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Perceived incentives to transdisciplinarity in a Japanese university research center

Giancarlo Lauto [a,b,*], Shintaro Sengoku [b,c,1]

[a] Department of Economics and Statistics, University of Udine, Italy
[b] The Institute for Integrated Cell–Material Sciences (WPI–iCeMS), Kyoto University, Japan
[c] Graduate School of Innovation Management, Tokyo Institute of Technology, Japan

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ABSTRACT

As a method of investigating complex socially relevant phenomena, transdisciplinary research (TDR) is gaining increasing centrality as a model of knowledge production. However, it is being discouraged by a scientific reward system based on disciplinary logic. The disincentive is even stronger for junior scholars who should be developing the capabilities necessary for achieving long-term scientific excellence.

Building on theories of the coordination of scientific communities and using the case of a research center of Kyoto University investigating the boundary between cell and material sciences, we aim to disentangle the interplay between institutional incentives and intrinsic motivation in the prioritization of TDR over monodisciplinary research.

We find that, despite strong interest in TDR among scientists and the center's mission to promote this orientation, only a minority of scientists prioritize this approach. Choice of research strategy is associated with its perceived benefits for idea generation, publication opportunities, intellectual effort required, the costs of team coordination, and satisfaction with organizational resources. Furthermore, the propensity to prioritize TDR drops among scientists beginning their careers.

Therefore, we recommend the development of evaluation schemes grounded in activity-based measures and the granting of permanent positions to scientists pursuing TDR.

1. Introduction

In many fields, such as the life and material sciences, investigations are targeting increasingly complex phenomena, a tendency triggered by policy pressures encouraging studies with direct implications for major societal issues and industrial innovation and enabled by novel and powerful instrumentation that is broadening the scope of research (Bonaccorsi, 2008; Cohen, Nelson, & Walsh, 2002; Gibbons et al., 1994; Nightingale & Scott, 2007).

Transdisciplinary research (TDR) is often called for in these investigations, since individual disciplines offer only partial views of the issues at stake. The literature offers several conceptualizations of TDR, possibly reflecting its heterogeneity and

* Corresponding author at: Department of Economics and Statistics, University of Udine, Via Tomadini 30/A, I-33100 Udine, Italy. Tel.: +39 0432 24 9593; fax: +39 0432 24 9229.
E-mail addresses: giancarlo.lauto@uniud.it (G. Lauto), sengoku@mot.titech.ac.jp (S. Sengoku).
[1] Address: Graduate School of Innovation Management, Tokyo Institute of Technology, W9-104, 2-12-1 Ookayama, Meguro-ku, Tokyo 152-8550, Japan. Tel.: +81 03 5734 3571; fax: +81 03 5734 3571.

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dynamism. The concept of TDR encompasses a great variety of research practices that all share an orientation toward a societal problem, interdisciplinarity, and stakeholder involvement (Buanes & Jentoft, 2009; Gibbons et al., 1994; Huutoniemi, Klein, Bruun, & Hukkinen, 2010; Jacobs & Frickel, 2009; Klein, 2004; Mobjörk, 2010; Pohl, 2011; Rhoten & Pfirman, 2007; Siedlok & Hibbert, 2014; Zierhofer & Burger, 2007).

This paper contrasts transdisciplinary with monodisciplinary research (MDR), which is conducted without the involvement of external actors and aims to deepen the theoretical understanding and applications of discoveries within one well-defined disciplinary area.

It is expected that TDR will soon gain increasing centrality as a model of knowledge production, challenging established disciplinary practices (Bruce, Lyall, Tait, & Williams, 2004; Lyall & Meagher, 2012). Accordingly, several incentive schemes and training programs have been launched (Bridle, Vrieling, Cardillo, Araya, & Hinojosa, 2013; Jacobs & Frickel, 2009; Lyall & Meagher, 2012), while novel organizational forms such as "university research centers" have been designed to provide a setting favorable to TDR (Bozeman & Boardman, 2003). However, this process requires that scientists, research organizations, and scientific systems redefine their priorities and build new research capabilities (Bercovitz & Feldman, 2008). This process seems problematic because science policy stimuli and scientists' preference for TDR may conflict with the established scientific criteria of quality, which are based on a disciplinary logic that typically rewards MDR. As a consequence, prioritizing non-mainstream approaches such as TDR is a rather risky strategy for scientists wanting to improve their professional standing (Bruce et al., 2004; Rafols, Leydesdorff, O'Hare, Nightingale, & Stirling, 2012; Siedlok & Hibbert, 2014). This is especially critical for junior scientists, who are expected to cultivate the transdisciplinary capabilities necessary for the long-term development of scientific systems but at the same time face tenure and career pressures.

We build on theories of the coordination of scientific communities (Carayol & Dalle, 2007; Dasgupta & David, 1994; Horlings & Gurney, 2013; Merton, 1957; Polanyi, 1962; Stephan, 2010; Ziman, 1987) to develop a series of propositions on the factors influencing the choice of transdisciplinary research strategy. We identify the factors scientists perceive as being conducive to the pursuit of each of three research strategies: prioritization of TDR, prioritization of MDR, and equal importance given to both. Our study contributes to the debate on TDR by providing new evidence on the interplay between external incentives and individual preferences in the definition of a research strategy. Moreover, we explore these issues in an empirical setting that has been under-researched.

Our study focuses on the Institute for Integrated Cell-Material Sciences (WPI–iCeMS), a university research center at Kyoto University, Japan. The center was established through the government-funded World Premier International Research Center Initiative program to contribute to the emerging field of cell-material sciences. We believe this case to be worthy of attention for several reasons. First, the Japanese research system has recently undergone profound changes driven by policies designed to encourage the diffusion of practices and organizational models for sustaining TDR, such as an orientation toward societal challenges, disciplinary integration, collaborative projects with industry, and the creation of world-class research centers (Anzai, Kusama, Kodama, & Sengoku, 2012; Gautam & Yanagiya, 2012; Urashima, Yokoo, & Nagano, 2012). Our study offers insights into this ongoing systemic transformation. One distinctive feature of the Japanese research system that seems to persist despite these changes is the fact that full professors enjoy a high level of autonomy and protection. While such employment conditions may lead to conservative or inefficient behaviors, they may also stimulate senior faculty at world-class organizations like WPI–iCeMS to experiment and undertake scientific risks, such as with TDR. Therefore, WPI–iCeMS offers a methodological opportunity to observe how the interplay among the organizational context and the intrinsic and extrinsic motivations for TDR varies across levels of seniority and academic rankings characterized by different levels of security. Finally, we believe that analyzing a Japanese case adds to our understanding of the organization of university research centers, the literature on which has focused mainly on the American experience (Boardman, 2009; Corley & Gaughan, 2005; Gaughan & Ponomariov, 2008; Ponomariov & Boardman, 2010; Youtie, Libaers, & Bozeman, 2006).

We carried out a survey on scholars working at WPI–iCeMS as well as in-depth interviews with selected scientists concerning their self-reported orientation toward TDR, their motivations and perceived opportunities, and the constraints associated with this approach. Our respondents report a generally positive attitude toward TDR, which is, however, prioritized by only a minority. Resistance is found particularly among those who have just entered academia. We also find that TDR or MDR prioritization is associated with a comparison of its potential benefits in terms of research insights and potential barriers to career development, as well as with the availability of research resources. Our study emphasizes the necessity of developing research evaluation systems and career paths consistent with the science policy goal of strengthening research systems' transdisciplinary capabilities.

The rest of this paper is organized as follows. Section 2 outlines the theoretical framework, examining how the governance of scientific communities and organizational-level practices affect research strategizing, particularly in the context of university research centers. Section 3 presents the research design, while the key results are presented in Section 4. Finally, we present the concluding remarks and discuss the study's limitations and implications in Section 5.

2. The drivers of TDR prioritization

2.1. The selection of a research strategy

We refer to a "research strategy" as the set of decisions researchers make concerning the domains of the scientific discourse they wish to enter; these decisions constitute the core process of the production of scientific knowledge (i.e., topics