Drivers

One of the driving factors mentioned is *windows of opportunity* (D16), where many R(R)I-related issues are deemed increasingly more relevant and urgent in recent years. Due to these developments at the societal level, it became easier or sometimes even possible to implement R(R)I-related changes (cp. textbox lab 3).

Focusing on *small wins* (D17) was mentioned by lab 3, who 'start[ed] with small changes in order to create real transformative changes'. This may create virtuous cycles driving institutional change (cp. also textbox lab 1).

Barriers

It is important to consider that *change takes time* (B11). According to lab 2, this is especially the case for large organizations that need a longer time to implement changes. Even in organizations which are inclined towards institutional changes such as those mentioned in lab 6 and lab 7, change takes time to manifest (cp. also textbox lab 1).

The *lack of monitoring* (B12) can hamper change because organizations are not aware how their current practices and desirable future practices relate to each other. Lab 4 reported that 'they were shocked to see that project officers […] only [had] to tick a box whether the project […] [was done] according to RRI principles or not'.

Discussion

In our analysis of the labs' experiences, we have identified drivers and barriers to R(R)I-related institutional change, many of which fit the IE model as proposed by Battilana, Leca, and Boxenbaum (2009) and other authors (e.g. Hardy and Maguire 2017; Randles 2017; Randles, Loconto, and Steen 2024). In many respects, we therefore find IE helpful for understanding institutional change. Especially in answering the question of which factors are important for institutional change and how to understand these

better, e.g. the demand for R(R)I (D4), the legitimacy of IEs (D5), their support from authorities (D7), and their proactive behaviour (D8).

We nevertheless found some misalignments between the factors identified in the practical work of the labs and in the four original dimensions of the IE framework. We believe that there are more elements that might help describe which processes contribute to organizational institutionalization. For instance, Timmermans et al. (2020) suggest that the institutionalization of R(R)I could benefit from experiential learning. Steen et al. (2018) refer to alignment with external bodies and agendas.

We therefore 'opened the black box' of institutionalization by introducing the dimension of 'institutionalization dynamics', which was not explicitly part of the original concept (Battilana, Leca, and Boxenbaum 2009). As mentioned afore, institutionalization dynamics are less about creating new sets of drivers and barriers, but more about the interaction between these factors.

First, on the level of the institution itself, activities such as the creation of an operational vision and strategy as well as the mobilization of allies behind the vision are of utmost importance for the creation of institutional change. In our case studies, we did not find an instance of sustainable change caused by a single actor, indicating the importance of multi-actor coalitions. Such an ensemble of actors – especially in the case of large and more complex organizations – needs an assemblage of steering instruments, perhaps most importantly including a vision that is operationalizable and then can build the basis of a strategy.

Second, we found a number of instances pointing to the importance of orchestration of/for collective action, devising intervention strategies, constructing fitting rationales for action, mobilizing resources, and navigating tensions and conflicts. These activities mostly are directed at the organizational level itself. They pertain to the interaction of a multi-actor coalition with its often closely knit organizational environment which over time has been developing values, norms, rules for dealing with a given mission and strategy, but also a set of traits of the institutional environment.

Third, organizations, but also their environment are interwoven in power relations. We found effects of these relations in each case study, and they are part of the themes field characteristics and actor's social position (Battilana, Leca, and Boxenbaum 2009). The drivers support from authorities (D7) and legitimacy (D5) are directly connected to power, as is the barrier hierarchies (B2).

Fourth, on the level of the environment each institution is faced with an ecosystem providing options for cooperation and competition alike. Indeed, in the analyzed cases multi-actor coalitions frequently included members of the institutional ecosystem, which were used to, e.g. create pressure for change, legitimation of actors, and provision of resources.

Fifth, on the societal macrolevel, various developments create pressure, which can lead to windows of opportunity (D16) for institutional change. We have found instances where crisis situations created such windows, such as those pertaining to climate, the COVID-19 pandemic, and the rise of AI.

As pointed out above, we found no single actor as the one and only driver of change. Indeed, 'the paradox is that no one actor is in control, but everyone is implicated, has agency and therefore is responsible' (Macnaghten et al. 2014, 195–196). Although dedicated lab leaders had important roles in providing initial energy for a kick-off, relaying

information, and coordinating activities, they were soon co-creating change as part of a multi-actor coalition.

Similarly, we could see that the institutional dynamics, of which both lab IEs and coalition were part of, and the immediate environment in the form of an ecosystem faced with specific field conditions as well as the societal macrolevel were heavily interacting. One could say that institutional dynamics and field conditions were mutually co-constructing themselves, e.g. when legitimacy was built due to the outcome of common projects of researchers and institutions such as research financing organizations or federal ministries.

On top of these observations on institutional dynamics, we found that the categorization as drivers or barriers was ambiguous. We think this is not necessarily the effect of the factors themselves, but in several cases results from the configurations of factors, which have changed over time. An example of this ambiguity is the factor support from authorities (D7), which could also be conceptualized as a barrier: lack of support from authorities. In the case of lab 1, it developed from a barrier into a driver over time (cp. textbox 1). Our results thus reinforce the findings of Owen et al. (2021a) which explain that committed leaders can substantially help embed R(R)I in organizations. This suggests that the effect of factors – being positive or negative – may thus be subject to change over time.

What we can learn from this is that a static analysis of institutionalization will show us only an incomplete picture of how these factors interact, and that we should consider the dynamics of institutionalization to better understand IE institutional change.

The starting point of our discussion was the identification of factors which may be either drivers or barriers – e.g. the support of authorities (D7) or the lack thereof – and later argued that we attribute this to evolving time, changing factor configurations, and thus institutionalization dynamics. However, in at least one case we think that the multifaceted nature of the factors is also responsible for this effect. Institutional heterogeneity (D2), being part of field characteristics, and disciplinary differences (B10), as well as of mobilisation of allies, are all expressions of heterogenous configurations of research field, organizations, and their ecosystems. Our observations indicate that heterogeneity indeed plays an important role in driving institutionalization as an opportunity to recognise options for change and as a challenge due to many factors, such as different perspectives on a potential change, and its pros and cons.

Messy reality thus creeps into the analysis of institutional change in manifold ways. Some factors relate to each other and may even have cross-cutting qualities. For example, institutional heterogeneity (D2) may be associated with conflicting understandings of responsibility (B5). Debates surrounding R(R)I institutionalization are nearly never about whether one needs R(R)I, but rather about what R(R)I actually means (Guston 2015; Stahl et al. 2014). Institutional heterogeneity exacerbates the interpretative flexibility of R(R)I and its related notions. Responsibility-related terms such as sustainability may acquire different meanings, depending on the backgrounds and worldviews of the involved actors.

In addition, sometimes factors are intricately linked in ways that are not always apparent, e.g. bureaucracy (B4) and hierarchies (B2) may both be considered as burdens (B7). However, large organizations (B1) tend to feature more sizable bureaucracies and are likely to display more hierarchical structures than smaller ones. The interlinkages of

these factors are shown in the lab case descriptions above, with organizational structures such as hierarchies playing a role in both cases (see text boxes in the results section).

Some factors also relate to other broadly discussed concepts. For example, there is widespread consensus within the innovation management literature that the size of organizations (B1) may impede radical innovation (known as the incumbent's curse; Chandy and Tellis 2000). Our results contribute to this debate by suggesting that their size also hinders the institutionalization of R(R)I.

Several factors relate to more than one dimension of IE, for example a lack of financial resources (B8) can hamper the mobilisation of allies but can also be conceptualized as a field characteristic that hinders IEs from the onset. Also, synergies (D11) depend on the field characteristics and the actor's social position. They can be useful for the vision but are also crucial to mobilising allies and influence overall process dynamics. Being proactive (D8) relates not only to the vision but also to the mobilisation of allies and is of overall importance for the IE concept because it describes the entrepreneurial mindset necessary for initiating institutional change.

The following Figure 1 tries to sum up our findings in a schematic way.

We build on the factors and stages proposed by Battilana, Leca, and Boxenbaum (2009) and extend them as follows: First and foremost, institutionalization dynamics is proposed as the critical 'missing link' in divergent change implementation, moving from visions and allies towards firmly embedding concrete R(R)I-related institutional changes in organizations. This process transitions from vision and allies to the firm embedding of concrete R(RI)-related institutional changes within organizations. However, the institutionalization process is not a linear progression towards 'success' (see also Hardy and Maguire 2017). It can be interrupted or reversed due to competing or countervailing tendencies, including alternative visions of institutional change sought by competing discourse coalitions, or powerful incumbents aiming to maintain the status quo (cf. Leišytė and Sigl 2018). Therefore, institutionalization dynamics refer to the evolving configurations of drivers and barriers over time and across social settings, which collectively and effectively drive or impede 'de facto' institutionalization of R(R)I-related changes.

Second, we highlight the interactive nature of divergent change implementation by introducing feedback loops. Steps and stages in a change process rarely follow a linear

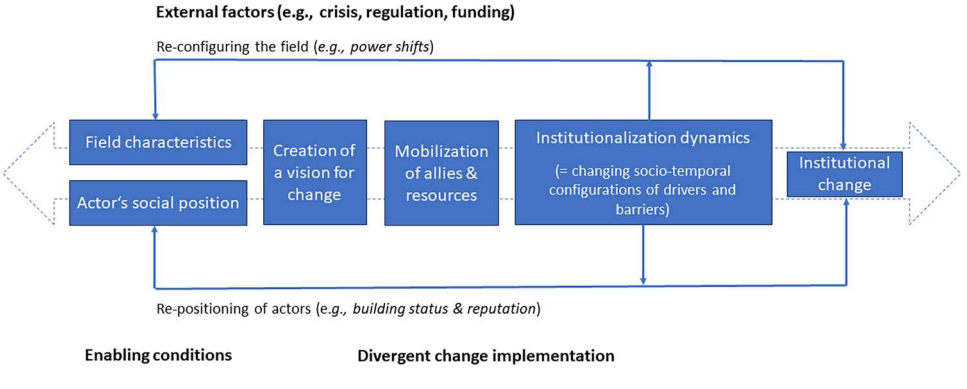

Figure 1. Overview of R(R)I-related institutional change process in organizations.

fashion but are characterized by manifold feedback loops (which have not been displayed in the schematic figure to preserve clarity). Final institutional changes may even result in adaptations of the enabling conditions at the beginning of the process.

Third, we draw attention to the environment in which institutional entrepreneurs and their change labs operate and which provide significant framework conditions for their institutionalization logics and efforts. These external factors may be disruptive (e.g. sudden crises, regulations) or pervasive (e.g. funding schemes) in nature.

Conclusion

We think that the IE perspective can add valuable insights to the questions of which factors are important for institutionalizing R(R)I in organizations. Our contribution to the R(R)I literature is to provide insights into the 'black box' of institutionalization processes and the dynamics regarding R(R)I in organizations.

Indeed, the main connection between IE and R(R)I lies in their shared goal of fostering institutional change. Institutional entrepreneurs can drive R(R)I by embedding ethical considerations and societal values into the new or transformed institutions they create. By doing so, they ensure that the innovations arising from these institutions are aligned with the principles of R(R)I, such as sustainability, inclusivity, and ethical responsibility.

This approach brings together important factors that have been discussed regarding institutional change. However, we suggest some adaptations of the concept. Most importantly, we introduce the theme of 'institutionalization dynamics', which provides a dynamic picture in comparison to the static perspective provided by original conceptions of IE, e.g. in Battilana, Leca, and Boxenbaum (2009).

We found that these institutional change processes are caused and effected by several factors, which are anything but static. Often enough, institutional dynamics and field conditions are co-creating each other. In addition, activities such as the devising of intervention strategies, orchestrating collective action, mobilizing resources, constructing rationales, and navigating tensions all are important elements of explanations for institutional entrepreneurship processes.

The downside of such an approach is that it quickly gets messy – a mirror of reality. We think that this trade-off 'messy vs. clear' is worthwhile, since it helps us to better understand institutional entrepreneurship. Yet, we are at the same time taught the lesson to stay humble in our expectations to create 'a general theory of IE'.

We also suggest to critically observe whether a factor classified as a driver may be a barrier in another context, having provided the example of heterogeneity (D2). In addition, we frequently found several factors to be interlinked, such as bureaucracy (B4) and hierarchy (B2). This also holds for factors related to more than one IE dimension. We thus suggest taking a close look at how they are conceptualized.

Regarding future research, we believe that there is still a lot to learn about the way in which organizational change comes about and the role of IE therein. Importantly, we find that IEs are influenced by a wide range of factors that they do not control, from the field characteristics of an organization to the IEs' social position, from institutional heterogeneity (D2) to the size of an organization. Yet, we also identified factors that the IEs can influence and that require specific strategies to foster R(R)I-related change. For

example, IEs can focus on promoting awareness of R(R)I (D3), gain support from authorities (D7), and create small wins (D17). Therefore, future research should further explore how IEs can leverage factors effectively for R(R)I institutionalization, e.g. the identification of windows of opportunity (D16), getting support from management, or harnessing stakeholders from the organization's ecosystem.

Finally, we think it is important to understand that there is no ready-made concept which will guarantee the institutionalization of organizational changes. Rather, the interplay of several factors, such as the type and size of an organization, its mission and ecosystem context, as well as its endowment with entrepreneurial individuals or groups are important. However, the very existence of IEs, which are proactively and energetically striving for change, is important. IEs can kick-off an initiative, relay information, and coordinate activities, even if without a multi-actor coalition sustainable change might be difficult to obtain.

Notes

1. Sometimes also referred to as the 'six keys', which includes the pillar of 'governance'. These keys first appeared in the Rome Declaration (2014) on Responsible Research and Innovation, which itself represented an abrupt outcome of political struggles to institutionalize RRI as an EU policy artefact, prior to becoming part of the Horizon 2020 program (Owen, Von Schomberg, and Macnaghten 2021b).
2. While there may be differences among various responsibility-related processes in different organizations (such as those related to environmental sustainability or diversity, equality and inclusivity, DEI), the aim of this study was not to delve into the specifics of these individual processes within an organization or compare them across varying organizations, despite their importance (examples of differing processes, e.g., Dobbin and Kalev 2017; Waxin et al. 2023). Instead, the study sought to analyse and describe the general dynamics that initiate and sustain various change processes. Further research is needed to explore detailed responsibility-related processes across different organizational dimensions.

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