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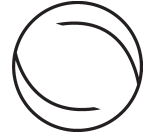*Coll William & Mary, Mason Sch Business, Williamsburg, VA USA*

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Micro-Institutional Affordances and Strategies of Radical Innovation

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Abstract

Institutional theory emphasizes the institutional constraints that render radical innovations illegitimate, but fails to explain how such innovations might succeed. Adopting a micro-institutional perspective, this paper addresses why and how embedded agency may overcome legitimacy crises within established systems. Drawing on a sample of 20 legitimacy problems identified in five radical innovation trajectories at two mature companies, we develop an empirically grounded theory of the institutional work through which proponents legitimize radical innovations within established firms. This theory describes a variety of micro-institutional affordances that enable different strategic responses to legitimacy crises. We thus extend institutional theory by explaining embedded agents' use of a range of options to pursue radical innovation, providing a robust explanation of both institutional stability and radical change.

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Introduction

Institutional theory argues that social and economic action is governed, enabled and constrained by widely shared regulative, normative and cultural-cognitive conventions, creating stability and similarity (Scott, 2001). Over the years, research has shifted attention from the stabilizing effects of institutions to agency and institutional change, by investigating strategic responses to institutional pressures (Oliver, 1991), institutional entrepreneurship (DiMaggio, 1988) and institutional work (Lawrence, Suddaby, & Leca, 2009). This work raises the issue of embedded agency (Seo & Creed, 2002): How is novel strategic action within institutions possible when actors are constrained by those institutions? Some institutional conditions, such as institutional contradictions, afford critical resources for strategic action (e.g. Hargrave & Van de Ven, 2009; Seo & Creed, 2002). But such institutional conditions have not yet been systematically related to repertoires of strategic action; furthermore, this prior work on such conditions is largely limited to the macro-level of institutional fields (Jarzabkowski, Matthiesen, & Van de Ven, 2009, p. 285). In this paper we instead explore embedded agency within the micro-institutional context of established firms, thereby building upon the growing number of micro-level studies of institutional work (e.g., Jarzabkowski et al., 2009; Zietsma & Lawrence, 2010).

Radical innovation provides an exemplary setting to investigate embedded agency, because it is incommensurate with existing institutional logics. Radical technological innovation involves new products, novel technologies and novel application areas or market segments (Gatignon, Tushman, Smith, & Anderson, 2002; Leifer et al., 2000), thus violating prevailing practices and contradicting institutionalized expectations about what is real, appropriate and beneficial to the organization (e.g., Aldrich & Fiol, 1994; Dougherty & Heller, 1994; Garud & Rappa, 1994). Institutional forces constrain innovators in established companies to what is legitimate within existing institutional logics and structures, thereby inhibiting radical innovation (see Christensen, 1993; Dougherty, 1992; Tripsas & Gavetti, 2000). Yet successful radical innovations do occur within established firms (Leifer et al., 2000). Dougherty and Heller (1994) observed that strategic actions may overcome problems of illegitimacy, but they did not explain how strategic responses emerge within restrictive institutional structures. Hence we investigate *how actors exploit micro-institutional conditions within firms in their strategic responses to legitimacy crises*.

We approach this question through qualitative studies of radical technological innovation trajectories in two established high-tech companies, in which we identified 20 legitimacy crises. Our research approach is oriented at theory elaboration (Locke, 2001; Vaughan, 1992), as we use and extend institutional theory perspectives (Battilana, Leca, & Boxenbaum, 2009; Scott, 2001), including concepts of legitimacy and legitimation strategies (Suchman, 1995) and a structurationist perspective on embedded agency (Giddens, 1984). We translate and extend this prior work to the organization level, viewing the established company as a micro-institution that both enables and constrains its members' behavior.

Our study contributes to the emerging literature on embedded agency, showing how actors may overcome illegitimacy within a micro-institutional context by exploiting affordances of that context. First, we differentiate between three types of micro-institutional affordances: heterogeneity, multiplicity and ambiguity, whereas existing literature typically focused on one such condition without clearly distinguishing them. Second, we show how radical innovators deployed four distinct strategic responses to legitimacy crises within established companies, including the strategy to seek tolerance, which Suchman (1995) did not identify. Our findings show how these strategic responses exploit different micro-institutional affordances, while also being constrained by regulative, normative and cognitive elements of the micro-institutional context. Third, we find that affordances

are conditions of institutional structures that do not determine action; instead, the exploitation of such conditions is a situated accomplishment by reflexive actors, demonstrating the vital role of agency in realizing radical innovation.

The paper is structured as follows. The next section grounds our work in institutional literature on innovation and embedded agency, and introduces the notion of micro-institutional affordances. Next, we outline our research methods and the qualitative data analysis procedures, used in an iterative dialogue between (emerging) theory and empirical data. Data about 20 legitimacy crises that occurred in the five innovation trajectories are used to analyze the micro-institutional affordances enabling different strategies to transcend innovative ideas' illegitimacy. Finally, we discuss how our findings contribute to institutional theory, embedded agency and the understanding of radical innovation in established companies.

Theoretical Background

Innovation in micro-institutions

Organizations can be viewed as micro-institutions that involve formal structures and procedures to achieve organizational goals, and are also infused with values and vested interests (Elsbach, 2002). Moreover, they embody understandings of social reality, organizational purpose, identity and norms that are reproduced by organizational members (Dougherty & Heller, 1994; Ocasio, 1997; Selznick, 1957). Organizations as micro-institutions comprise three pillars: *regulative* elements regarding the establishment of rules, inspection of conformity to them, and sanctions to influence behavior; *normative* elements that introduce a prescriptive, evaluative and obligatory dimension in social life; and *cultural-cognitive* elements, the shared conceptions that constitute social reality and shape meanings (Scott, 2001; Wicks, 2001). These institutional forces align the behavior of organizational agents to create enduring social structures and systems.

Recent research has investigated how innovation is both constrained and realized within organizations from a micro-institutional perspective. Vermeulen, Van den Bosch and Volberda (2007) adopted a micro-institutional perspective to investigate why established financial services firms struggle with their complex incremental product innovation efforts. They examined how regulative, normative and cultural-cognitive forces at the business unit level combined into institutional templates that either enabled or inhibited incremental product innovation processes. Unsuccessful projects were dominated by a 'business as usual' template, while successful projects deployed an 'innovation' template, which discarded standard rules and procedures, isolated innovative projects from the organization, treated risks as part of the innovation game, and framed projects as radical innovations. The finding that distinctive templates exist within different business units of the same firm resonates with ambidextrous organizations separating radical innovation and the exploitation of existing businesses (Tushman & O'Reilly, 1996).

Innovating actors may also find themselves pitted against existing institutional structures, because radical innovations often lack *legitimacy* (Aldrich & Fiol, 1994; Dougherty & Heller, 1994; Lounsbury & Glynn, 2001; Zimmerman & Zeitz, 2002; Zott & Huy, 2007). Legitimacy is a generalized perception or assumption that actions are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions (Suchman, 1995, p. 574). Actions or rationales are considered legitimate when perceived to correspond with institutional elements. Dougherty and Heller (1994) found that product innovations in established firms frequently faced legitimacy crises regarding connections of new products to firm strategies and structures, collaboration across departments, and links between technological opportunities and market

needs. Innovations that lack legitimacy may fail to acquire resources and be abandoned altogether (Dougherty & Heller, 1994; Zimmerman & Zeitz, 2002); such crises of legitimacy demonstrate the constraining influence of institutions.

In this research we examine the options that actors have for responding to legitimacy problems (Elsbach & Sutton, 1992; Oliver, 1991; Suchman, 1995), which may allow innovations to proceed despite initial lack of legitimacy (Dougherty & Heller, 1994). Drawing upon Oliver (1991), we define a strategic response as a reaction to institutional forces that is grounded in active agency and intended to advance particular interests. In the context of radical innovation, strategic responses by innovating agents are intended either to augment the legitimacy of their radical innovation ideas and activities or to continue with the radical innovation despite the legitimacy crisis.

Drawing on Suchman (1995), we distinguish three broad clusters of such strategic responses. First, *conformity* strategies adapt the proposed innovation to established interests, norms and beliefs used to evaluate the innovation. Actions and ideas thus adapted become more consistent with established practices, and fit better into established structures (Oliver, 1991). Second, *selection* strategies seek another sponsor within the larger organization who accepts the proposed innovation as legitimate. Such acceptance may be based on an alternative (partly idiosyncratic) established set of interests, norms and beliefs. Thus, rather than conforming to the demands of an initial setting, actors attempt to relocate to a more friendly environmental niche where the 'illegitimate' activities are accepted (Suchman, 1995). Third, *transformation* strategies introduce novel ideas to be incorporated into, merged with, or replace established interests, norms and beliefs of the organization or organizational groups (Dougherty & Heller, 1994; Suchman, 1995), thus legitimating the innovation by changing the micro-institutional context.

Institutions and agency

This paper examines how different strategic responses may emerge within an institutional context. Traditional interpretations of the institutional view allow little room for agents making deliberate choices or initiating institutional change, and predict a conformity response (Scott, 2001). More recent studies have explored how actors may engage in institutional work to create, maintain and change institutional structures (Lawrence et al., 2009; Zietsma & Lawrence, 2010), and how institutional entrepreneurs emerge, accrue agency and influence change in dominant institutional structures (Battilana et al., 2009; Garud, Hardy & Maguire, 2007; Maguire, Hardy & Lawrence, 2004). This stream of work confronts the paradox of embedded agency: How can actors 'change institutions if their actions, intentions, and rationality are all conditioned by the very institution they wish to change?' (Holm, 1995, p. 398). Resolutions to this paradox should explain that actors are neither 'cultural dopes' who dumbly follow institutional templates (Lawrence et al., 2009, p. 1) nor 'disembedded heroes' who are unaffected by the environment in which they operate (Battilana et al., 2009, p. 87).

Following several institutional theorists (e.g., Barley & Tolbert, 1997; Battilana & d'Aunno, 2009; Hardy & Phillips, 1999; Scott, 2001), we draw on structuration theory to conceptualize embedded agency (Giddens, 1984). First, the *duality of structure* implies that social structure is both the medium for *and* the consequence of action and agency. Social structure is recursively implicated in the process of social action: it enables and constrains action, but is also reproduced and changed through social action (Giddens, 1984). Whereas individual agents necessarily draw upon existing structures to act and make sense of the world, they are also able to act otherwise, say no and influence the social world, for example by enacting alternative structures. Second, *reflexivity* of social agents is a precondition for agency within social systems. People continually monitor actions while reflecting on their

consequences, thus allowing for deliberate choice and agency (de Rond, 2003; Giddens, 1984). Through processes of reflexivity, awareness and participation in multiple institutional spheres, human agents can criticize, reframe and renegotiate established institutional fabrics to exercise agency, despite pressures for conformity in any given setting (Emirbayer & Mische, 1998).

Agency may be influenced by external shocks and the social position of entrepreneurs, and also by institutional conditions (Battilana et al., 2009). Research in institutional theory argues that institutions can no longer be seen as monolithic, closed systems (Jarzabkowski et al., 2009; Townley, 2002; Zilber, 2002). Instead they are characterized by fragmentation and internal contradictions in their regulative, normative and cultural-cognitive elements, which make them susceptible to social agents' change efforts (Dorado, 2005; Greenwood, Magán Díaz, Li, & Lorente, 2010; Hargrave & Van de Ven, 2009; Seo & Creed, 2002).

In this paper, we use the term 'micro-institutional affordances' to refer to those conditions of the institutional logics and structures within organizations that actors may exploit in strategic action. The notion of affordances does not refer to specific regulative, normative, or cultural-cognitive institutional elements, but to configurational properties among those elements (such as contradictions) that allow action possibilities (see Gibson, 1979). The term 'affordances' is used because it connotes that these properties are not determinants of behavior, but must be enacted. Furthermore, 'affordance' is a relational concept, indicating that these properties offer opportunities only to specific actors and strategic behaviors.

Prior studies have used multiple concepts that refer to different types of affordances – including contradictions (Seo & Creed, 2002), competing logics (Marquis & Lounsbury, 2007), heterogeneity (Battilana & d'Aunno, 2009) and pluralism (Jarzabkowski et al., 2009) – but have used such concepts rather interchangeably without theorizing similarities and distinctions, and have not linked different strategic actions to types of affordances. Hence, we examine strategic responses to legitimacy crises in radical innovation trajectories and the distinctive micro-institutional affordances that enable those responses. We aim to identify the most important and strongest relations between affordances and responses in our cases. This serves to shed light on the embedded agency of innovators within the micro-institutional context of established companies.

Methods

We adopted a qualitative research approach to elaborate theory on strategic responses to crises of legitimacy (Strauss, 1987; Vaughan, 1992). A qualitative, inductive approach served to extend and refine existing categories and relationships (Locke, 2001, p. 103), such as embedded agency, types of strategic responses, and institutional conditions. Moreover, qualitative methods allowed us to examine actors' interpretations and their enactment of strategies and affordances. The qualitative research procedures relied on iterative comparison and systematic coding of critical episodes along innovation trajectories (Eisenhardt, 1989; Strauss & Corbin, 1998).

Research setting

Companies and innovations were selected using a theoretical sampling logic (Glaser & Strauss, 1967), to highlight radical innovation in established firms. Two European companies were selected: PhemCo, operating in advanced chemicals; and Omega, an electronics company, in particular OmegaSys, its medical electronics division.[1] These companies were selected because they are in dynamic industries where innovation is abundant. Further, both are established firms with a long history and ingrained systems of belief and behavior. Moreover, both organizations are large and

complex, with activities in many different countries and markets, and a variety of organizational units, creating differentiated micro-institutional landscapes. Finally, each organization has a long history in science- and technology-intensive endeavors, demonstrated in many successful products and several groundbreaking innovations.

Omega is one of the largest European electronics companies, with more than 110,000 employees and sales in 2009 of over €23 billion. From its origins at the end of the 19th century, Omega became one of the largest European producers in the nascent electrical industry. New technologies fueled a steady program of expansion and diversification, and today Omega includes over 60 different businesses, with over 100,000 active patents worldwide. OmegaSys, a current SBU, provides cutting-edge equipment and technologies for the healthcare market, particularly in medical imaging, with acquisitions in fields like digital ultrasound systems, nuclear medicine, diagnostic cardiology, patient monitoring and multi-slice CT systems. Omega's SBUs are supported by a corporate research organization (Omega Research), a corporate design agency (Omega Design) and a manufacturing technology organization (Omega Applied Technologies).

PhemCo, a €7 billion European chemicals company with some 20,000 employees worldwide in 2009, ranks among the global leaders in many fields. From its beginnings as a national coal mining company, PhemCo diversified into nitrogen fertilizers as a by-product of its mining activities; as mining ceased, PhemCo further diversified into industrial chemicals, petrochemistry, advanced synthetic materials and fine chemistry, and privatized, eventually being listed on the stock exchange. During the 1990s, PhemCo focused on products for the pharmaceutical and food industries, and advanced synthetic materials for the automotive and electronics industries. From the mid 1990s PhemCo pursued rapid growth in life science products through acquisitions and joint ventures, and selective growth in sophisticated performance materials. PhemCo relies on 1300 R&D staff worldwide.

In both companies, we sought innovations that embodied technologies or technological principles new to the company and that targeted similarly novel application areas or customers, thus exemplifying the characteristics of radical innovations (Gatignon et al., 2002; Leifer et al., 2000). Such radical innovations often face issues of legitimacy requiring strategic responses (Dougherty & Heller, 1994; Suchman, 1995). Second, we wanted innovations where agents persisted despite legitimacy crises, to be able to identify necessary conditions in a processual account of how strategic responses can overcome such crises (Mohr, 1982). Third, we focused on recent innovations that were reaching the end of R&D, in advanced prototype development, or at the beginning of market introduction and industrial manufacturing. Such innovation trajectories are almost complete and thus survived institutional hazards, yet are current enough to facilitate data access and limit both retrospective and outcomes biases.

Together with representatives of the CTO Office at each firm, we selected five innovations that matched our criteria. Three different radical technological innovations were selected for in-depth analysis at OmegaSys: (1) DaXo, a project on molecular medicine, which developed molecular diagnostics equipment for sepsis; (2) Zapim, a radically new imaging technology, based on magnetic particles; and (3) Icon, a novel hospital design concept for improving patients' experience. Two PhemCo innovation trajectories were identified: (1) Treemax, a new class of materials based upon dendrimers; and (2) anti-reflective coatings based upon new nanotech principles, Reflactone and Reflactix. Table 1 describes these innovation trajectories.

Data collection

Data were collected primarily through interviews with key stakeholders in the radical innovation process. Each radical innovation involved few innovating actors, usually four to ten people, who

Table 1. Initial characteristics of the five investigated innovation trajectories

Project & period	Description	Novelty of technology	Novelty of application area / customer base
DaXo 2000–2006	To grow the healthcare division, the Board of OmegaSys initiates a research program at Omega Research to explore opportunities of molecular medicine. DaXo concerned a molecular diagnostics device for sepsis (i.e., a bacterial infection).	Molecular diagnostics is based upon principles of biochemistry and molecular biology. This differs strongly from OmegaSys's existing competencies in electronics, imaging and radiation technology.	Application of molecular diagnostics technology for sepsis differed strongly from OmegaSys's existing application areas like cardiology, oncology, or ultrasound, with different user/customer groups in hospitals (lab and intensive care instead of radiology).
Zapim 2001–2006	Two researchers at Omega Research invented a novel magnetic particle imaging principle. Zapim is a breakthrough tomographic imaging method potentially capable of rapid dynamic 3D imaging of magnetic tracer materials, promising high imaging sensitivity and low manufacturing costs.	Magnetic particle imaging is based upon principles of magnetic resonance, but the technological principle is completely different from existing MRI technology (zero-point field), and OmegaSys had little experience with nanoparticle agents.	The application area of magnetic particle imaging was still unclear. It could be used and integrated with existing MRI or CT scanners and their application areas, or be used as real-time dynamic 3D imaging device during surgical interventions, opening up new market and application possibilities.
Icon 2001–2006	Omega Design developed solutions at suite, department and hospital levels to enhance user experiences and integrate Omega technologies in healthcare. Icon solutions aim to improve patient comfort, patient contact, patient workflow and personalization.	Icon solutions build upon existing technologies of OmegaSys and Omega but extend this with user experience design and include architectural solutions for the environment of MRI, CT or X-ray scanners.	Icon solutions also target other customer groups and decision makers in hospitals than the traditional businesses of MRI, CT and X-ray of OmegaSys, and offer new functionalities (patient comfort, contact, workflow and personalization) to the market.
Treemax 1994–2006	PhemCo Research invented a hyperbranched polymer for the Resins and Coatings SBU, with a highly functionalized surface. Functionalities of Treemax polymers enable novel application areas such as drug delivery and release, synthetic enzymes, and functional coatings.	Treemax builds upon PhemCo's competencies in polymers and dendrimers, but requires new competencies for specific applications (dental, paper coatings, oilfield chemicals) that differed strongly from PhemCo's competencies in life sciences and performance materials.	Treemax is a platform technology that can be applied in new areas and markets. The three most promising application markets (paper coatings, dental, and oilfield chemicals) were new to PhemCo's traditional focus on life sciences and high performance materials.

(Continued)

Table 1. (Continued)

Project & period	Description	Novelty of technology	Novelty of application area / customer base
Reflactone/ Reflactix 2001–2006	The Unotech SBU asked PhemCo Research to work on anti-reflective coatings for fiber-optic materials and LCD displays; they discovered a nanotech system to change the surface topology of materials with superior anti-reflective characteristics and superior manufacturability.	The Reflactone solution builds upon established competencies in coating systems at PhemCo. However, the knowledge about nanostructured surfaces and nanotech were novel to PhemCo, especially in this application area.	Two of the main application areas of the Reflactone and Reflactix solution platform were picture-frame glass and glass for solar panels. Both application areas were new markets for PhemCo.

could be interviewed extensively to gain reliable insights into the innovation process. For each radical innovation, three to five stakeholders from different backgrounds were interviewed at length: at least one person from R&D (scientists, engineers); one from a marketing/business development discipline (marketers, new business developers, sales managers); and one senior manager with decision-making authority (e.g., research department directors, technology strategy directors, corporate venturing and new business development directors). The first interviewees were suggested by the CTO Offices. Other stakeholders in the innovation process mentioned during interviews were interviewed too, to cross-check statements and findings. Interviewing people with different positions and types of involvement helped offset biases or lapses (Huber & Power, 1985). All interviews were conducted in 2005 and 2006.

Each semi-structured interview first elicited a short summary of the main events, critical decisions and conflicts of the innovation process. Next, the interview focused on issues arising from lack of organizational support for the innovation, resistance from organizational groups, conflicts over resource allocations, or debates over go/no-go decisions, as potential legitimacy crises. We sought details on the reasons for the resistance, conflicts or lack of support, the positions and perspectives of the stakeholders involved, actions to resolve issues, and rationales for actions. Our final questions addressed any issues previously identified in other interviews.

Interviews averaged 1.5 to 2 hours and were recorded and transcribed, producing about 600 pages of interview text; these were corrected by interviewees. Secondary data (e.g., project proposals, patents, presentations, articles and strategic reports) comprised 250 additional pages. We created a narrative reconstruction of each radical innovation, describing its main events and critical issues (Langley, 1999), which was validated by interviewees. These methods produced feedback on the data, corroboration of the observations across interviewees with different perspectives, and triangulated interviews with secondary data to enhance reliability and reduce individuals' potential retrospective biases (Jick, 1979; Yin, 2003). Table 2 describes interviewees and their positions, and the other data sources consulted.

Data analysis

Within the innovation trajectories, crises were identified that threatened the projects. Building on Suchman's (1995) definition of legitimacy, events described in the interviews were coded as a

Table 2. Interviewees and data sources

Radical innovation	Interviewees	Other data sources
DaXo*	Dr. Abbot* – senior scientist and project leader (Omega Research) Dr. Burton – department head molecular medicine (Omega Research) Dr. Newman – business developer Daxo (OmegaSys) Dr. Greenland – senior director technology strategy (OmegaSys) Dr. Petrakis – senior director software technology (OmegaSys)	Company reports (2) Patent files (2) Public presentations (3)
Zapim	Dr. Berkovich – senior scientist and project leader (Omega Research) Dr. Boisson – program director medical imaging (Omega Research) Dr. Popper – program director medical imaging (Omega Research) Dr. Greenland – senior director technology strategy (OmegaSys) Dr. Petrakis – senior director software technology (OmegaSys)	Scientific publications (2) Company report Patent file Project proposal Project portfolio matrix
Icon	Dr. Eckard – marketing manager MRI (OmegaSys) Mr. Kingsley – program manager Healthcare (Omega Applied Tech) Mr. Cooper – design director Healthcare (Omega Design) Dr. Greenland – senior director technology strategy (OmegaSys) Dr. Petrakis – senior director software technology (OmegaSys)	Company reports (2) Public presentations (2) Project proposal
Treemax	Dr. Morris – research project leader (Shared Research Unit) Dr. Sheridan – general manager (Treemax venture) Dr. Quinn – sales manager (Treemax venture) Mr. Steinbach – former director Corporate Venture Group (Phemco)	Company reports (3) Public presentations (3) Scientific publications (6)
Reflactone/Reflactix	Dr. Coleman – senior scientist and project leader (Shared Research Unit) Dr. Hyneman – business developer (PhemCo) Mr. Steinbach – Former director Corporate Venture Group (Phemco)	Company reports (3) Public presentations (2) Scientific publications (3)

*All names are pseudonyms.

legitimacy crisis when (1) lack of organizational support for a radical innovation threatened the project; and (2) this lack of organizational support arose from evaluations based on micro-institutional criteria: that is, they (a) represented established interests, norms, beliefs, definitions, procedures,

rules or practices attributed to the organization or its groups; (b) were socially shared among different members of the organization (they were not merely personal opinions or preferences); (c) were perceived as obligatory (that is, individual members felt responsible to these institutionalized criteria). Problems that did not meet these criteria were excluded from further analysis, including technological problems and a lack of support arising from personal opinion of a senior manager. Two coders independently applied these coding rules, as well as subsequent coding procedures, to draw on multiple readings of all data pertaining to a crisis and to avoid premature convergence on particular interpretations (Lincoln & Guba, 1985; Pettigrew, 1990); differences were discussed until consensus was reached. A total of 20 different legitimacy crises were identified across the five radical innovation trajectories. These legitimacy crises formed our basic unit of analysis in this study and were analyzed during the next phases.

A second phase of analysis involved identifying, categorizing and describing different types of *strategic responses* to the legitimacy crises. These responses were descriptively coded to capture the wide variety of strategic actions. We focused on those actions that indeed had an effect on legitimacy or enabled the innovators to continue with their innovation. These actions were compared across all legitimacy crises to identify similarities, and were initially categorized according to Suchman's typology of strategic responses (conformity, selection and transformation). Closer examination revealed that not all actions matched Suchman's type definitions, and an additional strategy type was defined (tolerance seeking). The entire dataset was then analyzed again using this more comprehensive typology.

A third phase of analysis identified and categorized micro-institutional affordances enabling the strategic responses to the legitimacy crises. Open coding served to identify statements in the interview texts describing aspects of established micro-institutional systems and innovation characteristics that either enabled or constrained innovators' pursuit of a particular response. Our focus was on actors' reasons for choosing a strategy, and how they interpreted their institutional setting. Axial coding compared the preliminary set of categories describing micro-institutional affordances across all interviews and strategic response types, to identify similarities across episodes and sort the categories of potential micro-institutional affordances and their relationships with each of the strategies. Selective coding refined the empirically grounded typology of relevant micro-institutional affordances, definitions and coding rules until saturation was achieved (Strauss, 1987). Table 3 contains the resulting codes, definitions and illustrative interview quotes. All crises were recoded according to these final definitions and rules.

Findings

Figure 1 summarizes our primary findings, displaying the interactive processes between four strategic responses to legitimacy crises, the institutional context that pushes conformity, and three types of micro-institutional affordances that may be exploited in alternative responses. The innovation's legitimacy crisis triggers a process of reflection on micro-institutional affordances and options for future strategic action, which results in a situated accomplishment of a particular response, contingent on apparent affordances, innovation characteristics and actor embeddedness. Our empirical findings add tolerance seeking as strategic response to Suchman's conformity, selection and transformation. Tolerance seeking does not alter legitimacy per se, but enables innovating agents to continue despite perceived illegitimacy: innovation is allowed to continue as dominant stakeholders who represent the micro-institutional logic – whom we term institutional actors – deliberately refrain from exercising their power to stop 'illegitimate' action.

Tables 4a to 4e show nine conformity responses in the total set of 21 responses (one crisis was addressed through two distinct responses). Conformity is the response predicted by traditional institutional theory, where institutional pressures and mechanisms foreclose agents' options for

Table 3. Concepts, exemplary quotes, and definitions

Concept	Exemplary quotes	Definition
Conformity	'Now we made choices to do things closer to PhemCo businesses, so we would have a better connection with the current PhemCo… And that is because of our [Board of Directors]. We didn't choose for it ourselves… we used to focus only on whether it was financially attractive and as such we did the most exotic things.' (Treemax)	Where radical innovation ideas and proposed actions are adapted to be consistent with established interests, norms and beliefs as used in the evaluation of legitimacy, the radical innovation exhibits conformity.
Transformation	'We did lobby a lot, at least the people from Newman's new business development team and also people from Research. It really is an area we should not miss… So much is happening, with very large margins, and it is closer to AlphaSys technology than most people think. Of course you have to demonstrate that this is really true. So we brought in people from the field, external experts with their stories.' (DaXo)	Where innovating actors successfully introduce novel interests, norms and beliefs that better legitimate the radical innovation and proposed course of action, these are incorporated in, and merged with or replace prior established interests, norms and beliefs of the organization or its groups. As such, established interests, norms and beliefs adapt to the radical innovation.
Selection	'It has been a quest for supporters and funds by Maddox and the people that believed in this technology. They wanted to find someone who understands what they are doing and who has access to funds. And that's how they found me.' (Reflactone)	The innovating actors seek out a more favorable group within the organization, for which the radical innovation and its proposed course of action are more legitimate. Selection of a more accepting locus moves the innovation into this alternative (partly idiosyncratic) established set of interests, norms and beliefs.
Seeking tolerance	'So Treemax stayed alive… and we are drifting on this wave of innovation. But still the question why we are doing it, is not answered.' 'In 2004 it could have crashed. But it didn't, because it didn't hurt. If we wouldn't have enough sales to pay for those 2.5 people, then it certainly would have crashed.' (Treemax project)	Innovating actors appeal to the benign neglect or tolerance of institutional actors for whom the radical innovation lacks legitimacy. The institutional actors deliberately allow the radical innovation to continue, despite its illegitimacy, requiring no adaptations to either the radical innovation, or to the established interests, norms and beliefs.
Ambiguity	'We are not only a hardware company, but we have also worked for years with fluids in other technologies… a LCD display also contains fluids. That are also very small amounts of fluids and we are pretty good at that.' (DaXo)	Institutionalized interests, norms and beliefs are ambiguous where different interpretations of particular institutional interests, norms and beliefs coexist or conflict; or when the meaning of such interests, norms and beliefs is vague or inconsistent.

(Continued)

Table 3. (Continued)

Concept	Exemplary quotes	Definition
Multiplicity	'So the whole innovation cycle started up again… Peyton [from the Board of Directors] also realized, hey 'innovation' that might be important to the company… and maybe we even want a lot of innovation, even more than we are doing now. And we need new areas and maybe we could use this Treemax in that…' (Treemax)	Multiplicity refers to several simultaneous alternative institutional interests, norms and beliefs that coexist within the same institutional logic.
Heterogeneity	'So we came to better understanding of the thought world of Omega Design. From an engineering background … that's really something different. We [Omega Applied Technologies] focus on technical realization, and Design is focused on shapes and appearances.' (Icon)	Heterogeneity of institutional context is defined as the existence of multiple institutional constituents (i.e., established organizational groups) within an organization that maintain differentiated sets of established interests, norms and beliefs (e.g. distinct SBUs).
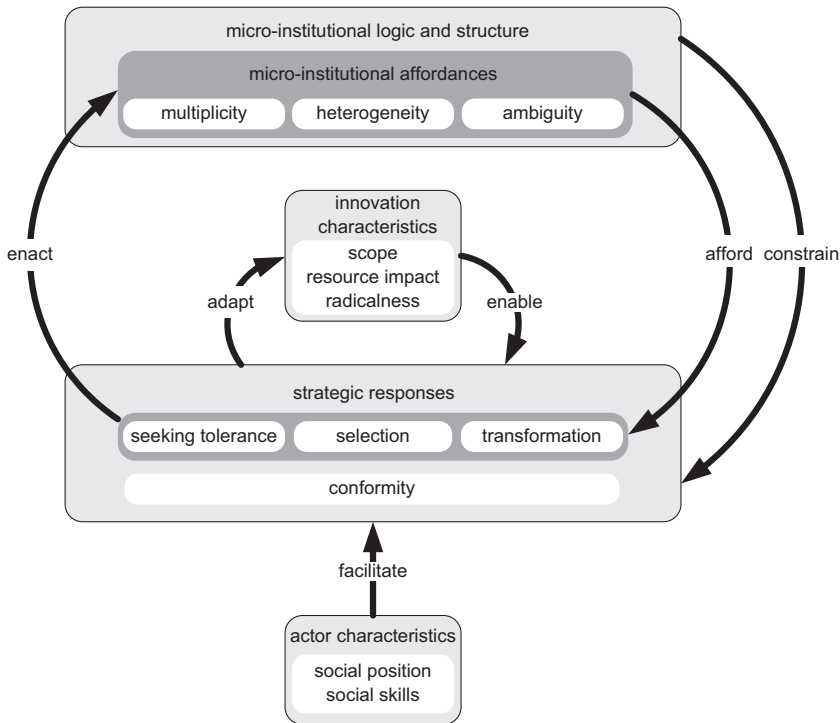
Figure 1. Micro-institutional affordances and strategic responses

change. Micro-institutional pressures toward conformity can strongly regulate innovators' behavior, compelling major adaptations of radical ideas, project postponement, or even cancellation, and thus possibly reducing the innovators' initial enthusiasm and commitment. However, more than half of the legitimacy crises were addressed through alternative responses: transformation (six times), selection (three times) and seeking tolerance (three times). How were these alternative strategic responses possible when institutional theory predicts conformity?

Figure 1 displays three distinctive types of micro-institutional affordances that were exploited in alternatives to conformity. *Heterogeneity* of the institutional system refers to the presence of different institutional constituents within an organization, with discrete sets of established interests, norms and beliefs, based on different tasks, background or contacts (e.g., different divisions or departments) (see Battilana & d'Aunno, 2009, p. 39). Heterogeneity within an institutional system offers innovators an array of potential sponsor groups within the organization; the radical innovation idea may be more legitimate for some of these groups than others. *Multiplicity* of an institutional logic refers to the coexistence of multiple alternative interests, norms and beliefs within the same institutional logic. Multiplicity may result in inconsistent implications, similar to competing demands (Jarzabkowski et al., 2009), yet within a single logic. This differentiates multiplicity from heterogeneity, which concerns groups with partly idiosyncratic institutionalized logics. The coexistence of alternative institutionalized interests, norms and beliefs offers innovating agents opportunities to manipulate or induce shifts in their ranking, or to appeal to alternatives. Finally, the *ambiguity* of micro-institutional interests, norms and beliefs offers innovating agents options to overcome conformity pressures and illegitimacy. Ambiguity arises where different interpretations conflict or where meanings of institutional interests, norms and beliefs are vague or inconsistent (March & Olsen, 1976). The difference between ambiguity and multiplicity is that with ambiguity the meanings and interpretations are vague or inconsistent, whereas with multiplicity meanings are clear, but are competing, conflicting or have inconsistent implications. Tables 4a to 4e display strategic responses and micro-institutional conditions for all legitimacy crises in each radical innovation trajectory. We explain and illustrate how each type of strategic response exploited a specific type of micro-institutional affordance.

Micro-institutional affordances and transformation

A major legitimacy crisis that threatened the Treemax innovation at PhemCo was overcome by a transformation strategy, exploiting ambiguity in the institutional context to enhance the innovation's legitimacy. In 2006, the Treemax venture team sought support from the Board of Directors of PhemCo and upper management of its Innovation Centre to pursue Treemax opportunities in the oilfield chemicals and paper chemicals markets. However, the Board of Directors had designated other target markets for innovation, and Treemax's application areas did not match either future goals or established interests, creating a legitimacy crisis. Difficulty was exacerbated because the Board of Directors and the Treemax venture team were using different logics: the Treemax team argued from technology push and strategic fit with technological competencies, while the Board of Directors instead emphasized market-pull innovation in envisioning future new businesses for PhemCo. This deepened the legitimacy crisis because the parties used conflicting rationales and concepts to evaluate the Treemax innovation.

The Treemax venture team demonstrated partial conformity to some of the Board's concerns (e.g., by increasing focus on application areas closer to established PhemCo businesses). More importantly, innovators also sought to influence upper management to redefine PhemCo in a broader business area, functional polymers (of which Treemax is an application). PhemCo's

Table 4a. Overview of legitimacy crises, affordances and responses for DaXo

Legitimacy crisis	Key micro-institutional affordances	Strategic response
2000 Q3 A new way of thinking and working (i.e., biology) was less legitimate with respect to the established way of thinking and developing technological solutions based on the dominant logic of physics, electronics and engineering.	*Ambiguity* Application of the established procedures and norms to the 'biologist's way of working' did not lead to satisfactory results, thus rendering ambiguous the applicability of established procedures and norms.	*Transformation* Adapting established ways of working to incorporate the novel 'biologist's way of working' gave the biologists more room for experimentation.
2003 Q1 Developing a novel competency in biochemistry for DaXo is not legitimate with respect to OmegaSys's identity as an 'electronics' company.	*Ambiguity* Paradigm changes and industry shifts called into question the consistency and fitness of established views of organizational identity.	*Transformation* Popularizing a new industry model and a pioneering role for the company in merging bio- and hardware technologies better legitimates the new competency.
2003 Q1 Developing a novel competency in 'fluids' was not legitimate with respect to OmegaSys's identity as a 'hardware' company, nor did established groups think that a 'hardware' company could excel in a 'fluids' competency ('we don't want to get wet'). Thus developing this new competency was seen as high risk.	*Ambiguity* Presenting facts that question the established view of organizational identity: 'we are not only a hardware company, but we have also worked for years with fluids in other technologies'.	*Transformation* Demonstrating the relatedness and familiarity of novel competency with past achievements and reframing organizational identity accordingly; further, stimulating novel interests by demonstrating the benefits of integrating the new competency with previously acknowledged competencies.
2003 Q3 DaXo, a 'diagnostic' technology, is not legitimate in the established view of OmegaSys as an 'imaging' company, and does not build upon or directly relate to existing product lines.	*Ambiguity* A novel and ambiguous concept of the 'total care cycle' generates ongoing strategic discussions.	*Transformation* Adoption of the total care cycle redefines and extends OmegaSys's potential business areas, to include diagnostic technologies.
2004 Q3 The DaXo team's need for fast, flexible and empowered decision making was not legitimate within the context of the established procedures, formalities and norms at OmegaSys.		*Conformity* Compliance with the established procedures and norms for budget approval and personnel hiring within the company.

Table 4b. Overview of legitimacy crises, affordances and responses for Zapim

Legitimacy crisis	Key micro-institutional affordances	Strategic response
2004 Q1 Zapim as an independent technology and new business was not legitimate with respect to commonly held interpretations of appropriate innovation as only 'variants' of already existing MRI technology.	*Ambiguity* Confusion about whether the Zapim innovation was a variant of the established 'MRI technology' is used to initiate transformation.	*Transformation* The Zapim team popularize a new label, 'imaging tracer,' for particular components of the technology to make a clear distinction between the 'old' and 'new' technology.
2005 Q2 Integrating Zapim with existing MRI technology and commercializing it through the related business unit was not legitimate with respect to established ('financial performance') goals and responsibilities of the MR business unit. The required investment in Zapim did not help the business unit achieve its performance targets in the short term.		*Conformity* The SBUs of OmegaSys in the end decide about the funding of 'contract research' projects. Integrating Zapim technology with existing MRI technology is abandoned, and the innovators decide to wait until a later stage, when technical risks are smaller and circumstances at the business unit more favorable.
2005 Q4 Continuation with research and development on Zapim was not legitimate in the face of established goals and responsibilities ('focus on high performance targets and core business') at the Technology Office of OmegaSys, and did not match the established criteria and models for technology funding (the 'business potential' logic) in use.	*Heterogeneity* OmegaSys had multiple sales organizations and multiple business units. OmegaSys had a dedicated CTO Office. Omega had a large Research department with multiple research groups and a total of four different technology incubators.	*Selection* After a search process an alternative source of funding is negotiated with the Research department itself. The idea for the technology development satisfied the funding criteria for a 'lab venture,' and matched Research department interests.

Table 4c. Overview of legitimacy crises, affordances and responses for Icon

Legitimacy crisis	Key micro-institutional affordances	Strategic response
2004 Q2 Investing in Icon did not match with the established interests of senior management and their dominant focus on maximizing short-term business profitability and shareholder value.		*Conformity* Final decision-making authority for all innovation projects resides with the CEO and Board of Management of OmegaSys. The innovators complied with the concerns and established interests of the CEO and senior management and the Icon project was put on hold till a later stage and budgets were recalled.
2004 Q3 Icon was not consistent with the established market approach and the value proposition of the existing business unit, and thus Icon was not legitimate with respect to its established interests and goals.	*Heterogeneity* OmegaSys had multiple sales organizations and multiple business units. OmegaSys had a dedicated CTO Office. There were several cross business unit networks and cross product division networks. Omega consisted of several different product divisions and staff departments relevant to Icon.	*Selection* After a search process, an alternative patron (corporate marketing executive/CMO) is found to sponsor the initiative, whose matching interests and shared view of company's future rendered Icon legitimate.
2005 Q3 The multilevel aspects of Icon (including hospital-level solutions) did not match established business scope definitions of individual business units, and various Icon components transgressed established business boundaries, responsibilities and interests. Thus Icon was illegitimate because it was not beneficial to the individual business units.		*Conformity* The SBUs of OmegaSys decide on the funding of their development projects and what is needed. Consequently, Omega Design adapted the radical Icon ideas to match individual business unit boundaries, scopes and interests. Most multilevel aspects/ components were cancelled.
2005 Q4 The Icon ideas are based on 'user experiences,' but this worldview is not legitimate in the established and dominant 'technology driven' worldview of engineers and technical product developers at the high-tech company.		*Conformity* Omega Design is viewed as service unit to the SBU clients and the SBUs in the end decide on funding development projects and decide on what is necessary and needed. Consequently, some 'experience'-based aspects of Icon are cancelled or adapted to meet technical, financial and timing constraints dictated by the dominant groups' 'technology driven' logic of 'engineering' at the SBU.

Table 4d. Overview of legitimacy crises, affordances and responses for Treemax

Legitimacy crisis	Key micro-institutional affordances	Strategic response
1994 Q2 Because the Treemax research project did not produce short-term positive results, it was seen as a highly uncertain project which did not match established norms for SBU R&D projects. Nor did it match with the business unit's established interests and needs, or contribute to short-term business goals.	*Multiplicity* The innovation serves longer-term business interests of the SBU, although short-term research and economic results are not positive.	*Tolerance seeking* SBU management allows the research project to continue despite negative short-term results and misfit with established norms for application research projects. Part of the funding of the project came from a government R&D subsidy which reduced the financial burden.
1998 Q1 Development projects for the Treemax technology were proposed for numerous promising application areas. These had a long-term focus, and did not align with established immediate business unit interests or issues.		*Conformity* The Management team of the SBU controls the SBU budget for application R&D and decides on funding. Consequently, the Treemax team adapted their plans to focus on only one potential application area better suited to the SBU. As such, they conformed to established shorter-term interests.
2001 Q3 The dental care application of the Treemax technology (a low volume, specialty chemicals business) was not legitimate with respect to PhemCo's identity and competencies as a 'bulk chemical' company.		*Conformity* The Treemax team complied with the concerns and cancelled the ideas for Treemax dental applications.
2003 Q4 The Treemax venture was no longer legitimate with respect to the established interests and goals of the company. It was not seen as strategic or relevant to the longer-term strategy and realization of growth goals of PhemCo.	*Multiplicity* Treemax was depicted as strengthening the corporate image of 'being an innovative company' although it did not directly contribute to the growth goals of PhemCo.	*Tolerance seeking* The strategic relevance and fit of Treemax with PhemCo remain weak, but the Board of Directors and top management of the Innovation Centre seeking an innovation allowed the venture to continue.
2006 Q2 The Treemax venture is not aligned with the longer-term strategic goals of PhemCo, since its target business areas do not match the designated end-markets defined by upper management. Treemax proponents reason from 'technology push' and 'fit with technological competencies,' an approach that conflicted with the established patterns of 'fit with end-markets' and 'market-driven innovation' of upper management at PhemCo and its business units.	*Ambiguity* The still ambiguous but generally supported future vision for PhemCo as a 'specialty chemical company' offers opportunities for transformation.	*Transformation* Innovative actors popularize new ways of thinking about the future vision of the company, positioning the Treemax venture as a prime example of future business models and competencies. As such, they stimulate new ways of thinking and new interests. Additionally:

(Continued)

Table 4d. (Continued)

Legitimacy crisis	Key micro-institutional affordances	Strategic response
		Conformity The Board of Directors of PhemCo pushed the Treemax team to align their plans better. The Board had decision-making power and controlled the budgets for new strategic initiatives. Consequently, the Treemax team adapted their business plans to improve alignment with the established and designated end-markets of PhemCo and their typical customer needs.

Table 4e. Overview of legitimacy crises, affordances and responses for Reflactone/Reflactix

Legitimacy crisis	Key micro-institutional affordances	Strategic response
2002 Q4 The project on anti-reflective coatings was illegitimate with respect to the established interests of a business unit focused on safeguarding their position in their current business under stress.	*Heterogeneity* At Phemco multiple product divisions and business units were present and relevant to Reflactone. Phemco also has a dedicated Venturing & Business Development unit and a Shared Research Unit.	*Selection* Search for alternative internal sponsors. After reframing and broadening the innovative idea's scope and aims (repositioning it as a technology platform with many different application areas), it matched well with the interests of the Venture and Business Development unit, who agreed to sponsor the project.
2003 Q3 One of the applications of the technology ('Reflactone') was not legitimate with respect to the established interests of PhemCo because it offered high risks, little growth opportunity and few synergies with established businesses.		*Conformity* After extensive analysis of the business potential of Reflactone in the electronic display market, the innovators agreed to meet the interests and concerns of the Board of PhemCo and licensed Reflactone out to a former technology partner.
2005 Q4 The Reflactix application (selling glass with anti-reflective coating) was not legitimate with respect to PhemCo's identity of a 'chemicals' company. Reflactix did not match with established interests of existing business units of PhemCo. It has little fit and low synergy with existing businesses of the company.	*Multiplicity* Reflactix strengthens the corporate image of 'being an innovative company' although it does not fit with existing businesses of PhemCo. Moreover, the innovation might become strategic in the future.	*Tolerance seeking* Although Reflactix remained 'strange' with respect to established views of PhemCo's identity, and had little synergy and fit with established businesses, upper management decided to allow the innovation to continue. Low investments were needed to set up the pilot plant and the potential rewards could be high.

espoused strategic goal, to move from bulk chemicals to specialty chemicals, favored more innovative, tailored products with higher profit margins. However, the Board was vague about what 'becoming a specialty chemical company' actually meant. The Treemax team showcased Treemax as an exemplar of specialty chemicals, a novel business model offering new revenue streams. The Treemax team embedded new perspectives and redefined interests into the existing micro-institutional logic to legitimize their radical innovation ideas. This response can be characterized as a transformation strategy.

Treemax business developer Sheridan described the circumstances that enabled a transformation strategy, emphasizing the role of ambiguity, as follows:

> So you can't escape the question how to proceed in the future? What is its *raison d'être*, why should we do it? The business model is that we have a product-technology platform and we should bring it to the market. And then we see clear examples in the industry that do just that, and those are the specialty polymer companies. And we have as an ambition to realize that for PhemCo in the next five or ten years. We see the Treemax technology as a valuable component in this process … And PhemCo has stated in its 2005 and 2010 strategy that we want to be a specialty company. Well, what does that mean? And we are currently shaping and filling this in. Because these are not precise directives from the top, no, these are just broad guidelines in the end …. Slowly people start to realize that a specialty business consists of connecting and combining smaller clusters of revenues of product/market combinations in a very smart way … instead of what we are used to do in the coal and mining business, or petrochemical business, or the nylon business.

Sheridan's comments articulate a new vision of PhemCo as a specialty chemical company, making concrete an idea that was previously vague and unspecific, although supported by dominant groups and mentioned in PhemCo's formal strategic plans and goals. The open-ended *ambiguity* of PhemCo's vision enabled innovators to portray Treemax and functional polymers as exemplary templates for becoming a specialty chemicals company, thereby redefining PhemCo's future in terms of Treemax capabilities.

Ambiguity enabled the Treemax team to transform institutionalized visions, redefining an accepted idea by linking it to their radical innovation, to significantly augment their venture's legitimacy. Widely shared but loosely defined ideas about organizational identity and established strategic roles allowed innovators to translate the notion of 'a specialty chemicals company' into Treemax's situation, to offer alternative institutional models, and initiate transformation. The meaning of prevailing institutional interests, norms and beliefs was vague, implicit and open to multiple interpretations – in other words, ambiguous (March & Olsen, 1976). Such ambiguity affords innovating agents opportunities to influence established micro-institutional structures and logics to the benefit of radical innovation ideas.

Micro-institutional affordances and selection

A major legitimacy crisis affecting the Reflactone innovation project, pursued by the Shared Research Unit of PhemCo, illustrates the selection strategy to seek more favorable oases within a heterogeneous institutional setting. PhemCo Unotech SBU sponsored a research project that identified interesting growth opportunities for Reflactone. However, an economic downturn in Unotech's primary business led to elimination of all activities not directly contributing to immediate survival, and Reflactone's mismatch with both established interests and immediate urgencies of the business unit generated a legitimacy crisis in 2002.

In response, the director of the Shared Research Unit, Dr. Maddox, actively searched for new sponsors within PhemCo. He found a backer in the director of PhemCo's Venturing and

Business Development Group (V&BD), Mr. Steinbach, who saw Reflactone as a very promising potential contributor to a specialty chemicals future. However, Steinbach was not willing to fund the project's initially limited focus on anti-reflective coatings for display applications. When Maddox explained that Reflactone could support all kinds of functional coating systems with many different properties and potential applications, some closely related to existing PhemCo businesses, this broader focus matched very well with the ambitions of Steinbach and the V&BD group. Maddox's search for new sponsors within PhemCo is an example of a selection strategy.

A closer look reveals characteristics of the micro-institutional context and the innovators' positions that enabled a selection strategy. Maddox, director of the Shared Research Unit (SRU), enjoyed easy access to a variety of organizational groups. As Steinbach noted:

> It has been a quest for supporters and funds by Maddox and the people who believed in this technology. They wanted to find someone who understands what they are doing and who has access to funds. And that's how they found me. And I must say, I can get along very well with Maddox. We agree on a lot of things… And he is a great guy, a real gentleman, who really has a vision and is determined.

As director of SRU, Maddox was responsible for most research activities within PhemCo (both contract research for the different business units and exploratory research projects), so he maintained working relationships with all SRU research groups, with development groups at the product divisions and business units, with management teams of the business units, and with the corporate planning staff as well as the PhemCo Innovation Centre, representing an array of multiple and diverse potential sponsors. The existence of diverse groups and networks within an organization supports selection strategies: PhemCo business units operate in very different industries and deploy distinctive technology platforms, each with their own experiences and identities (e.g., Unotech's Coatings and Resins, and the Performance Materials SBU, as well as the SRU). PhemCo even has a specific business unit (the V&BD group) supporting novel business and technology initiatives. This multitude of organizational groups sustained differentiated (and partly idiosyncratic) sets of micro-institutionalized interests, norms and beliefs, offering innovating actors many alternative sponsors to select.

Micro-institutional affordances and tolerance seeking

Tolerance-seeking strategies amount to finding a niche of benign neglect where progress can continue despite a legitimacy crisis. The Reflactone innovators encountered a further legitimacy crisis when, at a later stage, they proposed a novel business model, an example illuminating the dynamics of micro-institutional circumstances and innovators' actions to maneuver their radical innovation into a tolerant pocket of their micro-institutional system.

After the Reflactone research team developed an anti-reflective coating system for glass, they advocated commercialization by PhemCo applying the anti-reflective coating on pre-manufactured glass themselves. This approach was expected to increase profit margins significantly, compared to selling or licensing out the anti-reflective coating. However, this would be a completely new business model for PhemCo, moving the company up the value chain in a new business and new market, based on a novel technology. In 2005 this resulted in a conflict between different views of organizational identity and a poor fit with existing interests of PhemCo's established business. As Dr. Hyneman, a business developer, noted:

> PhemCo is not used to this type of business. It is very strange that a chemical company would handle glass now. That is something weird.

The idea of selling glass conflicted with the established view of what PhemCo as a chemical company is and does, its organizational identity. Since PhemCo's established businesses centered on producing and selling chemical raw materials (e.g., coatings) in business-to-business markets, the new business model was perceived to be a strategic misfit, with limited synergy with PhemCo's established businesses.

People at PhemCo and the Innovation Centre still considered selling glass a misfit with the established corporate identity, and major doubts about this strategic extension remained. The Innovation Centre management ultimately allowed the Reflactone team to proceed, despite the unresolved legitimacy crisis however, since both the Centre and the Board also wanted to demonstrate PhemCo's ability to innovate beyond its established footprint. We characterize this response as a tolerance seeking strategy, where innovating actors appeal to mixed institutionalized interests and beliefs, even though their course of action is not fully legitimate within the prevailing micro-institutional logic.

The *multiplicity* of micro-institutional interests and beliefs supported the innovators' tolerance-seeking strategy. Reflactone's project leader described it as follows:

> There are two reasons for [letting the Reflactone team continue with their plans] I think … The first one that I am pretty sure about is that PhemCo's history of successfully commercializing its own technology in new markets is fairly limited. In the last 20 years, if you look at the new products in performance materials I can think of two or three … So, three new products in 20 years. So there is a real commitment of top management to show to our investors that we are capable of doing new stuff.

Despite the conflict, top management was eager to demonstrate PhemCo's innovation capability to its shareholders. Thus, different goals and beliefs coexisted (and competed) within the same micro-institutional logic. Innovators can exploit this *multiplicity* to shift preferences, altering the hierarchy of established goals and beliefs to favor innovation. Here, illegitimate actions are allowed to continue because innovation can be advocated in view of long-term goals, albeit at the expense of short-term consistency. Actors representing the mainstream micro-institutional logic can reasonably conclude that full consistency with some important established interests and beliefs would contradict others. Innovating agents can appeal to this multiplicity, encouraging institutional actors to trade off different interests or rank them differently, justifying tolerance of (partly) illegitimate actions.

Enacting affordances and selecting responses

The previous sections explained how strategic responses are enabled by enacting particular types of micro-institutional affordances. Tables 4a to 4e display two intriguing phenomena that call for further explanation. First, multiple strategic responses were used at different moments within a single innovation trajectory, but there is no apparent pattern in the sequence of strategies over time. Second, this variety of strategic responses is even larger within the same organization: all strategic responses were observed at PhemCo, and all responses, except seeking tolerance, were found at OmegaSys. But why did those involved in different radical innovation projects in the same company, or even within the same project, enact their micro-institutional environment in such different ways?

First, affordances are content-specific and must be enacted in strategic responses; they are not causal drivers nor generically available resources for any issue of legitimacy. Ambiguity, heterogeneity and multiplicity arise from specific institutionalized norms and beliefs that may be relevant for one legitimacy crisis, but not for another. Moreover, actors must perceive these affordances and envision their potential relevance to enact them. This relevance may differ from legitimacy crisis to legitimacy crises because rather distinct crises emerged over time, exhibiting the unpredictable nature of innovation journeys (see Van de Ven, Polley, Garud, & Venkataraman, 1999). For example, the DaXo project at OmegaSys resolved its first four legitimacy crises through transformation responses, exploiting different ambiguities, some of which were purposefully created. Developing a competency in 'biochemistry' was illegitimate within OmegaSys as an 'electronics' firm, so innovating actors ambiguated this organizational identity, by pointing out how other 'electronics' firms were blurring those boundaries. In another crisis, Omega's 'imaging company' identity was constraining, so the novel and still ambiguous concept of the 'total care cycle' was used to initiate transformation. Thus, ambiguity may concern different aspects of the micro-institutional environment; a particular ambiguity does not pertain to every legitimacy crises. For the last legitimacy crises faced by DaXo, no ambiguity or any other affordance could be exploited, and a conformity response was chosen instead. An intrinsic connection between affordances and responses needs to be crafted for every crisis in each innovation trajectory.

Second, enactment of affordances and selection of responses also depend on *innovation characteristics*, including resource impact, scope and radicalness. These characteristics may be purposefully adjusted to enable seeking tolerance, selection or conformity responses; a successful transformation strategy most often preserved the original radical innovation ideas. Relatively *low resource impact* of a radical innovation encourages innovating actors to seek (and institutional actors to grant) institutional tolerance, because resources need not be withdrawn from other initiatives. Although Treemax had little fit with established interests and strategy of PhemCo, the innovation team resolved their fourth legitimacy crisis by appealing to the multiplicity of established interests to seek tolerance and by cutting back the required budget for Treemax considerably. As Dr. Sheridan, general manager of Treemax, stated:

> So if you want to know how I solved it? By disappearing under the blanket and putting down the performance. Just trim down and show them that we are right. And what happened is that we went back from 10 to about three employees… and we have proven something in only one market segment during that year, and the rest we kept alive, literally.

Low resource impact favors innovators' use of multiplicity to seek tolerance because it does not force trade-offs against other projects. Resource impact is partially adjustable; innovators can reduce resource impact to expand opportunities for tolerance within a micro-institutional regime.

Further, a radical innovation's *scope* is related to its potential appeal: narrowly construed innovations will appeal to fewer constituencies, while more broadly defined innovations potentially interest more institutional sponsors. Consequently, the apparent heterogeneity accessible to innovators to overcome a legitimacy crisis depends on the scope of the innovation itself. Sometimes innovators must reframe their radical innovation idea to highlight its match with alternative, more diverse institutional subgroups' interests. Steinbach mentioned this response in one of the interviews on Reflactone:

> There was some kind of dream that if we, as a specialty company of the future, could put very thin layers on all kinds of materials so that you could still see through the material, and that we could also add unique properties to it, then we are doing the right thing for the new PhemCo. And then I said I want to fund this research from the Venturing and Business Development group, because I really think this is an opportunity…

and I see this much broader than only anti-reflection. … [the ideas to broaden the scope] existed already. Also Maddox had thought extensively about it. But you know that when you work in a large company, you should not come up with too fuzzy concepts, because these usually don't stand a chance. But you have to keep them at hand, so that you can play that card at the right moment.

Broadening Reflactone's scope into multiple application areas aligned it with the V&BD unit's interests; a more narrowly focused application *scope* clearly held appeal for fewer institutional subgroups.

Finally, some strategic responses adapt the *radicalness* of an innovation. In particular, conformity responses required that plans and ideas were adapted to better match established logics and structures. None of the conformity responses that were observed abandoned the project altogether; instead they changed ideas into something less radical than initially envisioned, to enable innovators to continue with some of their innovative ideas. Omega Design developed the Icon concept to include design solutions and technologies at room, department and hospital levels to improve patients' experiences throughout the whole healthcare process. Because Icon's multi-mode approach transgressed traditional boundaries of MR and CT systems, it did not make sense to the OmegaSys business units, nor did Icon fit into any of their existing systems. The resulting legitimacy crisis, in 2005, threatened the further development of Icon, because SBUs were not willing to fund this project. Failing to convince the division marketing management to create a new organizational group for department- and hospital-level Icon solutions, Omega designers eventually decided to accommodate to the existing interests and boundary definitions of the SBUs. They focused on developing discrete Icon options for the MR suite and for the CT suite, abandoning multilevel Icon solutions that targeted other customer groups and decision makers in hospitals. Thus, Icon's innovators adapted their ideas to the established logic and structures, overcoming their legitimacy crisis by conformity. As long as the innovation is not compromised too much, conformity also supports the larger institutional frame, in return for legitimacy and support from established institutional groups.

Third, the enactment of affordances is facilitated by the *social position* of innovating actors (see Battilana, 2006), and their *social skills* (see Fligstein, 1997). Some actors see what others cannot; some communicate better than others; others still are better in maneuvering in political space or develop better ideas to adapt their innovation. Some of the differences in responses between (and within) projects in the same firm can be explained by differences in the social positions of the innovating actors involved in those projects. The Treemax team had a *boundary spanning position* within PhemCo that rendered them more aware and critical of ambiguity. As a relatively independent venture unit (supported by PhemCo's Innovation Centre), innovators were loosely coupled to the rest of the PhemCo organization, and active in a novel business field. Thus, the Treemax team was more receptive to alternative opportunities than insiders wedded to PhemCo's prior businesses. Similarly, exploiting heterogeneity of an institutional system to find alternative sponsors is easier for innovating agents occupying boundary-spanning positions, who are exposed to multiple subgroups and have extensive networks providing access to alternative viewpoints and information (Tushman & Scanlan, 1981).

The difference between the response to the second and third Zapim legitimacy crises can be explained by the *power* of an internal sponsor, who had come to support the project in the meantime. The second legitimacy crisis was resolved by a conformity strategy, while the third legitimacy crisis was overcome by a selection response. During the second crisis, the innovation team working on the Zapim technology lobbied for support from the SBU MRI for which they normally work. The small innovation team, a young project leader and two senior scientists relatively

new to the company, was unable to gain support from the MRI SBU, but their limited organizational network offered few options. By the time of the third legitimacy crisis, the head of their research department supported Zapim and leveraged his good connections with both the CTO Office of OmegaSys and within Omega Research itself for alternative sources of funding and organizational support.

Every enactment of an affordance to enable a strategic response to a legitimacy crisis is a *situated accomplishment*, crafting an intricate connection between what is at stake in the legitimacy crises and the specific content of the affordance. This accomplishment involves shaping innovation characteristics and depends on innovating actors' social positions and skills. As a consequence, different affordances are enacted and different responses are pursued to overcome legitimacy crises, even within the same project or the same organization.

Discussion and Conclusion

Established institutional logics and structures are relatively stable over time and exert constraining effects on innovating agents, but they also provide potential resources to overcome legitimacy problems associated with radical innovation. Vermeulen et al. (2007) found that regulatory, normative and cultural-cognitive forces combined into distinct institutional templates that were either conducive or inhibitive to incremental service innovations; and Dougherty and Heller (1994) observed how radical innovations were at odds with existing institutional templates. But we find that the institutional forces that render radical innovation as illegitimate, at the same time offer affordances that can be exploited to advance actions not initially countenanced as legitimate. Our empirical findings on such micro-institutional affordances explain why and how a variety of strategic responses to overcome legitimacy crises can arise within a single micro-institutional system.

First of all, our findings offer a differentiated perspective on conditions that may be exploited in strategic responses to legitimacy crises. Our analysis of strategic responses confirms the insight from institutional theory that institutional forces push innovating actors toward *conformity* (Scott, 2001). A central tenet of our findings, however, is that heterogeneity, multiplicity and ambiguity afford alternative paths for those pioneering radical innovations. A *heterogeneous* institutional context provides an array of differentiated institutionalized groups, for some of whom the radical innovation idea may be more legitimate, thus enabling a *selection* strategy. The *multiplicity* of institutional interests, norms and beliefs constitutes an array of conflicting demands, enabling innovating actors to appeal to those demands best corresponding to their radical innovation and *seek tolerance* for its lack of correspondence with other institutional demands. *Ambiguity* of micro-institutional interests, norms and beliefs offers innovating agents opportunities to propagate novel interpretations, *transforming* the institutional system to favor the innovation. Other scholars have used a range of related concepts (e.g., Battilana & d'Aunno, 2009; Hargrave & Van de Ven, 2009) but without explicitly differentiating them. Thus, we provide a more comprehensive and differentiated perspective on conditions for agency within institutional systems. Moreover, whereas the institutional literature has identified conditions that support agency in general (e.g., Battilana & d'Aunno, 2009), we identify connections between specific affordances and distinct strategies to overcome pressures toward stability. These connections should not be interpreted as deterministic or causal links between affordance and response, but rather are both part of a dynamic process of reflection and action triggered by a legitimacy crisis. Neither are these connections exclusive; we have identified the strongest links between affordances and strategies, but more than one affordance can be enacted and elements of more than one type of strategy may be combined or deployed

consecutively during an interactive and iterative process. The response to the last legitimacy crisis of Treemax, for example, showed how transformation and conformity were combined.

Second, our findings contribute to an enhanced understanding of embedded agency as called for in recent publications (Lawrence et al., 2009). Whereas the institutional entrepreneurship literature has been criticized for over-voluntaristic assumptions regarding agency (Battilana et al., 2009), our analysis shows that innovating actors were not 'disembedded heroes,' but highly contextualized actors. Building upon the structurationist concepts of duality of structure and reflexivity, we argue instead that actors' agency was enabled by their embeddedness. Ambiguity, heterogeneity and multiplicity are properties of structure as a medium of action, while strategic responses also (re)produce or change this structure. Each of these affordances enables a broader repertoire of actions: ambiguity offers multiple interpretations to draw upon; heterogeneity offers multiple constituents to appeal to; and multiplicity offers multiple beliefs and norms with potentially contrasting implications. The embeddedness of innovating actors allows them to exploit these affordances to generate action alternatives. These findings illustrate that institutionally embedded agency has generative potential.

Further, we find that affordances are enacted by embedded agents with reflexive capabilities (Giddens, 1984). Micro-institutional affordances are not exogenous or inert, exerting causal influence over social agents, but instead properties of the micro-institutional system as enacted by reflexive actors, and thus endogenous to the process of responding to legitimacy crises. Legitimacy crises trigger reflexivity because they force actors to reflect upon the situation of their innovation activities in the institutional environment. The experience of inconsistency in institutional elements may further trigger reflexivity (see Seo & Creed, 2002; Suddaby & Greenwood, 2005). This reflexivity, in turn, is critical because innovating actors must envision the opportunities offered by conditions of their institutional context, and be aware of implications for their innovation activities and purposefully adjust them. Moreover, they may construe conditions that afford continuation of their innovation activities by ambiguating institutionalized norms and beliefs; by emphasizing multiplicity to seek tolerance, or by selecting heterogeneity relevant for the innovation issues at stake. Reflexivity is thus endogenous to the processes of embedded agency in the face of a legitimacy crisis, because reflexivity is triggered by such a crisis but is also a necessary condition to craft a situated response to it.

The connections between strategic responses and micro-institutional affordances uncovered in our study are likely to depend on the aspirations of actors. Actors in our study were primarily concerned with continuing their radical innovation trajectory. For them, heterogeneity offered opportunities to select a corner of the institutional context more supportive of their innovation. Yet, in other studies, the presence of competing demands from multiple institutional constituents has been presented as a dilemma to be overcome (see Jarzabkowski et al., 2009; Reay & Hinings, 2009). Similarly, whereas Oliver (1991) argued that environmental uncertainty stimulates organizations to conform to established institutional logics, our findings suggest that ambiguity provides opportunities for transformation. Innovating actors do not seek to avoid uncertainty, but rather to identify and exploit it in order to proceed with their innovation. Thus, the role of the affordances identified in our study may depend on the objectives of the actors involved. This suggests that one way forward for recent work on the repertoire of institutional work (Battilana & d'Aunno, 2009; Lawrence et al., 2009) is to examine how alternative objectives affect how embedded agents can exploit affordances.

Finally, our findings raise challenging issues for the management of innovation. Can institutional templates ever be as supportive for radical innovation as Vermeulen et al. (2007) found for incremental service innovation? The radical projects investigated were embedded in experienced

organizations with espoused commitment to radical innovation and dedicated organizational struc-tures; yet these projects faced threats because they did not fit with widely shared beliefs, norms and interests. This suggests that structures can only be part of the solution to enable radical innovation, to be complemented by the agency of innovating actors. Novel concepts proposed in innova-tion management literature, such as ambidextrous organizations that separate exploratory inno-vation and exploitation of current businesses (Tushman & O'Reilly, 1996), may be beneficial by creating heterogeneity and ambiguity, but agency is essential to enact and leverage such affordances and make innovation happen.

A limitation of this study is that it is largely retrospective, which may limit the accuracy and completeness of data, in particular on reflective processes from the early phases of the innovation histories. Real-time investigation of radical innovation trajectories may extend the present study by exploring how strategic responses are crafted over time and interact with the interpretation and re-interpretation of micro-institutional affordances. Another limitation that calls for further research is that we only examined projects and instances where legitimacy crises were overcome to uncover how successful strategic responses were possible (see Mohr, 1982). Future research on failed pro-jects and unsuccessful attempts to overcome legitimacy crises may provide complementary theo-retical insight. Moreover, future research may also revisit incremental innovation to examine whether similar dynamics may be found in case incremental innovation runs into legitimacy crises.

The central question in our study has been how does radical technological innovation take place successfully within established institutional systems. Our findings show that existing institutional structures may pose constraints to radical innovation projects, even within organizations experi-enced in innovation. Although the search for more effective structures should not be discouraged, our findings point at the complementary and vital role of human agency in the pursuit of radical innovation. Moreover, this paper showed how embedded agency is possible because of affordances within institutional structures. Thus, this paper extends institutional theory toward a micro-institutional perspective on radical innovation, providing a robust explanation of both institutional stability and radical change.

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Note

1.   For reasons of confidentiality and non-disclosure, names of companies, innovations and actors have been anonymized.

References

Aldrich, H., & Fiol, M. (1994). Fools rush in? The institutional context of industry creation. *Academy of Management Review, 19,* 645–669.

Barley, S., & Tolbert, P. (1997). Institutionalization and structuration: Studying the links between action and institution. *Organization Studies, 18,* 93–117.

Battilana, J. (2006). Agency and institutions: The enabling role of individuals' social position. *Organization, 13,* 653–676.

Battilana, J., & d'Aunno, T. (2009). Institutional work and the paradox of embedded agency. In T. B. Lawrence, R. Suddaby, & B. Leca (Eds.), *Institutional work: Actors and agency in institutional studies of organizations* (pp. 31–58). Cambridge: Cambridge University Press.

Battilana, J., Leca, B., & Boxenbaum, E. (2009). How actors change institutions: Towards a theory of institutional entrepreneurship. *Academy of Management Annals, 3,* 65–107.

Christensen, C. (1993). The rigid disk drive industry: A history of commercial and technological turbulence. *Business History Review, 67,* 531–588.

De Rond, M. (2003). *Strategic alliances as social facts: Business, biotechnology and intellectual history*. Cambridge: Cambridge University Press.

DiMaggio, P. (1988). Interest and agency in institutional theory. In L. G. Zucker (Ed.), *Institutional patterns and organizations* (pp. 3–22). Cambridge, MA: Ballinger.

Dorado, S. (2005). Institutional entrepreneurship, partaking and convening. *Organization Studies, 26,* 385–414.

Dougherty, D. (1992). Interpretive barriers to successful product innovation in large firms. *Organization Science, 3,* 179–202.

Dougherty, D., & Heller, T. (1994). The illegitimacy of successful product innovation in established firms. *Organization Science, 5,* 200–218.

Eisenhardt, K. (1989). Building theories from case study research. *Academy of Management Review, 14,* 532–550.

Elsbach, K., & Sutton, R. (1992). Acquiring organizational legitimacy through illegitimate actions: A marriage of institutional and impression management theories. *Academy of Management Journal, 35,* 699–738.

Elsbach, K. (2002). Intraorganizational institutions. In J. A. C. Baum (Ed.), *Companion to organizations* (pp. 37–57). Oxford: Blackwell.

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology, 103,* 962–1023.

Fligstein, N. (1997). Social skill and institutional theory. *American Behavioral Scientist, 40,* 397–406.

Garud, R., & Rappa, M. (1994). A socio-cognitive model of technology evolution: The case of cochlear implants. *Organization Science, 5,* 344–362.

Garud, R., Hardy, C., & Maguire, S. (2007). Institutional entrepreneurship as embedded agency: An introduction to the special issue. *Organization Studies, 28,* 957–969.

Gatignon, H., Tushman, M., Smith, W., & Anderson, P. (2002). A structural approach to assessing innovation: Construct development of innovation locus, type, and characteristics. *Management Science, 48,* 1103–1122.

Gibson, J. (1979). *The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.

Giddens, A. (1984). *The constitution of society*. Berkeley, CA: University of California Press.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.

Greenwood, R., Magán Díaz, A., Li, S.X., & Lorente, J.C. (2010). The multiplicity of institutional logics and the heterogeneity of organizational responses. *Organization Science, 21,* 521–539.

Hardy, C., & Phillips, N. (1999). No joking matter: Discursive struggle in the Canadian refugee system. *Organization Studies, 20,* 1–24.

Hargrave, T. J., & Van de Ven, A. H. (2009). Institutional work as the creative embrace of contradiction. In T. B. Lawrence, R. Suddaby, & B. Leca (Eds.), *Institutional work: Actors and agency in institutional studies of organizations* (pp. 120–140). Cambridge: Cambridge University Press.

Holm, P. (1995). The dynamics of institutionalization: Transformation processes in Norwegian fisheries. *Administrative Science Quarterly, 40,* 398–422.

Huber, G. P., & Power, D. J. (1985). Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. *Strategic Management Journal, 6,* 171–180.

Jarzabkowski, P., Matthiesen, J., & Van de Ven, A. H. (2009). Doing which work? A practice approach to institutional pluralism. In T. B. Lawrence, R. Suddaby, & B. Leca (Eds.), *Institutional work: Actors and agency in institutional studies of organizations* (pp. 284–316). Cambridge: Cambridge University Press.

Jick, T. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 24,* 602–611.

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review, 24,* 691–710.

Lawrence, T., Suddaby, R., & Leca, B. (2009). Introduction: Theorizing and studying institutional work. In T. B. Lawrence, R. Suddaby, & B. Leca (Eds.), *Institutional work: Actors and agency in institutional studies of organizations* (pp. 1–27). Cambridge: Cambridge University Press.

Leifer, R., McDermott, C., O'Connor, G., Peters, L., Rice, M., & Veryzer, R. (2000). *Radical innovation: How mature companies can outsmart upstarts*. Boston, MA: Harvard Business School Press.

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. London: Sage.

Locke, K. (2001). *Grounded theory in management research*. London: Sage Publications.

Lounsbury, M., & Glynn, M. A. (2001). Cultural entrepreneurship: Stories, legitimacy, and the acquisition of resources. *Strategic Management Journal, 22,* 545–564.

Maguire, S., Hardy, C., & Lawrence, T. (2004). Institutional entrepreneurship in emerging fields: HIV/AIDS treatment advocacy in Canada. *Academy of Management Journal, 47,* 657–679.

March, J., & Olsen, J. (1976). *Ambiguity and choice in organizations*. Bergen: Universitetsforlaget.

Marquis, C., & Lounsbury, M. (2007). Vive la résistance: Competing logics in the consolidation of community banking. *Academy of Management Journal, 50,* 799–820.

Mohr, L.B. (1982). *Explaining organizational behavior*. San Francisco, CA: Jossey-Bass.

Ocasio, W. (1997). Towards an attention-based view of the firm. *Strategic Management Journal, 18,* 187–206.

Oliver, C. (1991). Strategic responses to institutional processes. *Academy of Management Review, 16,* 145–179.

Pettigrew, A. (1990). Longitudinal field research on change: Theory and practice. *Organization Science, 1,* 267–292.

Reay, T., & Hinings, C. R. (2009). Managing the rivalry of competing institutional logics. *Organization Studies, 30,* 629–652.

Scott, W. R. (2001). *Institutions and organizations*, 2nd edition. Thousand Oaks, CA: Sage.

Selznick, P. (1957). *Leadership in administration: A sociological interpretation*. Evanston, IL: Row & Peterson.

Seo, M. G., & Creed, W. E. D. (2002) Institutional contradictions, praxis, and institutional change: A dialectical perspective. *Academy of Management Review,* 27, 222–247.

Strauss, A. (1987). *Qualitative analysis for social scientists*. Cambridge: Cambridge University Press.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*, 2nd edition. Thousand Oaks, CA: Sage.

Suchman, M. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20,* 571–610.

Suddaby, R., & Greenwood, R. (2005). Rhetorical strategies of legitimacy. *Administrative Science Quarterly, 50,* 35–67.

Townley, B. (2002). The role of competing rationalities in institutional change. *Academy of Management Journal, 45,* 163–179.

Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal, 21,* 1147–1161.

Tushman, M., & O'Reilly, C. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review, 38,* 8–30.

Tushman, M., & Scanlan, T. (1981). Boundary spanning individuals: Their role in information transfer and their antecedents. *Academy of Management Journal, 24,* 289–305.

Vaughan, D. (1992). Theory elaboration: The heuristics of case analysis. In C. Ragin, & H. S. Becker (Eds.), *What is a case? Exploring the foundations of social inquiry* (pp. 173–202). Cambridge: Cambridge University Press.

Van de Ven, A. H., Polley, D. E., Garud, R., & Venkataraman, S. (1999). *The innovation journey*. Oxford: Oxford University Press.

Vermeulen, P., van den Bosch, F., & Volberda, H. (2007). Complex incremental product innovation in established service firms: A micro institutional perspective. *Organization Studies, 28,* 1523–1546.

Wicks, D. (2001). Institutionalized mindsets of invulnerability: Differentiated institutional fields and the antecedents of organizational crisis. *Organization Studies, 22,* 659–692.

Yin, R. (2003). *Case study research, design and methods*, 3rd edition. Newbury Park, CA: Sage.

Zietsma, C., & Lawrence, T. B. (2010). Institutional work in the transformation of an organizational field: The interplay of boundary work and practice work. *Administrative Science Quarterly, 55,* 189–221.

Zilber, T. (2002). Institutionalization as an interplay between actions, meanings, and actors: The case of a rape crisis center in Israel. *Academy of Management Journal, 45,* 234–254.

Zimmerman, M., & Zeitz, G. (2002). Beyond survival: Achieving new venture growth by building legitimacy. *Academy of Management Review, 27,* 414–431.

Zott, C., & Huy, Q. N. (2007). How entrepreneurs use symbolic management to acquire resources. *Administrative Science Quarterly, 52,* 70–105.

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