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Strategic and ethical foundations for responsible innovation

Krsto Pandza*, Paul Ellwood

Leeds University Business School, United Kingdom

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ABSTRACT

In this paper, we report on an inductive study of how members of two nanotechnology research groups experience the issue of responsible innovation. We argue that the nascent process of institutionalizing responsible innovation requires studying the interplay between strategic and ethical agency. In order to better conceptualize links between strategic and ethical agency, and to make connections to professional practices and organizational capabilities, we draw on MacIntyre's virtue ethics. Our empirical evidence suggests that researchers and strategists in laboratories experience responsibility at two levels. Firstly, they recognize responsibility as unproblematic if it relates to contexts characterized by low uncertainty of relations between action and impact. We argue that this is explainable by high congruency between the all three types of agency and the existence of strong, stable and homogenous professional identity. Secondly, responsibility is perceived as problematic and ambiguous if relations between action and impact are characterized by high uncertainty. If issues of responsibility challenge established criteria of what constitutes scientific excellence and these are no longer in the autonomous domain of agents who actively participate in the practices of science, their very professional identity becomes contested, and congruency between different types of agency is interrupted. We argue that members of research laboratories seek to develop new organizational capabilities such as collaboration with new stakeholders of science-driven innovation and learning a new discourse that enables better communication between different constituencies. This deliberate engagement with the distributed and uncertain quest for responsible innovation requires both ethical and strategic judgment.

1. Introduction

The human capacity to innovate largely surpasses the capability for innovation that has sustainable outcomes for society. Concerns about intended and unintended impacts of new technologies explain growing calls for *responsible innovation* (Morris et al., 2011), the sustainable transition of social and technical arrangements (Geels, 2010), and stronger engagement between science-driven innovation and society (Wynne, 2001; Smith et al., 2010). Responsible innovation becomes what Hoffman (1999) calls an issue around which members of technological fields (Carlsson et al., 2002) coalesce, because of its importance to the interests and objectives of specific organizations. Such issue-drive organizational fields are characterized by both convergent and divergent forces (Farjoun, 2002). While the former influence adaptation of similar practices and compliance to norms in order to gain legitimacy (Meyer and Rowan, 1977), the latter create contradictions and provide space for agency and change (Seo and Creed, 2002).

The impact that responsibility mandates have on members involved in science-driven innovation is still unclear and difficult to gauge. Garud and Gehman (2012) argue that such issues are better understood as aspirations that may never be absolutely achieved, suggesting its instantiation could only be imagined through observation of the practice of science-driven innovation. On the other hand Owen and Goldberg (2010) report how public funders have required grant applicants to identify societal and ethical issues in their proposals. This suggests that the issue of responsibility already obtains some characteristics of a coercive force that attempts to shape actions. It is possible to argue that the issue of responsible innovation creates a degree of institutional ambiguity (Hajer, 2006) where initially there are no clear rules about who is responsible for what, who has authority over whom and how things ought to be done. Calls for responsible innovation could be understood as a jolt that initiates a process of institutionalization (Barley and Tolbert, 1997; Greenwood et al., 2002) where a myriad of agents start engaging in a dialectic process of producing new principles and values that are supposed to define the range of technology innovation (Hargrave and Van de Ven, 2006). An emerging issue, however, could also create contradictions and tensions and these require examining actions of individuals or groups in the new contexts (Greenwood and Hinings, 1996; Shinn and Lamy, 2006) as well as paying special attention to the role of *agency* within the

* Corresponding author at: Leeds University Business School, Maurice Keyworth Building, University of Leeds, Leeds LS2 9JT, United Kingdom.
Tel.: +44 0 113 343 4509; fax: +44 0 113 343 4885.
E-mail address: kp@lubs.leeds.ac.uk (K. Pandza).

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emerging structural arrangements (Giddens, 1979; Seo and Creed, 2002).

Emirbayer and Mische (1998) disaggregate agency into three dimensions. Firstly, iterational agency stands for selective reactivation of past patterns that are routinely incorporated into activities in order to achieve stability of actions over time. This type of habitual agency is contained in the notion of organizational capabilities (Eisenhardt and Martin, 2000, Winter, 2003) suggesting actions of individuals within organizations are embedded in collective routines developed through the process of experiential learning (Winter, 2000). Secondly, projective agency involves imaginative generation of possible future trajectories of actions where available structures are creatively recombined in order to achieve desirable ends. This perspective is ingrained in the notion of strategic agency manifested in actors' ability to search for distant opportunities (Gavetti and Levinthal, 2000; Gavetti, 2012) and sensing change (Teece, 2007). Finally, evaluative agency entails the capacity of actors to make judgments among alternative possibilities in response to emerging demands, dilemmas and ambiguities of presently involving situations (Emirbayer and Mische, 1998, p. 971). Such judgments about values, rights and duties in the context of actual situations expose actors' ethical position (Treviño, 1986), which is especially pertinent if the responsibility of science and technology-driven innovation is considered (Doorn, 2012).

Studies of responsible innovation predominantly build on two normative theories–deontological and teleological ethics–and less often invoke virtue ethics. Whetstone (2001) observes a similar theoretical bias in business ethics and suggests attention is given to virtue ethics for a better understanding of ethical agency. Existing efforts to make science-driven innovation responsible often seek solutions based on duty-driven deontological ethics, which require that agents engaged in science-driven technology innovation adhere to rules, norms and principles. From this ethical perspective, the goal is first and foremost to make technological innovation free of any negative implications for the environment, human health and wider social wellbeing (Swierstra and Jelsma, 2006). Complying with the regulatory standards may be the simplest way to assure responsibility (Shatkin and North, 2010), yet as Owen et al. (2009) assert, there is often a significant time delay between the emergence of technology and understanding its consequences for health and the environment. Their proposal to improve risk management techniques and to pay serious attention to broader social and environmental implications through technology forecasting (Deuten et al., 1997; Rip, 1995) hint at the principles of teleological ethics. From this perspective, actions are judged solely on their consequences, and agents act responsibly if they understand these. This deontological focus on an obligation to act and teleological focus on consequences when investigating responsible innovation is insufficient because of the very *uncertainty* of science-driven innovation. Management and social studies of technological change (Anderson and Tushman, 1990; Currall, 2009; Currall et al., 2006) have already documented the uncertainty of discontinuous technological innovation; something further compounded by institutional ambiguity of an emergent organizational field with interest in responsibility. The intrinsic uncertainty that accompanies the dynamics of technology reveals the limitations of regulatory frameworks and risk management techniques, and suggests that technology innovation is highly unlikely to be responsible without actors being virtuous. The approach of virtue ethics shifts the emphasis from rules that are supposed to guide ethical behavior to ethical agency that is intrinsically motivated by the desire to make a valuable contribution to society (Koehn, 1995). The focus on agents and their embeddedness into social interactions (Weaver, 2006) in virtue ethics points to the relevance for understanding responsible innovation.

The inevitable uncertainty of technological change and absence of unambigous rules and norms for guiding actions in organizational field influenced by the issue of responibilty, expose the relevance of agency in building nascent structures. Understanding this institutionalization process of responsible innovation, especially its initial phase, requires investigating the relationship between strategic, ethical and reiterative (habitual) agency, the latter being embedded in organizational capability. In the next section, we review the literature that informs our theorizing about interactions between strategic and ethical agency and organizational capabilities. We then introduce our research design and methods, before reporting the insights gained from the in-depth and inductive study of two laboratories engaged in research into emerging nanotechnologies. Finally, we discuss how the issue of responsible innovation affects configuration of reiterative, strategic and ethical agency as well as sustainability of existent and development of new organizational capabilities.

2. Theoretical background

Conceptually exploring the triangle of strategic agency, organizational capabilities and ethical agency in the context of responsible science-driven innovation requires a review of different streams of literature, and speculation on how these initial theoretical constructs are linked. We embrace the notion that *agency* is demonstrated by purposive acts of knowledgeable agents that intervene in the relevant process and that, at any point in time, could have acted otherwise (Giddens, 1979). This conceptualization of agency has traction in studying technology innovation (Orlikowski, 2000; Garud and Rappa, 1994; Garud and Karnøe, 2003).

2.1. Strategic agency and organizational capabilities

Agency and organizational capabilities have never sat together comfortably in strategy research. This could be partly explained because reiterative and habitual agency has received much more systematic attention than forward looking strategic agency. Organizational capabilities embedded in cumulative and collective learning patterns (Helfat and Peteraf, 2003; Zollo and Winter, 2002) were deemed an effective replacement for the imperfect projective agency of strategists (Nelson and Winter, 2002). From this perspective, strategic agency is constrained by path-dependent learning histories (Dierickx and Cool, 1989; Vergne and Durand, 2010) or guided by exogenous forces that select the appropriateness of capabilities.

The recent revival of the role of strategic agency within the context of organizational capabilities comes from different directions. In the concept of dynamic capabilities, strategists take a more central role as purposive agents that mitigate between external changes and the reconfiguration of internal capabilities (Helfat et al., 2007; Peteraf and Reed, 2007). The Penrosian notion of opportunity-seeking agency (Penrose, 1959) is rediscovered as a key source of organizational capabilities (Teece, 2007). Often, scholars interested in the micro-foundations of organizational capabilities explore the role of managerial cognition that guides the search for new organizational capabilities within the competitive landscape (Gavetti and Levinthal, 2000; Gavetti, 2005). Strategists creatively span their experience with novel strategic challenges by utilizing analogical reasoning (Gavetti et al., 2005). Although individual experience presents a readily available source of capability development, Winter et al. (2007) suggest that the direction taken by the search remains in the domain of human imagination.

A different role for strategic agency in understanding the development of organizational capability is offered by the concept of path creation (Garud and Karnøe, 2001). If the development