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Dilution of innovation utility, reinforcing the reluctance towards the new: An upstream supplier perspective on a fragmented electricity industry

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ABSTRACT

This paper inquires into how a reorganization of the value chain running from client-utilities to equipment suppliers within the electricity industry has altered the conditions for diffusing/adopting technological innovation. Through an interview-based qualitative case study of the development and diffusion of high-voltage switchgear, it provides a supplier perspective on how the downstream capacity to recognize and assess the potential value of innovations has fared in the face of downsized utility organizations, seeking to cut costs through aggressive outsourcing of engineering, procurement and construction activities. Highlighting how relations between end-clients and upstream suppliers – following a strategic orientation towards activities considered to be core – increasingly have become mediated by consultants and project-based contractors, the narrative analysis first suggests that this has stolen the industry of important inter-organizational learning processes. This in ways that have reduced the 'absorptive capacity' of the utilities sector. Second, the analysis suggests that the contractual form that has come to dominate infrastructure projects further works to de-incentivize the adoption of new technology, by diluting the perceived utility of innovation across the array of actors populating the value chain. Thirdly, the paper calls for renewed policy measures to deal with this reinforced reluctance towards the new.

1. Introduction

Firmly supported by transaction cost economics (TCE) theory, the waves of market deregulation and reform that swept across OECD member states as well as many less industrialized countries during the 1990's and early 2000's were based on assumptions that a more competitive landscape in the utilities sector would also foster technological developments among suppliers of the components and subsystems constituting the electricity infrastructure (see, e.g., Joskow, 1998). Unbundling generation and transmission, and replacing the hierarchical structures of vertically integrated utility organizations with more market-based relationships should not only make for a more efficient and transparent supply, transmission, and distribution of electricity, but also drive the development and diffusion of new technology despite potential divestments in R&D on part of utilities. Lately, such preconceptions have induced an interest in utility organizations and their strategic investments in innovation (e.g., Worch et al., 2012), and motivated alternative theoretical perspectives to follow up on the promises and the premonitions conveyed by the reform programs and by TCE perspectives, for instance by shifting the attention towards the capacity to absorb knowledge and technology generated beyond downsized R&D departments (e.g., Gebauer et al., 2012; Worch et al., 2013).

In line with the burgeoning literature on 'absorptive capacity' (cf. Cohen and Levinthal, 1990), this research has acknowledged that an organization's combinative capabilities (e.g., Kogut and Zander, 1992; Van den Bosch et al., 1999) as well as the nature of its inter-organizational relationships (e.g., Lane and Lubatkin, 1998) make out central aspects of a utility organization's capacity to recognize and make use of external knowledge/technology. Gebauer et al. (2012) have for instance outlined how utility organizations could enhance their learning processes, cultivate their capabilities to combine resources in new ways, and establish specific modes of relating to other actors within this industrial environment so as to become more innovative. Whilst bringing attention to how innovation (absorption) strategies at once hinge on organizational capabilities, the organization's position in the industrial network, and the nature of its inter-organizational relationships, this research builds on the assumption that utility organizations are largely in command of how they relate to for instance upstream suppliers – which alongside government policy measures are typically perceived as one of two central forces pushing innovation within the electricity industry, as utilities have surrendered some of the technological initiative

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and cut down on R&D (cf. Burger and Weinmann, 2015).

Put somewhat differently, research addressing the absorptive capacity of utility organizations have largely treated these as unitary actors and exchange partners that are mutually dependent on a range of other actors in the industrial environment, but relate to these through dyadic relationships and on the basis of shared and overseeable interests, or in pursuit of joint value, as it were (cf. Anderson et al., 1994). As such, this stream of research has overlooked a question implied already by analyses of the impending reforms steeped in TCE theory, namely how the increasingly market-based modes of organizing the utilities sector, including for instance the widespread outsourcing of the engineering, procurement, and construction of new infrastructure, may impact the capacity of the downstream client-environment to absorb new knowledge/technology, and adopt innovations developed by upstream suppliers. The present article picks up on this question by focusing attention on the de-centered or fragmented character of the downstream client environment (cf. Berggren et al., 2001), which is supposed to absorb external knowledge and ultimately decide whether or not to adopt technological applications developed upstream. It does so by inquiring into how the perceived capacity of utilities and other client organizations to *recognize* and *evaluate* technological innovations developed upstream the value chain/network has evolved in the face of institutional rearrangements and strategic reorientations centered on divestments and contracting out activities to external consultants and contractors.

Approaching this issue from the perspective of an upstream supplier, the article seeks to complement and also complicate recent research that has addressed changing capability structures and innovation (absorption) strategies in the utilities sector by foregrounding how the dispersed and discontinuous character of the learning and communication processes spanning the client environment appears to affect the *potential absorptive capacity* of this industrial realm (cf. Zahra and George, 2002), not least by diluting the downstream environment of perceived utility of innovation. Although the relationships between client-utilities and upstream suppliers have often been posited as an important locus for technological innovation within this realm, how they are constituted and how they impact the conditions for adopting and diffusing technologies developed upstream largely remains a white spot of research addressing innovation in the electricity industry (cf. Jamasb and Pollitt, 2015; Worch et al., 2013). By taking a supplier perspective on the readiness to adopt technological innovations downstream, and exploring this aspect by means of a qualitative case study, the article provides an outside view on an array of actors and interests impacting the relational dynamics at work here, and supposedly also on a series of unintended and slightly overlooked effects of their strategic orientations, which could be difficult to capture by approaching them directly. In this way, the paper also serves a platform for further quantitative work which may wish to extend the empirical and theoretical observations made here.

2. Literature review

Characterized by long technological life-cycles (30–40 years), a high degree of physical interconnectivity, rigid technical and operational standards, and extremely high demands on reliability, the electricity industry has often been understood to be highly path-dependent, with a bias towards incremental innovation (cf. Hughes, 1987). The restructure and reform programs rolled out on a global scale over the past decades were expected, however, to open up the industry to more radical innovations and more diverse technological trajectories. Initiated analyses launched in the early stages of the transitions envisioned that they would incite a general demand for new technological applications – incremental or radical – with a capacity to improve aspects such as reliability. In an attempt to ensure that the 'reforms improve rather than degrade the performance of the electricity sectors' in transition, Joskow (1998) suggested, for instance, that breaking up vertically integrated utility organizations and 'turning as much of the resource allocation decisions as possible to competitive markets' should direct private investments towards less capital-intensive and more diverse technological solutions.

Heavily indebted to Williamson's (1975) work in transaction cost economics (TCE) theory, the argument circled around the notion that increased competition and accountability would be the surest way to increase transparency and incentivize utilities to exploit cost-saving opportunities in production (see also Joskow, 1991). Joskow (1998: 49) professed, moreover, that the efficiency of the market should '*stimulate* research, development and innovation among manufacturers of equipment' by creating new market opportunities and increasing demand for innovations concerned with improved reliability and network control. And although the reforms could be expected to further depress utilities' R&D expenditures, and complicate their investment decisions in infrastructure technology since no one actor would no longer be in control of the entire electricity production system, the new competitive landscape should nevertheless drive technological developments upstream, according to the same analysis. This, due to new regulation expanding international trade and putting an end to traditional spheres of influence associated with domestic procurement bias, which in turn should lead to developments across the board: 'lower costs for new equipment, better equipment performance, more performance risk placed on equipment vendors, and ultimately lower prices for electricity consumers.' (*ibid.*,: 39).

Such formalistic understandings of the relationship between restructured and reformed conditions in the utilities sector and upstream developments have, however, been advanced and indeed also challenged over the past decade.[1] And although equipment suppliers are often the parties conducting technological developments, much academic debate has circled around the utility sector and the modes of relating to R&D and to innovation, supposedly for the key role it plays in generating new demands, absorbing new knowledge and technology, and ultimately adopting innovation.

2.1. Liberalization and the innovative thrust of the utilities sector

With a particular interest in radical innovations – defined here as such innovations that impact the power production value chain both vertically and horizontally – Markard and Truffer (2006) have argued that a number of vertical constraints traditionally inhibiting such innovations have indeed disappeared in the wake of restructure and reform. As new technological solutions do not have to align with resources, competencies, and strategies that used to span the entire power production value chain, utility organizations have reportedly become more open to technological variation and experimentation a few years into the new millennium. And as investment decisions have also become more susceptible to influence from external stakeholders, they describe the so-called selection environment on a sectoral level as having changed both in regard to the technological and the organizational innovations it could potentially accommodate.

While declining R&D expenditure in the utilities sector could, according to Markard and Truffer's (2006) analysis, pose a threat to radical technological innovations, most of the drivers they identify for investing in radically new fuel cell technology are related to liberalization, and to utilities seeking to maintain a competitive edge. Indeed, it is only in the face of competition and increased uncertainty, they argue, that utilities have developed explicit innovation strategies – strategies primarily aimed at gathering technological experience for this form of electricity generation, and in a few cases also creating a market for it (see also Markard et al., 2004).

The conditions for- and the capacity of the utilities sector to learn

[1] For an overview of how the promises of the TCE-inflected outlook have been dealt with, see Kwoka (2008).