Track 5 - Are inter- and trans-disciplinarity living up to their promise in RRI?

(Harald Throne-Holst, OsloMet, Matthias Kaiser, UiB, Christian Wittrock, OsloMet)

Friday 30th 8:30-10:30 – Session 1 – Chair: Harald Throne-Holst

Friday 30th 13:20-14:30 – Session 2 – Chair: Harald Throne-Holst

Session 1
Chair: Harald Throne-Holst, OsloMet, Norway.

Abstracts

Across disciplines, to make an impact. The technological impact of boundary-spanning research projects

Federico Munari[1], Laura Toschi[1], Herica Morais Righi[1]
[1] University of Bologna, Italy

For over three decades, management studies have been investigating the consequences of spanning boundaries in different fields, such as strategy and finance, innovation, entrepreneurship. In the field of science, scholars have analyzed the dynamics of boundary spanning research from different perspectives, mostly at the individual level and by looking at the consequences in terms of generation of scientific impact (e.g. Leahey et al., 2016; Yegros-Yegros et al., 2015). If these studies have increased our understanding of how the combination of knowledge among different fields may play an important role, they mainly disregarded two elements: (i) the assessment of boundary spanning at the level of research projects, rather than at the individual level, and (ii) the link between boundary spanning scientific activity and technological impact, rather than scientific impact.

In this paper, we address these gaps by focusing on the boundary spanning nature of research projects (Boudreau et al., 2016; Criscuolo et al., 2016) that we define as researchers' ability to access and flexibly integrate different sources of knowledge which derives from outside the boundaries of their own disciplinary field. With this definition in mind, we intend to answer the following research questions: Are boundary spanning research projects more likely sources of technological impact? And, how does such relation is moderated by the academic seniority of the scientists leading the research projects?

This investigation is relevant for the following reasons. First, literature suggests that the process of scientific research is increasingly becoming the output of a team activity within projects (Paruchuri, 2010). Second, the interrelation between science and industry is recognized as crucial for increasing innovative performance, accelerating growth and supporting competitiveness of organizations and countries (Dumont, 2017; Jaffe, 1989). Third, there is an open 2 debate on the role of academic seniority in innovation and

technology transfer processes, on the one hand, and in the adoption of boundary-spanning research, on the other hand (Haeussler and Colyvas, 2011; Munari and Toschi, 2021).

We investigate our research questions exploring the scientific outcomes from 6,081 projects in Life Sciences, Physical & Engineering, and Social Sciences & Humanities funded by the European Research Council (ERC), the premier funding agency for frontier research in Europe, under the FP7 and H2020 programmes for the period 2008-2016. We identify the patents that relied on the knowledge produced by these projects and investigate to which extent boundary spanning projects are related to technology development. We measure boundary spanning using the diversity of subject areas (identified on the SCOPUS database) represented by the backward citations of the publications derived by each ERC-funded project. We assess technological impact in terms of i) a boundary-spanning research project's probability of having its scientific publications cited by at least one subsequent patent and ii) a boundary-spanning research project's ability to inspire patents that span across broad technological domains. In this paper, we are thus interested in tracing knowledge flows from science to technology.

Results from our regression analyses show that the relationship between boundary spanning and technological impact is not linear. Boundary spanning research projects are more likely to generate technological impact but there is a turn point where the increment on the knowledge range starts to hinder technological impact. Moreover, our results show that the researchers' academic seniority moderates the relationship. In particular, we find that for mediumlow levels of boundary-spanning, when the scientific projects are led by junior researchers, the inverted U-shaped relationship is more pronounced.

Who is the "we" in "The science we need for the ocean we want"?

Mimi Elizabeth Lam, University of Bergen, Norway

The UN Ocean Decade´s slogan is "The science we need for the ocean we want." But who is this "we"? And is it the same "we" in the "science we need" as in the "oceans we want"? These questions define the crucible of Responsible Research and Innovation in the global ocean context. To assess if research is responsible, it is necessary first to answer the question of responsible to whom and then, responsible for what? The writers of the slogan likely intended scientists to determine "the science we need," that is, scientists are the first "we". But they likely intended the second "we" in "the ocean we want" to be civil society.

The first problem, which is indeed a wicked problem, is for scientists to agree on "the science we need": this is fraught with challenges. Scientists from varied disciplines rarely communicate with each other, and if they do, they rarely agree, as the facts of interest, the methodological tools of investigation, and even, and most perniciously, the conceptual frameworks of structuring information and assessing merit can vary with discipline. So "we" (there is that unassuming, but obtrusive two-letter word again!) must then ask which scientists should be tasked or elevated (depending on one´s perspective of work to be done or power to be exercised or gained) to define "the science we need"? Should it be the oceanographers, since we are dealing with the oceans? Or the ecologists, if we are concerned also with the creatures living within the oceans? Or the social scientists (e.g., the anthropologists, sociologists, and geographers) that study people and their interactions with

the oceans? Or the meta-scientists (e.g., the historians, philosophers, and ethicists) that are concerned with the norms and biases within and about science? Or should it be all? But then how do "we" foster agreement? What criteria are to be used? And who decides? Should it be the elites, and if so, which elites, the most rich, published, awarded, or popular? How do we reconcile this diversity among humans? There is that wicked "we" again. It is unavoidable!

The second problem - of "the ocean we want" - is even wickeder, as more diversity exists within society than within the enterprise (or bubble) of science. Here, should the decision be made by majority vote, consensus, or (rich, political, intellectual, or otherwise powerful) elites within society? How do we ensure that the process will be fair, representative, and transparent and that those making the decisions will be (well-)informed. It can be next to impossible to agree on the movie "we" want to watch, let alone the ocean "we" want!

So how do we solve these wicked and wickeder problems? My answer: transdisciplinarity! But this only opens up new questions, such as how to elicit the preferences of the "we" and how to reconcile diverse preferences, knowledge sources, and values of this "we." In this talk, we – nay, I – will present the results of our efforts within the Managing Ethical Norwegian Seascapes Activities (MENSA) project, funded by the Research Council of Norway, both to elicit and to reconcile the diverse values and identities of Norwegians at the individual, community, and national levels with respect to ocean management and governance.

Students as agents of innovation and radical transformation of academia through design thinking

Simona Brozmanová[1], Alex Taylor[1], and Haizea Perez Machin[1]
[1] OsloMet, Norway

This project at Oslo Metropolitan University, explores the importance of students as agents of innovation and radical transformation within the academic realm through the application of systemic design thinking principles. The initiative addresses the pressing need for academia to undergo transformative change to become more relevant and responsive to societal challenges. It proposes that students, with their fresh perspectives and firsthand experience of the world's current issues, are uniquely positioned to drive this transformation. Their interest in change and the energy they bring are identified as critical components in generating innovative ideas and facilitating action.

The research underlines the limitations imposed by current academic structures on creative thinking and proposes the reevaluation of the traditional separations between research and student engagement. It advocates for a systemic rethinking of how academia interacts with its students, aiming to foster a more integrated and collaborative environment. The utilisation of systemic design and design thinking emerges as a fundamental approach to achieving this goal. These disciplines offer methodologies for action and intervention that not only encourage creativity within academic settings but also promote inter- and transdisciplinarity as essential for addressing complex societal issues.

The project highlights examples from the SPARC (Sustainable Partnerships and Research Collaborations), a student-driven pilot project conducted in 2023, showcasing the successful application of design disciplines in various structural sectors of educational institutions.

These examples illustrate design's potential to facilitate and require a shift towards more interdisciplinary and transdisciplinary approaches in academia.

Furthermore, the paper engages with the broader discourse on 'Transforming higher education for global sustainability.' as championed by UNESCO (UNESCO, 2022). Case studies appear to be a good approach when tailoring the innovation principles to the institution. Additionally, the complexity of "wicked problems" can be tackled through enhanced collaborative efforts across different knowledge systems and power structures. It critiques existing models of knowledge exchange within Responsible Research and Innovation (RRI), advocating for a model that better supports student-led initiatives and cross-level collaboration.

This exploration into the transformative potential of design thinking within academia contributes to the discourse on systemic design principles in social innovation, emphasising the importance of acknowledging interrelated problems, developing system-wide empathy, strengthening human connections to foster creativity, influencing mental models for change, and adopting an evolutionary approach to systemic change. Through this lens, the project offers a compelling argument for reimagining the role of students in academic innovation and societal transformation, encouraging a new form of inter- and transdisciplinarity.

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Fostering user involvement in collaborative innovation spaces: insights from living labs

Judy Hong Huang, University of Stavanger, Norway

The evidence of users' innovation ability can be traced back centuries (Bogers et al., 2010). Still, it was not until the 1970s that von Hippel (1976) showed users' innovation capability, from recognizing potential needs to developing and diffusing solutions. From giving inputs to product development to being the source and the center of innovation, users' roles are shifting, and a more active group of them are even innovating the rightfitting solutions for themselves and society at large (von Hippel, 1988, 2005, 2016). Users participate in every phase of the innovation process, from idea generation, conception, and testing to diffusion

(Bosch-Sijtsema & Bosch, 2015). A close look reveals that they have different roles and degrees of engagement in the process and, therefore, a spectrum of user involvement (Almirall et al., 2012). Given that users are often spread out, it is imperative to explore the avenues where they can engage in innovation. Firms and organizations actively seek out users to foster value exchange and co-creation (Ballon et al., 2018). Innovators and researchers have explored diverse ways of engaging users within innovation spaces to stimulate knowledge exchange and value creation (Caccamo, 2020). These collaborative innovation spaces, known by various names such as fab labs, open labs, living labs, and studios, bring together actors across different boundaries of domains to develop innovative solutions collaboratively (Fritzsche, 2018).

Since the 2000s, the living lab has emerged as a popular environment and platform for fostering innovation with users due to its openness, real-life context, and user-centric approaches (Leminen & Westerlund, 2019). Living labs facilitate activities around users, capturing tactic knowledge to develop solutions that fulfill their needs (Almirall et al., 2012; Leminen et al., 2017), and contribute to addressing complex technological and societal issues such as sustainability, education, health, and well-being (Hossain et al., 2019). While researchers have explored various aspects of this complex process, there remains a need to delve deeper into their approaches to user involvement.

This study explores the core elements influencing user involvement during the innovation process within the context of living labs. Adopting a qualitative research approach, we conducted interviews with 22 representatives from 18 living labs and the European Network of Living Labs (ENoLL), an international cluster of living labs with over 150 active members and extensive connections of non-member living labs. Through a detailed exploration of the user involvement dynamics and mapping onto emerging theories, this study presents a framework of user involvement in the innovation process and crucial factors affecting each. Our objective is to glean insights that can be used to support continuous user involvement through collaborative innovation spaces.

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The heart of the matter with Transdisciplinarity (TD)

Neeraj Mistry, University of Pretoria, Republic of South Africa

Transdisciplinarity (TD) is a form of transformative research intended to engage various disciplines to tackle complex challenges or "wicked" problems, which cannot be addressed within any single faculty alone. Furthermore, TD acknowledges the importance of an extended stakeholder group, which usually involves communities and sectors outside of the academic setting. These stakeholders include business or the private sector, non-profit organizations, local communities and civil society, governments, and international and regional agencies. The impetus behind this approach is that diversity of stakeholders and disciplines can create the enabling conditions for innovation, creativity, and transformative solutions.

A critical challenge, however, is not the rational or substantive alignment, synergies, and complementarities across stakeholders and disciplines, but the individual personality and human factors that enable or hinder collaboration and co-creation. The former, are commonly termed hard issues, which are problems that are well defined or well structured. These are routinely solved by application of a well-understood formula, process, or design. On the other hand, soft issues are "Problems that are highly dependent upon how they are perceived by the participants[i]," essentially - the heart of the matter.

This presentation will examine the nature and associations of hard and soft problems, and from a systems-thinking approach[ii], look at various methodologies and approaches to

specifically address soft problems. It will compare and evaluate two approaches: the corporate sector that embraced soft issues as part of their operations and strategy[iii], and the non-profit sectors that are valuing employee "passion, energy, and ideas"[iv]. The central argument will be based on the neglect of collaboration in academia. While it is identified as a key skill[v], there is less attention to its execution, particularly in the nuanced "soft" issue lens of understanding those factors that inhibit and promote collaboration. These factors are exaggerated with transdisciplinary work. This presentation is an exploration of examples of successful TD collaboration with particular attention to the soft issues as a key determinant to TD success by focusing on academic methodologies of collaboration.

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