CONSTRUCTING INSTITUTIONAL CHANGE

Emergence, Contestation, and Convergence of Business Models in the
Field of Java Application Servers

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How are innovative new business models established if organizations constantly compare themselves against existing criteria and expectations? Innovative and substantially new approaches often fall outside or are misrepresented by established expectations and evaluation criteria. Researchers and practitioners from different areas – strategic management, innovation and change management, and economics – are directly or indirectly confronted with this particular problem. The topic is critical because it addresses the question of how organizations and industries innovate despite the prevalence of institutionalized barriers that inhibit innovations from succeeding.

The objective of the present study is to address this question from the perspective of innovators and their ability to redefine established expectations and evaluation criteria. The research questions ask whether there are discernible patterns of discursive action through which innovators theorize institutional change and what role such theorizations play for mobilizing support and realizing change projects. These questions are investigated through a case study on a critical area of enterprise computing software, Java application servers.

In the present case, business practices and models were already well established among incumbents with critical market areas allocated to few dominant firms. Fringe players started experimenting with a new business approach of selling services around freely available opensource application servers. While most new players struggled, one new entrant succeeded in leading incumbents to adopt and compete on the new model. The case demonstrates that innovative and substantially new models and practices are established in organizational fields when innovators are able to refine expectations and evaluation criteria within an organizational field.

The present study addresses the theoretical paradox of embedded agency. Actors who are embedded in prevailing institutional logics and structures find it hard to perceive potentially disruptive opportunities that fall outside existing ways of doings things. Changing prevailing institutional logics and structures requires strategic and institutional work aimed at overcoming barriers to innovation. The present study addresses this problem through the lens of (new) institutional theory. The discourse methodology of the present study traces the process through which innovators were able to establish a new social and business model in the field

The study contributes to institutional theory by reframing the paradox of embedded agency from a practice perspective. Embeddedness is an active accomplishment that may succeed as well as fail. The study extends existing process models of institutional change by emphasizing conflict and contestation and the open-endedness of institutionalization processes. It thus highlights the role of astute innovators – institutional entrepreneurs – as source of innovation within organizations and organizational fields.

Keywords: Institutional entrepreneurship, Organizational change, Strategy practice, Innovation, Discourse analysis

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1. Introduction

How are innovative and potentially disruptive new approaches established if incumbent organizations benefit from the status quo and are powerful enough to prevent disruptive change? The status quo refers to the prevailing rules and expectations of doing business. Innovative and substantially new approaches often fall outside or are misrepresented by established expectations and evaluation criteria. The chance that potentially innovative and substantially new models and practices are adopted may therefore be small. Researchers and practitioners from different areas – strategic management, innovation and change management, or economics – are directly or indirectly confronted with this particular problem. The topic is critical because it addresses the question of how organizations and industries innovate to reinvigorate growth despite the prevalence of structural and cognitive barriers that inhibit innovations from succeeding.

The objective of the present study is to address this question through a case study on a critical area of enterprise computing software, Java application servers. In this case context, business practices and models were already well established among incumbents with critical market areas allocated to few dominant firms. Fringe players started experimenting with a new business approach of selling services around freely available open-source application servers. The prospect of competing with freely available software threatened the business model of incumbent firms. While most new players struggled, one new entrant succeeded in leading incumbents to adopt and compete on the new model. The case demonstrates that innovative and substantially new models and practices are established in organizational fields when organizations compare themselves against emerging opportunities rather than the status quo.

This chapter is structured in four sections and a conclusion. The first section outlines the background of the research. The present study investigates how the prevailing rules and expectations of an organizational field are constructed, maintained, and reconstructed. The role of language and communication is particularly salient in new institutional approaches adopted here to investigate processes through which new understandings are established. The second section outlines the research problem and

presents the research questions. It introduces the paradox of 'embedded agency' arguing that, on one hand, increasing institutionalization negatively constrains innovativeness of human actors while, on the other hand, human actors are creatively involved in socially constructing institutionalization processes. A cogent way of investigating institutional change is therefore to analyze what participating actors say and do that either sustains existing or promotes alternative understandings.

The third section outlines the discourse methodology adopted for the present study. The discourse methodology employs quantitative content analyses to identify key events and participants in combination with qualitative coding techniques to assess how and why arguments and thematic patterns developed over time. The Java application server field appeared particularly well suited for analyzing change processes because it involved the levels of firms, the field, and the technological standard governing multiple fields. The fourth section outlines the structure of this thesis. This thesis is structured in seven chapters including this introductory chapter, a literature chapter, a methodology chapter, two analysis chapters, a discussion chapter, and a concluding chapter.

Background to the Research

The present study is located in an area of business and management studies that primarily deals with the sociology of organizations and organizational fields. Broadly, an organizational field refers to an industry or sector with "organizations engaged in a similar function" vis-à-vis the broader environment in which they are embedded (Scott 2001: 137). Within this area, the present study is particularly concerned with how the collectively shared rules and expectations of organizations within a field influence the course of actions that these organizations undertake. That the innovativeness of these undertakings is severely constrained by taken-for-granted understanding and business processes forms a core tenet of the present study. The theoretical foundation for this assumption is in the New Institutionalism developed in economics and sociology. Here, institutions not only refer to the formally established arrangements of the state but also to customs and socio-cultural relations that govern economic conduct and human actions in general (Meyer and Rowan 1977).

Prevailing institutionalized rules and expectations define what counts as appropriate and legitimated conduct within a concrete action context. In the present study, the context of action is the organizational field and the course of action refers to the com-

petitive conduct that an organization adopts over time. However, the competitive conduct is subjected to institutionalized rules and expectations and thereby constrains the scope of strategic choices available to actors (North 2005). For example, decision-makers were repeatedly found to be constrained by a *dominant logic* that precludes managers from adopting innovative approaches outside prevailing understandings (Prahalad and Bettis 1986). Therefore, competitive actions may often lack the innovativeness required for recognizing and exploiting new opportunities.

The present study investigates how the prevailing rules and expectations of an organizational field are constructed, maintained, and reconstructed. The role of language and communication is particularly salient in new institutional approaches that focus on the cognitive 'framing' processes for establishing shared understandings (DiMaggio and Powell 1991). From a cognitive perspective, change processes primarily involve reweaving prevailing rules and expectations – the taken-for-granted 'webs of significance' that human actors have constructed over time (Weick 1979). With a focus on language and particularly on language-use, what appears as an abstract or hidden cognitive process of institutionalization turns into empirically observable instances evident in statements and arguments enrolled to frame shared understandings.

Prevailing rules and expectations are not only the objects of proactive framing but are, at the same time, a resource for those with the bargaining power to define and alter them (North 1990). Profound and disruptive changes are therefore less likely, because those with the bargaining power to define prevailing rules and expectations tend to benefit from the status quo. This raises the question of how "new institutions [are] created or existing ones changed over time" given low incentives of powerful actors to change the status quo (Seo and Creed 2002: 222). The paradox of embedded agency highlights this problem in order to better understand why innovations that improve long-term sustainability are either not recognized or actively disparaged in the short run.

Research Problem and Justification

Institutional change – changes in formal rules and shared expectations – brings the paradox of embedded agency to the fore. On one hand, increasing institutionalization fortifies prevailing rules and expectations and reinforces existing approaches. In this way, by defining what is thinkable and doable, institutions and associated approaches

endure over time (DiMaggio and Powell 1983; Meyer and Rowan 1977; Selznick 1957). On the other hand, institutionalization – increasing acceptance of prevailing rules and expectations – requires active involvement and support of human actors. In this way, by deciding what is thinkable and doable, human actors socially construct institutions (Berger and Luckmann 1966).

Institutional theorists explain change either exogenously, through external 'jolts' (Meyer 1982), or endogenously, through structural contradictions (DiMaggio 1988). Both cases rely on an abstract mechanism to explain institutional change. Institutional approaches only started considering individual-level dynamics when investigating institutional change, which brought the paradox of embedded agency to the fore (Battilana 2006). A cogent way of investigating institutionalization processes is therefore to analyze what participating actors *say and do* that either sustains existing or promotes alternative rules and expectations.

One study that explicitly focuses on how institutionalized rules and expectations change at the level of local action found that shared meanings changed gradually over time as new members joined the organization (Zilber 2002). However, the few institutional studies that focus on changing conceptions at the action level do not systematically investigate empirically how conceptions change at a more aggregated level, such as the field level, and how local and more aggregated processes reinforce each other. Other actor-level studies investigate *properties* of change agents, such as tenure and social position (Battilana 2007), thereby neglecting the *process* of change and how it is brought about. The present study fills this gap by analyzing how conceptions change at the level of the organizational field and how these changes are discursively constructed, maintained, and reconstructed at the level of individual action.

The 'new' institutional perspective in organization sociology focuses on cognitive beliefs and meaning systems rather than on explicated laws and rules (DiMaggio and Powell 1991: 15). Similarly, proponents of new institutional economics emphasize that "the *dominant beliefs* ... over time result in the accretion of an elaborate structure of institutions that determine economic and political performance" (North 2005: 2, added emphasis). The emphasis on cognitive belief and meaning systems reflects the 'cognitive turn' in the social sciences, dating back to Garfinkel's (1967) ethno-methodological and Berger and Luckmann's (1966) social constructionist approaches. The new institutionalism thus shares with constructionist approaches the view that institutionaliza-

tion "is experienced as an objective reality" which does not exist "apart from the man activity that produced it" (Berger and Luckmann 1966: 77-78).

The assertion that the objective reality – what social scientists measure and predict – is not *objective* in the last instance but contingent on human actors who in the aggregate produce it, constituted a paradigm shift in the social sciences (Delanty 1997). The implication is that even despite pervasive institutionalization there is no automatism of compliance: "all explanations will involve at least implicit reference both to the purposive, reasoning behaviour of agents and to its intersection with constraining and enabling features of the social and material contexts" (Giddens 1984: 179). Observed regularities or patterns of activities are thus grounded in the rules and expectations that actors endorse and enforce over time.

The present study investigates the process of institutional change along two research questions: (1) *Are there discernible patterns of discursive action through which participants in an organizational field theorize institutional change*, and (2) *What are the implications of theorizations for mobilizing support and realizing change projects?*

Discourse Methodological Approach

In order to study processes of institutional change, the organizational field of Java application servers appeared particularly well suited. The Java application server field and interrelated fields, such as those of server hardware or database systems, were dominated by few incumbent firms able to extract large profit premiums. At the time when the new entrants introduced a disruptive business model in the field, incumbents occupied powerful positions able to maintain or create entry barriers. The case thus directly addresses the problem of how, in the absence of external shocks, innovative and substantially new models and practices are established in a field if incumbents benefit from the status quo and are able to deter innovative newcomers from succeeding.

From an institutional perspective interested in how rules and expectations promote organizational homogeneity and contain innovative approaches, studying the evolution of organizational fields is particularly warranted. Here, "the key issue in assessing [organizational] action is determining the group of others who are looked to for comparison and modeling" (Fligstein and Dauber 1989: 93). While the tension between institutional isomorphism and change has garnered the focus of much theoretical attention, empirical research into the production of meaning at the level of local action

remains rare (Zilber 2002). Finally, information-rich data on how the discourse in the field evolved was available in detail through internet sources. The evolution of the Java application server field therefore presented a unique opportunity to analyze institutional change in an organizational field.

The present study adopted a quantitative and qualitative methodology. In particular, this study falls under a branch of discourse analysis using quantitative content analyses to identify key events and participants in combination with qualitative coding techniques to assess how and why arguments and thematic patterns developed over time (Jäger 2001). Large amounts of data for the study were systematically retrieved from internet sources. The sources included second-hand news services such as CNET, IDG, Jupitermedia, VNU, or Ziff-Davis as well as first-hand sources featuring self-published content in discussions and blogs, such as at Apache, Blogger, O'Reilly, ServerSide, or Sun.

The aim of the case study was to trace the process through which institutionalization is discursively constructed. Therefore, relevant data had to feature a narrative 'story line' informing about who (actor) did or said what (action) in a defined context (Charnley 1975). As a result, the final sample covered statements of those participants who were most vocal in shaping the discourse in the field. The qualitative approach was based on an open coding approach (Glaser and Strauss 1967) through which themes were assigned to statements of key participants (Gumperz 1982 [1999]). Each theme reflected how a statement addressed a contested issue or event by constructing a common goal or interest and the rationale for pursuing it, employing a rhetoric that underlines the endorsed point of view.

Outline of the Thesis

This thesis is structured in seven chapters including this introductory chapter and a concluding chapter. This *introductory chapter* introduces the background of the research, the research problem, and the discourse methodology. Second, the *literature chapter* reviews the literature on institutional change in organizational fields and introduces discourse and practice perspectives that are attentive to what participating actors say and do in relation to institutionalization processes. The first section demonstrates that compatibility with the prevailing institutional structure enhances organizational profitability and survivability. The more micro-oriented part introduces the

practice perspective to show how institutionalization affords intelligibility and performativity to practices suggesting low incentives for adopting changes. The second section introduces two mechanisms, structural *contradiction* and *overdetermination*, and shows how they mitigate or disrupt institutionalization dynamics and propel alterations in the prevailing institutional structure. The more micro-oriented part presents the conditions for recognizing and exploiting structural contradiction and overdetermination. The third section of the literature chapter introduces the concept of *institutional entrepreneurship* used to explain collective aimed at establishing potentially disruptive innovations. The more micro-oriented part shows how actors seek to alter or to maintain institutional structure by engaging in the concrete activities of institutional work. Finally, the fourth section demonstrates how discourses and institutions are recursively involved in the formation of rules and expectations. The more micro-oriented part outlines the recursive interplay between discourses, discursive action, and institutionalization.

The third chapter on *methodology* outlines a comprehensive discourse methodology for investigating institutionalization processes by tracing discourses and discursive action over time. The first section justifies the case selection and provides background information on the case. The second section outlines the data collection and sampling process. Defining the population involved establishing the types of content applicable for analysis. Relevant data was added to the sample in an iterative search and retrieval process, eventually comprising 1088 source documents containing 1383 statements by 36 participants. The third section defines the operationalization of the analytical concepts developed in the literature chapter. The fourth section presents a pre-analysis of data to reconstruct the chronology of major events and to identify the key events across all phases. The methodology demonstrates how institutional contexts can be linked to discursive action in studies of institutionalization processes.

Fourth, the chapter on *analysis of discursive structure* identifies the thematic pattern, prominent actors, and action orientations over time. The first section analyzes the first phase from January 1998 to March 2002. It demonstrates that the thematic pattern was dominated by arguments promoting the opensource approaches while the status quo remained marginal in the early discourse on opensource Java software, which was constructed primarily by opensource proponents. The second section analyzes the second phase during March 2002 to May 2005. The thematic pattern demonstrates that some opensource approaches lost momentum and that the proprietary approach to

Java governance gained momentum, which in this phase was constructed primarily by incumbent firms. The third section analyzes the final phase from May 2005 to August 2006. It demonstrates that the thematic pattern was almost exclusively dominated by arguments promoting opensource approaches. The shift vis-à-vis the previous phase was constructed primarily by incumbent firms followed by opensource firms. The analysis demonstrates that the discourse on opensource Java software was (1) started by peripheral actors, (2) turned pro-proprietary regarding Java governance as incumbents gained influence over the discourse, and eventually (3) endorsed opensource approaches almost exclusively with incumbents the major force behind the shift.

Fifth, the chapter on *analysis of discursive action* reconstructs the discourse on opensource Java software by tracing the actual statements supportive of either the opensource or proprietary approaches. The first section analyzes statements under the major themes during the first phase. Statements supporting opensource approaches embedded the new model, emphasized its innovativeness, and built developer communities while statements supporting proprietary Java model emphasized compatibility of Java software. The second section analyzes the major themes of the second phase. Statements supporting opensource approaches were aimed at exploiting their marginalized status to attract innovators. Statements supporting the proprietary Java model were aimed at legitimating Sun's control over Java. The third section analyzes statements under the major themes of the third phase, during which opensource approaches dominated not only the discourse on opensource Java software but also espoused strategies and courses of action. Each of the three sections identifies key discursive strategies employed to legitimate and embed espoused views. The chapter demonstrates how, over time, statements supporting opensource approaches shaped prevailing rules and expectations towards compatibility with the new model.

Sixth, the *discussion chapter* revisits the research questions and the key issues that were raised in the literature review. The first section presents a generic cycle of discursive emergence, contestation, and convergence (DECC generic cycle) which depicts the impact of discourse on institutionalization trajectories in the field. Competing theorizations aimed at shaping prevailing rules and expectations towards compatibility with espoused interests and projects drive institutionalization processes. Discourses are carriers of competing theorizations and shape institutionalization trajectories as theorizations are contested and evaluated. The following section presents the process of institutional change from a practice perspective summarizes the stages based on the

interplay between stability and change. The third section outlines the benefits of a practice perspective: embeddedness and institutionalization is never completely self-referential as latent contradictions promote new interpretations. The final section discusses the merits of the discourse methodology in order to account for the interplay of institutionalization and human action over time.

Finally, the *conclusion* shows how the present study contributes to the empirical application of institutional theory within the area of institutional change in organizational fields. In particular, the chapter shows how the combination of the institutional and the practice perspectives addresses the paradox of embedded agency. The practice perspective provides more detailed insights into the actual activities through which institutional entrepreneurs and other interested actors attempt to shape the trajectories of institutional change and institutionalization outcomes. It demonstrates that an in-depth and longitudinal analysis of discursive action is particularly warranted because institutionalization and institutional logics are only accessible in discursive reflections about them (Berger and Luckmann 1966). The combination of levels of analysis adds to extant theory because it demonstrates that interested actors not only draw on discursive structures to embed new models but that, by so doing, their discursive action also constitutes discursive structures that shape prevailing rules and expectations. Through a longitudinal analysis of institutionalization processes, this research not only demonstrated *that* institutional change occurs but also *how* interested actors discursively shape processes of institutionalization.

Conclusion

This chapter identified the background of the present study in an area of business and management studies that primarily deals with the sociology of organizations and organizational fields. Particularly, the focus is on how prevailing rules and expectations of an organizational field are constructed, maintained, and reconstructed. The role of language and language-use is a particularly salient aspect along which institutionalization processes are investigated. The second section introduced the paradox of embedded agency that this research addresses. It outlined a cogent way of investigating institutional change by focusing on what participating actors say and do that either sustains existing or promotes alternative understandings.

The third section outlined the discourse methodology developed for the present study. The methodology employs quantitative content analyses to identify key events and participants in combination with qualitative coding techniques to assess how and why arguments and thematic patterns developed over time. Finally, the fourth section introduced the outline of this thesis, which is structured in seven chapters including this introductory chapter, a literature chapter, a methodology chapter, two analysis chapters, a discussion chapter, and a concluding chapter.

2. Literature Review

Institutions in the broad sense are defined as the collectively endorsed and enforced rules and expectations affording human interactions with stability and meaning. This definition follows the constructionist view of an institution as "reciprocal typification [categorization] of habitualized actions by types of actors" (Berger and Luckmann 1966: 72). The constructionist view points to the human construction of rules and expectations as competing suppliers of truth claims, such as religious or scientific groups, vie for dominance (Mannheim 1982 [1928]). As a fundamental ontology of all social sciences, constructivism particularly attends to the context-dependent but often unacknowledged conditions of sociological or economic models and to their unintended consequences (Delanty 1997). For example, models based on observed regularities of social or economic life often attempt to predict the institutional relations that sociologists and economists have helped creating (Giddens 1976). As rules and expectations become accepted, they provide stability and meaning thereby further increasing their acceptance.

Institutional theorists in sociology and economics emphasize that "rules themselves are important types of resources" (Scott 1987: 508) and that "institutions are not necessarily ... socially efficient ... [but] serve the interests of those with the bargaining power to devise new rules" (North 1990: 16). However, differences exist regarding the focus of analysis. Economists tend to focus on institutions that are purposively designed by human actors while sociologists focus on institutions in the broader sense of reciprocally developed cognitive understandings that typically defy single-handed design (DiMaggio and Powell 1991: 8). Scott (2001) therefore proposes three dimensions of institutions: cognitive understandings, regulative power, and normative sanctioning. Purposively designed institutions, such as authorities or laws, particularly refer to the latter two dimensions.

I use the term *institution* to refer primarily to the prevailing cognitive understandings when focusing on the more macro-oriented and aggregated level while using the term *rules and expectations* when focusing on the more micro-oriented and local level of concrete action. Based on a typology of practice research (Jarzabkowski and Spee 2009), the micro perspective regarding the level of practitioners focuses on identifiable (rather than

anonymous) actors. In the present study, it encompasses the level of concrete action focusing on the interactions and action contexts. These interactions involve and express rules and expectations that inform local conduct. It analyzes the "situated social production" of aggregate outcomes across different action contexts (Knorr-Cetina 1981: 14). The macro perspective concerns the level of praxis in the typology of s-as-p research and focuses on the field-level outcomes of actions. In the present study, it encompasses the level of aggregated action focusing on the interrelationships arising from the summation of situated actions across multiple action contexts – interrelationships which human actors construe and classify thereby establishing institutions (Knorr-Cetina 1988). I therefore employ the term 'micro' to refer to situated actions by identifiable actors in concrete action contexts and the term 'macro' to refer the interrelationships that obtain between situated actions on the field level (see Johnson et al. 2007).

The local level of concrete action focuses on the myriad of interactions and action contexts which involve and express rules and expectations informing local conduct. It analyzes the "situated social production" of aggregate outcomes across different action contexts (Knorr-Cetina 1981: 14). The aggregated focuses on the interrelationships arising from the summation of situated actions across multiple action contexts – interrelationships which human actors construe and classify thereby establishing institutions (Knorr-Cetina 1988). Hence, I use the term *micro* to refer to situated actions in concrete action contexts and the term *macro* to refer the interrelationships that obtain between situated actions.

Attention is placed on the constructionist view that conceptualizes institutions and institutional structures as products of human practices that structure concrete actions and prove resistant against deliberate intervention. For example, institutions are defined as "socially constructed, routine-reproduced programs or rule systems" (Jepperson 1991: 149) "by which individuals and organizations produce and reproduce their material substance and organize" their activities (Friedland and Alford 1991: 243). Institutions are thus observable as "forms of material interactions or behaviors," whose understanding is mediated by "their interpenetration with wider cultural rules" (Lounsbury and Crumley 2007: 996). These accounts stress the more material and economic as well as the more symbolic and cognitive aspects of institutions.

The 'new' institutional perspective focuses primarily on cognitive understandings rather than on explicated rules, values, or conflicts (DiMaggio and Powell 1991). It thus reflects the 'cognitive turn' in sociology, emphasized by Garfinkel's (1967) ethno-

methodological and Berger and Luckmann's (1966) constructionist view. In contrast, research following the 'old' institutional perspective examined how prevailing laws and values underpin unequal power relations among opposing interest groups. If not explicitly mentioned, I refer to both streams of institutional theory to investigate how interests and understandings of various groups establish institutions and institutional structures.

The term *institutional structure* refers particularly to the systemic relations between four aspects (Van de Ven and Hargrave 2004): institutions in the narrower sense (e.g. laws and authorities), resource endowments (e.g. level of technology and financing), demands and requirements (e.g. market expectations), and the actual value-producing activities. In addition, special attention is given to *institutionalization* as the recursive process through which rules and expectations inform human interactions and further reinforce institutional structures (Tolbert and Zucker 1996). Finally, *institutional change* refers to purposive alterations in the institutional structure to precipitate desired outcomes (North 2005).

This chapter is structured in four sections with each section comprised of a first part featuring a more macro-level and a second part featuring a more micro-level perspective as well as a concluding summary. The first section develops the institutional argument by attending to the stability of institutions and routinization of interactions. The first part of the section demonstrates that compatibility with the prevailing institutional structure enhances organizational profitability and survivability. The second part introduces the practice perspective to show how prevailing rules and expectations afford intelligibility and performativity to decisions and courses of action. In the second section, the dialectical concepts of structural contradiction and overdetermination point to the fragility of institutions and the need to improvise in order to bridge ruptures and inconsistencies when following rules and expectations. The first part of the section demonstrates how structural contradiction and overdetermination mitigate or disrupt institutionalization dynamics and propel alterations in the prevailing institutional structure. The second part presents the conditions for recognizing and exploiting structural contradiction and overdetermination.

The third section attends to purposeful efforts aimed at shaping institutionalization processes. The first part of the section shows how institutional entrepreneurs mobilize collective action to establish potentially disruptive innovations in a field. The second part shows how interested actors explicitly seek to alter or to maintain institutional structure by engaging in institutional work. Finally, the fourth section specifies the role

of discourse and discursive action in institutionalization processes. The first part demonstrates how discourses and institutions are recursively involved in the formation of rules and expectations. The second part of the section outlines the recursive interplay between discourses, discursive action, and institutionalization processes. This chapter concludes with a summary and the research questions.

Institutionalization Dynamics: Stability of Institutions and Routinization of Transactions

In strategy research, *strategic fit* emphasizes matching organizational strategy with environmental demands and organizational structure with strategy (Chandler 1990 [1969]; Porter 1980). In contrast, *strategic competitiveness* emphasizes developing a unique strategy and competences as differentiator vis-à-vis competitors (Aharoni 1993; Conner and Prahalad 1996; Porter 1996). In this context, institutional theorists point out that achieving uniqueness and differentiation is hampered by organizational conformity as a result of regulative pressures, normative compliance, or taken-for-granted business practices (Scott 1995). The more micro-level of strategy-making and the more macro-level of field structure are thus mutually tied to each other (Jarzabkowski 2008).

Berger and Luckmann (1966: 73-78) outlined the recursive interplay between cognitive understandings and institutionalization processes:

> *Institutionalization is incipient in every social situation continuing over time. ... The most important gain is that each [actor] will be able to predict the other's actions ... [thereby] constructing a background ... which will serve to stabilize both their separate actions and their interaction. ... [This] in turn makes possible a division of labor between them, opening the way for innovations, which demand a higher level of attention. ... [Over time] the institutions ... are experienced as existing over and beyond the individuals who 'happen to' embody them at the moment. In other words, the institutions are now experienced as possessing a reality of their own ... an objective reality. ... [But] the objectivity of the institutional world, however massive it may appear to the individual, is a humanly produced, constructed objectivity.*

Through their socially informed interactions, human actors enter into pre-existing institutional structures and routinely reproduce prevailing rules and expectations (Reed 1997: 33). The more micro-oriented perspective attends to the organizational activities in which the tension between conformity and uniqueness plays out and is resolved in practice. It thus reconnects the institutional argument to the constructionist view of

institutions as reciprocal categorizations of routine activities and is thus able to account for either continuity or change.

This section on the *stability of institutions* develops the institutional argument and is structured in two parts. The more *macro-oriented part* demonstrates that compatibility with the prevailing institutional structure enhances organizational profitability and survivability. It introduces the organizational field for investigating the institutionalization dynamics within an area of institutionalized life. Another concept, which refers to the multilevel institutional structure, is that of nested systems. Isomorphism, the third concept, refers to organizational homogeneity arising from adopting a legitimated language, model, or practice. Finally, the concept of embeddedness highlights the ambivalence of institutionalization as it expands the scope of compatible while constraining potentially innovative divergent approaches.

The more *micro-oriented part* introduces the practice perspective to show how prevailing rules and expectations afford intelligibility and performativity to decisions and courses of action. The structuration process between institutional structure and situated action occurs in concrete action contexts that tend to reinforce institutionalization practices in order to maintain intelligibility and performativity. Attending to the intelligibility and performativity of action helps understanding why barriers of institutional change can be rather pervasive. In addition, the multilevel perspective links institutional structure to concrete action and is capable of accounting for the structuration of organizational fields. From a practice perspective, embeddedness points to the degree by which rules and expectations – and associated resource values and activities – are interwoven and defined by prevailing rules and expectations. Finally, a concluding summary presents the implications and problems of the institutional argument regarding institutional change.

Institutional Stability: Organizational Survivability through Compatibility with Institutional Structure

From a more macro-level perspective, compatibility with the prevailing institutional structure enhances organizational profitability or survivability. Institutional studies on organizations therefore investigate the market- or sector-specific contexts that impact organizational strategies and activities. Organizational profitability and performance is often judged along financial objectives (Child 1972). Institutional theorists argue that organizational conformity to market- or sector-specific rules and expectations ensures

long-term survivability while unilateral efforts to maximize operational efficiency and profits may jeopardize survivability (Meyer and Rowan 1977: 340). For example, adhering to prevailing rules and expectations provides tangible benefits as it fosters transactions with other organizations, workforce mobility, legitimation and reputation, as well as capital inflows (Donaldson 1995). Moreover, by routinely transacting with each other or by influencing key stakeholders, organizations indirectly or directly shape prevailing rules and expectations in the field (Child 1997).

Convergence on rules and expectations legitimates specific evaluation criteria (van den Belt and Rip 1987) leading to a 'distinctive style' associated with the actors that promoted it (Hughes 1983). Over time, coercive, mimetic, and normative factors – such as laws, best practices, and prevailing expectations – promote isomorphism and homogeneity between organizations (DiMaggio and Powell 1983). An organization's conformity to prevailing rules and expectations is even more pronounced if its mandate is not primarily to maximize profits (DiMaggio 1991). The juxtaposition of operational and financial versus institutional and socio-cultural criteria has therefore been criticized (Kraatz and Zajac 1996). Hence, performance evaluations of organizations or industries are not only recursively related to but often directly determined by rules and expectations embedded in the prevailing institutional structure.

The dynamics driving institutionalization processes among organizations are most evident in an *organizational field* where organizations that are maintaining similar sets of relations are exposed to similar demands requiring similar responses (Fligstein 1991). For example, DiMaggio and Powell (1983: 148-149) defined the organizational field as the set of key stakeholders who "constitute an area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products." These key stakeholders develop similar conceptions and logics (Lawrence 1999) through which rules and expectations become collectively endorsed and enforced (Zucker 1977, 1987).

Institutionalization dynamics are therefore recursively reinforced by systemic relations operating in a field (Van de Ven and Hargrave 2004). For example, the legitimation afforded by institutions in the narrower sense, such as authorities or technological standards, makes the resources employed and the demands addressed by legitimated models and practices more valuable thereby promoting a certain set of value-producing activities. Organizations in the field adopt a *dominant logic*: a taken-for-

granted "way in which managers conceptualize the business" and "identify, define, and make strategic decisions" (Prahalad and Bettis 1986: 490-491). Over time, systemic relations coalesce to promote organizations co-evolving with each other and their environments (Lewin and Volberda 1999). The organizational field therefore lends itself for investigating the interplay between systemic relations and individual logics that coalesce to reinforce institutionalization processes.

Recent institutional approaches attend to institutional structure as *nested systems* involving multiple loosely coupled levels, from the level of individual action to more aggregated levels of collective action (Holm 1995). The resulting complexity of institutional structure is a human-made "construct of rules, norms, conventions, and ways of doing things" (North 2005: 11) that affords identities to actors, value to resources and demands, and coherency to activities (Friedland and Alford 1991). Prevailing rules and expectations define which strategies and activities are acceptable while such legitimacy becomes itself a valuable resource for pursuing compatible strategies and activities.

Institutions therefore not only define the value of resources but *are* resources and thus sources of power (Scott 1987). Peripheral or smaller organizations seek to present themselves as compatible with expectations even when they benefit much less from conformity than more powerful central organizations (Fligstein 1991). New institutional theory therefore suggests that organizations choose to foreclose exploiting new opportunities if it would require strategies and activities that deviate from prevailing rules and expectations. The institutional structure thus presents itself as an elaborate web of powerful interests, resource endowments, and anticipated demands that coalesce to promote homogeneous strategies and activities. The recursive relationship between institutional structure and compatible action drives institutionalization dynamics in the field and accounts for the structuration of complex social systems (Giddens 1984). A multilevel structuration perspective thus highlights power as integral to institutionalization processes.

Organizations exposed to isomorphic pressure present themselves as compatible with prevailing expectations by adopting a legitimated language, model, or practice. For example, Meyer and Rowan (1977: 349-350) argued that the responses to isomorphic pressure are most evident in a compatible organizational language. They explained:

Organizations described in legitimated vocabularies are assumed to be oriented to collectively defined, and often collectively mandated, ends. ... On the other hand, organizations that omit environmentally legitimated elements of structure or create unique structures lack acceptable legitimated accounts of their activities.

The language used to convey legitimacy describes the organization in terms compatible with prevailing rules and expectations while, in turn, the use of such terms further institutionalizes the use of such language. Organizational language and symbolic moves reinforce the underlying rules and expectations while preempting alternative conceptions (Zucker 1987).

Fligstein (1987) located another response to isomorphic pressure in the ascendance of compatible functional and educational backgrounds of key participants. He found that the evolution of strategic emphasis from manufacturing over sales to finance during the 20th century occurred as groups with corresponding functional backgrounds became dominant. Job titles, as part of organizational language, reflect the shift. In addition, the adoption of a more generalist – rather than specialist – organizational orientation provides greater flexibility to adopt institutionally endorsed languages, models, or practices (Ruef and Scott 1998). Hence, the use of language is a key indicator for determining institutionalization and is discussed in more detail in the fourth section of this chapter.

The *embeddedness* of economic actors refers to the pervasive merging of organizations within their fields or – more general – of economic actors within nested systems of reciprocal relations (Granovetter 1985). Organizational embeddedness refers to the deep involvement and tight interdependence of organizations in networks of material and technical but also socio-cultural relations (Meyer and Rowan 1977). As organizations interact repeatedly with each other and with market participants, they increasingly adapt to and match the environment of which they are a part. Metaphorically speaking, organizations become "captives of the institutional environment in which they exist" (Tolbert and Zucker 1983: 22).

Organizational responses to isomorphic pressures further reinforce an institutional structure that imposes significant constraints on strategic choices by foreclosing exploitation of deviating innovations (North 2005). Yet, pursuing these types of opportunities makes organizations, industries, and economies "adaptively efficient" (North 1990: 81). The embeddedness of economic actors in systemic relations thus cogently highlights the ambivalence of institutionalization. On one hand, institutionalization

supplies legitimacy thereby increasing the scope of action while, on the other hand, it sanctions deviations thereby decreasing the scope of action. Indeed, self-reinforcing institutionalization dynamics implied by the institutional argument would suggest ever increasing levels of institutionalization and ever less adaptive institutional structures. This raises the paradox of embedded agency: "How can innovators, then, realize a change is necessary or possible in an inter-organizational field with established definitions of appropriate practices?" (Leblebici et al. 1991: 336).

In sum, this more macro-oriented part of the section on the *stability of institutions* argued that compatibility with the prevailing institutional structure enhances organizational profitability and survivability. The key stakeholders in the field converge upon and attempt to stabilize the 'rules of the game,' leading to the prominence of an institutional structure that expresses their interests and 'distinctive style.' Institutionalization thus instills the degree of trust among key stakeholders that enables more complex and otherwise risky undertakings (Berger and Luckmann 1966; North 1990). Conformity with institutional rules and expectations affords tangible benefits, such as improved credibility, resource exchange, and, ultimately, organizational survivability. Over time, incumbent organizations 'co-evolve' with their organizational field as they attempt to match as well as shape prevailing rules and expectations.

With increasing legitimacy of the institutional structure, the initial benefits of institutionalization exert coercive, mimetic, and normative pressures which incentivize organizational conformity. Organizations respond to isomorphic pressure by adopting a compatible organizational language. The embeddedness of economic actors highlights the ambivalence of institutionalization as it expands the scope of compatible while constraining potentially innovative and divergent approaches. Institutionalization is further reinforced by a dominant logic and systemic relations between institutions (in the narrower sense), available resource endowments, anticipated demands and requirements, and value-adding activities. The institutional structure thus constitutes a *nested system* which affords identities to actors, value to resources and demands, and coherency to activities. However, the self-reinforcing dynamics would suggest ever increasing levels of institutionalization and ever less adaptive institutional structures. The second part of this section therefore attends to the actual activities to demonstrate that self-reinforcing dynamics operate both ways to either increase stability or instability.

Routinization: Performativity through Adherence to Prevailing Rules and Expectations

On the local action level, the practice perspective on institutionalization investigates the interplay between institutionally defined action contexts, evaluations of courses of action and outcomes, and the concrete actions undertaken. For example, decisions to open or close a manufacturing site are made within the broader regulative and socio-cultural context as well as within the context of individual cognitive and emotive capacities. Rules and expectations that actors endorse act as "organizing principle of their actions" (Bourdieu 1977: 18). Institutions therefore play a key role for organizing practices. These practices can be defined as "arrays of human activity centrally organized around shared practical understanding" (Schatzki 2001: 2). Decisions and actions appear meaningful or intelligible within prevailing institutional structures, which afford actions the *performativity* that underpins complex institutions (Bourdieu 1990).

Institutional theorists adopting a practice perspective employ the concept of performativity borrowed from linguistic theory, were articulations are understood to *perform* whenever they appear meaningful and have the desired effect of being understood (Austin 1962). Hence, the concept of performativity used in institutional theory explicitly attends to the skillful appropriation of prevailing rules and expectations in changing and often disruptive contexts (Lounsbury and Crumley 2007). Therefore, assessments of what counts as performative are directly determined by the rules and expectations that actors employ when undertaking or evaluating decisions and actions.

The structuration process between institutional structure and situated action occurs in a "field of practices" defined as the "nexus of interconnected human practices" (Schatzki 2001: 2). The focus on human practices as sites where institutional structure and situated action meet makes institutions the outcome of human actions unfolding within the constraints of institutionally-defined action contexts. Taken-for-granted understandings of accomplishing objectives thus mediate "between existing institutions and the actions they guide" (Hargadon and Douglas 2001: 480).

A human practice can therefore be defined as a set of actions which are (1) organized around systems of practical rules and expectations involving acceptable ends, uses, and emotions and which (2) play out within an institutional structure constituted by other actors, their actions, and the resources they employ (Schatzki 2005). Human practices thus appear intelligible and performative only in relation to interconnected

other practices that are legitimated within the prevailing institutional structure. For example, stopping the car at an empty intersection in the middle of the night appears less performative to passengers unaware that a barely visible stop sign is mandating such action. The intelligibility and performativity of a set of actions is therefore an active accomplishment of both the protagonist and the observer, as both must search for and superimpose the most suitable action context out of possible other contexts (Sewell 1999). The interplay between institutional structure and situated action further institutionalizes practices if the set of actions continues to appear intelligible to those involved.

Attending to the intelligibility and performativity of action helps understanding why severe constraints inhibit institutional change, which requires rearranging rules and expectations as well as associated resource values and activities. For example, practice theorists understand social order as symbolic and material arrangement which defines the layout of actors and entities and their relationships with each other (Schatzki 2001). Someone's identity or something's value is defined by existing relations while relations emerge from identities and value-attributions. A practice perspective thus casts institutional structure as highly dynamic and constantly moving, rather than as a monolithic and stable construct.

The relational aspect highlights that rules and expectations as well as associated resources and activities obtain their meaning as they become interlinked in actual practices. Institutional rules and expectations therefore inform activity not by determining it, but by 'offering' possible interpretations to resolve a concrete situation. Such flexibility allows maintaining the intelligibility and performativity of activities even in novel or changing situations, which attests to the resilience of prevailing rules and expectations. However, in contrast to the institutional argument, the relational argument acknowledges self-reinforcing dynamics promoting either continuity or change, leading to increasing stability or instability, respectively. Whenever relations change, power resting in the "dynamic alignments" shifts, thereby reinforcing the change (Rouse 2001: 195). A focus on actual practices thus introduces a multilevel perspective that links institutional structure to concrete action and thus is capable of accounting for the structuration of organizational fields.

From a practice perspective, embeddedness points to the degree by which rules, resource values, expectations, and associated activities are interwoven and defined by prevailing rules and expectations. Here, rather than suggesting passivity of human ac-

tors, embeddedness attends to its active accomplishment through human practices (Whittington 1992). Because practices are understood as link between institutional structure and situated action, embeddedness adaptively changes as some institutional relations become emphasized while others deemphasized (Jarzabkowski 2004). In addition, actors prominently embedded in institutional relations have privileged access to valuable resources and may mobilize these resources towards institutional change – and they may purposively do so even if such change undermines the institutional relations on which their privileged status depends (Beckert 1999).

The reasons why well-established actors support institutional change may vary but they range from altruistic motives to anticipations of net benefits and include errors or misperceptions. This assumption mitigates the self-reinforcing institutionalization dynamics that suggests ever increasing returns as institutionalization progresses. This assumption is necessary to account for institutional change without recurring on self-efficacy independent of concrete human activities, such as a "logic of contradiction" (DiMaggio 1988: 13) or "environmental jolts" (Meyer, Brooks, and Goes 1990: 102). A focus on human practices thus becomes paramount once it is acknowledged that actors actively accomplish embeddedness and that actors can become 'de-embedded' by wittingly or unwittingly pursuing deviating strategies and activities.

In sum, this more micro-oriented part of the section on the *stability of institutions* argued that prevailing rules and expectations afford intelligibility and performativity to sets of action by organizing actions into practices legitimated within the institutional structure. The practice perspective suggests that actors align their actions in ways that make these actions appear intelligible as legitimated practices. The agreed-upon layout of actors and entities and their relationships conveys intelligibility so that, for example, a car stopping on an empty road appears performative only in relation to a stop sign mandating such action. The interplay between institutional structure and situated action constitutes a structuration process that further institutionalizes practices if the set of actions appears intelligible to those involved.

In particular the relational aspect of the practice perspective casts institutional structure as highly dynamic and constantly in flux. When being drawn upon to resolve the contingencies of a concrete situation, institutional rules and expectations are appropriated flexibly in order to maintain intelligibility and performativity. While such maintenance attests to the resilience of institutions, the relational argument ac-

knowledges self-reinforcing dynamics either increasing stability or instability. Hence, the embeddedness of actors is also relative and contingent on an active accomplishment that may succeed as well as fail. Seemingly minor changes may coalesce into ruptures that 'de-embed' actors and reinforce institutional change. After the concluding summary, the next section first presents a more macro perspective on such ruptures followed by a second part on how the actual experience of ruptures promotes variation.

Concluding Summary

The institutional argument posits that institutions, understood as collectively endorsed and enforced rules and expectations, constitute cognitive understandings, regulative power, and normative sanctioning. Institutions thus instill the degree of trust among key stakeholders that enables more complex and otherwise risky undertakings (North 1990). The key stakeholders in the field converge upon and attempt to stabilize the 'rules of the game,' leading to a widely endorsed and enforced institutional structure that expresses their interests and 'distinctive style.' The institutional structure thus defines the value of institutions in the narrower sense (e.g. laws and authorities), resource endowments (e.g. level of technology and financing), demands and requirements (e.g. market expectations), and the actual value-producing activities (Van de Ven and Hargrave 2004). Conformity with prevailing rules and expectations therefore affords tangible benefits, such as improved credibility, resource exchange, and ultimately organizational survivability.

However, these self-reinforcing dynamics would suggest ever increasing levels of institutionalization, both within organizations (Greenwood and Hinings 1988) and within industries or markets (Zucker 1988). Hence, when organizations face similar environmental demands, a tension exists between conforming to prevailing rules and expectations and creating unique strategic positions. A micro-level perspective attends to the local activities in which the tension between conformity and uniqueness play out and are resolved in practice. The practice perspective suggests that actors attempt to align their actions in ways that make these actions appear intelligible as legitimated practices. But such intelligibility is contingent on an active accomplishment that may succeed as well as fail. The relational aspect of a practice perspective suggests that minor deviations may coalesce into ruptures with self-reinforcing tendencies. The practice perspective on institutionalization reconnects the institutional argument to the constructionist view of institutions as reciprocal categorizations of routine activities and is thus able to account for either continuity or change.

Structural Contradiction: Fragility of Institutions and Improvisation Bridging Gaps

The previous section demonstrated that the institutional argument implies ever increasing returns to institutionalization and thus fails to account for the disruption of institutionalization dynamics and for the possibility of institutional change (Oliver 1991). Structural contradiction is evident within and across institutional structures with the effect of mitigating or disrupting the dynamics of institutionalization (Giddens 1984). Structural contradiction emerges from competing institutional structures, such as work and family, and thus creates conflicting interests or goals (Van de Ven and Poole 1995) as well as individual discretion when balancing these demands (Friedland and Alford 1991). Contradictory rules and expectations and ambiguity when solving contradictory demands make institutionalization inherently fragile and self-defeating.

Merton (1936: 903) attributed the inherently self-defeating tendency of institutionalization to unintended consequences of action:

> *This process may in part be due to the fact that when a system of basic values enjoins certain specific actions, adherents are not concerned with the objective consequences of these actions but only with the subjective satisfaction of duty well performed. Or, action in accordance with a dominant set of values tends to be focused upon that particular value-area. But with the complex interaction which constitutes society, action ramifies, its consequences are not restricted to the specific area in which they were initially intended to center, they occur in interrelated fields explicitly ignored at the time of action. Yet it is because these fields are in fact interrelated that the further consequences in adjacent areas tend to react upon the fundamental value-system ... [leading to] the transformation or breakdown of basic value-systems. Here is the essential paradox of social action – the 'realization' of values may lead to their renunciation.*

Structural contradiction thus potentially undermines prevailing rules and expectations and legitimates alternatives that deviate from taken-for-granted approaches. From the practice perspective, the focus is on the necessary condition for institutional change, that is, whether and how human actors recognize contradictions and act on perceived opportunities to change the status quo (Seo and Creed 2002). The practice perspective demonstrates that structural contradiction is conducive to institutional change only if human actors exploit opportunities for opening up new action trajectories.

This section on the *fragility of institutions* introduces the dialectical concepts of structural contradiction and overdetermination and is structured in two parts followed by a concluding summary. The more *macro-oriented part* demonstrates how structural contradiction and overdetermination mitigate or disrupt institutionalization dynamics and propel alterations in the prevailing institutional structure. Structural contradiction creates conflicting demands and ambiguity, which legitimates challenging prevailing institutions and deviating from taken-for-granted approaches. Structural contradiction is mutually tied to structural overdetermination, which supplies the diversity of plausible interpretations and approaches from the reservoir of competing institutional demands. Structural contradiction and overdetermination promote institutional change when interested actors exploit institutional ruptures and inconsistencies to pursue new opportunities. This part concludes with an overview of process models of institutional change.

The more *micro-oriented part* focuses on whether and how human actors are able to recognize and exploit structural contradiction and overdetermination. The structuration process mediating between institutional structures and situated actions disrupts institutionalization dynamics whenever prevailing rules and expectations fail to afford intelligibility and performativity in concrete action contexts. Contingencies of the local action context then legitimate diverging from taken-for-granted interpretations and approaches in order to get things done. If these deviations prove consistently more intelligible and performative over time, they may become established as the standard way of doing things. Institutional changes can thus be linked to relatively minor deviations on the level of local action. The concept of enactment suggests that variations in routine activities can become a source of institutional change.

Institutional Fragility: Structural Contradiction and Overdetermination Disrupting Institutionalization

A more macro-level perspective of institutional change seeks to investigate the role of systemic 'mechanisms' or relations that mitigate or disrupt institutionalization dynamics and propel alterations in the prevailing institutional structure. A preoccupation with institutional change is most evident in dialectical theory with its focus on structural contradiction and overdetermination as drivers of change processes (Delanty 1997). As long as competing institutional structures vie for dominance, *structural contradiction* creates conflicting demands and ambiguity about rules and expectations, which legitimates challenging prevailing institutions and deviating from taken-for-

granted approaches. Structural contradiction is therefore a key mechanism for explaining processes of institutional change (DiMaggio 1988).

Structural contradiction is mutually tied to *structural overdetermination*, which supplies the diversity of plausible interpretations and approaches from the reservoir of competing institutional structures (Hargrave and Van de Ven 2004). While institutionalization of prevailing rules and expectations "converts uncertainty into certainty" (North 2005: 36), structural overdetermination mitigates institutionalization through "surplus meaning" that discredits and challenges the prevailing institutional structure (Weick 1979: 226). By nurturing "insurgent logics" (Suddaby and Greenwood 2005: 39), these counter-balancing systemic relations render institutionalization incomplete (Steinberg 1999). But structural contradiction and overdetermination, like all systemic relations, operate only through human action and have no "self-efficacy" (Laclau and Mouffe 1985: 124; Popper 1969). The second part attends to the critical role of action and actors in identifying and exposing ruptures and inconsistencies. This first part focuses on how structural contradiction and overdetermination drive processes of institutional change.

Structural contradiction accounts for the dynamics that mitigate or disrupt institutionalization processes. From a dialectic perspective, contradictions are inherent features of complex social systems. For example, contradictions become evident when aligning differentiated and disparate parts in organizations, because doing so exposes the latent conflicts between different logics (Benson 1977; Ranson, Hinings, and Greenwood 1980). At the level of organizational fields, contradictions become evident when firms partner to promote a favored standard while also competing against each other around that standard (Garud, Jain, and Kumaraswamy 2002). Concerning strategy-making, contradictions as well as new opportunities result from diverging interests and expectations about future outcomes of different strategies (Jarzabkowski 2003). But "contradictions enable a shift in partially autonomous social actors' collective consciousness" (Seo and Creed 2002: 231). That is, contradictions induce changes particularly sought by peripheral players who only remotely benefit from the status quo (Greenwood and Suddaby 2006: 29).

Structural overdetermination has been developed in organization as well as discourse studies. Most widely referenced is Weick's (1979) concept of equivocality, which means a phenomenon can be equally well understood in a variety of ways. He refers equivocality back to Wallace (1961), who emphasized the inherently diverse yet

eventually complementary character of self-organizing activities. The surplus of meaning that comes with diversity produces the variety of options needed to adapt and survive in changing environments (Aldrich 1979). The over-determined character of meaning in complex social systems contributes to their stability and resilience (Scott 1994, 1995). However, organizing is intended to steer activities into desired directions by "reducing equivocality" (Weick 1979: 3). In other words, reducing equivocality – limiting the gamut of possible interpretations – is integral to organizing and organization but it undermines long-term stability. This fundamental contradiction constitutes the inherently self-defeating tendency of organizing and institutionalization processes.

Without a reservoir of multiple interpretations, contradictions are not interpreted as such and are simply ignored. This promotes stabilization in the short-term while contradictions remain latent and undermine long-term stability. In contrast, a reservoir of multiple interpretations allows swiftly exposing contradictions, which preempts pervasive stabilization and promotes long-term stability. Some discourse studies highlight the permanent oscillation between stability and instability. Here, "overdetermination ... is the field of contingent variation" to be seized by discursive action (Laclau and Mouffe 1985: 99). Overdetermination promotes contestation and the emergence of "differential discursive articulations" (Van Joost 1996: 1671). Language and meaning remain ambiguous unless appropriated to justify either change or the status quo (Rao, Monin, and Durand 2003). Structural overdetermination thus explains why actors embedded in the prevailing institutional structure are able to draw on diverging interpretations from competing institutional structures.

Structural contradiction and overdetermination promote institutional change when interested actors exploit ruptures and inconsistencies to pursue new opportunities. Seo and Creed (2002) identify four sources of contradictions that actors exploit to promote institutional change: (1) legitimacy versus functional inefficiency, (2) adaptation versus adaptability, (3) intra-institutional versus inter-institutional effectiveness, and (4) isomorphism versus divergent interests. Regarding the first contradiction, institutional contradictions are exposed when conformity to institutionalized rules and expectations leads to suboptimal outcomes. Here, "organizations adopt structures and practices that are in some respects suboptimal" (Powell 1991: 190). Regarding the second contradiction, one-time adaptation leads to institutional isomorphism, which restricts continuous adaptability. When one-time adaptation becomes institutionalized,

it increases resistance against further change (Zucker 1991), promotes organizational inertia (Jepperson 1991), and reinforces path-dependent lock-in (Arthur 1989).

The third contradiction refers to the tensions and conflicts that arise when conforming to one institutional structure, such as family life, becomes incompatible with conforming to another institution, such as work. Regarding the forth contradiction, institutionalized rules and expectations reflect various and often diverging interests. Seo and Creed (2002: 229) explained:

> *Actors whose ideas and interests are not adequately served by the existing social arrangements a[re] potential change agents who, in some circumstances, become conscious of the institutional conditions that leave their needs unmet and take action to change the present order.*

As a consequence of these contradictions, political contests ensue over interpretations, models, and practices making institutional change "rife with conflict, contradiction, and ambiguity" (DiMaggio and Powell 1991: 28).

The *process of institutional change* broadly involves a field characterized by a dominant institutional structure, disruptive models or practices entering the field, and their field-wide adoption including the field's adjustment to the change. Based on a review of process models of institutional change, Greenwood, Hinings, and Suddaby (2002) found six stages.

In the first stage, external 'environmental jolts' elicit organizational responses that deviate from prevailing rules and expectations (Meyer, Brooks, and Goes 1990). External influences are events such as workforce strikes, regulatory mandates, or competitive pressures (Fox-Wolfgramm et al. 1998; Powell 1991). The second stage is then characterized by the proliferation of deviations introduced by newcomers (Thornton 1995) or by ascending groups at incumbent firms (Fligstein 1991). In the following stage, the viability of these deviations is tested within the field. Greenwood, Hinings, and Suddaby suggested this to be a critical aspect that determines whether deviations become embedded in the institutional structure. They refer to the fourth stage as *theorization* characterized by efforts aimed at understanding the implications of the deviations. Theorization here involves the identification of a problem with the deviation as an appropriate solution as well as its justification and promotion (Tolbert and Zucker 1996). Successful theorization links the deviation to prevailing rules and expectations and establishes its superiority vis-à-vis existing conceptions (Suchman 1995). During

the fifth stage, the deviation becomes increasingly legitimated at which point institutionalization dynamics reinforce its further adoption (Haveman 1993; Kraatz 1998; Tolbert and Zucker 1996). Institutionalization, the final stage, occurs as rules and expectations are significantly altered to accommodate the deviation. Greenwood, Hinings, and Suddaby identify a lack of attention regarding the "battles" through which theorization is contested, rather than simply agreed upon.

The process of institutional change is an inherently contested one where competing *theorizations* vie for dominance. For example, Leblebici et al. (1991) highlighted the competitive dynamics of institutional change in their process model: first, a model for coordinating the field has been established; second, fringe players develop new solutions through trial and error thereby challenging incumbents; third, conventions around new solutions become established as fringe players successfully compete against incumbents; fourth, dominant players adopt new practices thereby further legitimating them; finally, adoption transforms relationships, positions, and resource values in the field. Similarly, Hinings et al. (2004) pointed to competing theorizations behind opposing proposals in their process model: first, destabilization through external 'jolts' occurs; second, players start seizing new opportunities; third, theorizations legitimate the new practices; fourth, conflict and contestation over theorizations ensue; finally, temporary closure brings stability.

The stages in processes of institutional change typically occur somewhat in parallel rather than in strict linear succession, as Lounsbury and Crumley (2007: 1006) found:

[Institutional change is] a reciprocal process that has multiple phases that include the emergence of anomalous activity, the problematization of extant practices, social recognition of a novel innovation, and political processes that may involve resistance by incumbents, as well as the theorization and legitimation of a new practice.

They propose a process model of institutional change involving six stages: (1) the occurrence of a deviating innovation, (2) the marginalization of the deviating innovation, (3) the theorization of the innovation's advantages vis-à-vis existing models or practices, (4) the field-wide problematization of the issue, (5) the field-level political negotiations addressing the issue, and (6) the adoption and integration of the innovation.

In sum, this more macro-oriented part of the section on the *fragility of institutions* demonstrated how structural contradiction and overdetermination mitigate or disrupt institutionalization dynamics and propel alterations in the prevailing institutional

structure. Structural contradiction creates conflicting demands and ambiguity about rules and expectations, which legitimates challenging prevailing institutions and deviating from taken-for-granted approaches. Mutually related to contradiction is overdetermination, which supplies multiple and diverging interpretations and approaches from the reservoir of competing institutional structures. The operation of structural contradiction and overdetermination allows institutional theorists to explain endogenous change of an otherwise self-reinforcing institutional structure (DiMaggio 1988; Zucker 1988).

However, structural contradiction and differentiated social positions are part and parcel of any social structure (Giddens 1984: 193, 83). Structural contradiction therefore cannot *per se* explain institutional change (Leblebici et al. 1991). Rather, attention focuses on the theorization of the espoused project and on mobilizing support in order to change the status quo (Seo and Creed 2002). A procedural view recognizing the interest-driven and political dimension thus focuses on the destabilization brought about by peripheral actors, the competitive and anti-competitive moves by incumbents, the contestation and conflict in the field, and eventual convergence on an altered institutional structure. The process of institutional change thus broadly involves a field characterized by a dominant institutional structure, disruptive models or practices entering the field, and eventually their field-wide adoption. But structural contradiction and overdetermination operate only through human action. The second part of this section therefore highlights the role of human actors in processes of institutional change.

Improvisation: Recognizing Ruptures and Perceiving Opportunities for Institutional Change

On the organizational and individual level, a focus on human action in processes of institutional change investigates how interested actors recognize and why they exploit structural contradiction and overdetermination. If not actively seized by actors, structural contradiction and overdetermination remain latent and are unable to counterbalance the "illusion-ridden, socio-cultural adaptive systems" (Buckley 1973: 204). For example, Greenwood and Hinings (1996) identify normative pressures as constraining organizational change and interest-driven and political dynamics as producing change. However, the extent to which actors were actually able to influence the prevailing institutional structure was not conceptualized. Similarly, while emphasizing that institu-

tional rules and expectations inform action, Barley and Tolbert (1997) argued that actors are able to assess and revise their conduct. But the conditions under which they are able to do so remain vague.

More attention is needed to demonstrate *how* actors embedded in prevailing institutional structures are able to conceive disruptive changes and, more importantly, *why* they would so. For example, Leblebici et al. (1991) found institutional change occurred in a field because peripheral actors actively exploited opportunities to advance their status and were less constrained than incumbents to experiment with more disruptive innovations. On the organizational level, Fligstein (1991) found interests of established actors sustaining the status quo, but competing groups able to advance changes and gaining power. By focusing on cognitive and emotive capacities of actors, this section demonstrates how and why interest-driven and political actors promote institutional change.

The structuration process between institutional structure and situated action disrupts institutionalization dynamics whenever prevailing rules and expectations fail to afford intelligibility and performativity in a concrete action context. But it requires recognizing that a gap or problem exists. For example, Feldman and Pentland (2003: 95) suggested that routines are intelligible and performative as long as they sustain "repetitive, recognizable patterns of interdependent actions" which human actors repeatedly and similarly relate to each other. Here, sustaining such routine work through observance of prescribed rules and expectations avoided experiences of rupture. In contrast, Orlikowski (2000) found work to be performative *because* it modified the prescribed format to the local action context. Here, the rejection of prescribed rules and expectations avoided experiences of rupture. In both cases, improvisation resolved contradictions locally thereby restoring intelligibility and performativity without significantly disrupting prevailing institutionalization dynamics.

Through improvisation, human actors are actively avoiding experiences of rupture by patching gaps and problems (Brown and Duguid 1991). It requires interested actors to recognize and exploit contradictions. Miner, Bassoff, and Moorman (2001: 317) provided a vivid example:

> *Team members initially framed their activity as solving a problem, but as they improvised, they generated novel actions or interpretations that transformed the problem into a perceived opportunity.*

New interpretations emerged from situated activity without the team explicitly seeking opportunities. Team members actively identified an opportunity and agreed to pursue it. This suggests that structural contradiction and overdetermination only operate if interested actors are not actively avoiding experiences of rupture and instead are seeking to exploit perceived opportunities.

The local action context legitimates diverging from taken-for-granted interpretations and approaches. For example, Jarzabkowski (2005) found organizations embedded within fields appear similar but pursue similar tasks through different sets of activities that reflect different histories and local action contexts. The rationale behind deviating activities is – at least partially – grounded in prevailing rules and expectations but with the crucial difference that they are *actively reinterpreted* to legitimate the deviation. The relational constitution of institutional structure makes it then possible that seemingly minor deviations coalesce to promote institutional change because specific strategies and activities are associated with specific action contexts that constitute "practice-arrangement bundles" (Schatzki 2005: 472). A change in action contexts may require corresponding changes of strategies and activities, which gradually constitutes a different practice-arrangement bundle that emphasizes different rules and expectations as well as different models and practices.

Institutional change in complex and self-organizing systems thus occurs as negotiations assess the viability of various competing interpretations. Negotiations unfold in a dialogic process of past actions and new action contexts, which together define the trajectories for further actions (Emirbayer 1997). New action trajectories call into question the taken-for-granted approach and local deviations from the status quo may then cascade up and down institutional levels (Holm 1995). During the process, the "space of intelligibility" that defines "the course and identity of people's interactions" is opened up, which allows different and hitherto unrecognized interpretations to proliferate (Schatzki 2005: 470). Institutional changes can therefore be linked to relatively minor deviations on the level of local action.

Attending to the contingencies of local action contexts shows how embedded actors who routinely and often passively reproduce institutional structures become aware of contradictions and new opportunities. Seo and Creed (2002: 230) explain:

The likelihood of a shift in collective consciousness that can transform actors from passive participants in the reproduction of existing social patterns into mobilized

*change agents increases when actors continually and collectively experience ten-
sions arising from contradictions in a given socio-historical context.*

Self-reflective and reconstructive efforts aimed at institutional change become possible
when multiple participants encounter ruptures and inconsistencies whose solution re-
quires the "reflective distance" from taken-for-granted patterns, active imagination,
and controversial choices (Emirbayer and Mische 1998).

Recent work on how practices and routines change suggest that embedded agency
is not opposed to endogenous institutional change (Feldman and Pentland 2003; Feld-
man 2004). Even radically new models and practices are built in some way on extant
knowledge and on prevailing rules and expectations (Lounsbury and Ventresca 2003).
Findings by Reay, Golden-Biddle, and Germann (2006: 993) suggest that

> *the process of legitimizing (as part of institutional change) occurs through the pur-
> poseful, continual actions of determined individuals who use their embeddedness to
> make change happen.*

A focus on how institutionalized practices play out in concrete action contexts recog-
nizes the interplay between institutional structure and situated action (Lounsbury,
Ventresca, and Hirsch 2003). Attending to the contingencies of local action contexts
thus allows accounting for endogenous change driven by actors who are at least par-
tially embedded in prevailing institutional structures.

The concept of *enactment* in organization research emphasizes that variation in
routine activities continuously occurs, because actors are actively involved in inter-
preting and engaging with their environments (Weick 1979). Regarding institutional
change, the issue is at which level variation is 'enacted' – whether perceived new op-
portunities at the local level cascade up to the organization, the field, or beyond. Dis-
ruption of taken-for-granted organizational approaches result from efforts aimed at
exploiting opportunities outside mainstream strategy (Kuratko, Montagno, and
Hornsby 1990) and, more generally, through developing adaptive solutions informed
by local activities (Brown and Duguid 1991).

Child (1972: 10) argued that strategic choice is characterized by the 'freedom' to
pursue a strategic decision even if it deviates from prevailing rules and expectations
prevalent in the organization's environment. He explicitly rejected the idea that insti-
tutional constraints posed by an organization's environment "directly or inevitably"
determines organizational strategy. Instead, "by importing new developments into an
organization," peripheral actors make strategic choice possible thereby ensuring

strategic renewal (Aldrich 1979: 251). As a consequence, "strategy formation then becomes a learning process" about strategic choices involving different levels within the organization (Mintzberg 1978: 946). However, interest-driven and political dimensions operate at various levels. Walsh and Fahey (1986) argued that strategies and activities are always contested by different interpretations and depend on how processes of contestation and negotiation play out. Similarly, interest-driven and political dimensions operate at the level of the organizational field. Hence, the capacity to identify ruptures and new opportunities is only one necessary condition for institutional change to unfold.

In sum, this more micro-oriented part of the section on the *fragility of institutions* demonstrated how interested actors recognize and why they would exploit structural contradiction and overdetermination. Institutionalization dynamics are disrupted when prevailing rules and expectations fail to afford intelligibility and performativity. However, embedded actors tend to bridge ruptures and inconsistencies through improvisation, which resolves contradictions and restores intelligibility and performativity without significantly disrupting prevailing institutionalization dynamics. A necessary condition for institutional change to unfold is therefore the recognition of contradictions and the ability to perceive opportunities.

Embedded actors experiencing contradictions in local action context are able to exploit contradictions by *reinterpreting* prevailing rules and expectations to legitimate the deviation. The relational constitution of institutional structure then makes it possible that seemingly minor deviations coalesce to promote institutional change. Attending to the contingencies of local action contexts allows investigating how embedded actors become aware of contradictions and conceive new opportunities. The *enactment* of variation in routine activities suggests that the ability to recognize contradictions and perceive new opportunities is a multilevel process including the local action level as well as the more aggregated organizational or field levels. As deviations cascade through the institutional structure, the process is interest-driven and contested and exhibits the power and political dimensions of institutional change. The interest-driven efforts aimed explicitly at changing institutions are the domain of institutional entrepreneur and institutional work, which are the focus of the next section of this chapter.

Concluding Summary

The institutional argument suggests ever increasing returns of institutionalization as conformity to prevailing rules and expectations benefits actors and further legitimates and reinforces conformity. This section attended to structural contradiction and overdetermination as counter-balancing systemic relations that mitigate or disrupt the dynamics of institutionalization. Structural contradiction creates conflicting demands and ambiguity about rules and expectations, which legitimates challenging prevailing institutions and deviating from taken-for-granted approaches. Mutually related to contradiction is overdetermination, which supplies multiple and diverging interpretations from the reservoir of competing institutional structures. However, structural contradiction continuously operates within institutionalized settings and can therefore not *per se* explain institutional change (Leblebici et al. 1991). Attention thus focuses on how human actors are able to recognize and theorize contradictions and to mobilize support in order to change the status quo (Seo and Creed 2002).

A procedural view recognizing the interest-driven and political dimension thus focuses on the destabilization brought about by peripheral actors, contestation and conflict in the field, and eventual convergence on an altered institutional structure. The practice perspective highlights that embedded actors are able to bridge ruptures and inconsistencies through improvisation, thereby restoring intelligibility without significantly disrupting prevailing institutionalization dynamics. A necessary condition for institutional change to unfold is therefore the recognition of contradictions and the ability to perceive opportunities. The ability to recognize contradictions and perceive new opportunities is a multilevel process including the local action level as well as the more aggregated organizational and field levels. This multilevel process is shaped by conflicting interests and exhibits the political dimensions of institutional change. The practice perspective demonstrates that structural contradiction and overdetermination are conducive to institutional change only if human actors perceive and exploit new opportunities.

Shaping Institutionalization: Institutional Entrepreneurship and Institutional Work

In most economies, competition is tamed by institutions that reflect the interests and conceptions of powerful societal groups. Reinforcing dynamics of institutionalization "serve the interests of those with the bargaining power" to further benefit from the process (North 1990: 16). But the previous section demonstrated that counter-balancing systemic relations mitigate or disrupt institutionalization dynamics *if* opportunities for institutional change are perceived and pursued by interested actors.

This section focuses on how interested actors pursue opportunities that potentially disrupt the prevailing institutional structure. Schumpeter (1944: 84-85) pointed out that within prevailing institutional structures

> *it is still competition [but] within a rigid pattern of invariant conditions, methods of production and forms of industrial organization ... [However] it is not that kind of competition which counts but the competition from the new commodity, the new technology, the new source of supply, the new type of organization ... [It is] competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives. This kind of competition is as much more effective ... and so much more important that it becomes a matter of comparative indifference whether competition in the ordinary sense functions more or less promptly; the powerful lever that in the long run expands output and brings down prices is in any case made of other stuff.*

Entrepreneurs are *institutional entrepreneurs* when introducing disruptive innovations that undermine established and require different models and practices. This section demonstrates how entrepreneurs, by exploiting new opportunities, confront established models and practices and become key protagonists in processes of institutional change.

This section on efforts aimed at *shaping institutionalization* processes is structured in two parts followed by a concluding summary. The more *macro-oriented part* demonstrates that institutional entrepreneurs theorize change and mobilize collective action to establish potentially disruptive innovations in a field. In order to make rules and expectations in the field receptive to potentially disruptive innovations, institutional entrepreneurs address the regulative, normative, and cognitive barriers inhibiting such innovation in the field. Institutional entrepreneurs are therefore driven by an interest to alter the prevailing institutional structure to make it more receptive and compatible with their endorsed innovation. These efforts are particularly

salient around industry standards in technological fields. Institutional entrepreneurship therefore involves collective action aimed at altering the prevailing institutional structure.

The more *micro-oriented part* shows how actors explicitly seek to alter or to maintain institutional structure by engaging in institutional work, which involves theorizing the espoused project and mobilizing key stakeholders. A practice perspective conceptualizes the field as the place where shared practical understandings (prevailing rules and expectations) meet purposeful action (institutional work). Broadly defined, institutional work either involves creating, maintaining, or disrupting institutions. This part concludes by introducing a process model of new practice creation involving six different stages.

Institutional Entrepreneurship: Disruptive Innovations through Collective Action

From a more macro-level perspective, institutional entrepreneurship focuses on the role of interested actors in institutionalization processes, particularly as they confront regulative, normative, or cognitive barriers (Rao and Giorgi 2006). For example, incumbents employ anti-competitive tactics to reduce the net benefit of a new model thereby forcing new entrants to renounce it or else exit the market (Van de Ven and Hargrave 2004). Often, the very criteria used to evaluate models vie for dominance (Constant 1980) leading to fierce contestation of evaluation regimes (Garud and Rappa 1994). Institutional entrepreneurship is aimed at making prevailing rules and expectations receptive to an endorsed model or practice. DiMaggio (1988: 14, original emphasis) explains:

> New institutions arise when organized actors with sufficient resources (institutional entrepreneurs) *see in them an opportunity to realize interests that they value highly.*

Following this definition, two aspects of institutional entrepreneurship stand out: *perceiving opportunities for realizing interests* and *organizing collective action*. These two aspects are also reminiscent of early accounts of collective action (Smelser 1967): A precipitating factor is interpreted in light of concrete interests and general beliefs and serves as an opportunity to promote espoused models or practices. If the interpretation is adopted widely, it mobilizes collective action and organizes support.

The struggle to overcome innovation-inhibiting institutionalized barriers is particularly salient in technological innovations. Recognizing that a new technological standard is necessary and converging on its key dimensions resembles a process of

negotiation in which relevant stakeholder groups struggle to define the basic evalua-tion criteria (Bijker, Hughes, and Pinch 1987; Anderson and Tushman 1990). For ex-ample, Van de Ven and Hargrave (2004: 282) noted that the interplay between technical and institutional dimensions expresses "collective achievements in construct-ing an industrial infrastructure for economic development among actors who are dis-tributed, partisan, and become embedded in a path-dependent process." Convergence on a collectively endorsed and enforced standard is thus the outcome of a "sociopoliti-cal process of compromise and accommodation" between diverging interests (2004: 286). In order to mobilize resources, institutional entrepreneurs must therefore be partially embedded in the status quo.

Collective action is required for creating conditions that are conducive for a tech-nological innovation, such as defining the evaluation criteria, the inter-organizational relationships, and institutions in the narrower sense (e.g. associations and standards). Continuous product and market experiments are necessary to test the viability of inno-vative and potentially disruptive technologies (Bower and Christensen 1995). Strate-gies aimed at creating conducive conditions include sponsoring the new technology and aligning other organizations behind it (Van de Ven et al. 1999). Once a new stan-dard is widely adopted, its specifications inhibit deviating innovations. For example, when a sponsor of a standard enforces the specifications against innovators who are also competitors, it risks losing its legitimacy as impartial sponsor of the standard (Ga-rud, Jain, and Kumaraswamy 2002). The struggle of developing an innovative standard, establishing it, and in turn defending it against emerging innovators thus exemplifies the structuration of organizational fields.

Technological standards are prime examples of how rules are constituted, both in terms of how technological components work together as part of a technological sys-tem (Garud and Kumaraswamy 1993) and in terms of how users evaluate and make sense of a particular technology within a wider set of available technologies (Garud and Karnoe 2003; Garud and Rappa 1994). Firms attempt to shape emerging technological standards to reflect attributes of their technologies in order to derive competitive ben-efits (Hamel and Prahalad 1994), especially when network externalities and increasing returns define the technological field (Arthur 1989; Farrell and Saloner 1986; Katz and Shapiro 1985; Shapiro and Varian 1999). But efforts aimed at altering the existing in-stitutional structure are also constrained by prevailing institutions and power differen-tials between incumbents and new entrants.

The short excursus into the domain of technological innovations highlights the complexity of institutional entrepreneurship. In order to create conditions that are conducive for an espoused model or practice, opportunities must be perceived and collective action mobilized. To do so, a cogent *theorization* must be developed. Here, theorization refers to the "specification of abstract categories, and the formulation of patterned relationships such as chains of cause and effect" capable of attracting support and mobilizing collective action (Strang and Meyer 1994: 104). In this way, a theorization of the opportunities and of the means to exploit them translates local innovations into more widely acceptable ends supported by larger groups (Greenwood, Hinings, and Suddaby 2002). Mutually related to theorization is legitimation, which occurs when key actors start endorsing or adopting the new model or practice. Hargrave and Van de Ven (2004: 312) explain:

> *Theorization lifts these localized experiments and provides a general story of how they are relevant to, and appropriate for, wider audiences ... First, it informs wider audiences of localized experiments. Second, it justifies abandoning old practices in favor of new ones. ... [L]egitimation occurs when innovations made by fringe players are adopted by established actors.*

Eventually, increasing legitimation propels dissemination of the new model or practice. Indeed, legitimation and dissemination appear as mutually interrelated aspects of theorization. Likewise, in the literature on social movements, framing is understood to provide theories to justify a new model or practice (Rao 1998).

Institutional entrepreneurs are driven by an interest to shape the prevailing institutional structure and to make it more receptive and compatible with their endorsed innovation. Fligstein (2001) suggested investigating the ways in which actors build goals and principles into emerging institutions (Meyer and Rowan 1977) by focusing on the skilled accomplishments through which institutional structure is sustained and disrupted (Giddens 1984). Efforts aimed at redefining prevailing rules and expectations by tying formerly disparate conceptions together are therefore closely associated with institutional entrepreneurship (DiMaggio 1988; Selznick 1957). For example, Garud, Jain, and Kumaraswamy (2002: 196-197) suggested that institutional entrepreneurs contest prevailing rules and expectations and mobilize collective action to establish alternative conceptions. Institutional entrepreneurs play a crucial role in the development and diffusion of new technologies. At the same time, innovations are evaluated against criteria that are often defined by the prevailing institutional structure.

Institutional entrepreneurship involves collective action in order to alter the institutional structure, particularly when prevailing power differentials inhibit institutional change. Collective action can be defined as "construction of new institutions through the political behaviors among many actors who play diverse and partisan roles in the organizational field" (Hargrave and Van de Ven 2004: 9). Through collective action, institutional entrepreneurs seek to purposively intervene in institutionalization processes (Jepperson 1991). Several questions are particularly important (DiMaggio and Powell 1991: 28):

> *How do institutional arrangements shape the nature of collective action? How persistent are institutions – how mutable are institutionalized practices? When do different institutional logics challenge one another? What is the role of elites in maintaining existing institutions? Under what conditions are challengers and entrepreneurs able to refashion existing rules or create new institutional orders?*

DiMaggio and Powell (1991) argued that, in general, incumbents gain by inhibiting institutional change but once the inappropriateness of existing institutions becomes evident, successful collective action is able to redefine prevailing rules and expectations.

In order to mobilize support, collective action builds on existing networks, associations, and organizations in the field (Lounsbury, Ventresca, and Hirsch 2003). Actors embedded in the institutional structure have privileged access to valuable resources and are able to recur on these resources when promoting institutional change (Beckert 1999). Institutional entrepreneurship is therefore mutually related to collective action aimed at shaping the prevailing institutional structure.

The recursive relationship between collective action and institutional structure is evident in the resourceful position of institutional entrepreneurs and their ability to theorize necessary changes and mobilize support to implement these changes. For example, Maguire, Hardy, and Lawrence (2004) found that the social position of institutional entrepreneurs endowed them with internal and external legitimacy as they pursued the interests of their represented groups. The authors argued that the bridging position allows institutional entrepreneurs to theorize new models or practices using arguments that represent multiple interests groups thereby negotiating successfully to create larger and more powerful coalitions. By occupying resourceful bridging positions, institutional entrepreneurs are able to integrate the negotiated changes back into rules and expectations endorsed by represented groups.

A review by Hargrave and Van de Ven (2004: 13-14) suggested that such theorization or framing addresses "how problems are defined and who is to blame for them ... [including] the articulation of solutions and appropriate strategies." The review differentiated between cognitive legitimacy, which refers to the acceptance and appropriateness of proposed changes, and sociopolitical legitimacy, which refers to the endorsement and enforcement of key stakeholders in the field. At the same time, opposing groups may accuse institutional entrepreneurs as motivated by self-interest, which potentially undermines the legitimacy of proposed changes (Garud, Jain, and Kumaraswamy 2002: 208). While experiencing or anticipating fewer benefits from prevailing institutions, institutional entrepreneurs are at least partially embedded in the status quo (Leblebici et al. 1991). Their social position allows mobilizing for change but potentially constrains the scope of change. On the other hand, the bridging position enables institutional entrepreneurs to translate between collective action and prevailing institutional structure. If powerful actors are in bridging positions and if they anticipate benefits from field-wide change, they are well-positioned to drive institutional changes (Greenwood and Suddaby 2006).

In sum, this more macro-oriented part of the section on *shaping institutionalization* demonstrated that institutional entrepreneurship and collective action are mutually intertwined efforts aimed at establishing potentially disruptive innovations in a field. By addressing the regulative, normative, and cognitive barriers in a field, entrepreneurship becomes a collective effort aimed at institutional change driven by various and often disparate interests. A core aspect of institutional entrepreneurship is therefore *theorizing opportunities for realizing interests* in order to mobilize collective action. At the same time, institutional entrepreneurs are constrained by the prevailing institutional structure, which tends to benefit incumbents and marginalize potentially disruptive innovators. Prevailing power differentials often disadvantage innovators, particularly if they threaten established business models or practices and thus the survival of powerful incumbents.

Successful theorization and subsequent mobilization shift power differentials in favor of the espoused model or practice. This requires a broader socio-political process through which existing rules are contested and prevailing expectations questioned. Institutional entrepreneurs are therefore particularly important for enabling technological breakthroughs that undermine the business model of incumbent firms. But institutional entrepreneurs are at least partially embedded in prevailing institutional structure: their

social position allows mobilizing for change while also constraining the scope of change. The next part of this section investigates in more detail what institutional entrepreneurs actually do in order to drive institutional change.

Institutional Work: Theorizing and Mobilizing Espoused Projects

The more micro-level perspective of institutional work focuses on the actual activities through which interested actors explicitly seek to alter or to maintain prevailing rules and expectations. A practice perspective conceptualizes the field as the place where social order meets institutional work aimed at shaping social order (Schatzki 2005). In contrast to the more macro-perspective of institutional entrepreneurship where the focus is on what happens *to* institutions over time, the practice perspective investigates the purposeful activities aimed at shaping institutionalization processes. Shaping institutionalization processes in an organizational field "requires institutional work ... [of] legitimating accounts that organizational entrepreneurs advance about labor markets, consumer markets, expertise, and distinctive products or services" (DiMaggio 1988: 15). Institutional work can thus be defined as "the purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions" (Lawrence and Suddaby 2006: 215).

Institutional work encompasses activities aimed at either altering or maintaining institutional structure. For example, a study on the early electrical lighting system found that the gas industry mobilized regulators against electrical lighting. Supporters of the new model "locate[d] their ideas within the set of existing understandings and actions ... yet set their innovations apart from what already exist[ed]" (Hargadon and Douglas 2001: 476). The previous section on the *fragility of institutions* demonstrated that embedded actors are able to mitigate experienced contradictions by improvising and bridging inconsistencies. *Theorizing* goes beyond that stage by skillfully crafting a conception that links opportunities to shortcomings and to prevailing understandings (Barley and Tolbert 1997; Dacin, Goodstein, and Scott 2002; Fligstein 1997; Greenwood, Hinings, and Suddaby 2002; Jarzabkowski and Evelyn 2006). In addition, it involves advocacy work aimed at enrolling widespread support for the espoused project from other groups (Henisz and Zelner 2005; Lawrence and Suddaby 2006; Suddaby and Greenwood 2005).

Lawrence and Suddaby (2006) suggest three broad categories of institutional work: creating institutions, maintaining institutions, and disrupting institutions. Regarding institutional work aimed at *creating institutions*, three distinct sets of practices can be

distinguished. First, political work is aimed at reconstructing rules, rights, and boundaries for accessing material resources. Second, what can described as symbolic work refers to reconfiguring the normative foundations of institutions by constructing social identities, norms, or networks. The third set of practices refers to informational work aimed at altering prevailing conceptions through naming, educating, or mimicry. Naming involves "both the communication of the concept and its elaboration through further theorizing" (2006: 226). Educating refers to promoting skills and knowledge necessary to engage with the new concept. Mimicry actively exploits prevailing understandings to embed innovative conceptions (also Hargadon and Douglas 2001).

Two distinct sets of practices are distinguished in institutional work aimed at *maintaining institutions*. First, political work here refers to activities aimed at enforcing established or deterring new conceptions. Second, symbolic work here refers to promoting established or disparaging new conceptions, to mythologizing or glorifying, or to further embedding established conceptions. Finally, regarding institutional work aimed at *disrupting institutions*, symbolic work appears most prominently, which here involves disconnecting sanctions and rewards from prevailing conceptions or disqualifying their moral foundations by disparaging established conceptions.

New and innovative models or practices emerge as interested actors recognize variations in situated activities as new opportunities. Hence, such "performativity-driven variation provides an endogenous mechanism" for change (Lounsbury and Crumley 2007: 1004; also Feldman 2003; Feldman and Pentland 2003; Orlikowski 2000; Orlikowski et al. 1995). Lounsbury and Crumley pointed to the recursive interplay as "practice[s] are intertwined with the prevailing theories" in the field that thus "constitutes actors and activities" (2007: 1004). For example, their findings suggest that innovative conceptions were initially not viewed as disruptive but merely as anomalous. Innovators then began to explicitly theorize the espoused project vis-à-vis established ones.

Theorizing involved differentiating the new model by emphasizing its benefits and disparaging the legitimacy of the prevailing model. Lounsbury and Crumley (2007: 1004) therefore argued "that a key condition for new practice creation is whether innovations generated by practice performativity become socially recognized as anomalies by field-level actors" and, if not problematized, "extant theory will not be challenged, and rogue [deviating] activities will wane or persist in a marginalized fashion." But if problematized, "field-level political negotiations will tend to ensue, as various actors with different interests make claims about the value of counter-

normative [deviating] activities." Incumbents then attempted to disparage the new model by mitigating or marginalizing the new practices. Ultimately, redrawing the boundaries of the practice field to include both models led to the field-wide diffusion of the new model and thus to its widespread adoption.

In sum, this more micro-oriented part of the section on *shaping institutionalization* demonstrated how interested actors explicitly seek to alter or to maintain institutional structure by engaging in institutional work aimed at theorizing the espoused project and mobilizing support. Theorizing involves skillfully crafting a conception that links opportunities to shortcomings and to prevailing understandings. Mobilizing involves advocacy work aimed at enrolling support for the espoused project from other groups. The practice perspective of institutional work thus attends to the purposeful activities aimed at shaping rules and expectations.

Broadly, institutional work seeks to intervene in institutionalization processes to create, maintain, or disrupt institutional structure. Some of the more salient activities involve (1) *political work* through which rules, rights, and resource access are reconfigured, (2) *symbolic work* through which expectations are constructed and deconstructed, and (3) *informational work* through which knowledge and awareness about conceptions are developed. This part focused on conceptualizing institutional work around activities aimed at theorizing the espoused project and mobilizing for support. The next section of this chapter focuses on discourses and discursive action through which theorization and subsequent mobilization take shape within a field.

Concluding Summary

Institutional entrepreneurs recognize and theorize ruptures and inconsistencies of prevailing rules and expectations to exploit opportunities arising from changing them. By addressing the regulative, normative, and cognitive barriers in a field, entrepreneurship becomes a collective effort aimed at institutional change driven by various and often disparate interests. Institutional entrepreneurship and collective action are therefore mutually intertwined efforts aimed at establishing potentially disruptive innovations in a field. A key aspect of institutional entrepreneurship is *theorization*, defined as the elaborate conceptualization of an espoused project expressing the adopted logic and aimed at shaping prevailing rules and expectations in the field. Successful theorization mobilizes collective action shifting power differentials in favor of the espoused project, which is particularly important if prevailing power differentials disad-

vantage a new model. This requires a broader socio-political process through which existing rules are contested and prevailing expectations questioned.

But institutional entrepreneurs are at least partially embedded in prevailing institutional structure: their social position allows mobilizing for change while also constraining the scope of change. The practice perspective on institutional work attends to the purposeful activities aimed at shaping rules and expectations in the field. Broadly, institutional work seeks to intervene in institutionalization processes to create, maintain, or disrupt institutional structure. *Theorizing* involves skillfully crafting a conception that links opportunities to shortcomings and to prevailing understandings. It involves advocacy work aimed at enrolling support for the espoused project. Rather than focusing on what happens *to* institutions over time, the practice perspective therefore investigates the purposeful activities aimed at shaping institutionalization processes.

Talking Institutionalization: Interplay of Institutions, Discourse, and Discursive Action

Throughout this chapter, direct or indirect references to discourse and discursive action have linked the use of language to institutionalization processes. The close ties between institutionalization and language follow from a constructionist view of institutionalization as "reciprocal typification [discursive categorization] of habitualized actions by types of actors" (Berger and Luckmann 1966: 72). Indeed, human practices, discursive action, discourse, and institutional structure are mutually constitutive (Phillips, Lawrence, and Hardy 2004). Institutional theorists adopting a discourse perspective therefore investigate the role of "knowledge systems, beliefs, and rules" in institutionalization processes (Scott 1995: xiii). In general, "discourse refers to the practices of talking and writing" that shape institutionalization processes "through the production, dissemination, and consumption of texts" (Hardy 2001: 26). Hence, *discursive action* refers to the articulation and referencing of statements and other communicative efforts.

Selznick (1957: 98), a founding institutional theorist in organization research, points to the critical role of language and language-use. Substituting 'organizing' with 'institutionalization' in the following quote, he argues:

Members playing different roles, and involved in varying degrees, will differ in their ability to understand the reasons behind many decisions. Many members will have only partial views of [institutionalization processes], and only a limited understanding of its objectives and principles. And because of weak or narrowly defined participation, their experience within [institutionalization processes] may offer little opportunity for greater comprehension. This makes it difficult to channel information easily ... [Therefore] the connection between participation and communication is of central importance ...

For example, an important discursive strategy is "the construction of accounts that make sense of the proposed institutional project and discredit the alternatives" (Holm 1995: 401). The analysis of discourse and discursive action thus investigates how institutions are constructed through processes of negotiation and contestation over plausible interpretations and appropriate courses of action (Mohr 1998). This section demonstrates how discourse and discursive action is intricately involved in institutional change and why it warrants focal concern when studying institutionalization processes.

This section on *discourse and discursive action* in institutionalization processes is structured in two parts followed by a concluding summary. The more *macro-oriented part* demonstrates that discourses and institutions are recursively involved in the formation of rules and expectations. From a discourse perspective, institutions are collectively endorsed interpretations of human practices. From the institutional perspective, discourses express rules and expectations evident in everyday practices. The potentially reinforcing dynamics between dominant discourses and prevailing institutions unfold in a field supplied with multiple and potentially subversive interpretations. Discourses are therefore essential for supplying alternative interpretations particularly during episodes of institutional change. The first part of this section reviews several discourse theoretical approaches and shows how discourses can be linked to institutional structure. It then attends to opposing interests and power differentials evident in discourses to suggest a discourse analysis of institutionalization processes.

The more *micro-oriented part* outlines analytical concepts for investigating the recursive interplay between discourses, discursive action, and institutionalization. Analyzing the interplay between discourse and institutionalization demonstrates how discursive action expresses power and interests and exhibits either iterative, pragmatic, or reconstructive action orientations as it confirms or reconstructs rules and expectations. This part then defines three analytical aspects for investigating the interplay between discur-

sive action and institutionalization: (1) interests and power bases of competing groups, (2) the focal institutional structure, and (3) action orientations exhibiting primarily itera-tive, pragmatic, or reconstructive tendencies of discursive action.

Discursive Structure: Formation and Constraining Influence of Rules and Expectations

A more macro-level perspective on discourse investigates how claims and counter-claims constitute the rules and expectations that inform human interactions which then constitute institutional structures. Giddens (1984: 91-92) identifies four factors shaping institutionalization processes: access to knowledge, modes of articulating knowledge, validity and legitimacy of discursive claims, and means to disseminate these claims. Making and disseminating claims and counterclaims constitutes dis-courses, which are intricately interwoven in institutionalization processes (Maguire and Hardy 2006: 9). Discourses *expose* internalized rules and expectations and make them the object of critical inquiry and of reconstructive efforts aimed at redefining conceptions (Knorr-Cetina 2001).

At the same time, discourses *constitute* discursive structures that "establish the framework within which knowledge claims are situated and provide the rules by which the claims are validated and challenged" (Scott 1994: 60). Here, discursive structure refers to the interrelationships between knowledge claims, including the fundamental assumptions for constructing and validating claims, which is sometimes referred to as *institutional logic* (Friedland and Alford 1991).

Similar to institutional structure, discourses engulf human agency and "constrain its capacity to change the underlying conditions of action" (Reed 2005: 1640). It follows that the "discursive structure is not a merely 'cognitive' or 'contemplative' entity; it is an articulatory practice which constitutes and organizes social relations ... [around] a growing proliferation of differences – a surplus of meaning" (Laclau and Mouffe 1985: 96, added emphasis). In other words, making claims and counterclaims instantiates new interpretations and courses of action by drawing on cognitive as well as material infrastructures, such as mental capacities or identity positions as well as concrete texts or other material references (Munir and Phillips 2005). Yet, similar to institutional structures, differences and tensions operating within and across make discursive struc-tures not completely determinative of human action and open to self-reflective appro-

priation (Heracleous and Hendry 2000). Hence, discourses and institutions are ly related to each other.

The potentially reinforcing dynamics between dominant discourses and prevailing institutions unfold in a field characterized by a 'surplus of meaning' supplying multiple and diverging interpretations. On one hand, the discourses in a field are linked to the prevailing institutional structure. Hardy, Palmer, and Phillips (2000: 1228) explain:

> *Strategic actors cannot simply produce a discourse to suit their immediate needs and, instead, must locate their discursive activities within a meaningful context if they are to shape and construct action. ... [Hence] activities of actors shape discourses, while those discourses also shape the actions of those actors.*

On the other hand, the macro perspective on the fragility of institutions in the second section of this chapter demonstrated that structural contradiction and overdetermination provide "insurgent logics" (Suddaby and Greenwood 2005: 39) that counterbalance institutionalization dynamics. The plurality of discourses available to embedded actors therefore extends beyond the prevailing institutional structure to include those of competing institutional structures. This larger "field of discursivity" supplies the diversity of plausible interpretations and approaches from the reservoir of competing institutional structures (Laclau and Mouffe 1985: 111). Discourses are therefore understood as *proto-institutions*, that is, "institutions in the making ... [with] the potential to become full-fledged institutions" once the conceptions they promote are internalized and collectively endorsed (Lawrence, Hardy, and Phillips 2002: 283).

A discourse understood as proto-institution is capable of substituting interpretations supplied by prevailing rules and expectations with alternative interpretations. From the plurality of available discourses, discursive accounts are capable of 'enacting' perspectives and courses of action (Boje 1995). Discourses are therefore essential for supplying alternative interpretations particularly during episodes of institutional change.

Analyzing institutional change along its discursive dimensions confronts the analyst with at least two problems: how to appropriate the variety of linguistic and discourse theoretical approaches and how to link concrete discursive action to institutional structure. I refer to a review by Corsaro (1985) and to some contemporary approaches to briefly illustrate some approaches. The multilevel character of institutionalization is sometimes bracketed out, for example, by Sacks, Schegloff, and Jefferson's (1974) conversational analysis with its emphasis on autonomous sequencing and Goffman's

(1974) frame analysis with its emphasis on individual communicative abilities. In contrast, Cicourel's (1980) cognitive sociology links cultural beliefs and interpretations to discourse as well as to participants' individual strategies for appropriating institutional rules and expectations in concrete action contexts.

Perhaps too encompassing for most studies, Labov and Fanshel's (1977) comprehensive discourse analysis recommends the inclusion of all required information to gain an understanding of linguistic articulations, from syntactic structure to socio-cultural information. Gumperz (1982 [1999]) strikes a middle ground with a broader semantic approach connecting discursive action to descriptive themes, such as 'discussing politics' or 'making a proposal', whose meaning and interpretation is negotiated over time and tied to interpretive frames that actors hold. This approach appears suitable for analyzing institutional change without going into the details of syntactic structure. This study therefore employs descriptive themes that are based on participants' statements and can be linked to institutional outcomes.

Regarding the second problem, linking concrete discursive action to institutional structure, Fiol (1991) proposed a recursive relationship where the full meaning of articulations and espoused projects remains somewhat underspecified, which allows for the ongoing rewriting of meaning. Here, prevailing rules and expectations define meaning quasi from top-down while, from bottom-up, context-specific local understandings rewrite and reassign the meaning of articulations and espoused projects. Similarly, Ford and Ford (1995) argued that articulations mold words into a specific context introducing slight changes to the original meaning. At the same time, the scope of plausible interpretations is constrained by prevailing rules and expectations (Lawrence and Suddaby 2006).

In particular, the 'critical' approach to discourse analysis highlights how forms of organizing stabilize some interpretations vis-à-vis others thereby intervening in the 'free' interplay between top-down and bottom-up dynamics (Van Dijk 1993). Hence, Fairclough (2003) suggested that the importance of discursive action in processes of opinion-forming warrants a detailed analysis of language-use. Another approach, the dialogic model, assumes relatively equal power relations between counterparts making changes in institutional structure the outcome of coevolving strategies and tactics pursued by counterparts (Hargrave and Van de Ven 2004). The dialogic model is particularly attentive to how shared understandings emerge from consensual negotiations (Gergen, Gergen, and Barrett 2004; Steinberg 1999). These accounts therefore stress

that power differentials between more central and more peripheral actors must be accounted for when linking discursive action to institutionalization outcomes.

A discourse perspective attentive to interests and power differentials investigates the discourses employed in struggles "over the appropriate relationships between institutions, and by which institutional logic different activities should be regulated" (Friedland and Alford 1991: 256). As noted earlier, the mere existence of claims and counterclaims is evidence of efforts by interested actors to exploit structural contradiction to promote institutional change (Ranson, Hinings, and Greenwood 1980). Discourses both inform and express the prevailing interpretations of what is deemed legitimate and are therefore intricately interwoven with the production of meaning in organizational fields.

However, while conceptualizing the production of meaning as integral to institutions, most empirical institutional studies focus on aggregated behavioral or structural features without linking these to the actual production of meaning in concrete action contexts (Zilber 2002). There are studies that link field-level changes to individual actions. For example, institutional change was a consequence of successfully theorizing change by courting multiple interests and negotiating successfully to create larger and more powerful coalitions (e.g. Maguire, Hardy, and Lawrence 2004). Another example of the micro-foundations of institutional change is a study on how practitioners in a field legitimized a new way of working through a series of microprocesses (Reay et al. 2006). The present study extends these efforts by linking discursive action over the field's discourse to institutional changes in the field.

Investigating discourses and discursive action allows tracing how the momentum behind competing institutional projects leads to "critical mass" – a broad coalition of supporters in the field (Hargrave and Van de Ven 2004: 288). Based on a systematic investigation tracing how interpretations and conceptions emerge and diffuse, discourse analysis can suggest "why the institutional arenas are patterned in the way that they are" (Friedland and Alford 1991: 243). This type of analysis is capable of making explicit the "microfoundations" on which institutions rest (DiMaggio and Powell 1991: 16). By attending to interests and power differentials in the production of meaning and institutionalization outcomes, discourse analysis is capable of accounting for the structuration of organizational fields.

In sum, this more macro-oriented part of the section on *discourse and discursive action* demonstrated that discourses and institutions are recursively involved in the for-

mation of rules and expectations in institutionalization processes. While discourses in a field are recursively related to the prevailing institutional structure, they also extend beyond it and emanate from competing institutional structures. As long as competing institutional structures vie for dominance, interested actors are able to draw on a reservoir of multiple and deviating interpretations. A discourse may thus be understood as *proto-institution*, conveying an entire arrangement of assumptions and beliefs that legitimates creating new institutions in the narrower sense (e.g. laws and authorities), using alternative resources, attending to different requirements, and pursuing associated activities. A discourse is thus capable of establishing alternative rules and expectations and analyzing discourses may explain how "actors change institutions if their actions, intentions, and rationality are all conditioned by the very institution they wish to change" (Holm 1995: 398).

The brief overview of discourse theoretical approaches showed that a cogent approach for analyzing the emergence and diffusion of new conceptions is to trace the development of descriptive themes grounded in statements of participants. An important corollary of such an analysis is to adequately account for the power differentials between more central and more peripheral actors when linking discursive action to institutional outcomes. When investigating institutionalization processes, a discourse analysis attentive to interests and power differentials focuses on claims and counterclaims aimed at shaping rules and expectations, particularly those aimed at constructing and validating relations and logics in the field. The next part of this section briefly defines the key characteristics of discursive action aimed at shaping institutionalization processes.

Discursive Action: Analyzing Power and Interests and the Iterative or Reconstructive Orientations

A more micro-level perspective of discourse and institutionalization focuses on how the formation of prevailing rules and expectations is linked to a dominant logic or discursive structure that is constituted through discursive action. An in-depth investigation of discursive action is warranted because "the 'logic' of institutions ... does not reside in the institutions and their external functionalities, but in the way these are treated in reflection about them" (Berger and Luckmann 1966: 82). Hence, institutional structures are either confirmed or challenged by discursive action (Heracleous and Hendry 2000). Competing theorizations reflecting different and often opposing theorizations vie for dominance in a field (Lounsbury, Ventresca, and Hirsch 2003). The arti-

culation of interests and their discursive contestation in the field drive institutionalization processes (Suddaby and Greenwood 2005).

Laclau and Mouffe (1985: 105) defined "articulation [as] any practice establishing a relation among elements such that their identity is modified as a result of the articulatory practice." The practice perspective on the fragility of institutions in the second section of this chapter demonstrated that such relating of action and meaning forms the essence of a relationally constituted institutional structure. It was stressed that institutional change requires interested actors to perceive variations as opportunities, but also to pursue them vis-à-vis prevailing constraints.

Through discursive action, institutional entrepreneurs develop theorizations espousing projects to seize opportunities for change, such as changing competitive conditions, the formation of counter-power, or the emergence of new models and practices (Beckert 1999). Via electronic media, discursive action achieves an almost global and immediate impact on situated action (Giddens 1984). Hence, interested actors are able to appropriate the plurality of discourses by engaging in discursive action which shapes prevailing rules and expectations in the field (Phillips, Lawrence, and Hardy 2004). This part focuses on defining three parameters for analyzing discursive action aimed at theorizing the espoused project and mobilizing support.

The first analytical aspect reflects the 'critical' approach to discourse analysis focusing on how discursive actions draw on established power bases to stabilize some interpretations vis-à-vis others (Van Dijk 1993). Here, analysis requires indentifying the interest-driven political dynamics behind articulations by competing groups that seek to structure relations and logics in the field. This approach would link the emergence and evolution of aggregated descriptive themes, which were discussed in the foregoing part, to concrete interests and positions of actors in the field.

For example, Lawrence and Suddaby (2006: 239) argued that the analysis of discursive action "provides methods and theories to aid in understanding how linguistic and symbolic practices create new objects and associate those objects with social controls that institutionalize them." Similarly, Beyer (2005: 163) asked:

> *How does this action participate in, legitimate, challenge, or contest higher and lower level actions by which it is constituted and which in itself it participates in constituting?*

The production of meaning – the intelligibility and performativity of action vis-à-vis prevailing rules and expectations – is explicitly located at the level of (discursive) ac-

tion. Moreover, meaning production is intimately related to power bases – both, when creating and sustaining prevailing rules and expectations but also when challenging or altering them (Beyer 2005).

Likewise, Suddaby and Greenwood (2005: 58-60) suggested that rhetorical strategies rearrange understandings and thus construct oppositional discourses that serve to further justify the promotion of or resistance to institutional change. Hence, "rhetorical strategies are the ways in which the meaning systems that underpin institutions are manipulated." Sillince (2005) focused on how the salience of rhetorical strategies is contingent on the fit between content and the larger institutional context. These accounts suggest that analyzing how discursive action is involved in shaping rules and expectations allows identifying the actual strategies and tactics that actors employ in institutionalization processes.

The second analytical aspect is a corollary of analyzing the institutional work of maintaining, disrupting, or creating institutions (Lawrence and Suddaby 2006). In multilevel institutional structures, assessing whether discursive action maintains, disrupts, or creates new rules and expectations is contorted by different time horizons of institutionalization at different levels. For example, the practice perspective on the fragility of institutions in the second section of this chapter pointed out that the local activities aimed at *maintaining* prevailing approaches were potentially *destabilizing* institutions at more aggregated levels. Similarly, discursive action aimed at defending the status quo at one level may undermine long-term stability at more aggregated levels. A multilevel analysis of institutionalization processes must specify what exactly is being maintained and what is disrupted.

The third analytical aspect concerns the aforementioned problem of linking concrete discursive action to institutional structure. Giddens (1984: 288) points to three components of discursive action: routine knowledge, motivations in immediate interactions, and "strategies of control" within local action contexts. Similarly, DiMaggio and Powell (1991: 22) suggest that Parsons's (1951) distinction between the sociocultural and cognitive, affective and expressive, as well as self-reflective and strategic dimensions of complex social systems defines three ideal-typical orientations of action. These three dimensions, respectively, represent actions that primarily exhibit iterative, pragmatic, or reconstructive orientations. Likewise, Emirbayer and Mische (1998) proposed three ideal-typical action orientations. Simply stated, action oriented at executing previously established routines is *iterative* by reproducing prevailing rules and expecta-

tions, action oriented at the changing contingencies of action contexts produce new variations, and action oriented at projecting new courses of action is *reconstructive.*

The analysis of discursive actions links iterative and reconstructive action orientations to certain discursive strategies. Cheney et al. (2004) identify a range of discursive strategies, for example, linking one issue with another (Identification), declaring an issue to be unrelated to another (Differentiation), asserting that the issue is not relevant (Denial), or downplaying an issue (Containment). Attending to how particular action orientations are evident in discursive action may explain when and why – through which types of discursive action – institutional structure is maintained, disrupted, and created.

In sum, this more micro-oriented part of the section on *discourse and discursive action* demonstrated that analyzing the interplay between discursive action and institutionalization includes the identification of (1) interests and power bases of competing groups, (2) the focal institutional structure, and (3) action orientations exhibiting primarily iterative, pragmatic, or reconstructive tendencies of discursive action. Attending to the first aspect is warranted because discursive action reflects interest-driven and political efforts aimed at structuring relations and logics in the field. The analysis is then able to link the emergence and evolution of aggregated descriptive themes that were discussed in the foregoing part to concrete interests and positions of actors in the field. By investigating discursive action above the level of syntactic structure, a discourse analysis of institutionalization processes is thus capable of identifying the actual strategies and tactics that actors employ when promoting desired institutional outcomes.

Regarding the second aspect, the focal institutional structure at which the institutional work of maintaining, disrupting, or creating institutions is targeted must be clearly delineated as the prevailing or dominant institutional structure. Finally, the third analytical aspect warrants investigation because it allows linking concrete discursive action to discursive and to institutional structure. In addition, identifying the action orientations allows a more differentiated analysis that is more attentive to the subtleties of multilevel institutional structures. Linking the particular orientations of discursive action to institutional outcomes may explain when and why – through which types of discursive action – institutional structures are maintained, disrupted, and created. The three analytical aspects for analyzing discursive action thus particularly attend to interplay between discursive action and institutionalization.

Concluding Summary

Discourses and institutions are recursively involved in the formation of rules and expectations in institutionalization processes. Similar to institutional structures, discursive structures engulf embedded actors while also featuring differences and tensions that open up possibilities for self-reflective appropriation by human actors. As long as competing institutional structures vie for dominance, interested actors are able to draw on a reservoir of multiple and deviating interpretations. A discourse may thus be understood as *proto-institution*, conveying an entire arrangement of assumptions and beliefs that legitimates creating new institutions in the narrower sense (e.g. laws and authorities), using alternative resources, attending to different requirements, and pursuing associated activities.

Studying institutional change from a constructionist perspective requires investigating how plausible interpretations and appropriate courses of action are constructed by human actors *over time*. However, while conceptualizing the production of meaning as integral to institutions, most empirical studies on institutional change do not investigate in any detail the actual production of meaning in concrete action contexts (Zilber 2002). In addition, longitudinal analyses that track the process of institutionalization as discursively constructed by different stakeholder groups remain rare (Heracleous and Barrett 2001). Yet, such a longitudinal analysis is needed to account for institutionalization processes unfolding over time (Heracleous and Hendry 2000).

An in-depth discourse analysis over time is particularly warranted because institutionalization and institutional logics are only accessible in discursive reflections about them (Berger and Luckmann 1966). Analyzing the interplay between discursive action and institutionalization includes the identification of (1) interests and power bases of competing groups, (2) the focal institutional structure, and (3) action orientations exhibiting primarily iterative, pragmatic, or reconstructive tendencies. The longitudinal discourse analysis of institutionalization processes is thus capable of demonstrating that interested actors not only draw on discursive structures but that their discursive action also constitutes discursive structures and institutional outcomes.

Conclusion

This conclusion briefly summarizes each of the four sections of this chapter before framing the key issues and the research questions. Table 1 provides an overview of the four sections and the key issues addressed in the present study. The first and second

section of this chapter conceptualized institutional change consistent with the institutional argument. The institutional argument posits that institutions, understood as collectively endorsed and enforced rules and expectations, constitute cognitive understandings, regulative power, and normative sanctioning. Institutions thus instill the degree of trust among key stakeholders that enables more complex and otherwise risky undertakings (Berger and Luckmann 1966; North 1990). Conformity with prevailing rules and expectations therefore affords tangible benefits, such as improved credibility, resource exchange, and ultimately organizational survivability.

Three major thrusts of institutionalization	**Linking contexts to iterative, pragmatic, and reconstructive action through discourse analysis**	
Compatibility with the prevailing institutional structure enhances organizational profitability and survivability.	Structural contradiction and overdetermination mitigate or disrupt institutionalization dynamics to propel institutional change.	Institutional entrepreneurship mobilizes collective action aimed at establishing potentially disruptive innovations in a field.
Institutional stability	**Structural contradiction**	**Institutional change**
Institutional structure		
Discursive structure		
Discursive action		
Interaction cycles		
Iterative routinization	**Pragmatic improvisation**	**Reconstructive work**
Adherence to prevailing rules and expectations affords intelligibility and performativity to decisions and courses of action.	Recognizing ruptures or gaps of prevailing rules and expectations and perceiving resulting variation as opportunity induces institutional change.	Advocating a change project and mobilizing key stakeholders for support reinforces processes of institutional change.

(Left margin label: Contexts — spanning upper rows; Practices — spanning lower rows)

Table 1: Linking contexts to action through discourse analysis

A micro-level perspective attends to the organizational activities in which the tension between conformity and innovativeness plays out and is resolved in practice. The practice perspective on institutionalization thus reconnects the institutional argument to the constructionist view of institutions as reciprocal categorizations of routine activities and is thus able to account for either continuity or change. But the institutional argument fails to account for the disruption of institutionalization dynamics and for the possibility of institu-

tional change (Oliver 1991). In this context, institutional theorists attended to structural contradiction and overdetermination as counter-balancing systemic relations that mitigate or disrupt the dynamics of institutionalization. However, structural contradiction continuously operates within institutionalized settings and can therefore not *per se* explain institutional change (Leblebici et al. 1991). A necessary condition for institutional change to unfold is therefore human actors recognizing contradictions and perceiving opportunities for change. The focus is on both, demonstrating *that* institutional change is possible and demonstrating *how* interested actors shape institutionalization processes.

The third and forth section of this chapter demonstrated how interested actors shape institutionalization processes. Institutional entrepreneurs recognize and theorize ruptures and inconsistencies of prevailing rules and expectations to exploit opportunities arising from changing them. A core aspect of institutional entrepreneurship is *theorization*, which refers to the conceptualization of an espoused project expressing the adopted logic and aimed at shaping prevailing rules and expectations in the field. But institutional entrepreneurs are at least partially embedded in prevailing institutional structure: their social position allows mobilizing for change while also constraining the scope of change.

The practice perspective on institutional work attends to the purposeful activities aimed at shaping rules and expectations in the field. Rather than focusing on what happens *to* institutions over time, the practice perspective therefore investigates the purposeful activities aimed at shaping institutionalization processes. In this context, institutional theorists emphasize the critical role of language and communication in shaping prevailing rules and expectations. Similar to institutional structures, discursive structures engulf embedded actors while also featuring differences and tensions that open up possibilities for self-reflective appropriation (Heracleous and Hendry 2000). While conceptualizing the production of meaning as integral to institutions, most empirical studies do not investigate in detail the actual production of meaning in concrete action contexts (Zilber 2002). In addition, longitudinal analyses that track the process of institutionalization as discursively constructed by different stakeholder groups remain rare (Heracleous and Barrett 2001). Discourse analysis may be capable of demonstrating that interested actors not only draw on discursive structures but that their discursive action also constitutes discursive structures and thus impacts prevailing rules and expectations. A longitudinal discourse analysis of institutionalization processes would therefore not only addresses *that* institutional change occurs but *how* interested actors discursively shape processes of institutionalization.

This chapter demonstrated that institutional change can be conceptualized consistent with the institutional argument. The institutional argument posits that prevailing rules and expectations exert such a pervasive influence on what are deemed plausible interpretations and appropriate courses of action that deviations are practically unthinkable. But the institutional argument implies ever increasing returns to institutionalization and thus fails to account for the disruption of institutionalization dynamics and for the possibility of institutional change (Oliver 1991). However, institutional change can be conceptualized consistent with the institutional argument if the constructionist view of institutions as reciprocal categorizations or *enactments* of routine activities is acknowledged. Reciprocal categorizations or enactments resolve the tension between conformity and uniqueness within concrete action contexts. The practice perspective demonstrates that structural contradiction and diverging interpretations are conducive to institutional change only if recognized as such by interested actors and used to theorize and mobilize change.

This chapter also demonstrated how embedded actors shape processes of institutional change. The focus throughout this chapter was on processes on the more macro-level and on activities on the more micro-level of the multilevel institutional structure. In order to address the 'how' question, the focus shifts from what happens *to* institutions over time to a focus on the human actors and their practices involved in institutionalization processes. Despite the constructionist definition of institutions as reciprocal categorizations or enactments (Berger and Luckmann 1966), few studies of institutional change have demonstrated "how institutional change is produced by, and in turn shapes, the interaction of individuals in day-to-day situations" (Selznick 1957: 4). Moreover, while institutionalization processes and institutional logics are only accessible in discursive reflections about them (Berger and Luckmann 1966), few studies have systematically investigated institutionalization processes by tracing discursive action over time.

The present study addresses the *paradox of embedded agency* and focuses on the shortcomings of existing research on institutionalization and institutional change: the production of meaning at the level of local (discursive) action and its role in constituting discourses and institutional outcomes. These considerations lead to the following research questions: (1) *Are there discernible patterns of discursive action through which participants in an organizational field theorize institutional change,* and (2) *What are the implications of theorizations for mobilizing support and realizing change projects?*

3. Methodology Chapter

The present study outlines a comprehensive discourse methodology for linking discursive action to institutionalization outcomes. Institutional theory grounded in the constructionist ontology investigates the interplay of systemic relations and human interaction over time. On one hand, institutional structures and underlying systemic relations, such as institutionalization dynamics or structural contradictions, operate *as if* autonomous and decoupled from human interaction. On the other hand, human interaction precipitates institutions which are the outcome of human actors reciprocally typifying or categorizing a set of related acts as particular practices. Hence, institutions are experienced as objective reality "confront[ing] the individual as an external and coercive fact" but "the institutionalizing process of reciprocal typification would occur even if two individuals began to interact *de novo*" (Berger and Luckmann 1966: 76, 73, original emphasis).

Analyzing change processes in management and organization studies must be able to account for the interplay of systemic relations and human interaction over time poses at least five empirical challenges. Pettigrew, Woodman, and Cameron (2001: 698-704) emphasized four of these challenges: First, analysis must investigate the process of change on multiple levels attending to "the terrain around the stream that shapes the field of events, and is in turn shaped by them." Second, analysis must trace the temporal interplay between context and action through an "interrogation of phenomena over time using the language of what, who, where, why, when, and how." Third, analysis must account for reinforcing complementarities that drive change processes using "a simultaneously aggregated and disaggregated analysis" to recognize complementarities reinforcing each other across levels. Fourth, analysis must address how the "degrees of receptivity to change" are contingent on the historicity and sequencing of action and events. Finally, with institutionalization processes and "the 'logic' of institutions ... [observable only] in the way these are treated in reflection about them" (Berger and Luckmann 1966: 82), analysis must employ a discourse perspective on institutional change.

Instead of using Glaser's (1992) approach to grounded theory, in which the researcher engages the subject without pre-existing ideas or frameworks, we adopted

Strauss and Corbin's (1990) approach, which allows for use of existing theory to guide the research (Locke, 1996). We drew on existing ideas from the literatures on strategic management and organization theory.

The methodology chapter is structured in four sections followed by a conclusion. The first section justifies the case selection and provides background information on opensource software (OSS), on application server software, and on the Java programming standard. The case was particularly suitable to investigate the (1) interests and power bases of competing groups, (2) changes in the focal institutional structure, and (3) action orientations of discursive action. The second section outlines the data collection and sampling process. It defines the relevant population, identifies the search procedure, and outlines the process of data retrieval as well as the process by which a sample of relevant source documents is identified and analyzed. Relevant data is added to the sample in an iterative search and retrieval process, eventually comprising 1088 source documents containing 1383 statements by 36 participants.

The third section defines the operationalization of the key analytical concept used to study institutional entrepreneurship, theorization. The discourse methodology addresses five empirical challenges: (1) multilevel constitution of institutionalization, (2) temporal interplay between context and action, (3) reinforcing complementarities of institutionalization, (4) relationship between sequencing of action and receptivity to change, and the (5) discursive construction of institutionalization processes. It then outlines the procedure for identifying descriptive themes and assigning themes to statements. The fourth section presents a pre-analysis of data in the sample that reconstructs the chronology of major events and identifies the key features of the discursive structure across all phases. This chapter thus outlines a novel methodology for systematically investigating the interplay between institutionalization processes and discourses and discursive action over time.

Case Study: Java Application Server Field

The research was based on a longitudinal case study design within one setting, the organizational field (Yin 2003). First- and second-hand data were collected on the evolution of Java governance in the Java application server field. As explained below, application servers provide computer programs to client computers via electronic networks. The case of Java application server software was selected for theoretical rea-

sons as an intentional sample (Glaser and Strauss 1967; Eisenhardt 1989). The selection criterion was strategic importance to the evolution of Java governance. Java application servers were at the core of the new Java programming language, which was targeted at providing computer programs across electronic networks. Studying a single critical case is therefore warranted (Patton 1990).

In addition, studying the Java application server field addresses the problem of how substantial change occurs in an organizational field if organizations constantly compare themselves and imitate each other. First, while the Java programming language was relatively new, field-wide practices and models were already well established among incumbent firms. Critical business areas, such as hardware, application server software, and databases, were allocated to few dominant firms. Incumbent firms were able to capitalize their strength in the new Java software market by extracting hefty profit premiums [215].[1] Second, fringe players in the field started experimenting with opensource versions of application servers. As explained below, opensource software (OSS) makes the software source code freely available and modifiable. The prospect of competing with freely available and modifiable software threatened the business model of incumbent firms. The field thus exhibited institutionally embedded – and thus advantaged – incumbents as well as newcomers who instigated field-wide institutional changes aimed at reducing the costs of server solutions. Institutional changes include concrete changes to the Java standard as well as general changes regarding the viability of opensource software. Finally, information-rich data on how the discourse in the field evolved was readily available through internet sources.

This section on the case study is structured in two parts. The first part provides background information on opensource software (OSS), on application servers, and on the Java programming language and standard. It introduces the opensource model as an approach to producing goods and information that guarantees the accessibility and reuse of the underlying production knowledge. The application server is the core software responsible for providing computer programs to client computers via electronic networks and plays a vital role in enterprise computing infrastructures. The Java standard defines

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[1] References to source documents of exemplary data snippets are in the Appendix.

[2] (1) Server hardware: Morgan, Timothy Prickett. "Sun Puts 1.05GHz US-III+ in Midrange, Enterprise Servers." ComputerWire, 6 Aug 2002, Nexis; (2) Application server software: BEA

a programming language for distributed and network-based applications that promises compatibility and interoperability between competing vendors and operating systems. The evolution of Java is therefore tightly interwoven with application servers.

The second part justifies the case selection and introduces the case of institutional entrepreneurship in the Java application server field. The case was particularly suitable to investigate the (1) interests and power bases of competing groups, (2) changes in the focal institutional structure, and (3) action orientations of discursive action. The case study starts in 1998, the year in which application servers entered the market, and ends in August 2006 when Sun started opensourcing the Java programming standard. The major players in the field are opensource firms Lutris and JBoss and incumbent firms Sun, IBM and BEA. The Java programming standard plays not only a role as technological framework but also as resource enrolled to either promote change or the status quo.

Background Information: Opensource Software, Application Servers, and the Java Programming Standard

The *opensource model* refers to a specific approach for producing goods and information that guarantees the accessibility and reuse of the underlying production knowledge, such as interface specifications, software code, or academic contributions. For example, interface specifications in the personal computer industry are standardized and freely accessible. This increases the number of competing manufacturers and reduces the costs of personal computers. Similarly, when the source code of the software or the cited academic contributions are freely accessible, other knowledge workers can participate in and extend the production of knowledge, which tends to increase competitiveness and innovation.

For example, a key finding of studies on the work setting posits that having access to a diverse pool of knowledge is conducive to the generation of new ideas (Utterback 1971: 81). In the present case study, Sun changed its position after prohibiting opensource Java software in order to promote innovation in the Java standard. The 'father' of Java, James Gosling, noted that *"it's always the unexpected that ends up being important"* [186]. Sun executive Schwartz argued that *"what open source tends to do more than anything else is it tends to spark innovation"* [186].

The main benefit of the opensource model is that freely accessible and modifiable production knowledge enables others to build upon and reinterpret that knowledge and to arrive at new inventions or conclusions. A drawback of the opensource model is that

the revenues innovators get from their innovations are potentially smaller than if the innovation had been developed through a proprietary model. On the other hand, innovation may not have been possible without freely accessing necessary knowledge or may not become widely adopted without the ability of others to freely access and reuse it.

Opensource software (OSS) is attractive to developers and end-users because the software can be freely modified and extended to meet new business requirements. Neither the services nor the permission of the provider are obligatory to make changes to the software. Developers and end-users thus avoid provider lock-in from the licensing and contractual restrictions of proprietary software. Because of development freedom and avoidance of provider lock-in, opensource software tends to become more quickly and widely adopted. Moreover, opensource software can be obtained at no costs. This is particularly important for developers who want to experiment and test new software. Because developers usually have the expertise to compare the technological features and the necessity for having these features, developers play a critical role in determining which software will be adopted in the longer term.

Opensource software is a prime example of user-led innovation (Von Hippel 2001). In the Java application server field, proprietary application servers were costly because they featured high-end functionalities that most customers did not use [215]. In contrast, opensource application servers started with minimal functionalities and subsequently added new functionalities based on market demand. Because the source code was freely accessible and modifiable, new functionalities were quickly added and software problems quickly solved. For example, a formerly opensource-skeptical incumbent argued that extending *"product innovation to a large community of untapped developers in opensource land"* is desirable [218]. For end-users requiring a reliable set of core functionalities, opensource approaches therefore feature several advantages vis-à-vis proprietary approaches. At the end of the study period, opensource and incumbent firms competed around opensource infrastructures and Sun opensourced the Java programming standard.

An *application server* is the core software responsible for providing computer programs to client computers across electronic networks. For example, most of today's online private banking applications are provided over a web server that transmits the requested service, such as transferring money between accounts. However, in order to process more complex tasks, such as real-time online brokerage with conditional order types, the client computer accesses an application server to download parts of the appli-

cation into computer memory where it then executes as if it were installed on the personal computer. The main benefit of centralized applications running from an application server is that only a single program has to be maintained on the server rather than on each of the client computers. The main benefit of decentralized *execution* is that processing power is allotted to the client computers, rather than the server, thereby allowing networks with a theoretically unlimited number of clients. The main bottleneck for network computing is the bandwidth of the network connections that link the application server to client computers. With the growth of the internet and the bandwidths of internet connections, the application server became increasingly important.

Driving the momentum behind opensource application servers were significant price differences between server solutions from incumbents and opensource firms. For example, a proprietary application server solution from incumbent firms using specialized Sun hardware, BEA or IBM application servers, and an Oracle database starts at US$ 1 million[2]. In contrast, a *comparable* server solution using Intel hardware based on the open-standards of a growing mass market and software based on opensource licenses costs US$40,000.[3] Incumbents were thus able to extract premium rents while freely available opensource software led to price pressure and increasing software commoditization.

The *Java programming standard* is unique in that it strives to guarantee the "write once – run everywhere" promise ensuring compatibility between competing Java software vendors but also between competing operating systems [108]. Sun officially unveiled Java in 1995 and promoted it as *the* programming standard for network computing and, particularly, for the internet. However, Sun's relatively expensive server hardware as well as its operating system became marginalized as the personal computer mass market proliferated and became dominated by Microsoft's Windows operating system. Sun expected to regain market share for its hardware and software

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[2] (1) Server hardware: Morgan, Timothy Prickett. "Sun Puts 1.05GHz US-III+ in Midrange, Enterprise Servers." ComputerWire, 6 Aug 2002, Nexis; (2) Application server software: BEA Systems, Inc. "BEA WebLogic tops benchmark results for both performance and value for enterprise and departmental application environments". PR Newswire, 26 Mar 2002, Nexis; (3) Database: Richtel, Matt. "As rivals steam forward, Oracle christens a database". The New York Times, 15 Jun 2001, Nexis.

[3] (1) Server hardware: Dell Computer Corporation. "Two PowerEdge(TM) servers bring new technologies to enterprise customers." Canada NewsWire, 19 Feb 2002; (2) Application server software: JBoss; (3) Database: MySQL.

business by guaranteeing the compatibility of Java software across operating systems. If all major software applications were written in Java, then the lock-in effect of Microsoft's Windows operating system would diminish. Sun thus partnered with other major players, such as IBM, to promote Java.

Java partners were committed in defending the new programming standard ever since Microsoft declared Java a *"major threat"* and quasi eliminated the popular internet browser Netscape arguing that *"Netscape is the major distribution vehicle [of Java]"* [100]. Despite this animosity, Microsoft initially licensed the Java technology from Sun. However, Sun criticized Microsoft's proprietary Java 'innovations' for compromising Java's ubiquitous compatibility promise. Sun successfully sued Microsoft for infringing the licensing terms. Since then, the settlement and Java's widespread adoption firmly established the new technology as well as Sun's control over it.

Case Study: Institutional Entrepreneurship in the Java Application Server Field

The case study on institutional entrepreneurship in the Java application server field starts in 1998, the year in which mature Java application servers entered the market, and ends in August 2006 when Sun started opensourcing the Java standard. Studying the Java application server field appears particularly suitable for three reasons.

First, the Java programming standard was created as response against the proliferation of Microsoft as a common threat, which led to the institutionalization of field-wide models and practices to protect Java. In addition, partner firms were allocated to specific areas and able to capitalize on their position in the new Java software market by extracting hefty profit premiums. *Second*, fringe players in the field started experimenting with opensource application servers. The prospect of competing with freely available and modifiable software threatened the business model of incumbent firms. The field exhibited institutionally embedded – and thus advantaged – incumbents as well as new entrants who triggered field-wide institutional changes. Institutional changes include concrete changes to the Java standard as well as general changes regarding the viability of opensource software. *Third*, information-rich data on how the discourse in the field evolved was readily available through internet sources.

The case study on institutional change in the Java application server field was thus well-suited to investigate the (1) interests and power bases of competing groups, (2) changes in the focal institutional structure, and (3) action orientations of discursive action. Studying the Java application server field thus directly addresses the problem of

embedded agency, that is, how substantial change occurs in a highly institutionalized organizational field. This section briefly introduces the key opensource and incumbent firms and the role of the Java programming standard.

The *opensource firms* include consulting firms Microstate and Lutris and startup JBoss. In November 1998, Microstate announced opensourcing its proprietary application server, which provided enterprise-level features which had been deployed in several critical applications at client firms [150]. Microstate justified the move arguing that *"it would be better for the code base to ... get as many people to look at it as possible"* because *"there are lots of developers who can't pay the $5,000 to $10,000 for an application server, but have ideas for Java applications"* [148]. However, Microstate failed to create momentum and disappeared. In January 1999, consulting firm Lutris opensourced its application server and became increasingly popular. A review of leading enterprise-level application servers noted that Lutris' opensource product *"held great promise"* against incumbent products [167].

The momentum behind Lutris' opensource application server increasingly threatened proprietary application servers. Moreover, on 16 March 2000, JBoss announced version 1.0 of its EJBoss application server. Sun then invoked Java specifications designed to deter Microsoft leading Lutris to withdraw its opensource application server in September 2001 [144]. This left only one opensource application server as serious contender in the field, JBoss. JBoss founder Marc Fleury held a PhD in physics and previously worked as sales consultant at Sun and as visiting engineer at MIT [162]. In his own words, Fleury *"set out to bang out some code ... [while] many others started pouring in ideas and by the time [version] 1.0 was out EJBoss was already a technology maverick, ... [which] then became JBoss and took on a life of its own"* [213]. By commercially exploiting the opensource model, JBoss established the commercial opensource model, which incumbents eventually adopted.

The *incumbent firms* primarily include Sun, BEA, and IBM. Sun's proprietary application server sprung from an alliance with Netscape, whose popular internet browser was *de facto* eliminated by Microsoft. Sun's alliance with Netscape was primarily motivated by a shared aversion against Microsoft but failed to produce an application server capable of competing on par with BEA or IBM. Around the time that Microstate announced opensourcing its application server, BEA introduced its application server, which became market leader, before IBM's proprietary and JBoss' opensource application servers rose to dominance.

At the same time, IBM collaborated with opensource group Apache to add new functionalities to its proprietary application server, which it introduced in May 1998. IBM was thus the most opensource-supportive of the incumbent firms and emphasized its commitment *"to give back to the community which has given us so much in terms of its creativity"* [278]. At the beginning of this study, Sun's application server was suited for mid- to higher-end demand while BEA and IBM targeted high-end transactional processing. Two other players were Oracle and Hewlett-Packard, who also remained behind BEA or IBM in terms of market share. The formation of the Java application server field thus started in 1998 with both opensource and proprietary solutions shaping the field from the very beginning.

The *Java programming standard* plays not only a role as technological framework for Java software but also as resource for incumbent Java partners against Microsoft or opensource competitors as well as contender among other rivaling programming standards. Regarding the first point, Sun's control over the Java programming standard guaranteed compatibility of Java software. On one hand, Sun's Java control successfully averted efforts by Microsoft to undermine the ubiquitous compatibility of Java software. On the other hand, Sun employed its leverage over Java to deter opensource competitors. This allowed incumbent Java partners to extract hefty profit premiums from their Java investments [215]. Sun risked forfeiting Java licensing fees if freely available opensource application servers were replacing sales of proprietary application servers. How determined Sun was on this issue became particularly evident as Netscape, the first Java licensee, had to withdraw from Java after making its browser available for free. Sun, however, blamed Netscape's *"business difficulties"* for withdrawing from Java [147]. Similarly, opensource Java software yielded no Java licensing fees and even threatened existing licensing fees if successfully competing against proprietary Java software.

Regarding the second point, the Java programming standard itself became the object of competitive dynamics as it competed against rivaling programming standards. Both Microsoft's new.NET standard as well as opensource scripting standards allowed developing less expensive solutions and were thus attractive for both individual developers and smaller firms. To better compete against rivaling programming standards, incumbents and opensource groups called for less control and more innovation in the Java programming standard, which eventually led Sun to opensource the Java programming standard itself.

Data Collection and Sampling: Open Sampling and Discriminate Sampling

The section on data collection and sampling is structured in two parts. The first part outlines the *open sampling* procedure aimed at systematically establishing a data corpus of *potentially* relevant source documents. It involves defining the relevant population, the data search procedure, and the process of data retrieval. Defining the population involves establishing the domains and types of content applicable for analysis. Defining the data search procedure involves assessing the suitability of several internet search engines for retrieving potentially relevant statements. Conducting the search requires identifying accurate query terms and executing the query. Finally, retrieving the data involves executing the initial internet query and the subsequent website queries. A total of 38286 web pages were retrieved and stored in a database.

The second part outlines the *discriminate sampling* procedure aimed at systematically establishing a sample of the population consisting *only* of relevant source documents. Extracting only the relevant sources involves a semantic – rather than keyword-only – query of the records in the database. The semantic query yielded 548 relevant source documents. Identifying participants requires manually assigning the names of individuals mentioned in each of the 548 source documents. Participants for the study are then identified based on the frequencies with which they were mentioned. Retrieving statements of participants involves querying the 38286 records in the database for the first and last names of the participants. The relevant records are added to the sample, which eventually comprised 1088 source documents containing 1383 statements by 36 participants.

Data Collection: Open Sampling for Retrieving *Potentially* Relevant Sources

This part on *data collection* defines the relevant population, the data search procedure, and the process of data retrieval. Defining the population involves establishing the domains and types of content applicable for analysis. The focus is on internet published content, including first-hand self-published content, which is used to corroborate and augment evidence (Yin 2003). Preparing the search involves assessing the suitability of several internet search engines for finding potentially relevant statements. Google was selected because of previous findings endorsing its search and ranking algorithms vis-à-vis other search engines. This step also involves identifying accurate query terms. Finally, retrieving the data involves executing the query via

Google and subsequently via the search engines of relevant websites. The search and retrieval process started with the Google internet search and was systematically extended to cover all relevant websites featured in the initial Google result list. A total of 38286 web pages featured in the result lists of the Google and website queries were retrieved and stored in a database.

First, *defining the population* involves establishing the domains and types of content applicable for analysis. The present study is particularly interested in how rules and expectations are institutionalized over time as participants endorse one theorization vis-à-vis others. In modern societies, institutionalized rules and expectations increasingly obtain their "presence-availability" – their impact on human interaction – via electronic communication media (Giddens 1984: 123). For example, internet communication – particularly self-published content such as discussions and blogs – constitutes wider discourses by linking interpersonal communication with the broadcasting of messages (Hargittai, Gallo, and Kane 2008). While self-published content is highly subjective, it is the aggregation of collective support for theorizations which is important for institutionalization processes – that is, how "sheer numbers" play out over time (Collins 1981: 99). Rather than retrospective personal accounts such as interviews, analyzing discourses via communication media is warranted because the focus of the present study is on how interested actors actively shape theorizations by partaking in discourses.

In addition, analyzing internet content is particularly suitable in the present case because the target group is informed and communicates via internet media. Hence, the field-wide evolution of opinion-forming and of dominant conceptions is in the present case more likely to be evident in internet media, rather than, for example, in trade journals (Hoffman 1999). Moreover, through internet publishing, communication between a few participants can quickly engage and mobilize a large number of other participants and, because of low "filtering processes" and low "cost of entry," access barriers are reduced allowing oppositional and marginalized theorizations to compete along established ones (Hargittai, Gallo, and Kane 2008: 68). For the present study, the population therefore comprises publicly accessible statements in internet media that construct a particular theorization on the investigated domain, that is, opensource Java application servers or, more generally, opensource Java software.

Second, *preparing the search* involves assessing the suitability of several internet search engines for finding potentially relevant statements. Internet search engines use

various retrieval steps and ranking algorithms whose accuracy may differ. Algorithmic retrieval and ranking functions search the submitted query term in electronic texts and present the most relevant results more prominently. I used the internet search engine Google for the initial internet query. Google was repeatedly found to yield more relevant rankings (Bar-Ilan, Mat, and Levene 2006) and the perceived relevancy of resulting web pages was found to be higher with Google than with competing search engines (Toms and Taves 2004).

Google's PageRank algorithms broadly involve three steps: finding internet pages containing the query term, computing their relative importance, and ranking them accordingly (Dominich and Skrop 2005). A recent study on Google found that five factors appear to drive a result toward the top end of the result list: Google's PageRank, the website's popularity, keyword density within the page, keywords in the unique web address (URL), and the domain level (Zhao 2004). These findings demonstrate that the way Google determines relevancy has been critically examined and approved. I therefore relied on Google (.com) for the initial retrieval of websites and on the websites' internal search engine for subsequent searches of each website.

Preparing the search also requires identifying accurate query terms. Potential query terms are typically found in the research or case description (Ul-Haq 2001: 239). Based on the case description, I ran Google queries using the term 'open source' in combination with the following: 'java' and 'server.' I excluded the term 'application' because it features a wide range of possible meanings which would make the query less precise. Excluding duplicate or similar results omitted by Google, the number of actually retrieved results for the query 'open source java' was 688, 495 for 'open source server java', and 504 for 'open source java server.' Because the retrieved results typically include product descriptions, tutorials, directories, and similar pages in which participants may be cited but do not actively partake in the discourse, sampling criteria are required to narrow down the scope of relevant results.

The sampling criteria require a narrative 'story line' about Java application servers or opensource Java software, which at least informs about who (actor) did what (action) in a defined context (Charnley 1975; Langley 1999). The relevancy of results is compared based on their precision ratio, which is defined as the proportion of relevant results among the top 10 percent of retrieved results. For the query 'open source server', the precision ratio was 1/71 or 0.01 percent, it was 40/69 or 58 percent for 'open source java', 12/50 or 24 percent for 'open source server java', and 17/50 or 34 percent for

'open source java server.' Because the query term 'open source java' yielded the highest precision ratio, I used this term in the Google and in the subsequent website queries.

Finally, *retrieving the data* involves executing the query in Google and the subsequent website queries. On 21 August 2006, I conducted the Google search using the query term 'open source java,' which retrieved 688 results (excluding similar results omitted by Google). The results were extracted, processed, and stored in a database. Based on the sampling criteria defined earlier, I classified 176 of the 688 results as relevant. Most of the 176 relevant web pages were part of a larger website. For each of these relevant results, I then run a website search using the term 'open source java', unless a website search was not provided or was already conducted on the same website. In total, I conducted 93 website searches, 12 web pages and their respective websites did not provide a website search, and the remaining 71 web pages were pointing to websites already searched. In other words, 40 percent of web pages were published by a website that was already represented within the set of relevant results. The 93 website queries produced a total of 38342 results, which were retrieved, processed, and stored in the database.

Actual data retrieval involves an automated procedure for accessing each web page listed in the search results and for storing the web page as record in the database. Automated processing involves assigning the publishing date, author, and publisher to the record. For all of the 38286 records, a title, full body text, and a valid URL were available. In addition to this information, the date of publication was initially stored for 68 percent of the records and the author of the article for 23 percent of records. The first record for which a date was initially stored was dated 22 May 1995 and concerned Sun's HotJava and Sunscreen products. The last date was 31 August 2006 featured several records, such as "Re: Irritation and Open Source Java" or "Hurricane debris could be fuel source." At this point, the database comprises all Google and website search results, many of which are not relevant. I obtained an initial grouping of the data along publication dates for the 68 percent of records for which dates were initially stored in the database. The distribution of records across the investigated period was skewed. For example, the years before 1999 accounted each for just 1 percent of total records while 2005 and 2006 accounted each for 14 percent and 16 percent respectively.

The main purpose of retrieving the distribution of publishing dates at this stage is to establish a 'baseline' against which subsets of relevant data retrieved through subsequent database queries can be compared. If the subset's distribution of publishing

dates deviates from the baseline, it may be attributable to peculiarities of the subset. For example, the subset retrieved from querying the database for 'open source application server' has fewer sources (22 percent) published in 2006 than in 2005 (28 percent). This suggests a decline peculiar to this subset rather than a general issue with the data corpus. Indeed, with increasing convergence around the opensource model in the Java application server field, the controversies declined, which is evident in fewer statements during 2006 than during 2005.

Sampling Strategy: Discriminate Sampling for Extracting the Most Relevant Sources

This part on the *sampling strategy* outlines the process by which a sample of relevant sources is extracted from the data corpus, key participants are identified, and their statements retrieved. Extracting relevant sources involves semantically querying the records of the database in order to get more meaningful results than with keyword-only queries. After manually verifying and excluding non-relevant records, such as adverts and duplicate content, the initial sample is established. Identifying participants requires manually assigning the names of individuals mentioned in each of the relevant source documents. Participants for the study are then selected based on the frequencies with which they are mentioned. The thresholds were chosen so as to include between 15 to 20 participants for each phase, some of which were involved in more than one phase. Retrieving statements of participants involves querying the records of the database for the first and last names of the participants. The relevant records were added to the sample, which eventually comprised 1088 source documents containing 1383 statements by 36 participants.

First, *extracting relevant sources* involves semantically querying the records of the database for query terms specific to the case. In order to provide more meaningful results than the keyword-only queries, the *semantic query* requires that the query terms appear in proximity to each other, that is, within a few sentences or a paragraph. To construct and conduct the semantic query, potentially relevant results from internet searches must be available in the database. I used the query terms 'open, source, application, server' or variants thereof with the condition that all four words appear within two sentences. In order to limit the amount of retrieved records, the condition had to be met at least twice within a document. The semantic query thus retrieved 1226 records. The relevancy of each record retrieved from the database was then manually assessed against the sampling criteria defined earlier. With only 283 or 23 percent

non-relevant records, the relevancy of the retrieved set is relatively high. However, 178 records were excluded because they featured primarily adverts while a further 217 records were excluded because they featured duplicate content from publishers who maintain multiple websites presenting the same content. The remaining 548 records constituted the initial sample of relevant source documents.

Second, *identifying participants* requires manually assigning the names of individuals mentioned in each of the relevant source documents comprising the initial sample. If a person's name is mentioned in the text, his or her name along with role and organizational affiliation, if mentioned, is assigned to the source document. Participants for the study are then identified based on the frequencies with which they are mentioned *in each phase*. In other words, participants are selected based on their prominence in each phase and do not necessarily remain in the sample throughout all phases. More precisely, a person was included – reflecting the lower number of records in earlier periods – whenever s/he was mentioned either two or more times in the first phase (and at least once in another phase), five or more times in the second phase, or seven or more times in the third phase. The thresholds were chosen so as to include between 15 to 20 participants in each phase, some of which were involved in more than one phase.

Third, *retrieving statements* of participants involves querying the records in the database for the first and last names of the participants. Based on sampling criteria defined earlier, which require an actor doing/saying something, relevancy of the retrieved records is assessed and relevant records containing a statements by the participant are added to the initial sample. The final sample used for analysis eventually comprised 1088 source documents containing 1349 statements by 36 participants. These statements, with a typical length of a few sentences to a paragraph, constituted the unit of analysis. Table 2 shows the names and frequency of references for the 36 participants, of which the 16 key participants are highlighted in bold.

Study participants		References to participants in total and per phase		
Name, Organization	(Total)	**Experimentation**	**Disruption**	**Adjustment**
Marc Fleury, JBoss	(272)	47	143	82
Jonathan Schwartz, Sun	(205)	7	123	75
Scott McNealy, Sun	(64)	14	50	0
Bob Bickel, JBoss	(60)	0	59	0
Jason Hunter, Apache	(52)	4	48	0
James Gosling, Sun	(50)	5	45	0
Joe Keller, Sun	(45)	0	16	29
Geir Magnusson, Apache	(43)	0	0	41
Scott Dietzen, BEA	(40)	0	40	0
Stephen O'Grady, analyst	(39)	0	17	22
Mike Loukides, O'Reilly	(37)	37	0	0
Eric Raymond, OSI	(36)	14	22	0
Simon Phipps, Sun	(31)	0	0	31
Rod Smith, IBM	(30)	0	28	0
Robert LeBlanc, IBM	(27)	3	0	24
Bill Roth, Sun	(26)	9	0	17
Shawn Willett, analyst	(24)	0	0	24
Michael Goulde, analyst	(23)	0	0	23
John Loiacono, Sun	(22)	0	0	22
Dana Gardner, analyst	(22)	0	0	22
Alfred Chuang, BEA	(21)	0	21	0
Keith Bigelow, JBoss	(19)	19	0	0
Richard Stallman, FSF	(17)	0	0	17
John R. Rymer, analyst	(17)	0	17	0
Shaun Connolly, JBoss	(17)	0	0	17
Sacha Labourey, JBoss	(16)	0	16	0
David Young, Lutris	(16)	16	0	0
Byron Sebastian, SourceL.	(14)	0	0	14
Matthew Szulik, Red Hat	(13)	13	0	0
François Letellier, ObjectW.	(11)	0	0	11
Dain Sundstrom, CDN	(9)	0	8	1
Winston Damarillo, LogicB.	(9)	0	0	9
Yancy Lind, Lutris	(8)	8	0	0
Thomas Murphy, analyst	(7)	0	7	0
Brian Behlendorf, Apache	(4)	4	0	0
Karen Tegan-Padir, Red Hat	(2)	0	2	0

Table 2: References to participants in total and per phase

Data Analysis: Operationalization and Coding Process

This section on *data analysis* is structured in two parts. The first part defines the operationalization of the key analytical concept, theorization. The discourse methodology addresses five empirical challenges: (1) multilevel constitution of institutionalization, (2) temporal interplay between context and action, (3) reinforcing complementarities of institutionalization, (4) relationship between sequencing of action and receptivity to change, and (5) discursive construction of institutions. It outlines how these dimensions inform the operationalization of the three analytical concepts, theorization, mobilization, and the interplay of action and institutionalization outcomes over time.

The second part outlines the process of identifying descriptive themes and defining coding criteria for assigning themes to statements. Themes are assigned to statements along three coding dimensions: (1) the *environmental dimension* defined by the situation in which the referenced issue occurs, (2) the *action dimension* defined by the expressed interest and rationale, and (3) the *ideological dimension* defined by the adopted rhetoric and viewpoint. Based on these coding dimensions, themes are established through an open coding approach. The process involves studying the source documents along the three dimensions, to establish and consolidate themes to ensure they are distinct and accurately represent the statement. Four group of themes emerged from the iterative coding process: the commercial opensource model, Sun's Java model, the opensource Java model, and general themes resonating in other themes. The first three groups represent the three theorizations that form the focus of subsequent analyses. This section further develops the discourse methodology for investigating institutionalization processes by tracing discourses and discursive action over time.

Operationalization: Institutionalization, Theorization, and Context

This part on the operationalization of analytical concepts defines the premises along which the actual measures of operationalization are established. Analyzing change processes in management and organization studies poses several challenges for empirical research. Pettigrew, Woodman, and Cameron (2001: 698-704) identified at least four challenges: First, analysis must investigate the process of change on multiple levels attending to "the terrain around the stream that shapes the field of events, and is in turn shaped by them." Second, analysis must trace the temporal in-

terplay between context and action through an "interrogation of phenomena over time using the language of what, who, where, why, when, and how." Third, analysis must account for reinforcing complementarities that drive change processes using "a simultaneously aggregated and disaggregated analysis" to recognize complementarities across levels. Fourth, analysis must address how the "degrees of receptivity to change" are contingent on the historicity and sequencing of action and events. In addition, a fifth challenge is to investigate largely unobservable institutionalization processes where "logic does not reside in the institutions and their external functionalities, but in the way these are treated in reflection about them" (Berger and Luckmann 1966: 82).

Institutionalization is defined along the interplay of action and context involving multiple levels within and adjacent to the prevailing institutional structure. The definition links discursive action via changes in the discursive structure to institutionalization at different levels thereby addressing the multilevel constitution of institutionalization outcomes as well as the discursive construction of institutions (Jarzabkowski 2008). The interplay of action and outcomes is conceptualized as theorization through discursive actions affecting institutional outcomes at multiple levels. In the present study, the multilevel constitution is evident on the level of the single organization, the field involving multiple organizations, and the Java standard involving multiple fields. This conceptualization links the adoption of a new model on one level to its adoption or negation at other levels. Investigating the interplay of action and outcomes thus links discursive action via changes in the discursive structure to institutionalization outcomes.

In addition, the definition of institutionalization processes along the interplay of action and outcomes focuses on the 'fit' between the two thereby addressing reinforcing complementarities of institutionalization. Complementarities and achieving 'fit' in institutionalization processes involves compatible theorizations and discursive actions. Hence, complementarities are defined as discursive complementarities and identified along business, technology, and legitimation dimensions which form the conceptual building blocks of theorizations. Investigating the interplay of action and outcomes along the 'fit' between business, technology, and legitimation conceptions allows determining how and why a theorization succeeds.

Theorization is defined as the elaborate conceptualization of an espoused project expressing the adopted logic and aimed at shaping prevailing rules and expectations in

the field. Hence, theorization expresses how participants construct the espoused project over time thereby addressing the temporal interplay between context and action. In the present study, action is operationalized as discursive action comprising a participant's statement, which is also the unit of analysis. Statements of key participants construct discourses and interact to shape organizational fields (Hardy, Lawrence, and Phillips 1998).

In addition, quantitative indicators of themes express the degree of mobilization behind a theorization. First, numerical frequency represents the number of statements behind a theme that endorses a theorization. Second, thematic scope represents the depth of each theorization measured by the number of themes endorsing the theorization. Third, temporal continuance represented the longevity of a theorization measured by the endurance of supportive themes over time.

Context is operationalized as the major events based on source reference volume. Process models of institutional change suggest that major events are change stimuli, conflict and contestation, and change outcomes. Critical events representing institutional change in the present study are the agreement to allow opensource Java software, incumbents' adoption of opensource application servers, and Sun's decision to opensource the Java standard. In order to address the temporal interplay between context and action, phases are operationalized as periods between the three critical events: (1) Sun allowing opensource Java software in March 2002, (2) incumbents adopting opensource application servers starting in May 2005, and (3) Sun announcing to opensource Java in May 2006.

In order to trace the *discursive construction* of projects over time, analysis attends to the "5 WH formula" of reporting: who did what, when, where, why and how (Charnley 1975: 186). In the present study, discursive construction involves statements addressing a contested issue or event by constructing a common goal or interest together with the rationale for pursuing it and employing a rhetoric that underlines the endorsed point of view. Each statement is attributed to a speaker and a time-point in the institutionalization process. This allows labeling statements along descriptive themes that represent how participants conceptualize the espoused project (Gumperz 1982). In addition, quantitative indicators trace shifts in aggregate statements, that is, the discursive structure.

The qualitative analysis identifies *discursive strategies* addressing the relationship between sequencing of action and receptivity to change. It identifies the core argu-

ments used to develop the business, technology, and legitimation conceptions under-pinning a theorization. These conceptions evolve and thus remain compatible with the changing context. For example, pushing a new model too early may result in failure while waiting too long to promote it may be viewed as opportunistic. Following Cheney et al. (2004), the discursive strategies identified in the present study are (1) linking one issue with another (Identification), (2) downplaying an issue (Containment), (3) declaring a concern to be overriding (Totalizing), (4) suggesting that a consensus is larger than it actually is (Self-expansion).

The *discursive structure* is defined as constituted by the thematic pattern, prominent actors, and action orientations. The analysis of the field's discursive structure focuses on these three indicators along which structural characteristics of the discourse on open-source Java software is assessed. The first indicator, thematic pattern, reflects the frequency and centrality of themes and points to the importance of a theme within a phase. Frequency is based on reference volume representing the amount of statements that support the theme. Social network analysis is employed to map the thematic pattern (de Nooy, Mrvar, and Batagelj 2005). The centrality of themes is defined by the number of ties through which the theme is linked to other themes. One theme is linked to another theme whenever someone in the set of participants referencing the one theme also references the other theme in other statements. In addition, themes supporting one theorization have positive ties among themselves while having negative ties to themes supporting competing theorizations. Network diagrams thus allow visualizing the thematic pattern and the relationship between competing theorizations.

The second indicator, prominent actor, identifies which type of organization – opensource firm, incumbent firm, or opensource group – is most prominent in shaping the discourse. It reflects the frequency and centrality of participants and, indirectly, of the organizations with which participants are affiliated. The centrality of participants is defined by the number of ties through which a participant is linked to other participants. One participant is linked to another participant whenever they reference the same theme in one of their statements. The centrality degree of participants expresses the embeddedness of a participant in the discursive structure.

The third indicator, action orientation, reflects whether a statement endorses or rejects a change project. Statements under themes that primarily endorse a change project vis-à-vis institutional barriers exhibit a reconstructive action orientation, aimed at promoting a new and potentially disruptive model. Statements under

themes that primarily reject a change project while endorsing the status quo exhibit an iterative action orientation, aimed at maintaining the status quo. Statements exhibit a hybrid orientation if neither a reconstructive nor an iterative orientation is primarily evident.

In sum, this part operationalizes the analytical concepts. Regarding the interplay of action and outcomes, operationalization requires conceptualizing theorization as affecting multiple levels. This allows linking discursive action via changes in the discursive structure to institutionalization outcomes thereby addressing the multilevel constitution of institutionalization. In addition, complementarities are defined as discursive complementarities and conceptualized as compatible business, technological, and legitimation conceptions enrolled in theorizations. This allows determining whether the 'fit' between these conceptions reinforces a theorization.

Theorization is defined as the elaborate conception of an espoused project that expresses the adopted logic, which is evident in statements of participants. Mobilization behind a theorization is operationalized through quantitative indicators of themes. Finally, *discursive structure* is operationalized based on aggregating statements leading to thematic patterns, prominent actors, and dominant action orientations. Investigating theorizations thus allows reconstructing the discourse on opensource Java software and to identify shifts in the thematic pattern, prominent actors, and the prevalent action orientations of each phase.

Coding Process: Systematically Assigning Coding Labels to Statements

This part outlines the coding process involving the definition of coding categories along which coding labels are assigned through an open coding approach as the basis to identify the themes along which theorizations are constructed. The present discourse methodology adopts a broader semantic approach connecting discursive action to descriptive labels, such as 'discussing politics' or 'making a proposal', whose meaning and interpretation is negotiated over time and tied to the understandings and beliefs that actors hold (Gumperz 1982 [1999]). In the present study, theorization is operationalized by descriptive labels or *themes* whose meaning and interpretation evolves over time, tied to evolving interests and understandings which participants express through their statements. The theorization concept thus links situated action (statements) to field-level institutional outcomes (collective understandings). A formalized approach for linking conditions, actions, and outcomes can be found in Strauss and Corbin's (1990) axial cod-

ing approach. Based on the axial coding categories, I developed six categories with a particularly discursive focus following Jäger's (2001) discourse methodology.

The six coding categories and the coding labels are defined so as to be disjunctive and precise avoiding overlap (Diekmann 1995). The six coding categories are defined as follows:

(1)   *Trigger* refers to the antecedent that was conducive to the emergence of a problem or issue (example: opensource initiatives started using Sun's Java standard).

(2)   *Problem* represents the central issue at which such actions are directed (example: Sun denied opensource implementations in Java).

(3)   *Goal* (or Action) identifies the effect which the observed or described action may have as constitutive element of a theme or discourse to which it contributes (example: urging Sun to allow opensource Java software).

(4)   *Reasoning* describes the actor's explicit or implicit understanding of how the goal can be realized or what effects the pursued action may have (example: allowing opensource Java software was argued to benefit Java).

(5)   *Rhetoric* refers to the concrete argument or criticism made in order to justify or interpret the promoted action (example: accusing Sun of protecting its revenues by curtailing opensource competitors).

(6)   *Ideology* describes the actor's explicitly or implicitly articulated view or stance as expressed by the claim (example: opensource is seen as paradigm shift).

Based on the six coding categories, coding labels are established for each category through an open coding approach. Open coding involves "giving each discrete incident, idea, or event a name, something that stands for or represents the phenomenon" (Strauss and Corbin 1990: 63).

The coding labels are assigned to each coding category based on the above definitions. In other words, when reading a statement – including the surrounding text – a coding label pertaining to each of the six coding categories is assigned to the statement. For example, a statement may contain the following sentences:

We have a very close adherence to the specifications from Sun ... To further acceptance in the mainstream, it would be helpful if JBoss were officially backed by Sun.

The statement can be read as follows: (1) *Triggered* by adoption of opensource software, at (2) *issue* was the (lack of) Java certification. The (3) *goal* or effect of this statement is to support certifying the JBoss opensource application server, (4) *reasoning* that it closely complies with Sun's Java specifications. The (5) *rhetoric* suggests that Sun denies Java certification to opensource competitors despite close compliance with

Java specifications. Overall, including related statements, the statement expresses an (6) *ideology* that is supportive of opensource Java software.

Consequently, the coding labels pertaining to each of the six coding categories for this statement are as follows: (1) opensource adoption, (2) certification denied, (3) certification demanded, (4) standard compliance, (5) opensource competition, (6) opensource software. As postulated by the axial coding approach, assigning and relating coding labels across the coding categories yields a highly dense account of what was observed or described. Thus, a narrative framework obtains capable of describing the event in relatively abstract terms.

After assigning coding labels, they are later grouped and consolidated to ensure they are precise and do not overlap. Grouping involves merging duplicate or too detailed coding labels that represent the same overall meaning. For example, the final coding scheme did not list the various opensource initiatives separately, but grouped them under the code 'opensource adoption' (rather than 'JBoss adoption'), thus representing all relevant opensource initiatives. The grouping of coding labels within a category and the consolidation across coding categories thus establishes a comprehensive coding scheme. Through an iterative grouping and consolidation procedure lasting several months, coding labels are reduced to a few top-level coding labels. A descriptive theme can then be assigned to the statement based on the unique combination of the top-level coding labels pertaining to each of the six coding categories. Table 3 exhibits the top-level coding labels for the themes identified in the present study.

Group of Themes: Summarizing the Main Theorizations in the Field

Four groups of themes emerged from the iterative coding process: the commercial opensource model, Sun's (proprietary) Java model, the opensource Java model, and general themes. The first three groups represent the three main theorizations that form the focus of subsequent analyses. The coding rules for each theme pertaining to one of the four groups are explained in detail in the following paragraphs and are summarized in Table 3 along the top-level coding labels.

THEORIZATION OF THE COMMERCIAL OPENSOURCE MODEL

The group of themes supporting the theorization of the *commercial opensource model* includes the four themes *OSS exploitation, Incumbent OSS move, OSS delivers*, and *Services model*. Coding rules specify that statements under the theme *OSS exploitation* refer to a situation where increased competition fueled competitive rivalry within the field. These statements express an interest to increase competitiveness by addressing

and exploiting opensource dynamics in the field, which is also reflected in the rhetoric employed by these statements. Participants thus express a view characterized by competitive rivalry. Statements supportive of this theme were primarily made by opensource firms. For example, JBoss claimed that *"every major player in software now has to have an opensource strategy to match Sun ... [which] just detonated a nuclear bomb in the [revenues] of IBM and the other traditional vendors"* [174].

Under the theme *Incumbent OSS move*, statements refer to a situation where commoditization or innovation pressure led to the adoption of the opensource model. These statements express an interest to increase competitiveness by adopting opensource projects. The rhetoric employed highlights the benefits of opensource software. Participants thus express a view characterized by competitive rivalry. Statements supportive of this theme were primarily made by incumbent firms. For example, just after its share price dropped significantly, an incumbent firmed justified *"looking at open source to officially get our innovations into more developers' hands"* [218].

Under the theme *OSS delivers*, statements refer to a situation where opensource adoption increased pressure to innovate. These statements express an interest to promote the commercial opensource model by addressing either innovation or competitive pressure in the field, which is also reflected in the rhetoric employed by these statements. Participants thus express a viewpoint characterized by competitive rivalry. Statements supportive of this theme were primarily made by opensource firms. For example, JBoss claimed that *"our technology is going to blow everybody else out of the water ... [and] we know how to survive and thrive in those conditions ... [but incumbents] can't survive with $0 in licenses"* [213].

Finally, statements under the theme *Services model* refer to a situation where commoditization pressure or opensource adoption led to widespread competition on services rather than products. These statements express an interest to increase competitiveness through the software-as-service model, which is also reflected in the rhetoric employed by these statements. Participants thus express a view characterized by competitiveness through a services model. Statements supportive of this theme were primarily made by opensource firms. For example, an analyst observed a *"shift from license revenues to making money on support and maintenance, and the opensource movement is really driving that"* [201]. The group of themes supporting the theorization of the commercial opensource model thus shares a concern with competitive rivalry and a willingness to adopt opensource projects to increase competitiveness.

Theme assignment Themes based on combination of six coding categories

	Trigger/Problem	Goal/Reasoning	Rhetoric/Ideology
Commercial opensource model			
OSS exploitation	• Competitive rivalry • Competitive pressure	• Competitiveness • Competitive dynamic	• OSS competitive • Competitiveness
Incumbent OSS move	• Commoditization or innovation pressure • Opensource adoption	• Competitiveness • OSS benefits	• OSS competitive • Competitiveness
OSS delivers	• Opensource adoption • Innovation pressure	• Promoting OSS • Commercial approach	• OSS competitive • Competitiveness
Services model	• Commoditization or opensource adoption • Software-as-service	• Competitiveness • Services model	• Software-as-service • Competitiveness
Sun's Java model			
Java stewardship	• Java control by Sun • Adoption barriers or pressure for change	• Java compatibility • Java compliance	• Java compliance • Java control
Java competitiveness	• Competing standards • Pressure for change	• Java promotion • Java innovation	• Innovation pressure • Java competitiveness
OSS shortcomings	• Opensource adoption • Adoption barriers	• Sustaining barriers • Barriers are deterring	• Barriers are deterring • Accepting barriers
Opensource Java model			
Open up Java	• Opensource adoption • Adoption barriers	• Promoting changes • Innovation pressure	• Criticizing barriers or endorsing changes • OSS adoption
OSS promotes Java	• Opensource adoption • Pressure for change	• Promoting OSS • OSS benefits Java	• OSS benefits Java • Java competitiveness
Control stifles OSS	• Opensource adoption • Adoption barriers	• Promoting OSS • Java too restrictive	• OSS benefits Java • Java competitiveness
General themes			
OSS paradigm	• Opensource adoption • Innovation pressure	• Promoting OSS • Broader benefits	• OSS general benefits • Innovativeness
Incumbent strategy	• Commoditization • Competitive rivalry or innovation pressure	• Competitiveness • Cost pressure or competitive dynamic	• Cost pressure or competitive dynamic • Competitiveness

Table 3: Themes based on combination of six coding categories

THEORIZATION OF SUN'S JAVA MODEL

The group of themes supporting the theorization of *Sun's Java model* includes the three themes *Java stewardship*, *Java competitiveness*, and *OSS shortcomings*. Coding rules specify that statements under the theme *Java stewardship* refer to a situation where Sun's Java control created either barriers to opensource adoption or pressure for change. These statements express an interest to ensure Java compatibility through compliance to standard specifications, which is also reflected in the rhetoric employed. Participants thus express a view supportive of Sun's sponsorship of Java. These statements were primarily made by Sun. For example, Sun justified its control stressing that otherwise *"Microsoft successfully fragments the Java technology"* [149].

Under the theme *Java competitiveness*, statements refer to a situation where rivaling programming standards led to competition between standards. These statements express an interest to promote the Java standard by ensuring its compatibility and innovativeness. The rhetoric employed highlights either innovation pressure or community participation. Participants thus express a view that is supportive of the Java standard. These statements were primarily made by Sun. For example, Sun maintained that despite Microsoft's marketing efforts, Java is *"more feature-complete, more mature"* [154].

Finally, statements under the theme *OSS shortcomings* refer to a situation where opensource adoption met with barriers to further adoption. These statements express an interest to sustain or accept existing reservations by upholding or succumbing to existing barriers, which is also reflected in the rhetoric employed by these statements. Participants thus express a view that existing barriers obstruct opensource adoption. For example, one new entrant withdrew its opensource application server citing Sun's restrictions making it *"illegal for our customers to deploy it"* [144]. The group of themes supporting the theorization of Sun's Java sponsorship thus shares a concern Java compatibility and a willingness to enforce Sun's Java control.

THEORIZATION OF THE OPENSOURCE JAVA MODEL

The group of themes supporting the theorization of *the opensource Java model* includes the three themes *Open-up Java*, *OSS promotes Java*, and *Control stifles OSS*. Coding rules specify that statements under the theme *Open-up Java* refer to a situation where opensource adoption met with barriers to further adoption. These statements express an interest to mitigate Sun's Java control either by highlighting innovation pressure to demand respective changes or by an outright adoption of required changes. The rhetoric employed either criticizes innovation barriers or endorses opensource innovation. Participants thus ex-

press a view supportive of opensource adoption. These statements were made by several players in the field. For example, an incumbent favored opensourcing Java because *"the marriage with open source is going to be critical"* [129].

Under the theme *OSS promotes Java*, statements refer to a situation where opensource adoption exerts pressure for change. These statements express an interest in opensource adoption citing benefits for the Java standard. The rhetoric employed highlights either community participation or Java competitiveness. Participants thereby express the view that opensource Java software benefits the Java standard. These statements were primarily made by opensource players and the media. For example, an opensource firm asked *"Sun to certify us and give us the backing and credibility to be successful in competing against Microsoft a[t] the entry-level"* [101].

Closely related is the theme *Control stifles OSS*, with similar coding rules except that the interest in opensource adoption is legitimated by a general need to encourage innovation. The rhetoric employed therefore questions exposed existing innovation barriers. For example, an influential news editor warned that by disparaging opensource competitors, *"Sun may succeed where Microsoft failed: in destroying the promise of Java"* [246]. The group of themes supporting the theorization of the opensource Java model thus shares a concern to mitigate Sun's Java control and a willingness to enforce Sun's Java control to adopt an open Java governance model.

GENERAL THEMES

The final group comprises general themes and includes the two themes *OSS paradigm* and *Incumbent strategy*. Statements under the theme *OSS paradigm* refer to a situation where opensource adoption increased innovation pressure. These statements express an interest either in opensource adoption or in promoting opensource approaches in general. The rhetoric employed highlights the innovation benefits of opensource software. Participants thus express a view supportive of innovation in general. These statements were made by several players in the field. For example, an opensource firm claimed that *"we have validated a professional category and model that is being copied"* [235].

Under the theme *Incumbent strategy*, statements refer to a situation where commoditization pressure led to competitive rivalry or innovation pressure. These statements express an interest to increase competitiveness by addressing commoditization pressure or competitive dynamics, which is also reflected in the rhetoric employed. Participants thus express a view characterized by competitive rivalry.

Pre-Analysis: Major Events and Discursive Structure

This section on the *pre-analysis* is structured in two parts. The first part reconstructs the chronology of major events across the three phases, referred to as Emergence, Disruption, and Adjustment phases. Major events are based on the reference volume per day for a particular topic. During the first phase, between 1 January 1998 and 21 March 2002, four events were classified as major events. They refer to opensource Java software and particularly to the conflict surrounding the first opensource application servers. The second phase featured six major events between 22 March 2002 and 9 May 2005. During the Adjustment phase, between 10 May 2005 and 31 August 2006, four events were classified as major events.

The second part identifies the key features of the discursive structure across all phases. Of the 1349 statements in the sample, 1183 statements were themed representing 88 percent of all statements. The themes *OSS exploitation* and *Incumbent OSS move* are by far the most prominent themes representing over a quarter of all themed statements. Overall, the theorization of the commercial opensource model is by far the most prominent across all phases. Regarding participants and organizations, JBoss founder Fleury and Sun executive Schwartz are by far the most prominent participants accounting for over 35 percent of all statements of the 36 participants in this study. This section presents an overview of key characteristics of the data in the sample. After the pre-analysis, intra-coder reliability testing was conducted on a randomly derived subset of 120 statements about six months after the initial open coding process. The reliability testing achieved 97 percent congruence with the initial coding of the subset of 120 statements.

Major Events: Chronology of Events across the Emergence, Disruption, and Adjustment Phases

This part on *major events* develops a chronology of events based on source reference volume. Major events are based on the reference volume per day for a particular topic. More precisely, a topic was defined as a major event whenever it was mentioned by three or more source documents from 2004 to 2006, or – reflecting the lower number of available data – by two or more source documents from 1998 to 2003. Table 4 presents a chronological list of the 17 major events which are mapped to the timeline in Figure 1.

During the first phase, between 1 January 1998 and 22 March 2002, four events were classified as major events. They refer to opensource Java software and particular-

ly to the conflict surrounding the first opensource application servers. Because open-source Java software started to gain attention, the first phase is referred to as Experimentation phase. The second phase featured six major events between 22 March 2002 and 10 May 2005. JBoss' disruptive opensource model features prominently in these major events, characterizing the second phase as Disruption phase. During the Adjustment phase, between 10 May 2005 and 31 August 2006, four events were classified as major events. These events refer either to JBoss responding to incumbents' adoption of the opensource model or to Sun's decision to opensource Java. Because of the field-wide adoption of the opensource model, the third phase is referred to as Adjustment phase. This part reconstructs a brief overview of each phase along the major events.

During the *Experimentation phase*, four events were classified as major events, based on source reference volumes. On 1 April 1998, the early debate on opensourcing the Java programming language gained attention. The second major event occurred on 18 August 2000, at a time when the conflict between Sun and opensource firm Lutris gathered increasing attention in the field. Opensource firm Lutris was preempted from licensing Java because the Java license barred licensees from opensourcing their Java software. Sun's handling of the issue drew the ire of loyal Sun supporters as well as the opensource community. The third major event occurred about two months later, on 13 October 2000, when Lutris introduced a new version of its application server but was reluctant to make it available as opensource software. On 14 September 2001, Lutris withdrew its popular opensource application server citing Sun's Java licensing restrictions.

Meanwhile, opensource group Apache and the media continued to pressure Sun on changing the Java licensing terms. Eventually, Sun pledged to concede in all points to Apache's ultimatum, thereby legalizing opensource Java software and paving the way for the commercial exploitation of opensource application servers. This major event, which was covered broadly on 26 March 2002, marks the end of the Emergence and the start of the Disruption phase. Changes to rules and legislation aimed at accommodating a hitherto marginalized approach are tangible evidence of institutional change in the field (Holm 1995).

Major events	Chronology of major events based on reference volume
Date	**Description**
① 1 April 1998	First ideas about opensourcing the Java programming standard
② 18 August 2000	Sun invokes restrictions prohibiting opensource Java software
③ 13 October 2000	Lutris introduces new version of its opensource application server
④ 14 September 2001	Lutris withdraws its opensource application server
⑤ 26 March 2002	Java standard is changed to allow opensource Java software
⑥ 17 November 2003	JBoss commits to certification, indemnifies customers against liabilities
⑦ 26 February 2004	IBM urges Sun to opensource the Java programming standard
⑧ 19 May 2004	Former market leader BEA opensources application development tool
⑨ 29 June 2004	Dispute intensifies about opensourcing the Java programming standard
⑩ 20 September 2004	JBoss introduces certified version of its opensource application server
⑪ 18 October 2004	JBoss moves into market for business process management
⑫ 10 May 2005	IBM adopts opensource application server
⑬ 27 June 2005	Sun adopts opensource application server
⑭ 27 September 2005	JBoss announces strategic partnership with Microsoft
⑮ 10/11 April 2006	JBoss acquired by leading Linux distributor Red Hat
⑯ 16/17 May 2006	Sun announces to opensource the Java programming standard
⑰ 15 August 2006	Sun provides details of opensourcing the Java programming standard

Table 4: Chronology of major events based on reference volume

The Disruption phase featured six major events between March 2002 and May 2005. On 17 November 2003, JBoss announced an agreement with Sun paving the way for Java certification and indemnifying its customers against potential lawsuits arising from the use of its source code. On 26 February 2004, IBM urged Sun to opensource the Java programming standard, which triggered a debate that involved incumbents and

opensource groups. Then, on 19 May 2004, former market leader BEA opensourced its application development tool for its application server. On 29 June 2004, the debate about opensourcing the Java programming standard resurfaced again. JBoss' first release of a Sun-certified opensource application server gathered attention on 20 September 2004. And about a month later, on 18 October 2004, JBoss' announcement of entering the business process management market with its opensource products drew attention. Overall, three of the six major events of the Disruption phase refer to opensource firm JBoss, which demonstrates that its opensource application server and its enterprise software became a dominant topic in the field.

Eventually, on 10 May 2005 and on 27 June 2005, incumbent firms IBM and Sun, respectively, announced adopting opensource application servers. A total of 34 source documents referred to these two events, which together mark the end of the Disruption and the start of the Adjustment phase. The adoption of opensource application servers demonstrates that the opensource application server, including selling services around the product, became a valid and viable business. Indeed, Marc Fleury, founder of the opensource JBoss application server found *"we have validated a professional category and model that is being copied"* [235]. Successfully introducing and establishing a radically new business category is tangible evidence of institutional change in an organizational field (Leblebici et al. 1991).

During the Adjustment phase, between May 2005 and August 2006, four events were classified as major events. Again, two of these events refer to opensource newcomer JBoss. On 27 September 2005, JBoss' announcement of a strategic partnership with Microsoft gathered attention. The move came just months after rivals IBM and Sun started to compete directly with JBoss in the area of opensource enterprise computing. And about half a year later, on 10 April 2006, JBoss accepted to become acquired by leading Linux distributor Red Hat for at least US$350 million. The acquisition, which 13 source documents referred to, signaled the maturity and consolidation of the commercial opensource model that JBoss introduced into the field. It is further evidence of the successful establishment of a disruptive and hitherto marginalized business model and thus proves that institutional change became successfully established in the field.

The remaining two major events concern the opensourcing of the Java programming standard. On 16 May 2006, Sun announced opensourcing the Java programming standard, a move that was covered by 14 source documents. About three months later, on 15 August 2006, Sun outlined its plan to opensource Java. The move to opensource Java reinvigorated the relationship between Sun, which understood its control over the Java

standard as 'stewardship,' and Java partners and developers, which criticized Sun's control over Java. Changes to Java governance aimed at adopting a hitherto marginalized model are further evidence of the profound institutional changes in the field.
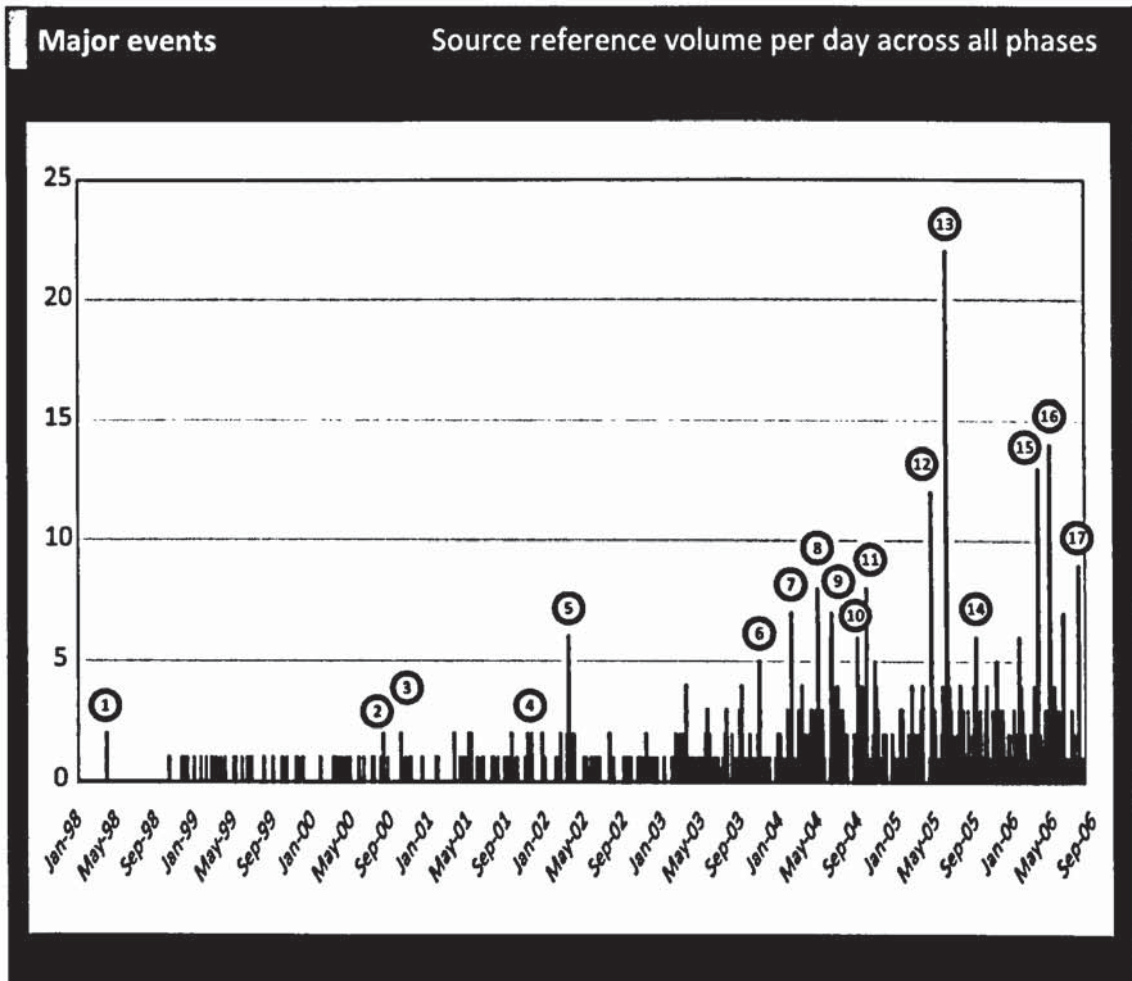
Figure 1: Major events based on source reference volume per day across all phases

Discursive Structure: Prominence of Themes, Participants, and Organizations

This part on the *discursive structure* provides an overview of prominent themes, participants, and organizations across all phases. Of the 1349 statements in the sample, 1183 statements were themed representing 88 percent of all statements. Analysis focuses on the subset of themed statements. Regarding themes, *OSS exploitation* is by far the most prominent theme representing 15 percent of all themed statements, followed by *Incumbent OSS move*, which represents 13 percent of all themed statements. Together, these two themes supporting the theorization of the commercial opensource model represent over a quarter of all themed statements.

Overall, the theorization of the commercial opensource model is by far the most prominent across all phases. Regarding participants and organizations, JBoss founder Fleury is by far the most prominent participant accounting for 20 percent of all statements, followed by Sun executive Schwartz, who accounts for 15 percent of all statements. Together, Fleury and Schwartz account for over 35 percent of all statements of the 36 participants in this study. This part reports the support behind the three theorizations, commercial opensource model, Sun's Java model, and the opensource Java model, as well as the prominence of participants and organizations across all phases.

The support behind the three theorizations, commercial opensource model, Sun's Java model, and the opensource Java model, is based on statements endorsing the respective themes. Table 5 reports the frequency by which themes were referenced by statements in total and per phase. The group of themes supporting the theorization of the commercial opensource model is by far the most prominent group of themes representing 44 percent of all themed statements. This group includes the four themes *OSS exploitation*, *Incumbent OSS move*, *OSS delivers*, and *Services model*. These themes share a concern with competitive rivalry and a willingness to adopt opensource projects to increase competitiveness.

The group of themes supporting the theorization of Sun's Java model represents 24 percent of all themed statements. This group includes the three themes *Java stewardship*, *Java competitiveness*, and *OSS shortcomings*. These themes share a concern Java compatibility and a willingness to enforce Sun's Java control. The group of themes supporting the theorization of the opensource Java model represents 17 percent of all themed statements. This group includes the three themes *Open-up Java*, *OSS promotes Java*, and *Control stifles OSS*. These themes share a concern to mitigate Sun's Java control and a willingness to adopt a more open approach to Java governance. Finally, the group comprising the two general themes represents 15 percent of all themed statements. This group includes the two themes *OSS paradigm* and *Incumbent strategy*. These themes share a general focus that resonates in other themes.

Contrary to expectations, overall and across all phases, incumbent firms are most vocal in shaping the discourse on opensource Java software in the field. Table 2 above exhibits the prominence of participants and, indirectly, of organizations based on the number of statements made. Statements from participants at incumbent firms represent 41 percent of all statements. Incumbent firms primarily include Sun, BEA, and IBM whose application servers also feature prominently in studies on overall market share

[253]. Two other incumbents are Oracle and Hewlett-Packard, who share of the application server market remained behind BEA or IBM's application server solutions.

Meanwhile, statements from participants at opensource firms represent 34 percent of all statements. Opensource firms primarily include Lutris and JBoss. Market share of JBoss steadily increased to reach 34 percent at the end of 2004, tying for first place with IBM [253]. During the last phase, new opensource startups entered the field providing services and support around opensource application servers. A final group comprising opensource advocates and industry analysts represents 25 percent of all statements, with analysts representing about 10 percent. Opensource advocates include participants at opensource groups Apache, Open Source Initiative (OSI), and Free Software Foundation (FSF) while analysts came from firms such as Forrester Research.

Themes	Frequency of themes in total and per phase			
Theme	(Total)	Experimentation phase	Disruption phase	Adjustment phase
OSS exploitation	(182)	0	91	91
Incumbent OSS move	(159)	5	58	96
Java stewardship	(135)	20	84	31
Open-up Java	(125)	25	85	15
OSS delivers	(118)	40	47	31
Incumbent strategy	(94)	0	70	24
OSS paradigm	(80)	19	16	45
Java competitiveness	(76)	6	38	32
OSS shortcomings	(69)	17	32	20
Services model	(63)	6	28	29
OSS promotes Java	(51)	14	12	25
Control stifles OSS	(30)	11	17	2

Table 5: Frequency of themes in total and per phase

Conclusion

This methodology chapter develops a comprehensive discourse methodology for investigating institutionalization processes by tracing discourses and discursive action over time. The first section justifies the case selection and provides background information on the case. Studying the Java application server field addresses the problem of how substantial change occurs in an organizational field if organizations constantly compare themselves and imitate each other. The case was particularly suitable to investigate the (1) interests and power bases of competing groups, (2) changes in the focal institutional structure, and (3) action orientations of discursive action. The second section outlines the data collection and sampling process. The *open sampling* procedure systematically establishes a data corpus of *potentially* relevant source documents. It involves defining the relevant population, the data search procedure, and the process of data retrieval. The *discriminate sampling* procedure systematically establishes a sample of the population consisting *only* of relevant source documents. It involves extracting relevant sources, identifying participants, and retrieving statements of participants. Relevant data was added to the sample in an iterative search and retrieval process, eventually comprising 1088 source documents containing 1383 statements by 36 participants.

The third section on data analysis starts with the operationalization of key analytical concepts. It then outlines the coding process involving the definition of coding categories along which coding labels are assigned through an open coding approach as the basis to identify the themes along which theorizations are constructed. Through an iterative process of grouping and consolidation, four groups of themes were established: theorization of the commercial opensource model, theorization of Sun's Java model, theorization of the opensource Java model, and a group of general themes. The fourth section presents a preanalysis of data in the sample that reconstructs the chronology of major events and identifies the key features of the discursive structure across all phases. The preanalysis identified three major events that serve as tangible evidence that institutional change occurred in the field: changes to the Java standard allowing opensource Java software, adoption of the opensource application server by incumbents IBM and Sun, and acquisition of opensource newcomer JBoss for at least US$ 350 million.

4. Analysis of Discursive Structure

This chapter on discursive structure identifies the thematic pattern, prominent actors, and action orientations for each of the three phases. The chapter is structured in three sections and a conclusion. Each section analyzes the thematic pattern of theorizations and investigates actor positions and action orientations of major themes. The first section analyses the *Experimentation phase* covering the period from January 1998 to March 2002. During 1998, a small consulting firm introduced the first opensource application server while incumbents Sun, BEA, and IBM introduced or extended their proprietary application servers. Two new opensource players, Lutris and JBoss, introduced opensource application servers during 1999. The popularity of Lutris and JBoss increasingly threatened proprietary application server. Sun invoked Java specifications leading Lutris to withdraw its opensource application server leaving JBoss as the only one major opensource firm in the field.

The second section analyses the *Disruption phase* from March 2002 to May 2005. The beginning of this phase is marked by Sun's agreement to allow opensource Java software. However, with Sun's Java certification as key differentiator, costs for Java compatibility testing and certification continued to erect entry barriers for small firms such as JBoss. JBoss threatened incumbents' revenues while Sun risked losing Java licensing fees. Sun's leverage over the Java standard became contentious with JBoss and opensource-supportive incumbents, such as IBM, becoming increasingly impatient with how Sun controlled the Java standard.

The third section analyses the *Adjustment phase* from May 2005 to August 2006. The beginning of this phase is marked by IBM's adoption of opensource application servers, which Sun followed by opensourcing its application server. The Adjustment phase is characterized by accelerating momentum behind opensource approaches and ends after Sun announced opensourcing the Java programming standard. The conclusion summarizes the key developments and outlines the relationship between theorizations and institutional outcomes of each phase.

Experimentation Phase (January 1998 – March 2002)

The Experimentation phase was characterized by emerging commoditization dynamics introduced by cost pressures from opensource software and open standards in computer hardware [257].[4] In November 1998, a small consulting firm introduced the first opensource application server, which provided enterprise-level features and had been deployed in several mission-critical solutions [150]. Sun's proprietary application server sprung from an alliance with an internet browser vendor. Around the time that Microstate announced opensourcing its application server, BEA introduced its application server, which became market leader before IBM's proprietary and JBoss' opensource application servers rose to dominance in the Disruption phase. Meanwhile, IBM collaborated with opensource group Apache to add new functionalities to its proprietary application server, which it introduced in May 1998. IBM was therefore one of the opensource-supportive incumbents. Two other players were Oracle and Hewlett-Packard, who remained behind BEA or IBM's application server solutions and play only a minor role in this study.

The formation of the Java application server field thus started in 1998 with both opensource and proprietary solutions shaping the field from the very beginning. During 1999, two new opensource application servers were introduced by consulting firm Lutris and startup JBoss. The popularity of Lutris and JBoss increasingly threatened proprietary application servers. Sun then invoked Java specifications leading Lutris to withdraw its opensource application server in September 2001 [144]. This left only one opensource application server as serious contender in the field, JBoss. But JBoss and opensource proponents successfully theorized the new opensource model and mobilized supporters against Sun's opensource restrictions. Eventually, Sun pledged to change the Java standard and licensing terms to allow opensource Java software. Changes to rules and legislation aimed at accommodating a hitherto marginalized approach are tangible evidence of institutional change in the field (Holm 1995).

This section on the Experimentation phase is structured in three parts and a concluding summary. The first part investigates the *thematic pattern* sustaining the discursive structure by analyzing reference volume, centrality, and clusterability of

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[4] References to source documents of exemplary data snippets are in the Appendix.

themes. It demonstrates that theorizations of the commercial opensource model and the opensource Java model dominated the thematic pattern while the theorization of Sun's proprietary Java model remained marginal. This analysis thus accounts for the emergence of new theorizations which endorsed and increasingly legitimated a view that diverged from prevailing rules and expectations.

The second part investigates the *prominent actors* sustaining the discursive structure. It demonstrates that commercial opensource firms as well as non-commercial opensource groups are among the most prominent organizational types in the Experimentation phase. The analysis first identifies the prominent organizations, of which JBoss, Lutris and O'Reilly Media are particularly prominent. The analysis then identifies the opensource firm as most prominent organizational type driving the emerging discourse on opensource Java software. Noteworthy is the shift of former supporters of Sun's proprietary Java model, such as O'Reilly Media or IBM, towards the opensource model. This analysis thus demonstrates that peripheral actors were able to construct an increasingly pervasive counter-discourse supportive of opensource approaches despite entrenched logics and power differentials supporting incumbents.

The third part investigates the *action orientations* sustaining the discursive structure by analyzing whether statements expressed primarily iterative, reconstructive, or hybrid action orientations. It demonstrates that major support during the Experimentation phase is behind opensource approaches. The analysis thus identifies the reconstructive action orientation as most prominent orientation of statements.

Thematic Pattern: Prevalence of Theorizations of the Commercial Opensource Model and of Opening Java Governance

This part on the *thematic pattern* of the discourse on opensource Java analyzes reference volume, centrality, and clusterability of themes during the Experimentation phase. It demonstrates that theorizations of the commercial opensource model and of an open Java governance model dominated the thematic pattern while the theorization of Sun's proprietary Java model remained marginal. This analysis first identifies the major themes based on reference volume, centrality, and clusterability of themes. The opensource-supportive themes *OSS delivers* and *Open-up Java* and the oppositional theme *Java stewardship* were particularly prominent among the major themes. Based on the major themes, the analysis identifies the most prominent theorization in the field.

The theorization of the commercial opensource model was most prominent, followed by the theorization of an open Java governance model. The theorization of Sun's proprietary Java model was least prominently referenced. Thus, in the early discourse on opensource Java software – in contrast to later phases – powerful incumbents were not prominently represented. There are at least two reasons, one of which can be attributed to the leverage that incumbents already had over the Java standard. The task of exposing barriers to innovation was therefore not with incumbents but with opensource proponents. The second reason was that opensource application servers remained peripheral leading Sun and other incumbents to focus on more pertinent issues, such as Microsoft's efforts to establish.NET as competitor to Java. Existing power differentials protecting incumbents from potentially disruptive innovations and existing logics insulating incumbents from perceiving new opportunities are prime examples of embedded agency. This analysis accounts for the emergence of a counter-discourse which endorsed and increasingly legitimated a view that diverged from prevailing rules and expectations.

Quantitative view		Reference volume and centrality of the 10 themes	
Experimentation phase			
	Frequency	**Connections**	**Centrality degree**
Themes	Reference volume	Links to other themes	Score based on links
OSS delivers	40	6	0.67
Open-up Java	25	9	1.00
Java stewardship	20	6	0.67
OSS paradigm	19	5	0.56
OSS shortcomings	17	6	0.67
OSS promotes Java	14	9	1.00
Control stifles OSS	11	4	0.44
Java competitiveness	6	5	0.56
Services model	6	7	0.78
Incumbent OSS move	5	7	0.78

Table 6: Reference volume and centrality of the 10 themes (major themes in bold and proprietary perspectives in italics)

Most statements supporting the *major themes* endorse opensource approaches, with oppositional themes endorsing Sun's proprietary Java model representing a quarter of all statements among the major themes. Table 6 reports the reference volume and centrality of themes in the Experimentation phase with major themes in bold and themes endorsing Sun's proprietary Java model in italics. Noteworthy are the high centrality degrees of opensource Java themes. A centrality degree of 1 suggests that the set of participants who referenced the theme also addressed in other statements all remaining themes. In other words, at least one of the participants who referenced the theme *Open-up Java* also referenced the oppositional theme *Java stewardship*. This suggests that at least some of those interested in opening Java governance where not completely against Sun's proprietary Java model.

Particularly prominent are the opensource-supportive themes *OSS delivers* and *Open-up Java* on one side and the oppositional theme *Java stewardship* on the other. As discussed in the Methodology Chapter, the theme *OSS delivers* represents statements promoting technological and competitive benefits of the commercial opensource model vis-à-vis skepticism about its credibility and viability. These statements were primarily made by Lutris and JBoss after introducing their opensource application servers. The theme *Open-up Java* represents statements endorsing an open Java governance model vis-à-vis Sun's proprietary model. These statements were primarily made in response to Sun prohibiting opensource Java software and were aimed at mitigating Sun's control over Java – and not necessarily at abandoning Sun's Java stewardship. Because the set of participants who referenced this theme also addressed in other statements all remaining themes, the theme *Open-up Java* along with theme *OSS promotes Java* were most widely anchored in the field, which is reflected by their high centrality degrees.

In contrast, the theme *Java stewardship* represents statements that endorse Sun's proprietary Java model citing concerns over Java compatibility vis-à-vis increasing adoption of opensource Java software and criticism of Sun's control. The relatively low centrality degree means that the group of participants who referenced this theme did not address many other themes, which suggests a peripheral positioning of this group in the discourse on opensource Java software. These three themes – *Open-up Java, OSS promotes Java,* and *Java stewardship* – prominently represent the tensions in the field after two new entrants introduced opensource application servers threatening not only incumbents' application servers but also Sun's Java licensing fees.

The remaining four themes among the major themes represent other arguments enrolled in either one of the three theorizations. The themes *OSS shortcomings* and *Control stifles OSS* represent how opensource opponents highlighted shortcomings of opensource software while opensource proponents blamed existing barriers for these shortcomings. The former theme represents statements that sustain or accept barriers to opensource adoption by questioning the credibility of the commercial opensource model. In contrast, the latter theme represents statements that link opensource adoption to Java innovation while casting Sun's Java control as innovation barrier. For example, an influential news editor warned that by continuing to disparage opensource competitors, *"Sun may succeed where Microsoft failed: in destroying the promise of Java"* [246].

The direct relationship between incumbents' efforts to disparage opensource competitors and the lack of credibility of opensource approaches is most evident in Sun's Java specifications prohibiting opensource Java software. For example, Lutris withdrew its opensource application server arguing that *"we have pressure from our largest customers ... [who] want the reassurance it's both legal and compatible"* [144]. The theme *OSS promotes Java* represents statements that link opensource adoption to Java innovation vis-à-vis programming standards competing with the Java standard. For example, JBoss asked *"Sun to certify us and give us the backing and credibility to be successful in competing against Microsoft a[t] the entry-level"* [101]. Finally, the general theme *OSS paradigm* represents statements endorsing opensource approaches by highlighting general innovation benefits of opensource software. The reference volume and centrality of themes thus suggests that the commercial opensource model and the more open Java model dominate the thematic pattern in the Experimentation phase.

Figure 2 exhibits a network view of the thematic pattern showing clusters based on centrality and positive ties among themes. Positive ties are shown as lines and negative ties are shown as dotted lines with increasing thickness and darkness showing increasing strength of positive or negative ties, respectively. In the Experimentation phase, themes endorsing opensource-supportive themes were defined as having positive ties among each other and negative ties to the themes supporting proprietary approaches. The dotted lines clearly show that – in general – opensource proponents and proponents of proprietary approaches where contesting each other. The network view based on reference volume, centrality, and positive ties demonstrates that opensource-supportive themes and theorizations dominated the early discourse on opensource Java software.
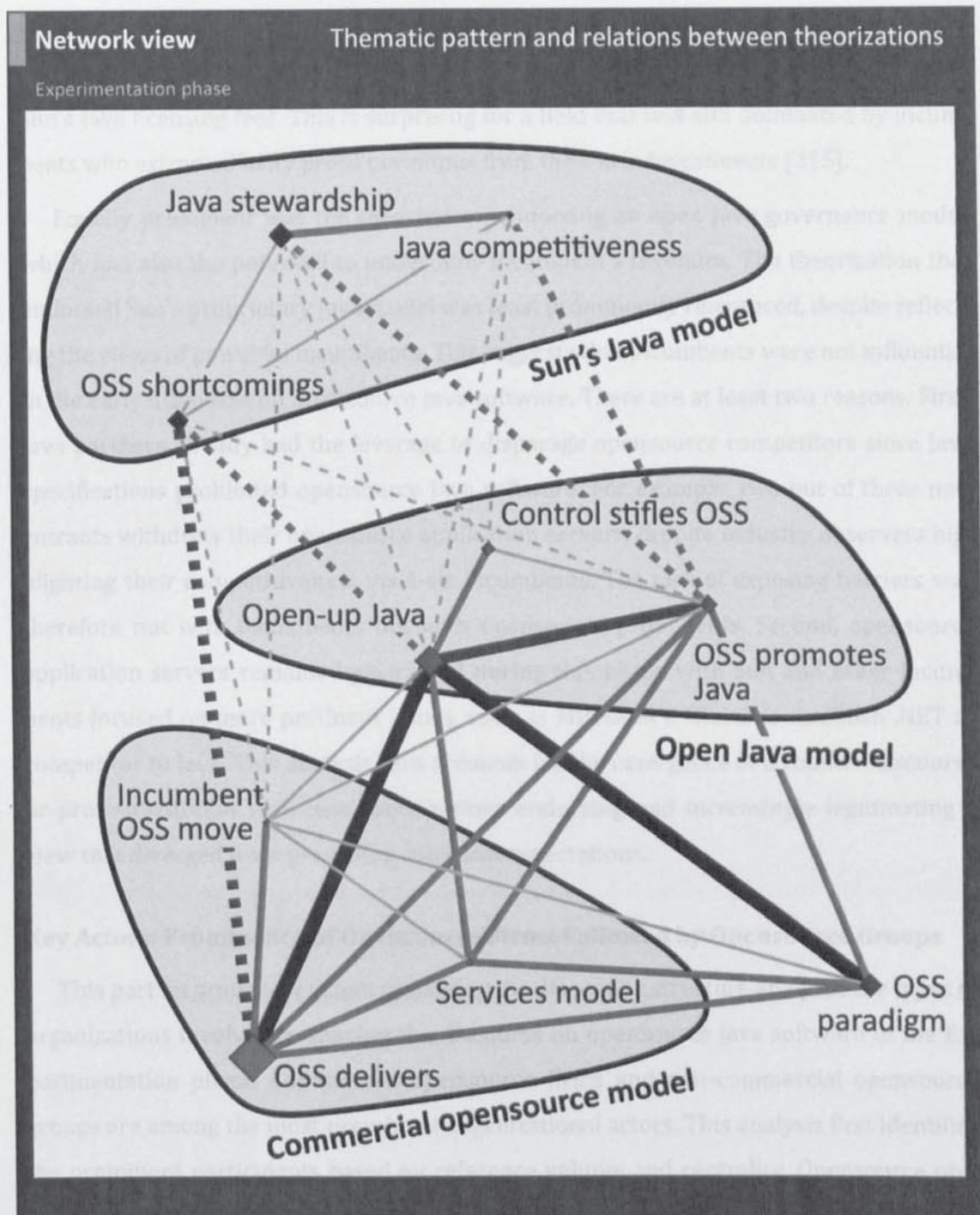
Figure 2: Thematic pattern and relations between theorizations in the Experimentation phase

In sum, this part on the *thematic pattern* of the Experimentation phase analyzed the reference volume, centrality, and clusterability of themes. It demonstrated that the commercial opensource model and the opensource Java model dominated the thematic pattern in the Experimentation phase. The most prominent themes were *OSS delivers*, which endorsed the commercial opensource model, followed by *Open-up Java* endorsing an open Java governance model and *Java stewardship* endorsing Sun's proprietary Java go-

vernance. Overall, most prominent was the theorization that endorsed the commercial opensource model, which threatened not only incumbent's application servers but also Sun's Java licensing fees. This is surprising for a field that was still dominated by incumbents who extracted hefty profit premiums from their Java investments [215].

Equally prominent was the theorization endorsing an open Java governance model, which had also the potential to undermine incumbent's revenues. The theorization that endorsed Sun's proprietary Java model was least prominently referenced, despite reflecting the views of powerful incumbents. This suggests that incumbents were not influential in the early discourse on opensource Java software. There are at least two reasons. First, Java partners already had the leverage to disparage opensource competitors since Java specifications prohibited opensource Java software. For example, two out of three new entrants withdrew their opensource application servers, despite industry observers highlighting their competitiveness vis-à-vis incumbents. The task of exposing barriers was therefore not with incumbents but with opensource proponents. Second, opensource application servers remained peripheral during this phase with Sun and other incumbents focused on more pertinent issues, such as Microsoft's efforts to establish .NET as competitor to Java. This analysis thus accounts for the emergence of a counter-discourse or proto-institution with new theorizations endorsing and increasingly legitimating a view that diverged from prevailing rules and expectations.

Key Actors: Prominence of Opensource Firms Followed by Opensource Groups

This part on *prominent actors* sustaining the discursive structure analyzes the types of organizations involved in shaping the discourse on opensource Java software in the Experimentation phase. Commercial opensource firms and non-commercial opensource groups are among the most prominent organizational actors. This analysis first identifies the prominent participants based on reference volume and centrality. Opensource proponents Fleury of JBoss, Loukides of O'Reilly Media, as well as Bigelow and Young of Lutris are particularly prominent. Based on the organizational affiliation of participants, the analysis then identifies prominent organizations, of which JBoss, Lutris, O'Reilly Media and Sun are particularly prominent. Overall, the most prominent organizational type in the early discourse on opensource Java software is the opensource firm followed by the opensource group. The type incumbent firm was least frequently represented. Indeed, Sun and other incumbents were primarily concerned about Microsoft threatening Java or were internally divided about opensource Java software.

Actor positioning	Reference volume and centrality of the 14 participants		
Experimentation phase			
	Frequency	Connections	Centrality degree
Participant (Organization)	Reference volume	Links to other actors	Score based on links
Fleury (JBoss)	47	10	0.71
Loukides (O'Reilly)	37	11	0.79
Bigelow (Lutris)	19	9	0.64
Young (Lutris)	16	6	0.43
Raymond (OSI)	14	11	0.79
McNealy (Sun)	14	9	0.64
Szulik (Red Hat)	13	7	0.50
Roth (Sun)	9	5	0.36
Lind (Lutris)	8	9	0.64
Schwartz (Sun)	7	2	0.14
Gosling (Sun)	5	3	0.21
Behlendorf (Apache)	4	7	0.50
Hunter (Apache)	4	7	0.50
LeBlanc (IBM)	3	4	0.29

Table 7: Reference volume and centrality of 14 participants in the Experimentation phase

The most *prominent participants* are JBoss founder Fleury, O'Reilly editor Loukides, as well as Lutris executives Bigelow and Young, who were supportive of opensource approaches, with only Sun CEO McNealy endorsing Sun's proprietary Java model among the prominent participants of the Experimentation phase. Table 7 reports the reference volume and centrality of participants in the Experimentation phase demonstrating that incumbents are not prominently represented in the early discourse on opensource Java software. For example, Sun CEO McNealy focused on defending Sun's proprietary Java model amid Microsoft's efforts to undermine the ubiquitous compatibility of Java software. After Sun successfully sued Microsoft for infringing Java specifications, Microsoft developed its.NET programming standard as a rival to Java. McNealy and other Sun executives were concerned about developers migrating to Microsoft's new.NET standard [106].

On few occasions, Sun addressed criticism that its control over the Java standard became increasingly synonymous with disparaging opensource firms. Executive Roth justified Sun's opposition against opensource competitors claiming that *"the control aspect is properly viewed as stewardship of the technology"* [249]. Meanwhile, opensource proponents cast Sun's proprietary Java model as biased and self-interested. JBoss founder Fleury suggested that *"Sun understandably appears concerned about protecting a lucrative high-end market"* [101]. O'Reilly editor Loukides argued that *"if they [Sun] had taken the courageous step of applying an opensource license [to Java] ... Microsoft's.NET initiative would be late and irrelevant,"* adding that *"Sun appeared to consider this option but ... now has withdrawn into its shell"* [246]. The strong criticism may also explain why Sun and other incumbents were reluctant to more vocally engage in the debate.

The prominently represented *organizational type* in the field is the cluster of commercial opensource firms, followed by the cluster of non-commercial opensource groups. Table 8 exhibits the support for major themes by type of organization showing that two most prominent clusters account for 85 percent of all statements among the major themes. The strong dominance of opensource firms and groups in the discourse on opensource Java software is only evident in this phase. Opensource firms JBoss and Lutris were behind the leading opensource application servers. Only when withdrawing its opensource application server did Lutris express opensource skepticism, which is represented by the theme *OSS shortcomings*. Moreover, opensource groups Apache and OSI were staunch advocates of opensource Java software.

Noteworthy is the shift of former supporters of Sun's proprietary Java model. For example, O'Reilly Media initially appeared supportive of Sun. In early 1998, Loukides argued that *"Java was best off under Sun's control"* [244] but by year-end explained: *"I have long believed that Java was the most important new software technology ... [but] it is also clear that the opensource community has development skills and energy that are unsurpassed"* [153]. Loukides' later statements as well as off-sample comments by the founder of O'Reilly Media confirm its shift towards one of Sun's most vocal critics [246]. In addition, IBM extended its opensource engagement leading to increasing tensions with Sun [191]. Meanwhile, Sun and other incumbents remained either preoccupied with Microsoft threatening Java or internally divided and thus left literally speechless on opensource Java software during this formative phase [149].

Organization type Experimentation phase	Support for major themes by type of organization		
	Incumbent firms	Opensource firms	Opensource groups
Major themes	15%	54%	31%
OSS delivers (40)		38	2
Open-up Java (25)		8	17
Java stewardship (20)	18 (mostly Sun)		2
OSS paradigm (19)		14	5
OSS shortcomings (17)	2	15 (mostly Lutris)	
OSS promotes Java (14)	1	4	9
Control stifles OSS (11)			11

Table 8: Support for major themes by type of organization in the Experimentation phase

In sum, this part on *prominent actors* analyzed the types of organizations involved in shaping the discourse on opensource Java software. It demonstrates that commercial opensource firms and non-commercial opensource groups are among the most prominent organizational types in the Experimentation phase. This analysis identified prominent organizations, of which JBoss, Lutris and O'Reilly Media are particularly prominent. Overall, most prominent was the type opensource firm. Table 8 shows that the emerging discourse on opensource Java software is particularly driven by commercial opensource players. Opensource firms JBoss and Lutris were behind the leading opensource application servers while opensource groups were somewhat less prominent. The type incumbent firm was least frequently represented.

Noteworthy is the shift of former supporters of Sun to some of its most vocal critics. For example, O'Reilly Media initially was supportive of Sun while IBM was Sun's major Java partner. Both turned increasingly away from Sun and endorsed opensource approaches. Meanwhile, Sun engaged in defending and legitimating its control over the Java standard, as represented by the theme *Java stewardship*. Sun and other incumbents were still concerned with Microsoft threatening Java or internally divided over

opensource Java software, which left incumbent firms literally 'speechless' on opensource Java software during this formative phase. This analysis demonstrated that peripheral actors were able to construct an increasingly pervasive counter-discourse or proto-institution supportive of opensource approaches despite entrenched logics and power differentials supporting proprietary models.

Action Orientation: Dominance of Reconstructive Orientation

This part on *action orientations* sustaining the discourse on opensource Java software analyzes whether statements exhibit an iterative, reconstructive, or hybrid action orientation. It demonstrates that major support during the Experimentation phase is behind a reconstructive orientation. Based on a more differentiated investigation into the major themes, this analysis identifies the support behind the proprietary, the opensource, or a hybrid approach. The support behind opensource approaches was particularly evident. Statements supportive of the proprietary approach endorse Sun's Java model. Statements supportive of opensource approaches endorse the commercial opensource model, an open Java governance model, or general innovation benefits of opensource software. Statements supportive of a hybrid approach often endorse the same themes but with different emphases.

Based on the support for the proprietary, opensource, or hybrid approach, the analysis then identifies the prominent action orientations of statements. Overall, the analysis identifies the reconstructive action orientation as most prominent orientation of statements. The reconstructive orientation is evident in statements that support the commercial opensource model, an open Java governance model, or general innovation benefits of opensource software. Far less prominent is the iterative orientation aimed at promoting the proprietary approach, which is evident in statements defending Sun's proprietary Java model. Statements endorsing a hybrid approach feature reconstructive as well as iterative orientations. The final paragraph summarizes the implications of action orientations for the process of institutional change in the field.

The *major support* during the Experimentation phase is behind opensource approaches, followed by support for a hybrid approach with least support for the proprietary approach. Table 9 reports orientations of statements based on support for the three approaches. It shows that among the major themes, more than two thirds of all statements express a reconstructive orientation while a fifth of statements express a hybrid and the remaining statements an iterative orientation. Iterative statements en-

dorse Sun's proprietary Java model citing concerns over Java compatibility, as represented by the theme *Java stewardship*. Reconstructive statements endorse the commercial opensource model (*OSS delivers*), an open Java governance model (*Open-up Java*), general innovation benefits of opensource software (*OSS paradigm*), or the benefits of opensource software for Java in general (*OSS promotes Java, Control stifles OSS*).

Action orientation	Prevalence of action orientations in major themes		
Experimentation phase			
	!terative	Reconstructive	Hybrid
Major themes	13%	68%	19%
OSS delivers (40)		35	5
Open-up Java (24)		25	
Java stewardship (20)	18		2
OSS paradigm (19)		19	
OSS shortcomings (17)		12	5
OSS promotes Java (14)		4	10
Control stifles OSS (11)		5	6

Table 9: Prevalence of action orientations in major themes of the Experimentation phase

Statements expressing a hybrid orientation often endorse the same themes but with different emphases. While endorsing the commercial opensource model (*OSS delivers*), some of these statements also stress benefits of the proprietary model thus proposing a mixed approach. For example, Lutris explained that *"we use as much open source as we think is appropriate, and we write a lot of code that's not open source [if] that's appropriate to businesses"* [252]. Similarly, some statements highlighting the benefits of opensource software for Java (*OSS promotes Java*) also emphasize the need for tight control of the Java standard. For example, Sun expected that *"a free license enabling them [users] to modify the [Java] code ... can greatly increase revenue opportunities"*

[181]. Statements expressing a hybrid approach thus approximate opensource approaches while not committing completely to it. The more differentiated analysis of the major themes thus allows identifying action orientations suggesting that the proprietary approach is largely supported by iterative while opensource approaches are primarily supported by reconstructive action orientations.

With major support behind opensource approaches, the most prominent *action orientation* of statements is reconstructive, aimed at establishing a new model in the field. The reconstructive orientation is evident in statements that highlight the business advantages of opensource application servers, advocate an open Java governance model, or predict a paradigm shift triggered by the opensource model. For example, amid opensource reservations in the field, opensource firm Lutris praised IBM's endorsement of the opensource model arguing that *"those businesses with bold opensource initiatives ... are helping the rest of us who have built a [new] business model around opensource technology [to] legitimize it in the eyes of enterprise customers"* [283]. Similarly, opensource firm JBoss pointed to the commercial and practical benefits of the opensource model and to the modular approach of software development as a key success factor when building complex software systems [214].

The reconstructive orientation also deconstructs prevailing understandings. For example, Lutris questioned Sun's proprietary Java model, asking *"How can they be stewards of a standard but try to exclude a huge number of people from participating in that standard?"* [131]. Moreover, highlighting the paradigm shift that opensource approaches brought to the field, Linux distributor Red Hat predicted that *"more and more traditional franchises will be attacked"* [197]. In contrast, the iterative orientation is aimed at maintaining the proprietary approach and is evident in statements that defend Sun's proprietary Java model. For example, Sun maintained that *"we believe our [existing] process is the most inclusive and efficient way to advance the technologies"* [125]. Finally, statements expressing a hybrid orientation feature reconstructive as well as iterative orientations.

In sum, this part on *action orientations* analyzed whether statements endorsed the proprietary, the opensource, or a hybrid approach. It demonstrated that major support during the Experimentation phase was behind opensource approaches. Statements supportive of the status quo endorsed Sun's proprietary Java model citing concerns over Java compatibility. In contrast, statements supportive of opensource approaches endorsed the commercial opensource model, an open Java governance model, or general innova-

tion benefits of opensource software. Statements supportive of a hybrid approach often endorsed the same themes but with different emphases. For example, while endorsing the commercial opensource model (*OSS delivers*), some of these statements also stressed benefits of the proprietary model thus proposing a mixed approach.

Based on these approaches and a differentiated investigation of themes, the analysis identified the reconstructive action orientation as most prominent orientation of statements. The reconstructive orientation was evident in statements that highlighted the business advantages of opensource application servers, advocate an open Java governance model, or predict a paradigm shift triggered by the opensource model. Far less prominent was the iterative orientation aimed at maintaining the status quo, as evident in statements defending Sun's proprietary Java model. Statements endorsing a hybrid approach featured reconstructive as well as iterative orientations. The dominance of the reconstructive action orientation suggests that the early discourse on opensource Java is conducive to institutional change and constitutes a proto-institution supplying new logics and sources of legitimation.

Concluding Summary

This section on discursive structure analyzes the thematic pattern, the prominent actors, and the action orientations sustaining the discourse on opensource Java software in the Experimentation phase. It demonstrates that theorizations of the commercial opensource model and the opensource Java model dominated the thematic pattern while the theorization of Sun's proprietary Java model remained marginal. Sun and other incumbents remained either preoccupied with Microsoft threatening Java or internally divided and thus left literally speechless on opensource Java software during this formative phase. This analysis thus accounts for the emergence of new theorizations which endorsed and increasingly legitimated a view that diverged from prevailing rules and expectations. These theorizations were constructed primarily by opensource firms followed by opensource groups, which constituted the two most prominent types of organization in the Experimentation phase.

Particularly JBoss, Lutris and O'Reilly Media were prominent in constructing a counter-discourse on opensource Java software that increasingly legitimated a new business category in the field. Noteworthy is the shift of former supporters of Sun's proprietary Java model, such as O'Reilly Media or IBM, towards some of Sun's most vocal critics. This analysis thus shows how peripheral actors were able to construct an

increasingly pervasive counter-discourse supportive of opensource approaches despite entrenched logics and power differentials supporting the status quo. Coinciding with the shift is the dominance of reconstructive statements supporting opensource approaches vis-à-vis institutional barriers in the field. This analysis demonstrated that the two theorizations of opensource approaches – the commercial opensource model and the opensource Java model – by far outweighed the theorization of Sun's proprietary Java model.

The discourse on opensource Java software in the Experimentation phase was driven by pro-opensource themes representing statements of opensource proponents. Incumbent firms who profited from the lucrative high-end market around enterprise computing infrastructures were not prominently represented in the early discourse on opensource Java software. Despite the potential threat of commoditization and revenue loss that open standards and opensource software were introducing into the field, incumbents were not prominently engaged in shaping the discourse on opensource Java software. There are at least two reasons, one of which can be attributed to the leverage that incumbents already had over the Java standard, for example, Java specifications prohibiting opensource Java software. It therefore appears that incumbents mainly trusted in existing institutional mechanisms in order to contain the proliferation of opensource competitors. The task of exposing these barriers was therefore not with incumbents but with opensource proponents. The second reason is that Sun and other incumbents remained preoccupied with Microsoft threatening Java and internally divided on opensource Java software during this formative phase.

This suggests that business strategies and practices of most incumbents remained embedded within the prevailing proprietary logic and the opensource model was either ignored or perceived as threat rather than opportunity. When Lutris withdrew its popular opensource application server citing existing Java licensing restrictions, latent conflict was exposed as developer communities mobilized against Sun's control over the Java standard. The most prominent themes in the Experimentation phase, *OSS delivers* and *Open-up Java*, cogently expressed the mobilization against the status quo. On 22 March 2002, Sun agreed to allow opensource Java software. Such changes to rules and legislation aimed at accommodating a hitherto marginalized approach are tangible evidence of institutional change in the field (Holm 1995).

Disruption Phase (March 2002 – May 2005)

The beginning of the Disruption phase is marked by Sun's agreement to allow open-source Java software. On 22 March 2002, Sun agreed to 1) *"allow independent implementations under open source licenses,"* 2) make the Java compatibility tests available to non-profit opensource initiatives, and 3) support these initiatives in performing the Java compatibility tests [222]. The first point is critical for both commercial and non-commercial opensource projects. It means that software developed with the Java programming language can be distributed under an opensource license. The second and third points highlight the conflicts that arose between commercial opensource firm JBoss and Sun. Because JBoss' services and support business was for-profit yet the product itself was free, JBoss was not able to pay for Java compatibility testing and certification [248]. JBoss, like other small firms, was thus effectively barred from Java compatibility testing and Java certification.

At the same time, incumbents who were wedded to the status quo felt the impact that JBoss had on their market shares. For example, former market leader and Sun partner BEA became increasingly pressured by JBoss, which was *"heralded as a disruptive force,"* as well as by IBM, which focused on services and support and thus was able to offer *"substantial discounts"* on its application server [117]. A news editor suggested that if the opensource model further increased its penetration in the application server field, the *"industry's power structure could be very different from what we have today"* [208]. Indeed, JBoss' market penetration increased from 14 percent in 2002 to 34 percent in 2004 thus leaving behind former market leader BEA while tying for first place with IBM [253]. Successfully introducing and establishing a radically new business category is tangible evidence of institutional change in an organizational field (Leblebici et al. 1991).

This section on the Disruption phase is structured in three parts and a concluding summary. The first part investigates the *thematic pattern* sustaining the discursive structure by analyzing reference volume, centrality, and clusterability of themes. It demonstrates that, regarding business models, the commercial opensource is more prominent than the proprietary model but, regarding the Java model, Sun's proprietary supersedes the opensource Java model in this phase. This suggests that Sun was able to regain opinion leadership in the discourse on opensource Java software standard. In other words, the commercial opensource model continued to dominate while Sun's proprietary Java model gained momentum in the discourse on opensource Java software.

The second part investigates the *prominent actors* sustaining the discursive structure. It demonstrates that incumbent firms followed by opensource firms are among the most prominent organizational types in the Disruption phase. Indeed, the incumbent firm is the most prominent organizational actor in this phase. This can be explained by incumbents addressing the competitive dynamics driven by the commercial opensource model and increasing software commoditization. The analysis specifies three 'levels' of opensource engagement by incumbents in response to opensource proliferation.

The third part investigates the *action orientations* sustaining the discursive structure by analyzing whether statements primarily expressed reconstructive, iterative, or hybrid action orientations. It demonstrates that the reconstructive action orientation is most prominent during the Disruption phase and is widely anchored within the field. This is surprising given that incumbents dominated the discourse on opensource Java software and Sun's proprietary Java model gaining momentum. However, in light of incumbents rushing to adopt the commercial opensource model and support for the proprietary Java model mainly originating only from Sun, the overall tone of action orientations is reconstructive.

Thematic Pattern: Prevalence of the Commercial Opensource Model and the Proprietary Java Model

This part on the *thematic pattern* of the discourse on opensource Java analyzes reference volume, centrality, and clusterability of themes during the Disruption phase. It demonstrates that the commercial opensource is more prominent than the proprietary business model but that Sun's proprietary Java model supersedes the opensource Java model. This analysis first identifies the major themes based on reference volume, centrality, and clusterability of themes. The opensource-supportive themes *OSS exploitation* and *Open-up Java* and the oppositional theme *Java stewardship* are particularly prominent among the major themes. Based on the major themes, the analysis identifies the prominent theorizations in the field.

The theorization of the commercial opensource model is most prominent, followed by the theorization of Sun's proprietary Java model. In this phase, the theorization of the opensource Java model is least prominently referenced. Given that incumbents were the most prominent actors, it suggests that, regarding the business model, incumbents adopted the commercial opensource model. Regarding the Java governance model, it suggests that Sun was able to regain opinion leadership regard-

ing the debate on Java governance. The influx of incumbent voices shaping the discourse on opensource Java software thus was double-edged. On one hand, the dominance of incumbents led to a surge in support for the theorization of Sun's proprietary Java model. On the other hand, the dominance of incumbents led to further proliferation of the commercial opensource model. This analysis exposes the tensions among incumbents, particularly between IBM and Sun, and the fragility of the status quo that promoted institutionalization of the new proto-institution around opensource approaches.

Quantitative view	Reference volume and centrality of 12 themes		
Disruption phase			
	Frequency	Connections	Centrality degree
Themes	Reference volume	Links to other themes	Score based on links
OSS exploitation	91	11	1.00
Open-up Java	85	11	1.00
Java stewardship	84	11	1.00
Incumbent strategy	70	11	1.00
Incumbent OSS move	58	11	1.00
OSS delivers	47	11	1.00
Java competitiveness	38	11	1.00
OSS shortcomings	32	11	1.00
Services model	28	11	1.00
Control stifles OSS	17	11	1.00
OSS paradigm	16	11	1.00
OSS promotes Java	12	11	1.00

Table 10: Reference volume and centrality of the 12 themes (major themes in bold and proprietary perspectives in italics)

Most statements supporting the *major themes* endorse the commercial opensource model, while support for Sun's proprietary Java model outweighs support for the opensource Java model. Table 10 reports the reference volume and centrality of themes with major themes in bold and themes endorsing Sun's proprietary Java model in italics. Noteworthy are the centrality degrees of all themes. The set of par-

ticipants referencing one theme also referenced all other themes in other statements. This suggests that at least some of those who supported one theme were also supporting oppositional themes. This somewhat softens the impression that the field was characterized by irreconcilable views. Indeed, neither was Sun's Java model completely rejected by all opensource proponents nor did Sun reject opensource approaches in general.

Particularly prominent are the opensource-supportive themes *OSS exploitation* and *Open-up Java* on one side and the oppositional theme *Java stewardship* on the other. As discussed in the Methodology Chapter, the theme *OSS exploitation* represents statements that seek to enhance competitiveness by addressing and exploiting opensource dynamics in the field. Initially, these statements were primarily made by JBoss. Over time, these statements were also made by incumbents exploiting opensource approaches to gain a competitive advantage.

The themes *Open-up Java* and *Java stewardship* remained particularly prominent with the former theme endorsing an open approach to Java governance while the latter theme endorsed Sun's proprietary Java governance. These two themes prominently represent the conflict that divided the field into proponents and opponents of opensourcing the Java standard. During the first half of the Disruption phase, statements under the theme *Open-up Java* primarily represented demands to make Java certification available to opensource firms. However, during the second half of this phase, statements primarily represented calls to opensource the Java standard itself. Statements under the theme *Java stewardship* reflect this shift with an initial emphasis on discouraging JBoss from Java certification with emphasis shifting towards discouraging opensource Java in the second half of this phase. These three themes prominently represent the momentum behind the commercial opensource model and the dividing lines between proponents and opponents of the opensourcing Java.

The remaining four themes among the major themes represent arguments enrolled in either one of the three theorizations. The themes *Incumbent OSS move* and *Incumbent strategy* represent incumbents' responses to the competitive dynamics in the field. The former theme represents statements that seek to enhance competitiveness by adopting specific opensource projects. For example, after allowing opensource Java software, Sun explained that *"what we did was expand the community ... [to] allow more folks to work in a tighter community"* [113]. In contrast, the general theme *Incumbent strategy* represents statements that seek to enhance competitive-

ness through other than opensource efforts. For example, BEA focused on developing superior products, arguing that *"the biggest cost is the ongoing cost to manage, maintain and enhance these applications"* [104]. BEA thus pointed to the total costs of ownership including services costs of opensource software.

The theme *OSS delivers* represents statements promoting the commercial opensource model vis-à-vis reservations. Since they were primarily made in the first half of the Disruption phase, it may suggest that opensource skepticism decreased over time. Similarly, most of the statements under the theme *Incumbent strategy* were also made during the first half of this phase, which suggests that enhancing competitiveness through other than opensource efforts became less relevant over time. With support for other major themes relatively constant over time, this suggests that the momentum behind the opensource model accelerated in the second half of Disruption phase. Finally, the theme *Java competitiveness* represents statements promoting the Java standard by highlighting both Java compatibility and innovativeness while endorsing Sun's Java control.

Figure 3 exhibits a network view of the thematic pattern showing clusters based on centrality and positive ties among themes. Positive ties are shown as lines and negative ties are shown as dotted lines with increasing thickness and darkness showing increasing strength of positive or negative ties, respectively. As previously, themes endorsing opensource-supportive themes were defined as having positive ties among each other and negative ties to themes supporting proprietary approaches. The strong positive ties between the themes Java competitiveness and Incumbent strategy (thick black line) on one hand and between the themes Incumbent OSS move and OSS exploitation (thick dark grey line) form the top and bottom lines of a rectangle in the middle of the graph. Both pairs are linked to each other by strong negative ties (thick dark dotted lines). The graph visually represents the tensions that existed between maintaining the proprietary Java model and existing strategies vis-à-vis increasing commercial exploitation of open source and incumbents' adoption of the new model. The network view based on reference volume, centrality, and positive ties demonstrates the emergence of two strong oppositional factions, those supporting Sun's proprietary Java model and those supporting the commercial opensource model or the opensource Java model.
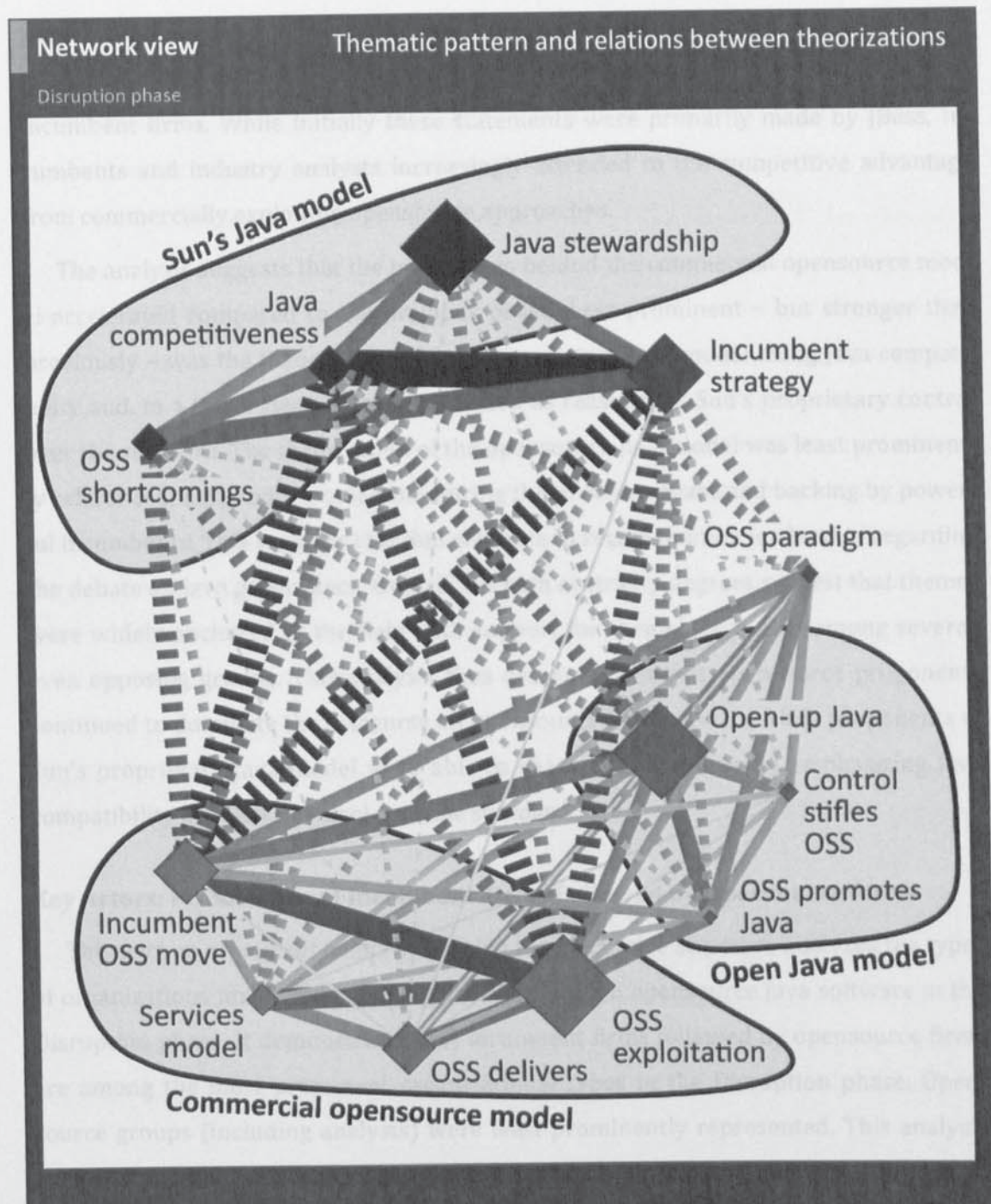
Figure 3: Thematic pattern and relations between theorizations in the Disruption phase

In sum, this part on the *thematic pattern* of the Disruption phase analyzed the reference volume, centrality, and clusterability of themes. It demonstrated that the commercial opensource was more prominent than the proprietary model but that Sun's proprietary superseded the opensource Java model. The most prominent themes were *OSS exploitation*, which endorsed the commercial opensource model, followed by *Open-up Java* endorsing the opensource Java model and by *Java stewardship* endorsing Sun's

proprietary Java model. Overall, most prominent was the theorization that endorsed the commercial opensource model, with major support for the new model coming from incumbent firms. While initially these statements were primarily made by JBoss, incumbents and industry analysts increasingly attended to the competitive advantage from commercially exploiting opensource approaches.

The analysis suggests that the momentum behind the commercial opensource model accelerated compared to the previous phase. Less prominent – but stronger than previously – was the theorization of Sun's proprietary Java model citing Java compatibility and, to a lesser degree, Java innovation as reasons for Sun's proprietary control over the standard. The theorization of the opensource Java model was least prominently referenced, despite its momentum during the previous phase and backing by powerful incumbents. This suggests that Sun was able to regain opinion leadership regarding the debate on Java governance. Overall, the high centrality degrees suggest that themes were widely anchored in the field with support for themes dispersed among several, even opposing groups. This analysis thus demonstrates that opensource proponents continued to dominate the discourse on opensource Java software while proponents of Sun's proprietary Java model were able to shape the discourse by emphasizing Java compatibility and Sun's control over the standard.

Key Actors: Prominence of Incumbent Firms Followed by Opensource Firms

This part on *prominent actors* sustaining the discursive structure analyzes the types of organizations involved in shaping the discourse on opensource Java software in the Disruption phase. It demonstrates that incumbent firms followed by opensource firms are among the most prominent organizational types in the Disruption phase. Opensource groups (including analysts) were least prominently represented. This analysis first identifies the prominent participants based on reference volume and centrality. While JBoss CEO Fleury and Sun executive Schwartz are particularly prominent, the list of participants is well-balanced featuring the major firms of the application server field as well as important developer groups and industry analysts.

Overall, the most prominent organizational type in this phase is the incumbent firm. One explanation for the prominence of incumbent firms is the open conflict between Sun and IBM about Java governance. Another more important reason is that incumbent firms started to actively address the competitive dynamics driven by the commercial opensource model and increasing software commoditization. The analysis found three

'levels' of opensource engagement by Incumbent firms: (1) responding to opensource dynamics with proprietary product strategies, (2) contributing software to the opensource community, and (3) commercially exploiting opensource approaches by outlining or adopting comprehensive opensource strategies.

By far the most *prominent participants* are JBoss CEO Fleury and Sun executive Schwartz. Table 11 reports the reference volume and centrality of participants in the Disruption phase. The high centrality degrees suggest that at least some of those participants who are linked to one participant are linked to many other participants. This suggests a high degree of interaction even between participants who are supporting oppositional themes. Fleury is particularly prominent in the themes *OSS exploitation* and *OSS delivers* but, surprisingly, also in *Java stewardship*. For example, JBoss initially struggled to gain Sun's Java certification. But after gaining certification and with IBM urging Sun to opensource Java, Fleury supported Sun stressing that *"the success of Java has been its ironclad portability"* [230]. At this time, IBM was increasingly moving into opensource software and the services and support market thereby threatening JBoss.

Sun executive Schwartz is particularly prominent in the themes *Incumbent OSS move* and *Java stewardship*. For example, Sun was starting to rebuild its relationship with the opensource community. Schwartz was determined to maintain *"one of the healthiest relationships with the opensource community,"* adding that *"we've been a phenomenal contributor"* to opensource projects [179]. At the same time, Schwartz emphasized the benefits of Sun's proprietary Java model *"to ensure that compatibility ruled the day"* [225]. Overall, the majority of participants from both opensource and incumbent firms are increasingly supportive of the commercial opensource model but divided over the right approach to govern the Java standard.

The prominently represented *organizational type* in the field is the cluster of incumbent firms, followed by the cluster of commercial opensource firms. Table 12 exhibits the support for major themes by type of organization. It shows that the two most prominent clusters account for over 80 percent of all statements among the major themes. Opensource groups (including analysts) were least prominently represented. This contrasts sharply with the previous phase where opensource players were dominant. One explanation is that the only major opensource firm still active in the field was JBoss. In addition, the emphasis in the discourse on opensource Java software clearly shifted to commercial exploitation of open source, leaving non-commercial opensource groups little room to contribute prominently to the debate.

Actor positioning Disruption phase	Reference volume and centrality of 18 participants		
	Frequency	**Connections**	**Centrality degree**
Participants (Organization)	Reference volume	Links to other actors	Score based on links
Fleury (JBoss)	143	17	0.94
Schwartz (Sun)	123	17	0.94
Bickel (JBoss)	59	17	0.94
McNealy (Sun)	50	15	0.83
Hunter (Apache)	48	17	0.94
Gosling (Sun)	45	16	0.89
Dietzen (BEA)	40	18	1.00
Smith (IBM)	28	17	0.94
Raymond (OSI)	22	12	0.67
Chuang (BEA)	21	13	0.72
O'Grady (analyst)	17	17	0.94
Rymer (analyst)	17	14	0.78
Keller (Sun)	16	15	0.83
Labourey (JBoss)	16	16	0.89
Sundstrom (CDN)	8	10	0.56
Murphy (analyst)	7	17	0.94
Magnusson (Apache)	2	9	0.50
Tegan-Padir (Red Hat)	2	11	0.61

Table 11: Reference volume and centrality of 14 participants in the Disruption phase

Incumbent firms Sun, IBM and BEA increasingly addressed the opensource dynamics in the field along three 'steps' of opensource engagement. The least opensource engagement involved responding to opensource dynamics with proprietary product strategies addressing the cost pressure and commoditization dynamics, as represented by theme *Incumbent strategy*. The next level of opensource engagement involved contributing software to the opensource community in order to benefit from the momentum behind opensource approaches to software development, as represented by the theme *Incumbent OSS move*. Finally, full opensource engagement

involved commercially exploiting opensource approaches by outlining or adopting bold opensource strategies, as represented by the theme *OSS exploitation*. Incumbents thus gradually started to address competitive dynamics driven by the commercial opensource model and increasing software commoditization. However, incumbents remained divided about the right approach to Java governance with major Java partners, such as IBM and BEA, urging Sun to opensource the Java standard.

Organization type Disruption phase	Support for major themes by type of organization		
	Incumbent firms	Opensource firms	OSS groups (Analysts)
Major themes	51%	32%	17%
OSS exploitation (91)	6	61	24
Open-up Java (85)	25	26	34
Java stewardship (84)	64	18 (all JBoss)	2
Incumbent strategy (70)	61		9
Incumbent OSS move (58)	54		4
OSS delivers (47)		45	2
Java competitiveness (38)	30	2	6

Table 12: Support for major themes by type of organization in the Disruption phase

In sum, this part on *prominent actors* analyzed the types of organizations involved in shaping the discourse on opensource Java software. It demonstrates that incumbent firms followed by opensource firms were among the most prominent organizational types in the Disruption phase. While this analysis identifies prominent participants, such as JBoss CEO Fleury and Sun executive Schwartz, the list of participants is well-balanced featuring the major firms of the application server field as well as important developer groups and industry analysts. The high centrality degrees suggest that at least some of those participants who are linked to one participant are

linked to many other participants. This suggests a high degree of interaction even between participants who are supporting oppositional themes.

Overall, the most prominent organizational type in this phase is the incumbent firm. Table 12 shows that the discourse on opensource Java software in the Disruption phase is largely driven by commercial firms. This can be explained by incumbent firms starting to address the competitive dynamics driven by the commercial opensource model and by increasing software commoditization. Incumbent firms appeared to follow three 'steps' of opensource engagement: (1) responding to opensource dynamics with proprietary product strategies, (2) contributing software to the opensource community, and (3) commercially exploiting opensource approaches by outlining or adopting comprehensive opensource strategies. Another explanation for the prominence of incumbent firms is the open conflict between Sun and IBM regarding the Java governance model. This analysis demonstrates that support for the commercial opensource model was driven by incumbents who became dominant in constructing the discourse on opensource Java.

Action Orientation: Prevalence of Reconstructive Orientation with Iterative Orientation Growing

This part on *action orientations* sustaining the discourse on opensource Java software analyzes whether statements exhibit an iterative, reconstructive, or hybrid action orientation. It demonstrates that major support during the Disruption phase is behind a reconstructive orientation. Based on a more differentiated investigation into the major themes, this analysis identifies the support behind the proprietary, the opensource, or a hybrid approach. The support behind opensource approaches is by far most prominent. Statements supportive of opensource approaches endorse the commercial opensource model or the opensource Java model. Statements supportive of the proprietary approach endorse Sun's Java control or proprietary product strategies. Statements supportive of a hybrid approach often endorse the same themes but with different emphases.

Based on the support for the proprietary, opensource, or hybrid approach, the analysis then identifies the action orientations of statements, of which the reconstructive orientation is most prominent. The reconstructive orientation is evident in statements endorsing the commercial opensource model, the opensource Java model, or a hybrid approach with strong opensource involvement. Far less prominent is the

iterative orientation aimed at promoting the proprietary approach, which is evident in statements endorsing the proprietary business model or Sun's proprietary Java model. Least prominently referenced are statements expressing a hybrid orientation featuring reconstructive as well as iterative orientations. The final paragraph summarizes the implication of action orientations for the process of institutional change in the field.

During the Disruption phase, the *major support* of statements is behind opensource approaches, followed by support for the proprietary approach and a hybrid approach. Table 13 specifies orientations of statements based on support for the three approaches. It shows that among the major themes, half of all statements are supportive of opensource approaches, about a quarter are supportive of the status quo, and only about a fifth of statements are supportive of a hybrid approach. Statements supportive of the status quo either endorse the proprietary business model (*Incumbent strategy*) or Sun's proprietary Java control (*Java stewardship* and *Java competitiveness*). Statements supportive of opensource approaches endorse the commercial opensource model (*OSS exploitation, Incumbent OSS move,* and *OSS delivers*) or the opensource Java model (*Open-up Java*).

Statements supportive of a hybrid approach often endorse the same themes but with different emphases. For example, while endorsing Sun's proprietary Java model (*Java stewardship*), some of these statements also stressed the benefits of opensource Java software. Hence, Sun's 'father of Java' Gosling noted that he *"would love to make it opensource ... [but] if you happen to have a bully on the block who is really strong, it really doesn't work"* [269]. Similarly, some statements endorsing the proprietary business model (*Incumbent strategy*) also emphasize the need to address cost pressure and software commoditization. For example, Sun anticipated that *"IBM's going to find themselves ultimately blunted ... when a Sun ONE application server is available for free on every one of the systems on which they've been expecting to harvest a $50,000 CPU"* [273]. Statements supportive of a hybrid approach thus endorse approximating opensource approaches while not committing completely to it. The more differentiated analysis of the major themes confirms that the proprietary approach is largely supported by iterative while opensource approaches are largely supported by reconstructive action orientations.

Action orientation Disruption phase	Prevalence of action orientations in major themes		
	Iterative	**Reconstructive**	**Hybrid**
Major themes	28%	50%	22%
OSS exploitation (91)		91	
Open-up Java (85)		75	10
Java stewardship (84)	46		38
Incumbent strategy (70)	52		18
Incumbent OSS move (58)		24	34
OSS delivers (47)		47	
Java competitiveness (38)	32		6

Table 13: Prevalence of action orientations in major themes of the Disruption phase

The major support behind opensource approaches means that the most prominent *action orientation* of statements is reconstructive, aimed at establishing a new model in the field. The reconstructive orientation is evident in statements endorsing the commercial opensource model, the opensource Java model, or a hybrid approach with strong opensource involvement. Opensource proponents emphasize the commoditization dynamics and cost pressures introduced by the commercial opensource model as well as efforts to reconcile the opportunities of the opensource model with existing approaches. For example, JBoss' Fleury claimed offering *"technology that's sold for millions today – we're offering it free"* [228].

Noteworthy are reconstructive efforts aimed at opening the Java standard, which either promote the opensource Java model or attempt to reconcile opensource Java software with Sun's proprietary Java model. For example, opensource advocate Raymond observed that Sun was internally split over opensourcing Java with some endorsing the *"opensource route completely ... [while] others are saying, 'No! No! If we do that, all our profit margins go away and everything that makes us Sun goes away'"* [223]. In contrast, the iterative orientation is evident in statements endorsing the proprietary business

model or Sun's proprietary Java model. For example, Schwartz claimed that Sun *"will be in a position to innovate ... [because] we control the components, the performance, the interaction and the provisioning"* [195]. Finally, statements endorsing a hybrid approach feature reconstructive as well as iterative orientations.

In sum, this part on *action orientations* analyzed whether statements endorsed the proprietary, the opensource, or a 'hybrid' approach. It demonstrates that major support during the Disruption phase is behind opensource approaches. Statements supportive of the proprietary approach endorse Sun's Java control or proprietary product strategies. Statements supportive of opensource approaches endorse the commercial opensource model or the opensource Java model. Statements supportive of a hybrid approach often endorse the same themes but with different emphases.

Based on these approaches and a differentiated investigation of themes, the analysis identifies the reconstructive action orientation as most prominent orientation of statements. The reconstructive orientation is evident in statements endorsing the commercial opensource model, the opensource Java model, or a hybrid approach with strong opensource involvement. Far less prominent is the iterative orientation aimed at maintaining the status quo, which is evident in statements endorsing the proprietary business model or Sun's proprietary Java model. Least prominently referenced are statements endorsing a hybrid approach featuring reconstructive as well as iterative action orientations.

The dominance of the reconstructive action orientation together with adoption of the commercial opensource model by incumbents suggests that the discourse on opensource Java was shaping understandings and practices in a way that was compatible with opensource approaches. At the same time, opponents of opensource Java were able to partially reshape the debate as their theorization of Sun's proprietary Java model gained ground. The Disruption phase is thus characterized by ambiguity over the trajectory of Java governance. However, dominance of the reconstructive action orientation and of the commercial opensource model demonstrates that a new business category has been established in the field.

Concluding Summary

This section on the Disruption phase analyzed the thematic pattern, the prominent actors, and the action orientations sustaining the discourse on opensource Java software. It demonstrates that the commercial opensource was more prominent than the proprietary model but that Sun's proprietary superseded the opensource Java model.

In other words, the commercial opensource model continued to dominate while Sun's proprietary Java model gained momentum in the discourse on opensource Java software. This analysis thus accounts for the contestation of opposing theorizations suggesting an iterative and gradual process of institutionalization.

Theorizations were constructed primarily by incumbent firms followed by opensource firms. However, major incumbents such as BEA and IBM were endorsing the opensource Java model while Sun and opensource firm JBoss endorsed Sun's proprietary Java model. Particularly Sun and JBoss were prominent in constructing the discourse on opensource Java software, which increasingly legitimated the commercial opensource model but expressed divisions regarding Java governance. Noteworthy is the shift of allegiances with Sun's major Java partners endorsing opensource Java and former opponent JBoss endorsing Sun's proprietary Java model. Sun was able to promote its theorization of the proprietary Java model. Coinciding with Sun's efforts were tensions among Sun and IBM on Java governance and between JBoss and IBM who were increasingly competing against each other. This analysis demonstrated that the theorization of the commercial opensource model continued to dominate the discourse on opensource Java software while the theorization of Sun's proprietary Java model gained support.

The discourse on opensource Java software in the Disruption phase was dominated by statements endorsing the commercial opensource model. But in contrast to the previous phase, the majority of all statements among the major themes were made by incumbents. Incumbents not only dominated the discourse on opensource Java software but also started to move into the services and support market around opensource software. This suggests that major incumbents no longer questioned *whether* the commercial opensource model was a viable business category but, rather, where concerned *how* to respond to potential threats and opportunities. Incumbent firm Sun, who was previously heavily criticized for inhibiting opensource Java software, now became the most vocal proponent of the commercial opensource model. But vis-à-vis influential calls to opensource the Java programming standard itself, Sun also became much more vocal in emphasizing the benefits of its proprietary Java model. And despite initially delaying JBoss' Java certification, JBoss later supported Sun in defending its proprietary control over Java.

At the same time, old allegiances between incumbent firms became less relevant as competition intensified and tensions regarding Sun's leverage over the Java standard intensified. Both, the competitive dynamics around opensource adoption and the tensions

regarding Java governance, reinforced the disruption of prevailing institutional structures that further promoted adoption of the opensource model. From a business perspective, the disruption is most evident as JBoss outrivaled incumbents in terms of market penetration and as incumbent firms IBM in May and Sun in June 2005 began offering opensource application servers. These developments confirm that the formerly marginalized commercial opensource model became a well-established business approach to which the field adjusted during the next phase. Successfully introducing and establishing a radically new business category is tangible evidence of institutional change in an organizational field (Leblebici et al. 1991).

Adjustment Phase (May 2005 – August 2006)

On 10 May 2005, IBM acquired the small startup founded by developers who were working on Apache's opensource application server Geronimo and IBM announced offering it as entry model to its application server line. Later in June 2005, Sun also introduced an opensource version of its application server. These two events mark the adoption of opensource application servers by major incumbent firms. On 10 April 2006, JBoss agreed to be acquired by leading Linux distributor Red Hat. Finally, at the JavaOne conference in May 2006, Sun announced opensourcing the programming language Java. These three key events – 1) incumbents adopting opensource application servers, 2) Red Hat acquiring JBoss, and 3) Sun opensourcing Java – reflect the responses by established players responding to the adoption of the opensource model in the field. These events are further evidence of successful institutional change, that is, a disruptive and hitherto marginalized model changing the logic, power differentials, and norms governing the field.

During the Adjustment phase, incumbents remained most prominent in shaping the discourse on opensource Java software. In addition, the prominent role of industry analysts attests to the financial and strategic maturity of the opensource model in the field. This suggests that the business model of commercial opensource software was by now sufficiently established to attract the attention of various analyst and investor communities. Meanwhile, Java governance shifted from a preoccupation with enforcing Java compatibility and compliance towards a concern about innovativeness and reaching out to developer and user communities. The comprehensive strategic moves towards

adopting opensource application servers by established players and Sun's announcement of opensourcing the Java programming language – after years of tensions over the issue – suggest that opensource approaches became deeply entrenched within the field.

This section is structured in three parts and a concluding summary. The first part investigates the *thematic pattern* sustaining the discursive structure by analyzing reference volume and centrality of themes. It demonstrates that that the commercial opensource model and the opensource Java model are by far the most prominent theorizations in this phase. The adoption of opensource projects by incumbents emerged as the key theme in the discourse on opensource Java software. In addition, innovation in the Java standard became increasingly important. By emphasizing the need to innovate and announcing to opensource Java, Sun redefined the meaning of its Java governance from proprietary to the opensource Java model.

The second part investigates the *prominent actors* sustaining the discursive structure. It demonstrates that the most prominent organizational type is the incumbent firm, closely followed by the opensource firm. Incumbent firms Sun, IBM and BEA continued to address software commoditization and the service logic by adopting the opensource model. In contrast to the previous phase, incumbents' response to opensource dynamics is outright adoption of the commercial opensource model. This analysis demonstrates that both incumbent and opensource firms were constructing the discourse on opensource Java software around the commercial opensource model and the opensource Java model.

The third part investigates the *action orientations* sustaining the discursive structure by analyzing whether statements primarily expressed reconstructive, iterative, or hybrid action orientations. It demonstrates that major support during the Adjustment phase is behind opensource approaches making reconstructive statements by far the most prominent action orientation.

Thematic Pattern: Dominance of the Commercial Opensource Model and the Opensource Java Model

This part on the *thematic pattern* sustaining the discourse on opensource Java analyzes the reference volume, centrality, and clusterability of themes during the Adjustment phase. It demonstrates that that the commercial opensource model and the opensource Java model are by far the most prominent theorizations in this phase. This analysis first identifies the major themes based on reference volume. The opensource-

supportive themes *Incumbent OSS move* and *OSS exploitation* are particularly prominent. In addition, the themes *Java competitiveness* and *Java stewardship* are particularly noteworthy because they demonstrate that the meaning of Sun's Java governance shifted from proprietary to opensource sponsorship. Based on these major themes, the analysis then identifies the prominent theorizations in the field.

The theorization of commercial opensource model was most prominent, followed by the one endorsing the opensource Java model. But with Sun opensourcing Java, this analysis demonstrates that Sun's Java governance continued to play a leading role in the Java standard. Sun's rather stark change regarding Java governance relative to statements of the previous phase can be explained by pressure from rivaling programming standards. By emphasizing the need to innovate in order to compete, Sun redefined the meaning of its Java governance and eventually endorsed the opensource Java model.

Quantitative view	Reference volume and centrality of 12 themes		
Adjustment phase			
	Frequency	Connections	Centrality degree
Themes	Reference volume	Links to other themes	Score based on links
Incumbent OSS move	96	10	0.91
OSS exploitation	91	10	0.91
OSS paradigm	45	11	1.00
Java competitiveness	32	10	0.91
Java stewardship	31	11	1.00
OSS delivers	31	11	1.00
Services model	29	10	0.91
OSS promotes Java	25	11	1.00
Incumbent strategy	24	10	0.91
OSS shortcomings	20	10	0.91
Open-up Java	15	11	1.00
Control stifles OSS	2	5	0.45

Table 14: Reference volume and centrality of the 12 themes (major themes in bold)

Almost all statements supporting the *major themes* endorse opensource approaches, either the commercial opensource model or the opensource Java model. Table 14 reports the reference volume and centrality of themes with major themes in bold. The high centrality degrees of almost all themes demonstrate that the set of participants referencing one theme also referenced all other themes in other statements. This suggests that at least some of those who supported one theme were also supporting some of the other themes attesting to the cohesiveness of the debate.

Particularly prominent are the opensource-supportive themes *Incumbent OSS move* and *OSS exploitation*. As discussed previously, the theme *Incumbent OSS move* represents statements that seek to enhance competitiveness by adopting specific opensource projects. As the most prominent theme in this phase, it exemplifies the shift in the discursive structure of the field.

The adoption of opensource projects by incumbents emerges as the key theme in the discourse on opensource Java software. For example, after adopting opensource application servers, IBM stressed that *"we know how to take products to market based on the Apache [opensource] license"* [123]. Similarly, Sun emphasized that *"the products we deliver ... we will opensource and open up to the community to facilitate in the evolution of those products"* [259]. Meanwhile, BEA focused on high-end features rather than entering the opensource application server market. Analysts noted that *"we're finding increasingly there are a lot of customers who aren't interested in those bells and whistles and aren't going to be anytime soon"* [221]. After BEA started considering opensource approaches, an analyst explained that *"it's a threat that they [BEA] are trying to make into a friend"* [224].

The momentum behind opensource approaches accelerated as incumbents were outrivaling each other on adopting opensource projects. As discussed previously, the theme *OSS exploitation* represents statements that seek to enhance competitiveness by addressing and exploiting opensource dynamics in the field. For example, after partnering with IBM's archrival Microsoft, opensource firm JBoss noted that *"we've always been in heavy competition with IBM and BEA ... so the competitive landscape is as brutal as usual"* [241]. These two themes thus prominently exemplify how opensource approaches became intricately related to competitiveness in the Java application server field.

The remaining four themes among the major themes represent other arguments enrolled in either one of the theorizations. Particularly noteworthy are *Java competitiveness* and *Java stewardship* representing statements endorsing Sun's Java model but the

former emphasizes innovation in Java software and in the standard while the latter emphasizes Java compatibility and Sun's role in defining the Java standard. During the Disruption phase, the former theme was more than twice as prominent as the latter theme. In this phase, both themes are equally well represented, which suggests that innovativeness became a key driver in the shift from proprietary to the opensource Java model.

In addition, the themes *Java competitiveness* and *Java stewardship* were the only themes were core conceptions of the theorization fundamentally changed. The theorization continued to be supportive of Sun's Java governance, alone the rationale for maintaining it completely changed vis-à-vis the proliferation of rivaling programming standards. For example, Sun allowed individual developers to participate in its Java governing body and later opensourced the Java programming standard under the most popular and far-reaching opensource license GPL. Emphasizing innovation in the Java standard, Sun's new CEO Schwartz pledged *"to make sure all of you have your voice heard [because] this is not about corporations defining development of a platform ... [but] about users"* [183]. At the same time, Sun remained committed to Java compatibility, noting that *"people are worried about ... an incompatible fork [version] used to get a competitive advantage"* [172]. Sun thus redefined the meaning of its Java governance model by emphasizing the need to innovate in the Java standard and endorsing the opensource Java model. Overall, the high centrality degrees demonstrate that major themes were widely anchored in the field suggesting broad support behind opensource approaches. With Sun's Java governance redefined under the opensource Java model, the commercial opensource model and the opensource Java model are by far the most prominent theorizations in this phase.

Figure 4 exhibits a network view of the thematic pattern showing clusters based on centrality and positive ties among themes. Positive ties are shown as lines and negative ties are shown as dotted lines with increasing thickness and darkness showing increasing strength of positive or negative ties, respectively. As previously, themes endorsing opensource-supportive themes were defined as having positive ties among each other. All but one theme were primarily supportive of open source. *OSS shortcomings,* the only oppositional theme, primarily represents statements criticizing the commercial exploitation of the opensource model by large incumbent firms rather than the opensource model as such. The network view based on reference volume, centrality, and positive ties demonstrates that the commercial opensource model and the opensource Java model dominated the discourse on opensource Java software.
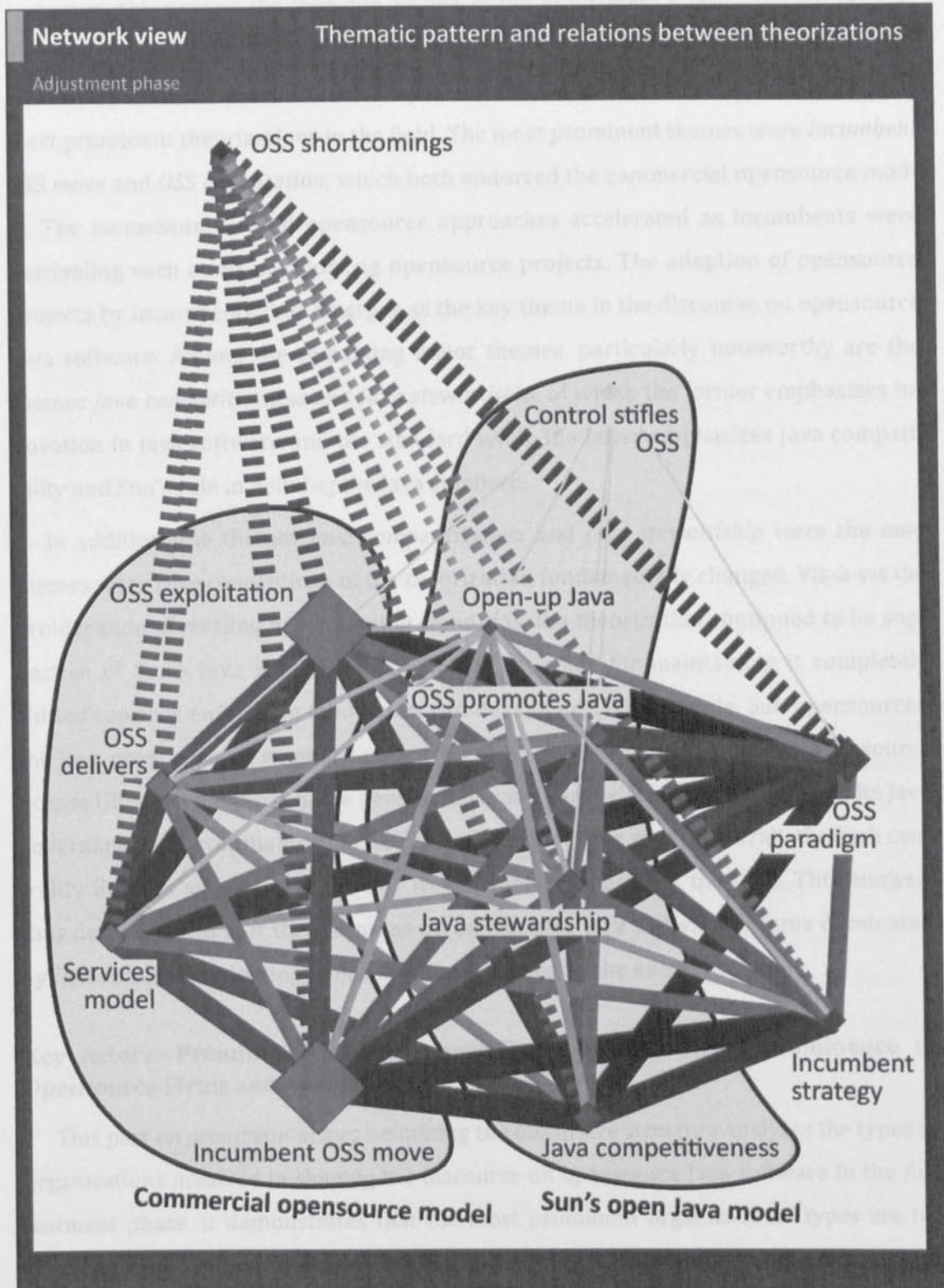
Figure 4: Thematic pattern and relations between theorizations in the Adjustment phase

In sum, this part on the *thematic pattern* of the Adjustment phase analyzed the reference volume, centrality, and clusterability of themes. It demonstrates that the commercial opensource model and the opensource Java model have become the by far most prominent theorizations in the field. The most prominent themes were *Incumbent OSS move* and *OSS exploitation*, which both endorsed the commercial opensource model. The momentum behind opensource approaches accelerated as incumbents were outrivaling each other on adopting opensource projects. The adoption of opensource projects by incumbents thus emerges as the key theme in the discourse on opensource Java software. Among the remaining major themes, particularly noteworthy are the themes *Java competitiveness* and *Java stewardship*, of which the former emphasizes innovation in Java software and the standard while the latter emphasizes Java compatibility and Sun's role in defining the Java standard.

In addition, the themes *Java competitiveness* and *Java stewardship* were the only themes were core conceptions of the theorization fundamentally changed. Vis-à-vis the proliferation of rivaling programming standards, the theorization continued to be supportive of Sun's Java governance, alone the rationale for maintaining it completely shifted towards embracing innovation and developers. For example, Sun opensourced the Java programming standard under the most popular and far-reaching opensource license GPL. By emphasizing the need to innovate, Sun redefined the meaning of its Java governance and eventually endorsed the opensource Java model. Overall, the high centrality degrees suggest that themes were widely anchored in the field. This analysis thus demonstrates that the discourse on opensource Java software became dominated by theorizations endorsing opensource approaches by the end of this study.

Key Actors: Prominence of Incumbent Firms with Growing Prominence of Opensource Firms and Analysts

This part on *prominent actors* sustaining the discursive structure analyzes the types of organizations involved in shaping the discourse on opensource Java software in the Adjustment phase. It demonstrates that the most prominent organizational types are incumbent firms, closely followed by opensource firms, with industry analysts (including opensource groups) least prominently represented. However, the prominence of both opensource firms and industry analysts increased relative to the previous phase, which reflects entry of new opensource firms and growing involvement of industry analysts. Based on reference volume and centrality, this analysis identifies JBoss CEO Fleury and

Sun executive Schwartz as particularly prominent. The list of participants continues to be well-balanced featuring major firms, developer groups and industry analysts.

In addition, while the most prominent organizational type in this phase continues to be the incumbent firm, both opensource firms and industry analysts increased their share suggesting a leveling of incumbents' previous prominence in the discourse on opensource Java software. Also in contrast to the previous phase, the most prominent response of incumbent firms is outright adoption of the commercial opensource model, which by far supersedes responses endorsing proprietary product strategies.

Similar to the previous phase, by far the most *prominent participants* are JBoss CEO Fleury and Sun's new CEO Schwartz. Table 15 reports the reference volume and centrality of participants and their organizational affiliation in the Adjustment phase. Overall, the list of participants is well-balanced featuring the major firms of the application server field as well as important developer groups and industry analysts. The high centrality degrees means that the set of participants who referenced one theme also addressed in other statements all remaining themes, which suggests that the discourse on opensource Java software is widely anchored within the field.

Fleury is particularly prominent in the themes *OSS exploitation* and *OSS delivers*. While incumbents adopt the commercial opensource model, JBoss extends the model to other areas of enterprise computing. For example, as incumbents entered the opensource market, JBoss' Fleury claimed that *"this year is the year people [incumbents] have put a target on [us],"* adding that *"people realize we're making money on this and it's a viable job and it's a real category"* [120]. But with increasing attention, outlining new opportunities and revenue streams became important. Fleury argued that JBoss' market *"may seem like a niche from the outside, but from the inside it's a big niche ... [while] there are other areas we're looking at, very specifically PHP and.NET"* [142].

Meanwhile, the success of rivaling programming standards PHP and.NET led Sun to opensource Java. Sun's Schwartz is particularly prominent in the themes *Java competitiveness* and *Java stewardship* but also in *Incumbent OSS move*. For example, Schwartz promoted Java vis-à-vis rivaling standards, claiming that *"the [Java] community is the single most successful community in the history of computing"* [231]. Sun anticipated that its opensource moves would generate demand for its product by *"allow[ing] people to participate ... [which] enlarges the community"* [175]. Overall, the vast majority of participants from both opensource and incumbent firms are supportive of opensource approaches, including the opensource Java model.

Actor positioning	Reference volume and centrality of 19 participants		
Adjustment phase			
	Frequency	Connections	Centrality degree
Participant (Organization)	Reference volume	Links to other actors	Score based on links
Fleury (JBoss)	82	18	1.00
Schwartz (Sun)	75	18	1.00
Magnusson (Apache)	41	16	0.89
Phipps (Sun)	31	17	0.94
Keller (Sun)	29	18	1.00
Willett (analyst)	24	17	0.94
LeBlanc (IBM)	24	16	0.89
Goulde (analyst)	23	18	1.00
Loiacono (Sun)	22	16	0.89
O'Grady (analyst)	22	18	1.00
Gardner (analyst)	22	18	1.00
Stallman (FSF)	17	16	0.89
Roth (BEA)	17	13	0.72
Connolly (JBoss)	17	16	0.89
Sebastian (SourceLabs)	14	17	0.94
Letellier (ObjectWeb)	11	18	1.00
Damarillo (LogicBlaze)	9	16	0.89
Sundstrom (CDN)	1	9	0.50
Bickel (JBoss)	1	11	0.61

Table 15: Reference volume and centrality of participants in the Adjustment phase

The most prominently represented *organizational type* in the field was the cluster of incumbent firms, closely followed by the cluster of commercial opensource firms, while the cluster around analysts and opensource groups grew. Table 16 exhibits the support for major themes by type of organization. It shows that the two prominent clusters account for 75 percent of all statements among the major themes. For example, incumbent firms Sun, IBM and BEA continued to address the opensource dynamics in the field along three 'steps' of opensource engagement. But the proprietary

approach featuring the least opensource engagement was no longer the most favored approach, as represented by the low support behind the theme *Incumbent strategy*. Instead, a higher level of opensource engagement through adoption of opensource projects emerged as the most favored approach, as represented by the prominence of the theme *Incumbent OSS move*.

A few statements of incumbents even endorsed a comprehensive and almost exclusive opensource engagement, as represented by theme *OSS exploitation*. In addition, participants were initially still divided over Java governance, until Sun announced opensourcing Java in May 2006. Meanwhile, several new opensource firms entered the marked offering services and support around opensource software while JBoss was acquired by leading Linux distributor Red Hat. Overall, prominence of both opensource firms and industry analysts increases relative to the previous phase, which reflects market entry by new opensource firms and the growing involvement of industry analysts in the discourse on opensource Java software.

Organization type	Support for major themes by type of organization		
Adjustment phase			
	Incumbent firms	**Opensource firms**	**Analysts (OSS groups)**
Major themes	41%	34%	25%
Incumbent OSS move (96)	76		20
OSS exploitation (91)	4	61	26
OSS paradigm (45)	12	14	19
Java competitiveness (32)	22	4	6
Java stewardship (31)	23	2	6
OSS delivers (31)	2	23	6
Services model (29)	6	18	5

Table 16: Support for major themes by type of organization in the Adjustment phase

In sum, this part on *prominent actors* analyzed the types of organizations involved in shaping the discourse on opensource Java software. It demonstrated that the most prominent organizational types are incumbent firms, closely followed by opensource firms, and that prominence of both opensource firms and industry analysts increased relative to the previous phase. While this analysis identified prominent participants, such as JBoss CEO Fleury and Sun's new CEO Schwartz, the list of participants was well-balanced featuring the major firms of the application server field as well as important developer groups and industry analysts. Moreover, the high centrality degrees suggest that at least some of those participants who are linked to one participant are linked to many other participants. This suggests a high degree of interaction even between participants who are supporting oppositional themes.

The two by far most prominent themes, *Incumbent OSS move* and *OSS exploitation* were primarily supported by incumbent and opensource firms. The themes *Java competitiveness* and *Java stewardship* were particularly supported by Sun as it started to opensource the Java programming standard while recommending itself as steward of the Java standard. While the most prominent organizational type in this phase continues to be the incumbent firm, both opensource firms and industry analysts increased their share reflecting market entry by new opensource firms and the growing involvement of industry analysts. Incumbents continued to address the opensource dynamics in the field along three 'levels' of opensource engagement. But in contrast to the previous phase, the most prominent response is adoption of the commercial opensource model, which by far superseded responses endorsing the proprietary model. This analysis demonstrated that both incumbent and opensource firms were constructing the discourse on opensource Java software around the commercial opensource model and the opensource Java model.

Action Orientation: Dominance of Reconstructive Orientation with Iterative Orientation Negligible

This part on *action orientations* sustaining the discourse on opensource Java software analyzes whether statements endorsed the proprietary, the opensource, or a hybrid approach. It demonstrates that major support during the Adjustment phase continues to promote opensource approaches. Based on a more differentiated investigation into the major themes, this analysis identifies the support behind the proprietary, the opensource, or a hybrid approach. Statements supportive of the proprietary approach ceased to be articulated by the end of the Adjustment phase while statements

supportive of the commercial opensource model further strengthened while starting to level off regarding the opensource Java model. Statements supportive of opensource approaches endorse the commercial opensource model or the opensource Java model. Statements supportive of a hybrid approach often endorse the same themes but with different emphases.

Based on the respective support, the analysis then identifies the action orientations of statements, of which the reconstructive orientation was most prominent. The reconstructive orientation is evident in statements endorsing the commercial opensource model or the opensource Java model, as well as in hybrid approaches with strong opensource focus. Far less prominently referenced are statements endorsing a hybrid approach featuring reconstructive as well as iterative orientations. Least prominent is the iterative orientation aimed at promoting the proprietary approach, which is only evident in early statements endorsing Sun's proprietary Java model. The final paragraph summarizes the implications of action orientations for the process of institutional change in the field.

With almost 80 percent, the *major support* of statements during the Adjustment phase is behind opensource approaches, followed by support for a hybrid approach, with negligible support for the proprietary approach. Table 17 specifies orientations of statements based on support for the three approaches. It shows that among the major themes, almost four fifths of all statements are supportive of opensource approaches with almost one fifth supportive of a hybrid approach. For example, at the beginning of this phase, the themes *Java stewardship* and *Java competitiveness* continued to represent a few statements supportive of Sun's proprietary Java model, which faded out over time. Instead, Sun stressed its determination to opensource the Java programming standard.

At the same time, Sun continued recommending itself as steward of Java by building credibility and reputation with developer communities. The meaning of Sun's Java model thus changed from enforcing Java specifications, even via legal deterrence, to coaching the process of Java's evolution through a community-led approach. This included managing the process of opensourcing the Java programming standard, including *"work[ing] through all sorts of issues – legal, access, encumbrances, relationships with Java licensees"* [196]. Overall, all themes are primarily supportive of opensource approaches, with a majority of themes endorsing the commercial opensource model (*OSS exploitation, Incumbent OSS move, OSS delivers,* and *Services model*), two themes endorsing the opensource

Java model (*Java stewardship* and *Java competitiveness*), and one theme endorsing open-source approaches in general (*OSS paradigm*). Finally, Statements supportive of a hybrid approach often endorse the same themes but with different emphases. The ubiquitous support behind opensource approaches confirms the previous findings that the new model emerged as dominant model by the end of the Adjustment phase. The more differentiated analysis of the major themes confirms that that opensource approaches emerged as dominant model by the end of the Adjustment phase.

Action orientation Adjustment phase	Prevalence of action orientations in major themes		
	Reconstructive	Iterative	Hybrid
Major themes	4%	78%	18%
Incumbent OSS move (96)		70	26
OSS exploitation (91)		91	
OSS paradigm (45)		42	3
Java competitiveness (32)	3	4	23
Java stewardship (31)	10	13	8
OSS delivers (31)		31	
Services model (29)		25	4

Table 17: Prevalence of action orientations in major themes of the Adjustment phase

The ubiquitous support behind opensource approaches means that the most prominent *action orientation* of statements is reconstructive, aimed at establishing a new model in the field. The reconstructive orientation is evident in statements endorsing the commercial opensource model or the opensource Java model, as well as in hybrid approaches with strong opensource focus. For example, opensource proponents promoted the adoption or extension of the commercial opensource model in other areas of enterprise computing as well as opensourcing Java to compete against rivaling programming standards. An analyst noted that Sun's opensource initiative *"fills a gaping*

hole in their middleware for integration" [276]. Sun justified its opensource initiative with developer momentum, arguing that *"JBI [Java Business Integration] and open source reduce the barriers to entry for developers"* [210].

Indeed, incumbents raced for leadership in opensource projects while disparaging competitors' efforts. JBoss CEO Fleury noted that *"IBM says we're not pure open source, we don't let others participate [as much, but] ... having IBM sit around and tell me what open source is all about is irritating"* [219]. Meanwhile, Schwartz claimed that *"Sun is the largest contributor to open source"* [231], adding that *"Everything that Sun produces will be open source and free"* [266]. Finally, statements endorsing a hybrid approach feature reconstructive as well as iterative orientations. For example, an analyst commented an incumbent's move to opensource software, arguing that *"software vendors [need] to begin to expand the exploitation of open source as it best fits their business models"* [161].

In sum, this part on *action orientations* analyzed whether statements endorsed the proprietary, the opensource, or a hybrid approach. It demonstrated that support behind opensource approaches was by far most prominent during the Adjustment phase. Statements supportive of the proprietary approach ceased to be articulated. In contrast, statements supportive of the commercial opensource model further strengthened while those supportive of the opensource Java model started to level off. Statements supportive of opensource approaches endorse the commercial opensource model or the opensource Java model. Statements supportive of a hybrid approach often endorse the same themes but with different emphases.

Based on these approaches and a differentiated investigation of themes, the analysis identified the reconstructive action orientation as most prominent orientation of statements. The reconstructive orientation is evident in statements endorsing the commercial opensource model or the opensource Java model, as well as in hybrid approaches with strong opensource focus. Far less prominently referenced are statements endorsing a hybrid approach featuring reconstructive as well as iterative orientations. Least prominent is the iterative orientation aimed at maintaining the proprietary approach, which is only evident in early statements endorsing Sun's proprietary Java model.

The dominance and pervasiveness of the reconstructive action orientation suggests that the discourse on opensource Java software redefined prevailing understandings as well as the strategies and actions that firms in the field valued and pursued in efforts to increase their competitiveness.

Concluding Summary

This section on the *Adjustment phase* analyzed the thematic pattern, the prominent actors, and the action orientations sustaining the discursive structure. It demonstrated that that the commercial opensource model and the opensource Java model are by far the most prominent theorizations in this phase. The momentum behind opensource approaches accelerated as incumbents were outrivaling each other on adopting opensource projects. Particularly noteworthy are the themes *Java competitiveness* and *Java stewardship*, of which the former emphasizes innovation in Java software and the standard while the latter emphasizes Java compatibility and Sun's role in defining the Java standard. These were the only themes were the meaning of the theorization fundamentally changed. The theorization continued to be about Sun's Java governance, alone the rationale for maintaining it completely changed vis-à-vis the proliferation of rivaling programming standards.

The theorizations of the commercial opensource model and of the opensource Java model were constructed primarily by incumbent firms followed by opensource firms, which continued to be the two most prominent types of organization in the Adjustment phase. Noteworthy is the shift of Sun from opponent to proponent of opensource Java under its new CEO Schwartz. This analysis shows how competing theorizations play out during institutionalization processes to converge around a new model within the field. Coinciding with the convergence was rapprochement between Sun and IBM while rivaling programming standards continued to threaten the momentum behind the Java standard. The analysis thus demonstrates that the theorizations of the commercial opensource model and of the opensource Java model did not only redefine prevailing understandings but also the strategies and actions that firms in the field pursued.

The discourse on opensource Java software in the Adjustment phase became almost completely dominated by statements endorsing opensource approaches. Similar to the previous phase, the majority of all statements were made by incumbents. The dominance of incumbents in shaping the discourse on opensource Java software was mirrored by the key events of this phase. The key events – 1) incumbents adopting opensource application servers, 2) Red Hat acquiring JBoss, and 3) Sun opensourcing Java – reflect the responses by established players responding to the disruption that occurred in the field. These events are further evidence of successful institutional change, that is, a disruptive and hitherto marginalized model changing the logic, power differentials, and norms governing the field.

In addition, the prominent role of industry analysts attests to the financial and strategic maturity of the opensource model in the field. This suggests that the business model of commercial opensource software was by now sufficiently established to attract the attention of various analyst and investor communities. At the same time, the Java programming language itself faced competition from rivaling programming languages. Hence, the meaning behind 'good' Java governance shifted from a preoccupation with enforcing Java compatibility and compliance towards a concern about innovativeness and reaching out to developer and user communities. The comprehensive strategic moves towards adopting opensource application servers by established players and Sun's announcement of opensourcing the Java programming language – after years of tensions over the issue – suggest that opensource approaches became deeply entrenched within the field.

Conclusion

This chapter on discursive structure identifies the thematic pattern, prominent actors, and action orientations for each of the three phases. The first section analyzes the Experimentation phase covering the period from January 1998 to March 2002. The thematic pattern was dominated by theorizations of the commercial opensource model and the opensource Java model while the theorization of Sun's (proprietary) Java model remained marginal. These theorizations were constructed primarily by opensource firms followed by opensource groups. The section demonstrates that the two theorizations of opensource approaches by far outweighed the theorization of proprietary approaches to software development and distribution. The early discourse on opensource Java software was therefore dominated by proponents of the new model.

The second section analyzes the Disruption phase covering the period from March 2002 to May 2005. The thematic pattern demonstrates that the commercial opensource was more prominent than the proprietary model but that Sun's proprietary superseded the opensource Java model. In contrast to the previous phase, theorizations were constructed primarily by incumbent firms. Major incumbents were endorsing the opensource Java model while Sun and opensource firm JBoss endorsed Sun's proprietary Java model. The section demonstrates that the theorization of the commercial opensource model continued to dominate the discourse on opensource Java software while the theorization of Sun's proprietary Java model gained support. It also demonstrates that allegiances shifted with some incumbents supporting the opensource Java model while opensource firm JBoss started to support Sun's proprietary Java model.

The third section analyzes the Adjustment phase covering the period from May 2005 to August 2006. The thematic pattern was dominated by theorizations of the commercial opensource model and the opensource Java model with the theorization of Sun's Java governance endorsing the opensource Java model. As in the previous phase, theorizations were constructed primarily by incumbent firms. The section demonstrates that the opensource approach was widely and almost completely supported by all key participants. Theorizations of the commercial opensource model and of the opensource Java model did not only redefine prevailing understandings but also tangible institutional outcomes, such as rules, strategies and actions that firms in the field pursued.

Comparative view   Degree of mobilization behind theorizations over time

— — — Commercial opensource model
······· Opensource Java sponsorship
——— Proprietary Java sponsorship
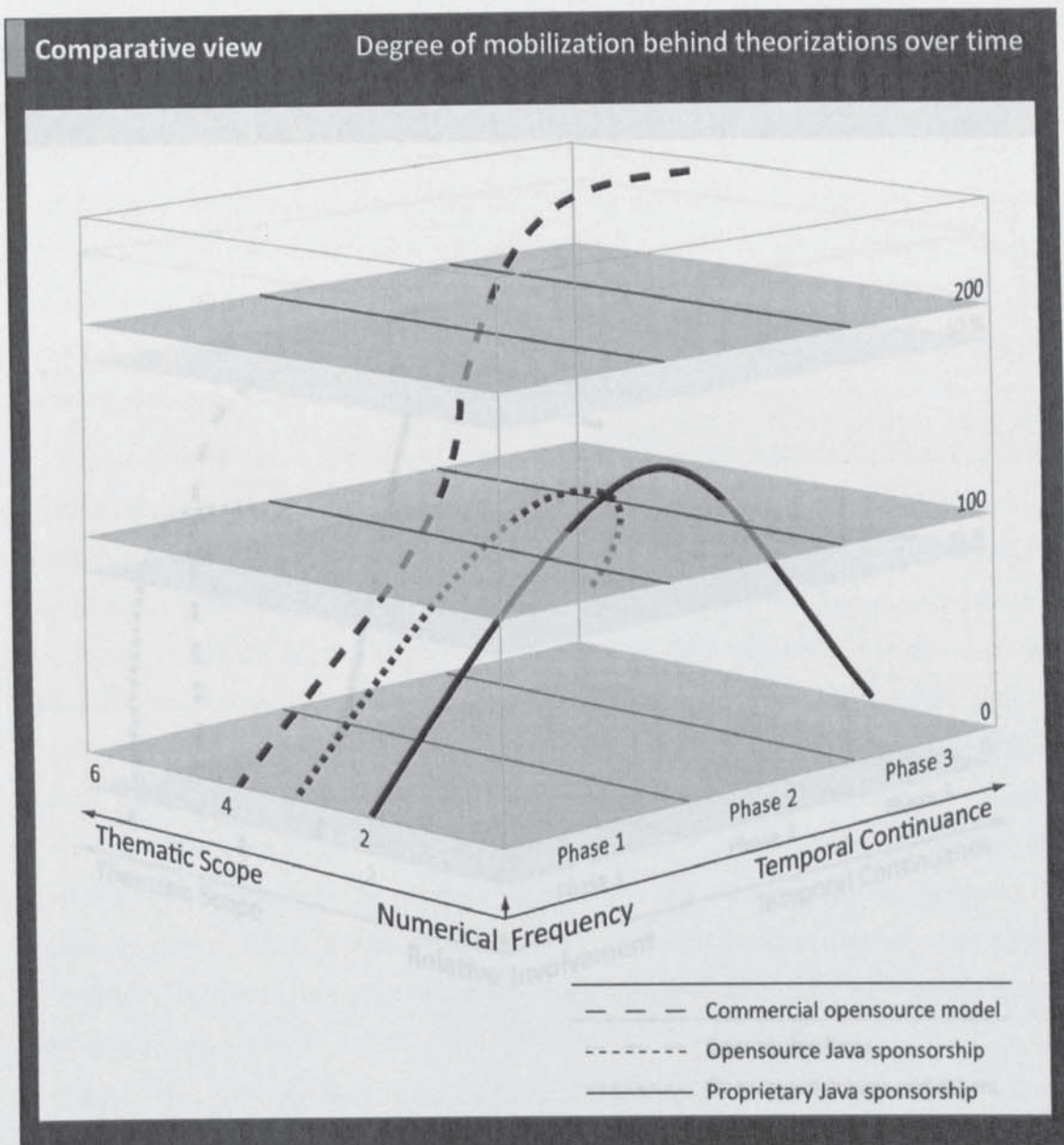
Figure 5: Degree of mobilization behind theorizations over time

Three quantitative indicators appeared particularly salient for tracing the degree of mobilization behind a theorization over time. First, *numerical frequency* represents the support behind the themes that were endorsing either one of the three theorizations, the commercial opensource model, the opensource Java model, and the proprietary Java model. Second, *thematic scope* represents the depth of each of the three theorizations measured by the number of themes endorsing a theorization. Third, *temporal continuance* represents the longevity of each of the three theorizations measured by the occurrence of endorsing themes over time. These indicators provide tangible evidence for linking discourses to institutional outcomes.

Figure 6: Degree of involvement of prominent actors over time

Figure 5 exhibits a comparison of the *degree of mobilization* behind each of the three theorizations based on all twelve themes. The four themes theorizing the commercial opensource model are supported by 51, 224, and 247 statements over the three phases, respectively. The number of themes theorizing the opensource Java model increases from three to five being supported by 50, 114, and 42 statements over the three phases, respectively. In contrast, the two themes theorizing proprietary 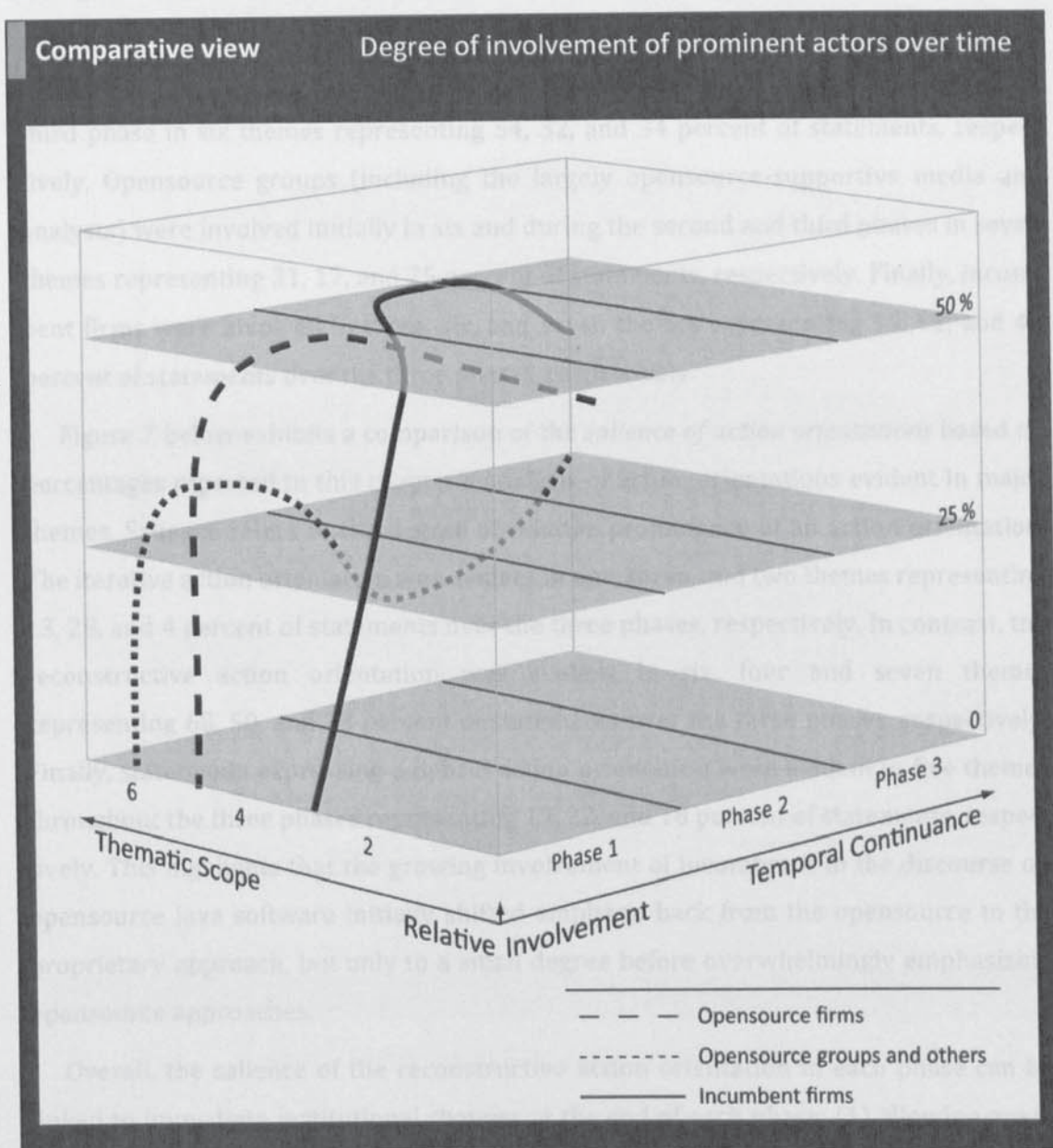Java model represent only 26, 122, and 13 statements over three phases. Clearly evident is the heightened participation in the debate on Java governance in the Disruption phase, where different logics competed head-on for dominance.

Figure 6 exhibits the *degree of involvement* of prominent actors based on relative involvement in percent reported in this chapter's analysis of key actors. Opensource firms were involved during the first and second phases in five themes and during the third phase in six themes representing 54, 32, and 34 percent of statements, respectively. Opensource groups (including the largely opensource-supportive media and analysts) were involved initially in six and during the second and third phases in seven themes representing 31, 17, and 25 percent of statements, respectively. Finally, incumbent firms were involved in three, six, and seven themes representing 15, 51, and 41 percent of statements over the three phases, respectively.

Figure 7 below exhibits a comparison of the *salience of action orientations* based on percentages reported in this chapter's analysis of action orientations evident in major themes. Salience refers to the degree of relative prominence of an action orientation. The iterative action orientation was evident in one, three, and two themes representing 13, 28, and 4 percent of statements over the three phases, respectively. In contrast, the reconstructive action orientation was evident in six, four and seven themes representing 68, 50, and 78 percent of statements over the three phases, respectively. Finally, statements expressing a hybrid action orientation were evident in five themes throughout the three phases representing 19, 22, and 18 percent of statements, respectively. This highlights that the growing involvement of incumbents in the discourse on opensource Java software initially shifted emphasis back from the opensource to the proprietary approach, but only to a small degree before overwhelmingly emphasizing opensource approaches.

Overall, the salience of the reconstructive action orientation in each phase can be linked to immediate institutional changes at the end of each phase: (1) allowing opensource Java software, (2) adoption of opensource application servers by incumbents,

and (3) opensourcing of the Java standard. The first and last outcomes are key indicators of regulatory changes precipitating changes in the prevailing institutional structure. The second outcome is evidence of the successful establishment of a new business category in the field. The analysis of discursive structure is thus able to link institutional changes to shifts in thematic patterns, prominent actors, and action orientations over time. The next chapter analyzes the actual statements to demonstrate that the theorizations are indeed directly linked to the content of institutional changes.
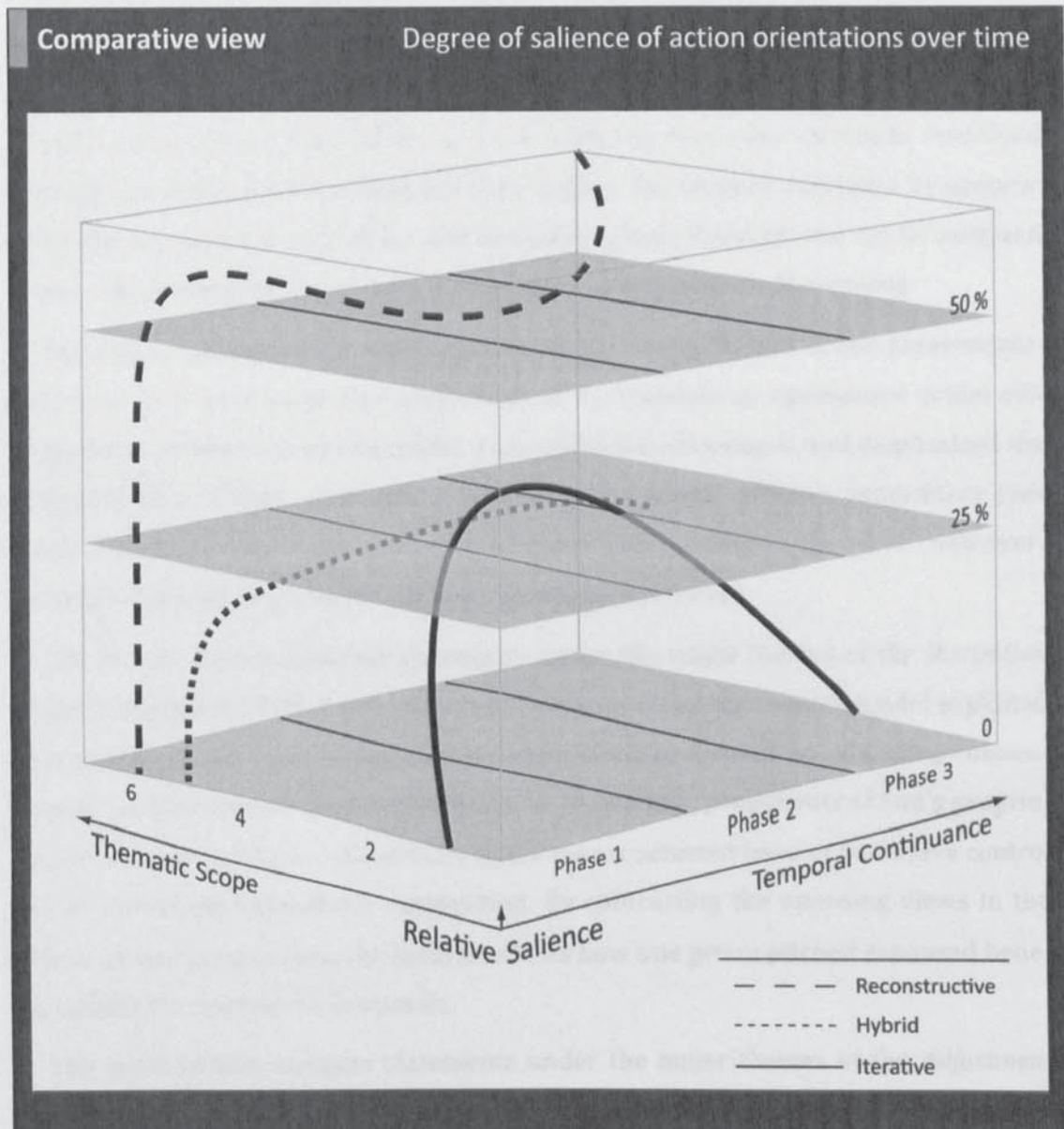

Figure 7: Comparison of action orientations over time based

5. Analysis of Discursive Action

This chapter on discursive action reconstructs the discourse on opensource Java software by tracing the theorizations of the commercial opensource model, of Sun's (proprietary) Java model, and of the opensource Java model. Recognizing the challenge to use some data statements for *showing* (exemplify) what occurred and other statements for *telling* (explain) what occurred (e.g. Eisenhardt & Graebner 2007; Golden-Biddle and Locke 1997), statements are carefully used to either exemplify or to help explaining phenomena. Each of the sections identifies discursive strategies employed to legitimate and embed the espoused theorization. The chapter concludes by summarizing the key issues of each phase and by outlining how theorizations can be analyzed in more detail along their business, technology, and legitimation dimensions.

The first section analyzes statements under the major themes of the *Experimentation phase*. It demonstrates that proponents of the commercial opensource model embedded the software-as-service model, exploited price advantages, and emphasized the innovativeness of their approach. In contrast, proponents of Sun's proprietary Java model linked the widely approved Java compatibility promise to the more controversial issue of prohibiting commercial opensource Java software.

The second section analyzes statements under the major themes of the *Disruption phase*. It demonstrates that proponents of the commercial opensource model exploited their marginalized status to attract consenters but also focused on educating customers and on assuaging incumbent competitors. In contrast, proponents of Sun's proprietary Java model tied Java compatibility to the more contested issue of Sun's Java control and of containing opensource competition. By contrasting the opposing views in the debate on opensource Java, the analysis shows how one group pitched espoused benefits against the opponent's proposals.

The third section analyzes statements under the major themes of the *Adjustment phase*. It demonstrates that proponents of the commercial opensource model competed on the new model and thus further reinforced its adoption in the field. Investigating the theorization Sun's redefined open Java model demonstrates that proponents endorsed opensourcing Java to drive innovation but remained committed to Java compatibility.

Experimentation Phase (January 1998 – March 2002)

The Experimentation phase starts at the beginning of the year in which the first opensource application servers started to gain momentum and ends with Sun allowing opensource Java software. This section on discursive action is structured in two parts and a concluding summary. The concluding summary presents the key developments and the role of the discursive strategies in institutionalization processes during the Experimentation phase.

The first part investigates *reconstructive* discursive action by analyzing statements constructing the theorization of the commercial opensource model during the Experimentation phase. It demonstrates that proponents, largely constituted of JBoss executives, embedded the software-as-service model, exploited price advantages, and emphasized the innovativeness of their approach. The opensource model enabled Lutris and JBoss to offer technical features that often matched or surpassed proprietary application servers. Legitimation of the commercial opensource model was particularly based on support from individual developers and smaller firms.

The second part investigates *iterative* discursive action by analyzing statements under themes that endorsed Sun's proprietary Java model. It demonstrates that proponents, largely constituted of Sun executives, linked the widely approved Java compatibility promise to the more controversial issue of prohibiting commercial opensource Java. The technology conception centered on Java specifications prohibiting opensource Java software while the legitimation conception linked Sun's Java control to Java's compatibility promise.

The analysis demonstrates that proponents of the commercial opensource model primarily employed the discursive strategies of *Reframing*, by educating about the new model and addressing reservations, and of *Identification*, by linking innovativeness to opensource approaches. In contrast, proponents of Sun's Java governance also employed the discursive strategy of *Identification*, by tying the widely approved Java compatibility to Sun's control over the Java standard.

Commercial Opensource Model: Linking Innovativeness to Open Source

This part on *reconstructive* discursive action analyzes statements constructing the theorization of the commercial opensource model along the business, technology and legitimation conceptions. It demonstrates that proponents, largely constituted of JBoss

executives, embedded the software-as-service model, emphasized the innovativeness of opensource approaches, and built a developer community around their opensource application servers. The summary identifies the salient issues and the discursive strategies from the pattern of arguments enrolled in the theorization.

Regarding the business conception, Lutris and JBoss addressed the novelty and legal ambiguity around free opensource software by linking it to selling services and support, which was a more established approach. Regarding the technology conception, opensource firms Lutris and JBoss were able to offer technological features that often matched or surpassed proprietary application servers. Regarding legitimation, the opensource model was supported by developers and smaller firms unwilling to approve incumbents' high price tags. This analysis identifies two discursive strategies employed by proponents of the commercial opensource model: *Reframing*, by educating about the new model and addressing reservations, and *Identification*, by linking innovativeness to opensource approaches.

BUSINESS CONCEPTION

The *business conception* of the commercial opensource model was yet unproven and proponents attempted to attract confidence in the viability of selling services and support around free opensource software while emphasizing cost advantages for customers. One important aspect of these efforts involved educating developers and customers about opensource approaches while another aspect involved directly disparaging incumbents. For example, concerning the former aspect, Lutris executive Bigelow explained the business model around its opensource application server [251]:

> ... instead of a development house or consulting firm having to pay a retail price for it, we're giving them the product, and as they use it, we hope they extend it, make it better and give it back to the community.

Similarly, JBoss founder Fleury explained [213]:

> For JBoss Group, our commercial Company, which sells training, support, consulting and documentation for JBoss, it's clear that without a first-class product, no one would buy any of the related services. Our business model for open source is to sell the services.

Giving customers the ability to hold the provider accountable is particularly critical because opensource software has no contractually liable vendor.

As shown previously, Sun and other incumbents disparaged the commercial opensource model. In turn, JBoss' Fleury defended the model [122]:

[The application server in] open source is now a credible alternative to much more established players in the field ... we offer a credible alternative for Fortune 1,000,000,000, something I feel is important for the future adoption of the [Java] platform

Fleury suggested that JBoss, through mass volume, would lower the costs of Java server solutions while incumbents' focus on high-end features and corporate customers would push smaller firms towards Microsoft's competing .NET standard. Lutris and JBoss also addressed the ambiguity around free opensource software by linking it to selling services and support, which was a more established approach.

Driving the momentum behind opensource application servers were significant price differences between server solutions from incumbent and opensource firms. For example, a proprietary application server solution using specialized Sun hardware, BEA or IBM application servers, and an Oracle database starts at US$ 1 million[5]. In contrast, a *comparable* server solution using Intel hardware based on the open-standards of a growing mass market and software based on opensource licenses costs US$40,000[6]. JBoss founder Fleury explained [213]:

You can imagine the number of Fortune 1000 that download our stuff just because they are trying to cut on cost. Wasting money is un-American.

Fleury understood that after the 'dot-com' boom and amid an economic downturn, paying for unneeded high-end features became less justifiable.

At the same time, incumbents IBM and Hewlett-Packard adopted opensource initiatives to lower the costs of server solutions expected to drive their consulting and hardware businesses. These executives perceived the pressure brought about by open-standards and opensource software as opportunity. In turn, the endorsement by major incumbents reinforced the momentum behind opensource approaches. For example, Lutris founder David Young argued [283]:

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[5] (1) Server hardware: Morgan, Timothy Prickett. "Sun Puts 1.05GHz US-III+ in Midrange, Enterprise Servers." ComputerWire, 6 Aug 2002, Nexis; (2) Application server software: BEA Systems, Inc. "BEA WebLogic tops benchmark results for both performance and value for enterprise and departmental application environments". PR Newswire, 26 Mar 2002, Nexis; (3) Database: Richtel, Matt. "As rivals steam forward, Oracle christens a database". The New York Times, 15 Jun 2001, Nexis.

[6] (1) Server hardware: Dell Computer Corporation. "Two PowerEdge(TM) servers bring new technologies to enterprise customers." Canada NewsWire, 19 Feb 2002; (2) Application server software: JBoss; (3) Database: MySQL.

So what does open source get in return for all this big-business leverage? Legitimacy, to be precise. We applaud those businesses with bold opensource initiatives because they are helping the rest of us who have built a business model around opensource technology legitimize it in the eyes of enterprise customers.

The significant cost differences between proprietary and opensource application server solutions were crucial for the adoption of the opensource model.

TECHNOLOGY CONCEPTION

Regarding the *technology conception*, the commercial opensource model allowed Lutris and JBoss to match or surpass proprietary application servers concerning widely used features. Apache and JBoss were collaborating on opensourcing the so-called *software stack* that includes the core components of Java-based server solutions. In October 2000, JBoss founder Fleury announced [122]:

We have serious numbers on invocation time, it is FAST ... the full [Java] stack lives in open source. It is a reality; an integrated [Java] stack now lives in open source.

Fleury argued that by opensourcing the core components of Java-based server solutions would allow developers to freely improve and thus drive innovation around the stack.

When the wireless web made headlines about a year later, Lutris' opensource application server was the first to support wireless internet technologies [143]. Lutris' Bigelow explained [209]:

Ironically, the only application server available today with full support for J2ME [mobile Java] and XHTML [dynamic content] is from the open source community. Open source and open standards continue to tear down the proprietary walls that inhibit the adoption of a wireless internet.

In addition, Lutris incorporated promising new opensource technologies such as XML. Lutris' Young highlighted that XML allows separating the work of programmers from designers thus improving design and usability [280].

JBoss implemented the ability to pool low priced Intel-based server hardware to match the processing power of much more expensive hardware from Sun. This feature was lacking or underdeveloped in incumbents' application servers. Fleury explained [213]:

Before, you needed to spend many frustrating hours installing clunky IBM/BEA software. With JBoss 3, you can now get this done through the network with no intervention.

Lutris and JBoss were thus not only able to benefit from innovations due to opensource approaches to software development, but also from innovations outside existing product areas or taken-for-granted customs.

The growing internet market and online transactions required more integrated approaches to Java-based server solutions. JBoss remained focused on integrating the application server and was rewarded with increasing market penetration [253]. For example, Fleury emphasized JBoss' technological superiority while disparaging incumbents [213]:

> Again and again, we bring features to market way ahead of everyone else. We enable the hot-deploy of server modules, not just applications running on top of it ... This is going to blow a hole in all the wannabe players who offer embeddable solutions in the [mainstream] market because they can't sell anywhere else. This is what some of our more desperate competition falls back on ... our technology is going to blow everybody else out of the water.

Incumbent firms – including Sun, BEA, IBM, and Oracle – were specialized on providing the components for integrated platforms. But without Sun's official Java certification, JBoss was hampered competing in this area.

At the same time, JBoss' Fleury emphasized not only the technological innovativeness of the opensource model but also its productivity gains in software development, testing and distribution. He explained [214]:

> Modularity in open source is not just a good idea. Modularity is the only way a project can mature. Successful opensource projects are usually measured by the number of people that participate in the development ... the key to growing the codebase is to enable lots of developers to work on modules around the core.

During 2001, when he made these statements, JBoss was in a particularly vulnerable position as Lutris was about to withdraw its opensource application server citing Sun's Java restrictions. The increasing uncertainty around opensource Java software threatened the progress that JBoss made in proving its credibility and longer term viability. JBoss' leading role in the discourse on opensource Java software was thus a response to prevailing barriers.

LEGITIMATION CONCEPTION

The *legitimation conception* of the commercial opensource model was framed around developers interested in experimenting without buying expensive licenses as well as around smaller firms satisfied by less features and lower costs. Referring to the volume base of Apache's market leading web server, Lutris executive Young claimed

market leadership by announcing that *"We want to ... become the Apache of application servers"* [280]. JBoss' Fleury also alluded to Apache's web server when identifying *"many parallels here with JBoss"* [213]. He claimed [213]:

> *JBoss in my not so humble opinion will become the de facto standard, an 'open monopoly' of sorts in the near future. We have the technology, the ease of use, the mindshare, the customers, the supporting company. Our place in the [Java] market is to own it.*

Because the commercial opensource model was driven by volume and price, rather than high-end features, individual developers and smaller firms were main beneficiaries.

According to market surveys, JBoss market penetration rose from zero in 2000 to 14 percent in 2002 [253]. This demonstrates that JBoss was able to grow despite Lutris abandoning its opensource application server citing Sun's restrictions and customer reservations. Fleury attributed the increasing adoption of JBoss to individual developers and smaller firms [122]. He particularly targeted the growing market of infrastructure integration and internet services, which remained dominated by incumbent firms [122]. Fleury repeatedly pointed out that the single most important success factor for the opensource model is reaching critical mass, at which point it would leverage its potential regarding software development and distribution. To this end, JBoss targeted the neglected but rapidly growing share of individual developers and smaller firms involved in internet projects thereby making the JBoss application server irreplaceable in this area and somewhat immune against legal action by Sun.

SUMMARY

In sum, this part on reconstructive discursive action analyzed statements constructing the theorization of the commercial opensource model. It demonstrated that proponents, largely constituted of JBoss executives, embedded the software-as-service model, emphasized the innovativeness of opensource approaches, and built a developer community around their opensource application servers. Overall, proponents of the commercial opensource model primarily employed the discursive strategies of *Reframing*, by educating about the new model and addressing reservations, and of *Identification*, by linking innovativeness to opensource approaches.

Regarding the *business* conception, Lutris and JBoss addressed the novelty and legal ambiguity around free opensource software by linking it to selling services and support, which was a more established approach. The momentum behind opensource ap-

plication servers was driven by significant price differences between application server solutions of incumbents and of opensource firms.

In addition, by using opensource approaches to software development, Lutris and JBoss were able to offer *technical* features that often matched or surpassed proprietary application servers. For example, Lutris was able to quickly integrate wireless internet technologies while JBoss introduced features that made it easier to substitute specialized server hardware with mass-market hardware based on open-standards. This suggests that Lutris and JBoss were not only able to benefit from innovations due to opensource approaches, but also from innovations outside existing product areas or taken-for-granted customs.

Regarding *legitimation*, the opensource model was supported by developers and smaller firms repelled by incumbents' high price tags. However, JBoss skillfully developed credibility was at risk when Lutris was about to abandon its opensource application server, citing Sun's Java restrictions. Fleury responded by stepping up efforts to mobilize support, which kept JBoss in the news shielding it from unpopular legal actions by Sun.

Sun's Proprietary Java Model: Tying Java Compatibility to Sun's Control

This part on *iterative* discursive action analyzes statements constructing the theorization of Sun's proprietary Java model along the business, technology and legitimation conceptions. It demonstrates that proponents, largely constituted of Sun executives, linked the widely approved Java compatibility promise to the more controversial issue of prohibiting commercial opensource Java. The summary identifies the salient issues and the discursive strategies based on the overall tone of arguments enrolled in the theorization.

Regarding the business conception, freely available opensource application servers were threatening incumbent firms. While Java was freely available, vendors were required to pay royalties to Sun for sold Java products. The technology conception centered on prohibiting the distribution of modified source code, initially designed against Microsoft. But with increasing momentum behind opensource application servers, Sun reactivated these Java specifications to restrict opensource Java software. The legitimation conception linked Sun's Java control to Java's compatibility promise. But even former supporters criticized as anti-competitive the double standard that Sun applied regarding non-commercial and commercial opensource projects. The analysis identi-

fies *Identification* as a typical discursive strategy employed by proponents of Sun's Java governance. Identification strategy involved tying the widely approved Java compatibility to Sun's control over the Java standard.

BUSINESS CONCEPTION

The *business conception* of Sun's Java governance was framed around the threat that freely available opensource application servers were posing to profits and licensing revenues of incumbent firms. Industry reports found that, between 1998 and 2000, high-end but often unused features of incumbent application servers were wasting US$ 1 billion with price differentials of up to 80% [215]. Initially, however, the prime concern was with Microsoft, against which Sun had established the new Java standard. To enforce Java specifications against Microsoft, Sun CEO McNealy announced *"fairly aggressive legal action to protect ... Java"* [145]. He also rejected making Java an international standard stressing the *"very political processes that need money to run and sometimes their constituencies change"* [173]. Sun feared that Microsoft would be able to gain control over Java.

During the year 2000, while settling its dispute with Microsoft, Sun's attention turned to Lutris' and JBoss' popular opensource application servers. Sun's McNealy stressed that Java is freely available but vendors were required to pay royalties to Sun for sold Java products [171]. However, Lutris and JBoss were selling services and support while giving the products away for free. Sun then invoked Java specifications which – on paper – were prohibiting opensource Java software while – in practice – Sun supported Apache's opensource Java software. Sun executive Roth was then quoted justifying Sun's enforcement of Java specifications against Lutris and JBoss by stressing that low-cost competitors destroy profits for all [202].

In August 2000, after unsuccessfully negotiating with Sun, Lutris president Lind concluded that Java *"is a money-making endeavor for Sun"* [131]. Sun executive Bill Roth acknowledged *"an inexorable march toward open source"* but warned that *"we have lawyers involved"* [202]. Less than a year later, Lutris announced withdrawing its opensource application server while JBoss remained preempted from Sun's Java certification [144]. However, Sun avoided hinting at legal action against increasingly popular JBoss, fearing it would backlash [240]. While Sun and other incumbents supportive of Sun's Java control largely cited compatibility concerns, Sun also cited low-cost competition as concern for prohibiting opensource Java software.

TECHNOLOGY CONCEPTION

The *technology conception* of Sun's Java control centered on preventing the distribution of modified source code. Sun was thus able to prevent Microsoft from redefining Java to link it more exclusively to its operating system. For example, Sun's 'father of Java' Gosling suggested that *"if Microsoft successfully fragments the Java technology, the cross-platform benefits to vendors, developers, and users of the Java technology will be damaged"* [149]. Even O'Reilly Media editor and opensource proponent Loukides initially approved Sun's Java control because *"Microsoft is actively pushing a dumped-down pseudo-Java in order to split the developer community"* [244]. By enforcing the Java specifications, Sun was able to prevent Microsoft from establishing its own version of Java and using its leverage to create momentum behind it.

However, specifications prohibiting the distribution of modified source code also affected – at least on paper – opensource Java software, which Sun actively supported at opensource group Apache. Opensource Java projects, particularly by the Apache Foundation, complemented and extended incumbent offerings making Sun's Java standard more attractive vis-à-vis Microsoft's efforts. For example, in June 1999, Apache representative Hunter praised the opensource collaboration with Sun [170].

> *Perhaps the most exciting aspect of the announcement is that it marks the first time Sun proprietary Java source code will be available under a [opensource] license ... individuals and companies are free to use the source code for nearly any use without royalty payments of any kind.*

This suggests that Java specifications prohibiting opensource Java software were not invoked as long as Sun and other incumbents benefitted from non-commercial opensource projects.

In addition, Lutris and JBoss became popular *because* they were distributing compatible application servers. In other words, the threat of incompatible Java software though opensource projects was low. Yet, Java compatibility became increasingly synonymous with disparaging opensource competitors. Loukides therefore criticized Sun for putting forward an *"objection [that] doesn't really hold water"* [246]. This suggests that underlying fears were exploited to fend off competition from new entrants.

LEGITIMATION CONCEPTION

The *legitimation conception* of Sun's Java governance was framed around Java's compatibility promise aimed at preventing vendor lock-in, particularly vis-à-vis Microsoft's dominance. Less explicitly, Sun' Java control was also legitimated, at least among

some incumbents and customers, by the need to prevent low-cost opensource competitors from gaining a foothold. As Java sponsor, Sun had to address concerns of its major licensees, who feared low-cost competition, and its customers, who feared the spread of incompatible Java software.

These fears became pronounced in the debate about opensourcing the Java standard. For example, in early 1998, O'Reilly Media editor Loukides explained [244]:

> [Sun's control is] important for the Java platform to be used commercially, and too many important commercial users are scared to death of free software. As far as I can tell, the reasons for their fear are completely irrational, but you can't control other people's fears.

Sun executives also actively sustained these fears. For example, Sun CEO McNealy claimed that "if you go from capitalism to the commune, where there are no trademark and property rights, you can't promise 'write once, run everywhere'" [108]. Hence, promising compatibility became increasingly synonymous with disparaging opensource competition.

Perhaps most striking is the double standard regarding non-commercial and commercial opensource projects. On one hand, if non-commercial and complementing, Sun supported opensource projects. On the other hand, vis-à-vis commercial and competitive projects by Lutris and JBoss, Sun executive Roth identified "a fundamental conflict between open source and trying to produce a compatible [Java] standard" [249]. Referring to Lutris and JBoss, Sun executives reiterated that opensource Java software would undermine Java's brand and compatibility [247]. By the end of 2001, Loukides openly criticized Sun for prohibiting unwanted opensource competitors from "legally releas[ing] an opensource implementation" [246]. Taken together, practices and statements of opensource opponents suggest that Sun's legitimation for controlling Java was based on guaranteeing compatibility and disparaging opensource competition.

SUMMARY

This part on *iterative* discursive action analyzed statements approving Sun's Java control. It demonstrated that proponents, largely constituted of Sun executives, linked the widely approved Java compatibility promise to the more controversial issue of prohibiting commercial opensource Java software. Overall, proponents of Sun's Java governance primarily employed the discursive strategy of *Identification*, by tying the widely approved Java compatibility to Sun's control over the Java standard.

Regarding the *business* conception, freely available opensource application servers were threatening incumbent firms. While Java was freely available, vendors were required to pay royalties to Sun for sold Java products. However, Lutris and JBoss were selling services and support while giving their popular opensource application server away for free. While negligible in terms of resources and customers, the momentum behind Lutris and JBoss threatened Sun and other incumbents. In addition, application servers constituted core components of enterprise computing.

The *technology* conception centered on prohibiting the distribution of modified source code, initially designed against Microsoft. These specifications would also prohibit opensource software, but Sun and other incumbents supported non-commercial opensource Java projects that complemented their offerings. However, with increasing momentum behind commercial opensource application servers, Sun reactivated the technical specifications to prohibited opensource competition. As a consequence, Lutris announced abandoning its opensource application server.

The *legitimation* conception linked Sun's Java control to Java's compatibility promise. However, promising compatibility became increasingly synonymous with disparaging opensource competition. Even former supporters criticized as anti-competitive the double standard that Sun applied regarding non-commercial and commercial opensource projects.

Concluding Summary

This section on discursive action in the Experimentation phase investigates how the theorizations were constructed by participants along the business, technology, and legitimation dimensions. Overall, this analysis demonstrates that proponents of the commercial opensource model primarily employed the discursive strategies of *Reframing*, by educating about the new model and addressing reservations, and of *Identification*, by linking innovativeness to opensource approaches. Proponents of Sun's Java governance also employed the discursive strategy of *Identification*, by tying widely approved Java compatibility to Sun's control over the Java standard.

The first part investigates *reconstructive* discursive action by analyzing statements constructing the theorization of the commercial opensource model. It demonstrates that proponents embedded the software-as-service model, emphasized the innovativeness of opensource approaches, and built a developer community around their opensource application servers. Lutris and JBoss addressed the novelty and legal ambiguity

around free opensource software by linking it to the more established approach of selling services and support. In addition, by using opensource approaches to software development, Lutris and JBoss were able to offer technical features that often matched or surpassed proprietary application servers. The opensource model was primarily supported by developers and smaller firms repelled by incumbents' high price tags.

The second part analyzes *iterative* discursive action by analyzing statements constructing the theorization of Sun's proprietary Java model. It demonstrates that proponents linked the widely approved Java compatibility promise to the more controversial issue of prohibiting commercial opensource Java software. Freely available opensource application servers were threatening revenues of incumbent firms. Sun and other incumbents were invoking Java specifications prohibiting the distribution of modified source code. Sun justified its stance against opensource competitors with having to guarantee Java's compatibility. But even former supporters criticized the double standard that Sun applied regarding non-commercial and commercial opensource projects.

Disruption Phase (March 2002 – May 2005)

The Disruption phase starts with Sun allowing opensource Java software and ends with incumbents' adoption of opensource application servers. This section on discursive action is structured in three parts and a concluding summary. The concluding summary presents the key developments and the role of the discursive strategies in institutionalization processes during the Disruption phase.

The first part investigates *reconstructive* discursive action by analyzing statements constructing the theorization of the commercial opensource model. It demonstrates that proponents initially exploited their marginalized status to attract opensource developers but also focused on educating customers about their approach and on assuaging incumbent competitors.

The second part investigates *iterative* discursive action by analyzing statements under themes that endorsed Sun's (proprietary) Java model. It demonstrated that proponents legitimated Sun's Java control with a rather abstract concern about protecting developers and customers.

The third part contrasted *reconstructive* with *iterative* discursive action by analyzing statements constructing either the theorization of the opensource Java model or

the theorization of Sun's proprietary Java model. It demonstrated that proponents pitched innovation and cost advantages against Sun's proprietary Java model while opponents pitched compatibility and interoperability against the opensource Java model.

The analysis demonstrates that proponents of the commercial opensource model employed the discursive strategies of *Self-promotion*, by enrolling a marginalized position to attract consenters, and of *Containment*, which downplayed adoption barriers by educating stakeholders and assuaging opponents. In contrast, proponents of Sun's proprietary Java model employed the discursive strategy of *Self-expansion*, by suggesting that developers and customers widely approve Sun's proprietary Java model. Regarding the debate on opensource Java, both proponents and opponents employed the discursive strategies of *Totalizing*, by declaring, respectively, either Java innovativeness or Java compatibility as the overriding concern, and of *Dismissal*, by pitching the supported project against the project of opponents.

Commercial Opensource Model: Downplaying Institutional Barriers to Adoption

This part on *reconstructive* discursive action analyzes statements constructing the theorization of the commercial opensource model along the business, technology and legitimation conceptions. It demonstrates that proponents, largely constituted of JBoss executives, initially exploited their marginalized status to attract opensource developers but also focused on educating customers about their approach and on assuaging incumbent competitors. The summary identifies the salient issues and the discursive strategies from the pattern of arguments enrolled in the theorization.

Regarding the business conception, while initially still unproven, the commercial opensource model became increasingly attractive with the proliferation of the software-as-service model. The technology conception initially centered on JBoss' innovativeness and Java compliance but was increasingly framed around integrating the enterprise computing infrastructure. The legitimation conception highlights the crucial role of individual developers and smaller firms in driving its momentum. These stakeholders proved vital for constructing the legitimacy behind the commercial exploitation of the opensource model while it was still contested, both in the field as well as within incumbent firms. This analysis identifies two discursive strategies employed by proponents of the commercial opensource model: *Self-promotion*, by enrolling a marginalized position to attract consenters, and *Containment*, which downplayed adoption barriers by educating stakeholders and assuaging opponents.

BUSINESS CONCEPTION

The *business conception* of the commercial opensource model remained ambiguous as JBoss initially still struggled to gain Java certification while becoming increasingly accepted as the software-as-service model gained momentum. During the first half, JBoss and some incumbents, such as IBM and HP, continued testing the viability of the new model risking tensions with Java sponsor Sun. For example, in a full-featured article of a leading technology news service, JBoss CEO Fleury explained [237]:

> *The bottom line there is that Sun doesn't really want to acknowledge that a compliant app server is free. Because then which one are you going to choose if both are compliant? You're going to choose the free one.*

JBoss cast Sun's Java certification as a symbolic rather than technical seal of compliance aimed at instituting barriers of entry and keeping control over the field.

In that article, Fleury referred to the cost barrier that kept JBoss from Java certification – and thus from attracting corporate customers. Fleury continued:

> *We're going to stick with what's a winning formula for us, which is a bottom-up approach ... meaning we have almost cult status with the developers. ... So the developers keep pushing that and that's a very strong base.*

JBoss counted on developers' disposition to test and modify its highly popular and freely available opensource application server. Fleury emphasized reaching *"critical mass in the minds of developers"* [282] reasoning that developers' technological endorsement together with the low price tag would promote JBoss within their companies.

But Java certification remained the condition for reaching corporate customers, thus pressuring both Sun and JBoss to resolve their standoff. JBoss executive Bickel explained that *"now IT managers are deploying JBoss and they kind of want the safety, if you will, of having something endorsed by Sun"* [275]. In November 2003, after paying *"a truckload of money"* [250], Bickel confirmed that JBoss would become Java-certified [274]. As *"standards renegade,"* according to a Sun executive [240], JBoss initially attracted developers alienated by Sun's proprietary Java model, while later complying to Java certification to court higher-level decision makers at corporate customers.

In the second half of the Disruption phase, experimentation gave way to exploitation as the new model extended from application servers to other areas of enterprise computing. The move required educating potential customers about the commercial opensource model. For example, JBoss' Fleury explained [237]:

Middleware is very consulting intensive. We have a profitable consulting operation ... We're highly structured and commercially focused. We just use open source as R&D and recruitment.

In order to exploit the new model, JBoss acquired US$ 10 million in venture capital funding [137] for *"taking that methodology and model and replicat[ing] it to a new market"* [140].

Besides educating customers about its model, JBoss also had to assuage much larger incumbent competitors in whose market JBoss was moving. Fleury attempted to downplay the threat JBoss was posing by assuring competitor that their business will not "evaporate overnight" [111]:

> *I think there was a lot of nervousness about open source because our model, and I mean business models now, is disruptive to the industry. ... [But] an industry doesn't evaporate overnight ... It's a maturity step for the whole industry, figuring out our business model, our company model and how we play with the others – and for the other companies to understand that open source is there, it's not going away ...*

With Java certification and further expansion, JBoss competed directly with its larger competitors for the same customers. The success put JBoss on the radar of incumbent competitors, including opensource-supportive IBM, who increasingly viewed JBoss as threat.

Analysts endorsed JBoss' model mainly because "it keeps the pressure on price, and that may be the biggest impact that BEA and IBM see" [256]. Analyst Rymer argued that "they're [JBoss] changing the way the rest of the industry plans to make money off of software" [201]. Indeed, even opensource-skeptic BEA started to adopt opensource initiatives, arguing that it "get[s] our innovations into more developer hands" [218]. Meanwhile, after equating open source with going from "capitalism to the commune" [108], Sun's McNealy announced that "we think open source is great" [185]. Similarly, after ensuring "that any opensource efforts don't impact the viability" of Java [247], former Sun executive Tegan-Padir found "the speed in innovation enabled by the opensource model is unprecedented" [281]. This suggests that JBoss' expansion started to pressure larger competitors.

TECHNOLOGY CONCEPTION

The *technology conception* of the commercial opensource model continued during the first half of this phase to center on JBoss' innovativeness and Java compliance while increasingly involving other enterprise computing components and middleware. For

example, BEA criticized the lack of a *"comprehensive opensource [Java] container"* for enterprise applications [112]. JBoss promptly announced *"focus[ing] on the container technology, the middleware, where there is a lot of innovation"* [270]:

> *All [Java]-based application servers support the minimum requirements, in terms of functionalities. Then there are additional features like clustering and failover, which are high-end features. You'll find them in the JBoss opensource product.*

Fleury was keen on presenting JBoss as disruptive and innovative force attempting to demonstrate innovation leadership.

But low costs were still associated with low quality, leading Fleury to stressed JBoss' technological prowess rather than its cost advantage. He explained [237]:

> *Definitely price is a big factor – particularly these days. But if you talk to Corporate Express, which is a $5 billion company, cost was No. 5 on the list. Usually, you will see uptime – rock solid stability – as the No. 1 criteria. So in some instances, stability is a big factor and open source is usually good at stabilizing the code base.*

Fleury attempted to address the strengths of incumbents while mentioning the 'natural' opensource benefits, such as low price and open source code, as additional benefits.

With JBoss' expansion into other areas of enterprise computing, incumbents started outrivaling each other in commercially exploiting the opensource model. During 2004 and 2005, incumbent firms BEA, IBM, and Sun increasingly adopted the opensource model. For example, BEA announced opensourcing its development tool, expecting developers *"and their customers to migrate to BEA products down the road"* [218]. IBM followed by announcing to opensource its database, expecting *"to work with the opensource community in developing new applications"* [127]. Sun then announced opensourcing its entire Java Enterprise System infrastructure, expecting the move *"will define Sun as the only company that is truly committed to open source as a means of driving innovation"* [159].

LEGITIMATION CONCEPTION

The *legitimation conception* of the commercial opensource model highlights the role of individual developers and smaller firms driving the momentum. Initially, the legitimacy of the commercial opensource model was still contested. For example, in early 2003, JBoss CEO Marc Fleury noted that *"when people look at open source, they feel like they need permission to use open source"* [270]. Fleury explained how the commercial opensource model redefines the role of developers [111]:

For-profit open source is a good thing for the developers involved in open source. Everyone here has stock in this company. And if one day there is liquidity, all my guys will make money. And that's a big motivation for a lot of people.

JBoss therefore had a developer-centric culture able to convince developers working at potential customers, emphasizing that its software *"allows developers to play with it and not pay $80,000 per CPU for an integration suit"* [254].

During the second half of this phase, adopting opensource projects increasingly came to be associated with innovativeness and competitiveness. For example, BEA announced entering *"Open Source Land"* two days after its share price dropped by 23 percent [277]. However, incumbents' opensource moves were highly contested internally. For example, opensource advocate Raymond found opensource issues stirring *"bitter factional warfare inside Sun"* [133]. While some of Sun's projects endorsed open source, other projects appeared willing to enforce patents, which in turn infuriated some opensource supporters.

In order to position Sun more firmly as opensource-supportive, Sun executive Schwartz pledged that *"we love the opensource community, we spawned from it"* [164] asking about *"the right way to interact with you, to build a high-integrity relationship with you"* [158]. Meanwhile, BEA CEO Chuang was forced to restructure his organization after top executives left the firm, among them opensource proponent Dietzen [236]. This suggests that developers played a critical role in the adoption of the opensource model while incumbents remained internally split and divided over the right opensource strategy.

SUMMARY

This part on *reconstructive* discursive action analyzed statements that endorsed the commercial opensource model. It demonstrated that proponents, largely constituted of JBoss executives, initially exploited their marginalized status to attract opensource developers but also focused on educating customers about their approach and on assuaging incumbent competitors. Overall, proponents of the commercial opensource model employed the discursive strategies of *Self-promotion*, by enrolling a marginalized position to attract consenters, and of *Containment*, which downplayed adoption barriers by educating stakeholders and assuaging opponents.

Regarding the *business* conception, while initially still fledging, the commercial opensource model became increasingly attractive with the proliferation of the soft-

ware-as-service model. Initially, as *"standards renegade"* and Sun contestant, JBoss was able to exploit sentiment against Sun to attract developers, while later complying with Sun's Java certification to court higher-level decision makers of potential customers. With increasing experience and learning from the commercial opensource model, experimentation gave way to exploitation as it extended into other areas of enterprise computing. JBoss accompanied its expansion by educating about the new model and assuaging larger competitors by downplaying the competitive move.

The *technology* conception initially centered on JBoss' innovativeness and Java compliance but was increasingly framed around integrating the enterprise computing infrastructure. After JBoss' expansion into other areas of enterprise computing, incumbents started outrivaling each other in commercially exploiting the opensource model.

The *legitimation* conception highlights the crucial role of individual developers and smaller firms in driving its momentum. These stakeholders proved vital for constructing the legitimacy behind the commercial exploitation of the opensource model while it was still contested, both in the field as well as within incumbent firms.

Sun's Proprietary Java Model: Implying Widespread Support for Sun's Control

This part on *iterative* discursive action analyzes statements constructing the theorization of Sun's proprietary Java model along the business, technology and legitimation conceptions. It demonstrated that proponents, largely constituted of Sun executives, legitimated its Sun's Java control with a rather abstract concern about protecting developers and customers. The summary identifies the salient issues and the discursive strategies based on the overall tone of arguments enrolled in the theorization.

Regarding the business conception, the agreement to allow opensource Java software led Sun to focus on Java certification and branding as key differentiator in an increasingly commoditizing market. But tensions between Java partners also increased as Sun mobilized support for the Java standard while trying to outrival allies who were also competing on the standard. While the technology conception reinforced Sun's Java control, Sun further alienated former Java partners by refusing to grant them an equal voice in defining the standard. Sun attempted to ground the legitimation for its proprietary Java model in the widely approved Java compatibility promise designed to protect developers and customers from single vendor lock-in. At the same time, IBM and Sun were increasingly vying for dominance in the field while former market leader BEA became ever less profitable. This analysis identifies a typical discursive strategy

employed by proponents of Sun's proprietary Java model: *Self-expansion*, which involved implying that developers and customers widely approve Sun's proprietary control over Java.

BUSINESS CONCEPTION

The *business conception* of Sun's proprietary Java model almost exclusively centered on Java certification and on Java branding as a crucial differentiator in an increasingly commoditizing market. The unique selling point of Java was the compatibility promise of Java software. Sun awarded Java certification and the Java brand name only to Java software that was licensed from Sun and had passed the extensive – and expensive – compatibility testing. This proved to be effective for preempting Microsoft from diluting the standard but also preempted JBoss and other potentially innovative firms from competing with incumbents on a *"level playing field ... regardless of their funding"* [245].

The upper six-figure price tag of Java certification in effect kept JBoss from gaining the industry's seal of approval and thus access to corporate customers [138]. Less than three months after agreeing to allow opensource Java software, Sun executive Schwartz succinctly explained [114]:

> *If you want to go implement [Java] in the opensource community, have at it. You just can't call it [Java]. You can go ahead and implement it. Go look at JBoss. It's open source. Sun's not going to go sue them. IBM might.*

Preempting JBoss from applying the name 'Java' to its Java software constrains its adoption only to the most initiated. Rather than prohibiting opensource competition and starting a feud with the opensource community, Sun charged firms a fee for certifying Java products that was high enough to deter new entrants.

JBoss continued to call its application server 'Java-compatible' rather than 'Java-certified' – only to be reprimanded by Sun for misusing the Java brand name. Sun CEO McNealy justified Sun's position [113]:

> *You can't use the Java brand unless you submit to the terms and conditions around compatibility testing and all the rest of it. Yeah, that's true. And that will always be true. We think that's a better model.*

After agreeing to allow opensource Java software, thereby surrendering royalties off Java products, Sun asserted its leverage over Java certification as crucial differentiator in an increasingly commoditizing market.

Sun's tight control over Java not only appalled opensource firm JBoss but repelled its long-term Java partner IBM and other partners. Sun justified its grip on Java by evoking the external threat of Microsoft establishing an incompatible Java version and the internal threat of Java licensees creating vendor lock-in. For example, CEO McNealy and other executives repeatedly cast Sun as steward of Java fighting the *"dark side"* [199]. Sun executive Schwartz explained [103]:

> *Microsoft has the edge because they have locked up the way users use software. There is an expense involved in retraining someone to move off Microsoft. ... They [also] make it difficult for other vendor's products to interoperate.*

By defining what constitutes Java compatibility, Sun gained a degree of leverage over competitors' innovativeness that led JBoss and also IBM question the benefits of Java certification.

In response, Sun vehemently rejected increasing criticism of accusing it of proprietary tactics at the costs of other Java vendors and users. Sun executive Schwartz explained [114]:

> *IBM's pretty much shown their hand in the last couple of years, that they've had no interest in trying to drive Java standards. They had every interest in trying to drive IBM standards. So with their partnership with Microsoft, I think they're tipping their hand [revealing proprietary intentions] ... IBM has cast their lot with Microsoft, and if the marketplace needs to see Sun on the one hand, IBM-Microsoft on the other, well then, that's the way it will be.*

The open conflict between the formerly close Java partners Sun and IBM shows how Sun's unilateral leverage over Java certification and Java branding increasingly exposed the inherent tensions between mobilizing support for the Java standard while outrivaling partners who were also competing on the standard.

TECHNOLOGY CONCEPTION

The *technology conception* of Sun's proprietary Java model, particularly regarding Java certification and Java branding, required Java licensees to submit their Java products to Sun's extensive compatibility testing. Sun was thus able to back its Java compatibility promise against Java licensees who may be tempted to develop Java products well-aligned with their own products but incompatible with other vendors' products. For example, former market leader BEA allegedly 'tuned' its application development tool towards its application server [146]. Sun CEO McNealy explained [264]:

If you're writing to an app server, use the AVK and test on one other app server ... just to make sure you haven't grabbed some proprietary extension or written outside the [Java] specifications.

Sun extended the Java compatibility testing tools with the Application Verification Kit (AVK) in order to better safeguard Java against misuse by single vendors.

With mounting criticism of what became seen as Sun's ubiquitous grip over Java, Sun executive Schwartz suggested a more participatory approach that, however, would still keep Sun in charge. He explained [107]:

Sun has a specific definition of open standards. By 'open', we mean specifications that are reliable, free from the threat of legal encumbrances, able to work across development and deployment environments, [and] subject to peer review and input ...

Sun's "specific" interpretation of openness is in contrast to the opensource model and suggests that Sun remained unwilling to grant its Java partners an equal voice in defining compatibility testing criteria. Sun's position thus reinforced the impression that *"Sun wants the appearance of openness without the substance"* [246].

At the same time, Sun addressed criticism of its standoff with JBoss by linking the rather uncontested and widely approved Java compatibility promise to the highly contested issue of discriminating smaller players through *"prohibitive"* certification costs [110]. For example, addressing criticism about preempting smaller firms from certifying Java software, Schwartz reiterated that no one can *"call it Java unless [they] have passed the Java compatibility tests that we and the Java community have invested so richly in"* [225]. This suggests that tying the Java compatibility promise to its control over compatibility testing served to reinforce Sun's preeminence, but it also intensified tensions with partners that further undermined Sun's legitimacy.

LEGITIMATION CONCEPTION

The *legitimation conception* for Sun's Java control was framed around the widely approved Java compatibility promise designed to protect developers and customers from single vendor lock-in. Sun linked its control over Java to the need for compatibility testing, which it legitimated by emphasizing that maintaining the quality of Java software benefits all players. For example, Sun's 'father of Java' Gosling emphasized that compatibility testing *"has been a point on which I think everybody agrees on the basic arguments about why we need to protect"* Java [113]. However, enforcing Java compatibility required Java licensing and testing that remained too expensive for smaller players.

Responding to criticism, Sun pledged to financially support non-commercial open-source groups in their efforts to certify their Java software. But the only two open-source groups that Sun supported were Apache, with which Sun closely collaborated, and ObjectWeb, a non-commercial association backed by an industry consortium. More importantly, the Java software these groups were seeking to certify was the open-source application server – in direct competition to JBoss. Despite the growing momentum behind JBoss, without the funds for Java certification, JBoss was effectively barred from reaching corporate customers while Sun was supporting JBoss' competitors.

Meanwhile, BEA CEO Chuang underscored his company's weight in the field stressing that *"BEA has 14,000 paid customers for support"* compared to *"only 75 paid customers for support"* at JBoss [208]. Nevertheless, JBoss increasingly became an option among corporate customers, who were key revenue sources for Sun and its major Java licensees. As market penetration of JBoss reached 14 percent and IBM took over market leadership from BEA, Chuang acknowledged that profits had *"not been as consistent as we would like"* [271]. BEA executive Dietzen accused IBM of undermining prices noting that *"IBM ... is discounting the software to compete with us"* [112]. Since Sun and IBM were vying for dominance in the field, BEA became an even more important partner for Sun. Sun's initially uncompromising stance against JBoss must therefore be seen against the backdrop of JBoss taking market share away from BEA.

SUMMARY

In sum, this part on *iterative* discursive action analyzed statements that endorsed Sun's proprietary Java model. It demonstrated that proponents, largely constituted of Sun executives, legitimated Sun's Java control with a rather abstract concern about protecting developers and customers. Overall, proponents of Sun's proprietary Java model employed the discursive strategy of *Self-expansion*, by implying that developers and customers widely approve Sun's proprietary Java model.

Regarding the *business* conception, the agreement to allow opensource Java software led Sun to focus on Java certification and branding as key differentiator in an increasingly commoditizing market. But Sun's preeminence and leverage in the Java standard led not only JBoss but also former partner IBM to question the benefits of Java certification. The conflict between Java partners Sun and IBM exposed the inherent tensions between mobilizing support for the Java standard while outrivaling partners who were also competing on the standard.

While the *technology* conception reinforced Sun's Java control, Sun further alienated former Java partners by refusing to grant them an equal voice in defining the standard. Hence, tying the Java compatibility promise to its control over compatibility testing served to reinforce Sun's preeminence, but also intensified tensions that undermined Sun's legitimacy.

Sun attempted to ground the *legitimation* for its proprietary Java model in the widely approved Java compatibility promise designed to protect developers and customers from single vendor lock-in. At the same time, IBM and Sun were vying for dominance in the field while former market leader BEA lost market share against IBM and JBoss. Sun's refusal to certify JBoss while supporting Java certification of JBoss' competitors must therefore be seen against the backdrop of JBoss taking market share away from BEA. This suggests that the rather abstract legitimation about protecting developers and customers may have been superseded with the more imminent concern of safeguarding profitability and disparaging JBoss.

The opensource Java model: Declaring Java Innovativeness as Overriding Concern

This part contrasts *reconstructive* with *iterative* discursive action by analyzing statements constructing either the theorization of the opensource Java model or the theorization of Sun's proprietary Java model. It demonstrated that proponents, largely constituted of IBM and Apache, pitched innovation and cost advantages against Sun's proprietary Java model while opponents, largely constituted of Sun and JBoss, pitched compatibility and interoperability against the opensource Java model. The summary identifies the salient issues and the discursive strategies based on the overall tone of arguments enrolled in the theorization.

Regarding the business conception, proponents framed the opensource Java model around innovativeness, both as product innovation and as innovation in the standard. Opponents warned that it would compromise Java compatibility and were, at least initially, successful in disquieting calls to opensource Java. The technology conception reflected the opposing views with the opensource Java model centered on technological innovation and competitiveness of Java software solutions. In contrast, opponents claimed that technological features beyond Java specifications promote incompatibilities and vendor lock-in. Proponents as well as opponents legitimated their views by emphasizing the respective benefits for developers and customers. This analysis identi-

fies two discursive strategies employed by both proponents and opponents of the opensource Java model: *Totalizing*, by declaring, respectively, either Java innovativeness or Java compatibility as the overriding concern, and *Dismissal*, by pitching the supported project against the project of opponents.

BUSINESS CONCEPTION

Regarding the *business conception*, proponents framed the opensource Java model around competitiveness, both of individual firms as well as of the Java standard vis-à-vis rivaling programming standards. The competitiveness of the opensource Java model was associated with the user-driven and innovation-promoting opensource approach. But Sun opposed opensourcing Java and framed its proprietary sponsorship around the Java compatibility promise.

In early 2004, the debate on opensourcing Java resurfaced prominently. Opensource advocate Raymond urged Sun to opensource Java pointing to better integration of Java and Linux and competition from rivaling programming standards [119]. IBM executive Smith joined Raymond calling for an *"independent project to opensource Java"* [128]. The most contentious issues involved ultimate authority over Java specifications and testing, prohibitive costs of Java licensing and certification, and Sun's appropriation of intellectual property rights from its licensees [169].

Meanwhile, Sun executive Schwartz maintained that *"many of the things [IBM's] Rod asked for were already freely available, source code for example"* [168]. Sun CEO McNealy was therefore *"trying to understand what problem does it solve that is not already solved"* [193]. Sun's 'father of Java' Gosling wondered whether *"they [are] saying that they don't want to be compatible"* because *"the only thing that IBM is constrained by is the compatibility testing"* [192]. Even JBoss CEO Fleury stressed that *"the great success of Java has been Sun's stewardship,"* adding that *"the standard has to be tightly owned"* [141]. Fleury explained [111]:

> *The thing on IBM was, I couldn't shake the feeling that it was a political move ... IBM would like to be the controller of Java. ... if there is no one for-profit entity, then the biggest guy wins. And right now that's IBM at Apache.*

The fear of incompatible Java versions and vendor lock-in remained deeply embedded in the field and was even drawn upon by disruptive innovator JBoss. Sun was thus able to tie the fear for Java compatibility to its tight control over the Java standard.

During the second half of 2004, the momentum behind opensourcing Java started to grow. Raymond predicted that someone will develop an opensource version of Java *"at which point they're [Sun] going to lose control"* [223]. Even BEA, major partner of Sun after Sun repelled IBM, wanted *"to go on the record publicly in favor of opensourcing [Java]"* [255]. BEA executive Dietzen even suggested that removing compatibility testing from Sun's ultimate authority by opensourcing it would *"solve some of the issues around the current complexity of achieving compatibility"* [105]. He argued that *"we could get more innovation in Java if we were reaching out to opensource communities"* [132]. BEA CEO Chuang criticized Sun's proprietary Java model process as *"just not fast enough"* to incorporate innovative new features [118].

IBM seized the momentum emphasizing that *"we want to see innovation happen at a more rapid pace"* [232]. IBM's Smith argued that opensourcing Java is necessary *"to experiment outside the box"* testing innovative technology to assess what *"can be done in the enterprise"* [109]. Smith also wanted better integration of Java and opensource Linux, because *"the combination of opensource and Java is really starting to grow, and can be accelerated for all of us in growing [our] opportunities"* [261].

At the same time, Sun and JBoss were united in suspecting that IBM would *"wrest control of stewardship away"* [190]. Sun and JBoss feared that IBM would exploit its strong presence at corporate customers and its good relationship with the opensource community to establish its own Java version. In this context, Sun executive Gosling emphasized that slight incompatibilities are *"just different enough to be a pain in the butt"* leading to vendor lock-in [232]. Eventually, in May 2005, Apache announced developing an opensource Java version independent of Sun but with IBM's support [233].

TECHNOLOGY CONCEPTION

The *technology conception* of the opensource Java model centered on innovation in Java products as well as in the Java standard to enhance competitiveness of Java vis-à-vis rivaling programming standards. But opponents claimed that distributing Java software with technological features outside Java specifications would create incompatibilities between vendors and promote vendor lock-in. For example, IBM endorsed opensourcing Java to innovate in and around the Java standard. IBM's Smith explained [128]:

> *IBM is a strong supporter of the opensource community and we believe that a first class opensource Java implementation would further enhance Java's position in the industry by spurring growth of new applications and encouraging new innovation in the Java platform.*

Smith argued that integrating the enterprise computing components required closer collaboration and *"an opensource Java married more with the opensource projects that [Apache's] Brian and other folks are doing"* [129]. While JBoss' Fleury opposed opensourcing Java fearing IBM's leverage, JBoss executive Labourey criticized that Sun unilaterally changes Java specifications: *"we were only told once it had been decided"* [178]. Apache representative Hunter noted that *"you could have a 10 to zero vote, but if the spec lead [often Sun] says no, it doesn't matter"* [272].

Sun executive Schwartz acknowledged that innovators *"are frustrated by standards ... [while] laggards like them, because it's an occasion to catch up"* [188]. But Sun maintained that standards ensure compatibility and that Sun tries to balance innovative new features while promising the compatibility of Java software. Sun's Gosling argued that the Java *"source [code] is out there"* for anyone to improve but that *"you can't redistribute it, if it's deviant"* [267]. Proponents of the opensource Java model expressed a genuine interest in the Java standard but aimed at entrusting an impartial body with the definition of Java specifications. In contrast, opponents also expressed a genuine interest in the Java standard but argued that an impartial body is susceptible to demands of its financial backers.

LEGITIMATION CONCEPTION

Proponents and opponents framed the *legitimation conception* around the respective benefits for developers and customers. Proponents of opensource Java argued that the opensource Java model would allow the developer community to innovate in the Java standard and to collectively define the salient aspects of Java specifications. But according to opponents, what developers and customers were valuing most about Java was its compatibility, which meant salvaging incompatible innovative features. For example, BEA's Dietzen emphasized innovation around the Java programming language by opensourcing Java [255]. IBM's Smith legitimated the move by stressing that *"the opensource community would rally around this effort"* [279] and that customers would benefit from lower costs of server solutions [232]. Apache representative Hunter disparaged the Sun-led Java governance body as anti-competitive, suggesting it *"does not believe in free markets"* [272].

In contrast, Sun positioned itself as steward of the Java community. Sun's Gosling remained skeptical whether *"market pressures will enforce the values of the developer community"* [269]. He emphasized that customers want compatible and reliable Java

software and Sun to ensure *"that it is what we say it is"* [157]. He explained why Sun was needed to enforce compatibility [194]:

> *When your company is billing billions of dollars' worth of transactions every day ... that software has got to work right the first time and every time. In those kinds of situations, small problems can be magnified into tremendously big problems.*

Gosling argued that Sun wanted to be "as close to open source as possible while not violating the expectations of the rest of the world around interoperability and compatibility" [234]. He claimed that most customers are "actually somewhere between uninterested and hostile to the sort of wild and wooly world of open source" [234].

These statements suggest that proponents of the opensource Java model pitched innovation and cost advantages against Sun's proprietary Java model while opponents pitched compatibility and reliability against the opensource Java model. Apache's decision to develop an opensource version of Java without Sun's support was thus a proactive as well as provocative step towards opensourcing the Java standard.

SUMMARY

This part contrasts *reconstructive* with *iterative* discursive action by analyzing statements that either endorsed nonproprietary or Sun's proprietary Java model. It demonstrated that proponents, largely constituted of IBM and Apache, pitched innovation and cost advantages against Sun's proprietary Java model while opponents, largely constituted of Sun and JBoss, pitched compatibility and interoperability against the opensource Java model. Overall, both proponents and opponents employed the two discursive strategies of *Totalizing*, by declaring, respectively, either Java innovativeness or Java compatibility as the overriding concern, and of *Dismissal*, by pitching the supported project against the project of opponents.

Regarding the *business* conception, proponents framed the opensource Java model around innovativeness, both as product innovation on the level of firms and as innovation in the standard on the level of the field. Opponents, including JBoss, warned about compromising Java compatibility and were, at least initially, successful in disquieting calls to opensource Java. This shows how the fear of incompatible Java versions was deeply embedded in the field. Sun was able to tie the fear around Java compatibility to its tight control over the Java standard. But momentum behind opensourcing Java began to grow again, driven by major partners of Sun, such as IBM and BEA. The statements suggests that proponents tied innovativeness of Java products and the Java

standard to the opensource Java model while opponents tied Java compatibility to Sun's proprietary Java model.

The *technology* conception reflected the opposing views with the opensource Java model centered on technological innovation and competitiveness while opponents claimed that technological features beyond Java specifications promote incompatibilities and vendor lock-in.

Proponents as well as opponents *legitimated* their views by emphasizing the respective benefits for developers and customers. Proponents emphasized need for the developer community to innovative more freely and define the Java specifications. Opponents claimed developers and customers valued Java compatibility rather than potentially incompatible innovative features.

Concluding Summary

This section on discursive action in the Disruption phase investigates how the theorizations were actually constructed by participants along the business, technology, and legitimation dimensions. Overall, this analysis demonstrates that proponents of the commercial opensource model employed the discursive strategies of *Self-promotion*, by enrolling a marginalized position to attract consenters, and of *Containment*, which downplayed adoption barriers by educating stakeholders and assuaging opponents. Proponents of Sun's proprietary Java model employed the discursive strategy of *Self-expansion*, by suggesting that developers and customers widely approve Sun's proprietary Java model. Regarding the debate on opensource Java, both proponents and opponents employed the discursive strategies of *Totalizing*, by declaring, respectively, either Java innovativeness or Java compatibility as the overriding concern, and of *Dismissal*, by pitching the supported project against the project of opponents.

The first part investigates *reconstructive* discursive action by analyzing statements constructing the theorization of the commercial opensource model. It demonstrates that proponents initially exploited their marginalized status to attract opensource developers but also focused on educating customers about their approach and on assuaging larger competitors. The second part investigates *iterative* discursive action by analyzing statements constructing the theorization of Sun's proprietary Java model. It demonstrates that proponents, largely constituted of Sun executives, legitimated its Sun's Java control with a rather abstract concern about protecting developers and customers. The third part contrasts *reconstructive* with *iterative* discursive action by ana-

lyzing statements constructing either the theorization of the opensource Java model or the theorization of Sun's proprietary Java model. It demonstrates that proponents, largely constituted of IBM and Apache, pitched innovation and cost advantages against Sun's proprietary Java model while opponents, largely constituted of Sun and JBoss, pitched compatibility and interoperability against the opensource Java model.

Adjustment Phase (May 2005 – August 2006)

The Adjustment phase starts with incumbents' adoption of opensource application servers and ends with Sun opensourcing the Java programming standard. This section on discursive action is structured in two parts and a concluding summary. The concluding summary presents the key developments and the role of the discursive strategies in institutionalization processes during the Experimentation phase.

The first part investigates *reconstructive* discursive action by analyzing statements constructing the theorization of the commercial opensource model. It demonstrates that proponents, largely constituted of Sun, JBoss and IBM, competed on the new model and thus further reinforced its adoption in the field. The momentum behind the commercial opensource model was driven by a reinforcing dynamic that started with the introduction and success of the new model, followed by widespread adoption, which led to consolidation and a new level of competition along ubiquitous field-wide adoption.

The second part also investigates *reconstructive* discursive action by analyzing statements constructing the theorization of opensource approaches regarding the governance of the Java standard. It demonstrates that proponents, largely constituted of Sun executives, endorsed opensourcing Java to drive innovation but remained committed to Java compatibility. In addition, firms adopted or extended the commercial opensource model to gain technological leadership in the emerging area of service-oriented architectures.

The analysis demonstrates that proponents of the commercial opensource model primarily employed the discursive strategies of *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change. Proponents of the opensource Java model also employed the discursive strategy of *Identification*, by linking innovativeness to opensourcing the Java standard.

Commercial Opensource Model: Tying Innovation to Open Source while Downplaying Profitability

This part on *reconstructive* discursive action analyzes statements constructing the theorization of the commercial opensource model along the business, technology and legitimation conceptions. It demonstrates that proponents, largely constituted of Sun, JBoss and IBM, competed on the new model and thus further reinforced its adoption in the field. The summary identifies the salient issues and the discursive strategies based on the overall tone of arguments enrolled in the theorization.

Regarding the business conception, JBoss' success with the commercial opensource model threatened incumbents which then adopted the new model to compete directly against JBoss. The technology conception of infrastructure integration under the service-oriented architecture (SOA) was particularly suitable for opensource approaches thereby further reinforcing the success of the commercial opensource model. The legitimation for the commercial opensource model was based on the ability of customers and developers to freely test and modify the software before making purchasing decisions. Firms adopting the commercial opensource model thus legitimated the new model vis-à-vis more skeptical financial analysts and investors by highlighting the benefits for customers and developers. This analysis identifies two discursive strategies employed by proponents of the commercial opensource model: *Identification*, by linking innovativeness to opensource approaches, and *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change.

BUSINESS CONCEPTION

The *business conception* of the commercial opensource model proved its viability during the previous phase and was further confirmed as incumbents applied the model to application servers and other areas of enterprise computing. However, IBM's entry into the opensource application server market caught the field with surprise and left some participants wondering about its motivation. For example, IBM executive LeBlanc justified the move with *"a shift in the business model"* opening up *"a lot of opportunity at the low end of the market"* [123]. LeBlanc stressed the need *"to address requirements of developers, of department application developers, of small SMBs, small ISVs"* expecting them to *"move up to the higher-end offering that's represented by the WebSphere [application server] product line that has a lot of capabilities for larger enterprises"* [211].

However, analysts questioned whether the target group will require and pay for pricey enterprise-level features and whether synergies materialize between IBM's completely different opensource and proprietary application servers. For these reasons, analyst Willett doubted whether *"people all of a sudden pay for software after getting the free [version]"* [124]. Meanwhile, JBoss executives suggested that IBM was trying to put JBoss out of the market. Bickel identified *"a move to try to create a competitor to JBoss ... [because] IBM does not want to see JBoss rise to dominance"* [111]. Connolly added that JBoss' market position *"really is a threat, if you will, to the [IBM] WebSphere cash cow"* [124].

Meanwhile, Fleury admitted that the *"big news ... caught us off-guard"* and that IBM felt threatened because *"we with opensource take a radically different approach, a very disruptive approach."* The interviewer argued that *"despite being characterized as a toy by those it threatens – JBoss is clearly eating into the market share of commercial offerings"* [207]. This suggests that by proving the competitiveness of the commercial opensource model, JBoss threatened incumbents who in turn adopted the model to compete against JBoss. Both IBM and Sun invested into the commercial opensource model and in the developer communities that further reinforced the momentum behind the new model.

The commercial opensource model that JBoss established in the field increasingly pressured JBoss as incumbents adopted the successful model. But JBoss emphasized its viability suggesting that IBM's and Sun's opensource moves were primarily targeted at each other rather than at niche player JBoss. For example, Fleury cast IBM's opensource application server in the context of IBM and Sun vying for dominance in the Java standard. Fleury claimed that IBM's move was *"the most aggressive standards stance ... against Sun"* because *"if IBM controls volume distribution in middleware, Sun's [Java control] ... will go the way of the dinosaurs"* [268]. Similarly, after Sun opensourced critical components of enterprise computing, Fleury claimed that *"Sun just detonated a nuclear bomb in the [revenue stream] of IBM and the other traditional vendors"* [174].

A few months later, JBoss started cooperating with Microsoft, a longtime skeptic of open source and archrival of Sun and IBM. JBoss' Fleury commented the unconventional partnership: *"We're not a pain for Microsoft. We're a pain for IBM"* [219]. Analysts suggested that Microsoft's backing benefits JBoss. O'Grady argued that the partnership *"gives JBoss more momentum and credibility"* carrying *"negative implications for [IBM application server] WebSphere"* [265].

At the same time, IBM and Sun further intensified their opensource engagement. Eventually, on 10 April 2006, JBoss agreed to be acquired by leading Linux distributor Red Hat for US$ 350 million plus an US$ 70 million performance-related pay, which marked the second largest opensource acquisition at the time [205]. Fleury interpreted the move as *"another proof point that [commercial opensource] is transforming the industry"* [239]. Analysts widely approved the acquisition. Goulde argued that *"this represents the reassembly of a [vendor] ecosystem"* [260] and *"helps validate the opensource alternative"* [176]. Gardner found the market *"in some turmoil"* and incumbents challenged by a strong competitor with a global presence [165]. The momentum behind the commercial opensource model reinforced as JBoss threatened incumbents, followed by their adoption of the model threatening JBoss, and cumulating into Red Hat's acquisition of JBoss that created a corporate opensource competitor on a global scale.

TECHNOLOGY CONCEPTION

The *technology conception* centered on integrating the enterprise computing infrastructure beyond application servers under the so-called service-oriented architecture (SOA). SOA proved particularly suitable for development under the coordinated but self-organizing opensource approach [152] and therefore *"very ripe for opensource implementations"* [238]. For example, in June 2005, JBoss announced offering an integration infrastructure for software services [139]. At the same time, Sun worked on *"integration technologies and the consolidation of integration with application servers"* [226].

A few weeks later, Sun announced acquiring new components and opensourcing its integration infrastructure, which analysts widely approved. Willet argued that *"this fills a gaping hole in their middleware for integration"* [276]. O'Grady argued that *"it makes them competitive in the integration area where they just haven't played before"* [135]. Similarly, IBM's LeBlanc promoted efforts around the service-oriented architecture [126]. He introduced IBM's integration component as *"an enabler for the whole environment"* of enterprise computing [203].

In April 2006, Red Hat's acquisition of JBoss was largely approved by analysts arguing that it strengthened JBoss in the integration area. JBoss' Fleury promised to offer the *"opensource platform for SOA"* and claimed [216]:

> *[IBM's opensource application server] lags JBoss in many capabilities ... [It] is a low end, closed or 'private' source product with minimal support for SOA capability including only single server support for basic web services and EJB 2.*

Analyst Goulde pointed to the leverage of this new *"ecosystem ... with open source"* [239]. Similarly, Gardner anticipated *"a seismic shift in the opensource landscape"* due to the combined portfolio [152].

Meanwhile, Sun executive and new CEO Schwartz emphasized that Sun has *"a product line that allows us to go after our competitors and win"* [263]. By August 2006, analyst Willet observed that JBoss' struggled with its infrastructure and that *"JBoss is also falling behind others in the opensource world, [such] as Apache ... and of course Sun"* [229]. These statements and developments suggest that major incumbents employed the commercial opensource model to gain technological leadership in the emerging area of service-oriented architectures. Sun was able to contain JBoss not through Java licensing restrictions but through technologically competitive products.

LEGITIMATION CONCEPTION

The *legitimation conception* of the commercial opensource model was framed around the ability of customers and developers to freely test and modify the software before purchasing, but financial analysts and investors remained skeptical. For example, IBM justified its opensource application server by arguing that users may *"move up to the higher-end WebSphere offerings"* [220]. Sun's new CEO Schwartz argued that *"revenue to Sun is a lagging indicator of the adoption of our developer platforms,"* which is *"a tough thing for the [Wall] Street to understand"* [116].

At the same time, Sun executive Phipps explained the need to convince developers rather than purchasing managers [206]:

> *And when the business is ready to put that [opensource] solution into production they are then willing to spend money on support and services. So the money in the game moves from the point of selection to the point of value. If you buy that as a paradigm, then the first thing Sun has to do is make sure its software is there, available, because in the future the money will not come from people making selections, but from people who are putting software into production.*

The emphasis on meeting changing user and customer requirements thus superseded concerns about protecting existing revenue channels. JBoss' Fleury explained [198]:

> *Give it for free and charge for the service. The point is, do you have enough volume? If that's your model, you monetize 1% to 2% of the user base, ergo you need a pretty large user base.*

Attracting developers was therefore critical for extending market share.

Sun executive Keller argued that opensourcing its application server and infrastructure components *"allows the communities to participate and have access in ways that they hadn't before"* [262]. Sun's new CEO Schwartz announced the *"Participation Age ... [where] individuals are now participating in the network rather than just observing"* [227]. Mobilizing users to drive innovation and momentum behind a platform thus became paramount for driving future business. Analysts in the field largely approved the opensource strategies. Goulde claimed *"that open source is mainstream today,"* adding that *"it should be something you're considering, if you're not already"* [151]. The commercial opensource model was legitimated vis-à-vis financial analysts and investors by highlighting the benefits for customers and developers.

SUMMARY

This part on *reconstructive* discursive action analyzed statements that endorsed the commercial opensource model. It demonstrated that proponents, largely constituted of Sun, JBoss and IBM, competed on the new model and thus further reinforced its adoption in the field. Overall, proponents of the commercial opensource model primarily employed the discursive strategies of *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change.

Regarding the *business* conception, JBoss' success with the commercial opensource model threatened incumbents which then adopted the new model to compete directly against JBoss. This suggests that the momentum behind the commercial opensource model was driven by a reinforcing dynamic that started with the introduction and success of the new model, followed by widespread adoption, which led to consolidation and a new level of competition along ubiquitous field-wide adoption.

The *technology* conception of infrastructure integration under the service-oriented architecture (SOA) was particularly suitable for opensource approaches thereby further reinforcing the success of the commercial opensource model. Major firms adopted or extended the new model to gain technological leadership in the emerging area of service-oriented architectures.

The *legitimation* for the commercial opensource model was based on the ability of customers and developers to freely test and modify the software before making purchasing decisions. IBM and Sun were counting on developers to drive innovation and momentum to attract paying customers, which was the same strategy that JBoss pur-

sued. Firms adopting the commercial opensource model legitimated the new model vis-à-vis more skeptical financial analysts and investors by highlighting the benefits for customers and developers.

The Opensource Java Model: Tying Innovation and Compatibility to (Sun's) Opensource Java

This part on the opensource Java model also investigates *reconstructive* discursive action along business, technology and legitimation conceptions by analyzing statements constructing the theorization of opensource approaches regarding the governance of the Java standard. It demonstrates that proponents, largely constituted of Sun executives, endorsed opensourcing Java to drive innovation but remained committed to Java compatibility. The summary identifies the salient issues and the discursive strategies based on the overall tone of arguments enrolled in the theorization.

Regarding the business conception, the opensource Java model centered both on innovation in Java software and the Java standard as well as on Java compatibility. The technology conception centered on system innovation extending across enterprise computing to include the underlying operating system. Legitimation behind the opensource Java model continued to be based on the benefits for developers and customers while also drawing on concerns of financial analysts and investors. This analysis identifies two discursive strategies employed by proponents of the opensource Java model: *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change.

BUSINESS CONCEPTION

The *business conception* of the opensource Java model centered primarily on competitiveness of Java products and of the Java standard but also acknowledged Java compatibility, with former opponents emphasizing compatibility more so than other supporters. One of the main reasons for opensourcing the Java standard was its growth not only in enterprise computing but in other areas, such as mobile devices, which outgrew the capacity of a proprietary and closed governance approach. For example, BEA executive Roth, formerly at Sun enforcing Java specifications against Lutris and JBoss, explained [177]:

> *For two years we've been stuck, and we've had to innovate around the JCP. ... The process they've [Sun] set up for development doesn't work anymore.*

Even JBoss, which previously opposed opensourcing Java, acknowledged *"a positive impact on the Java industry"* by providing the *"ability for people to innovate"* [204]. Similarly, Sun executive Phipps expected that *"the Java community will see an increase in innovation thanks to the move towards opensourcing the code"* [156]. Sun's new CEO Schwartz pointed to the growth of Java-enabled mobile devices as one of the main reasons for opensourcing the standard [183].

But Sun also emphasized its commitment to ensure Java compatibility. For example, Schwartz emphasized *"that compatibility is what creates the market Sun, and others, can monetize with network innovations"* [160]. Phipps highlighted Sun's prominent role in ensuring Java compatibility [172]:

> *Our concern is to make sure that the natural instinct of the successful players in the Java market drift into making ever-so-slightly incompatible versions does not happen. The tendency of an uncoordinated process is to drift apart.*

Apache representative Magnusson pointed out that Sun still enjoyed significant leverage over the Java standard *"through careful control of the brand Java"* [121]. This suggests that by opensourcing Java, Sun remained committed to Java compatibility and well-positioned to continue playing a prominent role in the Java standard.

TECHNOLOGY CONCEPTION

The *technology conception* of the opensource Java model centered on system innovation extending across the enterprise computing infrastructure to include the underlying operating system. The scope and complexity of the system perspective, which even surpassed that of the service-oriented architecture, promoted an opensource approach to Java. Sun CEO Schwartz outlined the system perspective [212]:

> *What Sun will deliver to enterprises is system innovations – all the components working together. We bring it to enterprise pre-assembled, leveraging opensource software and open standards. We are unique the only company with an operating system, middleware, provisioning engine and hardware, both storage and computing.*

Schwartz then explained why opensource approaches are critical [163]:

> *The 'cheap revolution' is winning out in high performance computing ... general purpose systems and operating platforms have emerged as fast enough to displace proprietary and specialized systems*

Similarly, Sun's Phipps expected that opensourcing Java will accelerate software development and testing [200].

Meanwhile, with the leading version of the Linux operating system and the leading opensource application server JBoss, Red Hat's prominent position as system innovator strengthened considerably [217]. However, Red Hat avoided showing a preference for JBoss after acquiring it to assuage its Linux partner IBM with Fleury assuring that *"it doesn't change the IBM dynamics much"* [136].

At the same time, analysts pointed to advancements in the opensource scripting language PHP and its integration with Linux that made it an increasingly serious competitor to the Java programming standard. O'Grady stressed that PHP *"play[s] credibly at workloads and in markets that were regarded as out of its realm"* [258]. He concluded what would *"be important for [Java] going forward is ... running side by side with technologies that in some respects might be competitive"* [180]. Similarly, Gardner pointed to developers preferring the less complex PHP platform over *"more extravagant platforms such as Java and .NET"* [115]. This suggests that the technology conception increasingly required not only opensource Java software but opensourcing the Java programming standard, thus reinforcing the momentum behind the opensource Java model.

LEGITIMATION CONCEPTION

The *legitimation conception* of the opensource Java model continued to emphasize the benefits for developers and customers while also addressing concerns of financial analysts and investors. For example, addressing concerns of the latter group during his announcement to opensource Java, Sun CEO Schwartz pledged not to *"mistake free software for lower revenue"* but, rather, as *"pro market and pro opportunity"* [102]. He pointed to the *"linkage between developer interest and infrastructure opportunity"* [166], which *"opens more market opportunity, and gives developers an opportunity to choose what they want from within Sun"* [184]. Sun's Phipps clarified that *"this is not volunteerism"* but *"directed self-interest"* [189]. Sun thus legitimated opensourcing Java by emphasizing user and customer benefits and the need to salvage existing revenues to promote future competitiveness.

Because Sun linked revenue to attracting developers, mobilizing users behind its software became paramount. After allowing individual developers into the Java governance body (JCP), Schwartz urged developers to join the Sun-led body. During his announcement to opensource Java, he explained [134]:

> Give us feedback, participate in the JCP, use [Sun's] NetBeans – you can depend on it to be 100% compliant – and if you step up and do this regularly, we'll be able to open up Java.

Schwartz advertised Sun's NetBeans application development tool vis-à-vis IBM's tool, which was governed by a popular and completely community-led opensource approach.

However, because Schwartz made these statements at the Sun-loyal Java developer conference, they were interpreted as *"call to action to Java developers"* [134]. Analyst Gardner noted [242]:

> *Sun seems to have finally recognized that community support around Java is dependent upon improving its relationship with that community. So the pressure seems to be building. It doesn't seem to be coincidental that this is coming only weeks after Scott McNealy stepped down as CEO.*

This suggests that Sun's announcement to opensource Java occurred in the context of IBM intensifying its opensource efforts at various fronts, such as supporting the opensource Java version developed by Apache.

Sun's announcement to opensource Java constituted an endorsement of the opensource Java model, but Sun struggled on whether and how it would be able to play a privileged role in the Java standard. Particularly, Sun remained determined to ensure Java compatibility and to disparage powerful players from leveraging their market power to seize control over the standard. Sun executive Phipps argued that *"maintaining both of those dimensions of compatibility is imperative because the Java market is a huge successful open market in which many companies are serving many other companies"* [182]. But Phipps acknowledged that the difficult *"question was how do we make it opensource and preserve those two values"* [187]. In contrast to the previous phase, Sun avoided pitching compatibility against innovation. Sun's new CEO Schwartz stressed that *"Sun takes seriously its role as the steward of the Java community"* while emphasizing *"the Java platform's legendary compatibility and innovation"* [130].

Meanwhile, Apache's Magnusson questioned whether Sun would be needed to ensure Java compatibility. During the Experimentation phase, Sun legitimated prohibiting opensource Java software by tying Java compatibility to its Java control. After agreeing to allow opensource Java software in March 2002 *"there was much consternation that the sky would fall in terms of splintering the [Java] standard, but now 3-4 years later we've seen no such problems"* [155]. Apache's Magnusson explained [243]:

> *In the end there always is a governance model. I can't think of any serious open source project that just lets random, anonymous, unknown people add code. There's always some kind of gating mechanism to ensure that code contributions are aligned with whatever metrics or objectives the community around the code has chosen to establish.*

Magnusson stressed *"that it's not through control of source code that Java maintained its compatibility promise, but through careful control of the brand Java,"* which Sun still owns [121]. By the end of the Adjustment phase, Sun implemented the opensource governance model used by Apache and Linux for developing the new version of Java. On 13 November 2006, Sun opensourced its Java programming standard under the most popular and far-reaching opensource license GPL.

SUMMARY

This part on *reconstructive* discursive action investigates the shift in the meaning behind Sun's approach to Java governance by analyzing statements that endorsed the opensource Java model. It demonstrates that proponents, largely constituted of Sun executives, endorsed opensourcing Java to drive innovation while remaining committed to Java compatibility. Overall, proponents of the opensource Java model employed the discursive strategies of *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change.

Regarding the *business* conception, the opensource Java model centered both on innovation in products and the Java standard as well as on Java compatibility. Sun emphasized innovation by opensourcing Java, but remained committed to Java compatibility and determined to leverage its reputation and branding to continue playing a prominent role in the Java standard. The *technology* conception centered on system innovation extending across enterprise computing to include the underlying operating system.

Legitimation behind the opensource Java model continued to be based on the benefits for developers and customers while also drawing on concerns of financial analysts and investors. Sun legitimated opensourcing Java by emphasizing user and customer benefits and the need to salvage existing revenues to promote future competitiveness. Because Sun tied generating revenues to generating momentum with developers, mobilizing users behind its software became paramount. The focus on developers occurred in the context of Sun and IBM vying for dominance in the field. Sun therefore remained determined to ensure Java compatibility and to disparage powerful players from leveraging their market power to seize control over Java. Apache questioned Sun's motivation, arguing that Sun had previously prohibited opensource Java software citing incompatibilities, which did not materialize after allowing open source. Sun eventually opensourced the Java programming standard under the most far-reaching opensource license GPL.

Concluding Summary

This section on discursive action in the Disruption phase investigated how the theorizations were actually constructed by participants along the business, technology, and legitimation dimensions. Overall, this analysis demonstrated that proponents of the commercial opensource model as well as of the opensource Java model primarily employed the discursive strategies of *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change.

The first part analyzed *reconstructive* discursive action by analyzing statements constructing the theorization of the commercial opensource model. It demonstrated that proponents, largely constituted of Sun, JBoss and IBM, competed on the new model and thus further reinforced its adoption in the field. The momentum behind the commercial opensource model was driven by a reinforcing dynamic that started with the introduction and success of the new model, followed by widespread adoption, which led to consolidation and a new level of competition along comprehensive and firm-wide adoption.

The second part also investigated *reconstructive* discursive action by analyzing statements constructing the theorization of opensource approaches regarding Sun's proprietary Java model. It demonstrated that proponents, largely constituted of Sun executives, endorsed opensourcing Java to drive innovation but remained committed to Java compatibility. Major firms adopted or extended the new model to gain technological leadership in the emerging area of service-oriented architectures. The shift in the theorization of Sun's proprietary Java model occurred in the context of Sun and IBM vying for dominance in the field. Sun therefore remained determined to ensure Java compatibility and to disparage powerful players from leveraging their market power to seize control over Java.

Conclusion

This chapter on discursive action reconstructs the discourse on opensource Java software in the field by tracing the theorizations of the commercial opensource model, of Sun's proprietary Java model, and of the opensource Java model. Each section investigates the three theorizations along the business, technology, and legitimation conceptions and identifies discursive strategies employed to legitimate and embed the

espoused theorization. The links between salient conceptions in theorizations and discursive strategies as well as field-wide practices are specified in Table 18 and are discussed below.

The first section analyzed statements under the major themes of the Experimentation phase. Analyzing reconstructive action investigated the theorization of the commercial opensource model and demonstrated that proponents embedded the new model, emphasized its innovativeness, and built developer communities. Analysis of iterative action investigated the theorization of Sun's proprietary Java model and demonstrated that proponents emphasized compatibility of Java software and associated concerns of existing customers.

The second section analyzed statements under the major themes of the Disruption phase. Analysis of reconstructive action investigated the theorization of the commercial opensource model and demonstrated that proponents exploited their marginalized status to attract consenters while also focusing on educating customers and on assuaging competitors. Analyzing iterative action investigated the theorization of Sun's proprietary Java model and demonstrated that proponents legitimated its Sun's Java control with a concern about protecting developers and customers. Contrasting reconstructive with iterative action orientations investigated the theorization of the opensource Java model vis-à-vis the theorization of Sun's proprietary Java model. It demonstrated that both pitched espoused benefits against opponents' proposals.

The third section analyzed statements under the major themes of the Adjustment phase. Analysis of reconstructive action investigated the theorization of the commercial opensource model and demonstrated that proponents competed on the new model and thus further reinforced its adoption in the field. Analyzing reconstructive action in the theorization of opensource approaches regarding Sun's proprietary Java model demonstrated that proponents endorsed opensourcing Java to drive innovation but remained committed to Java compatibility.

The analysis of discursive action demonstrates that *theorization* is a collective accomplishment involving multiple actors drawing on salient business, technology, and legitimation conceptions. Regarding these conceptions, respectively, cost advantage, technological innovation, and community-building constituted core conceptions common to theorizations endorsing the commercial opensource model. The complementarities between the business, technology, and legitimation conceptions were important

because one conception alone would not have constructed a unique and novel conceptualization of software development and distribution.

In contrast, the core conceptions in theorizations endorsing Sun's proprietary Java model changed over time. The business conception was initially framed around the revenue threat from opensource Java software, then around the alleged threat of Java splintering into deviant versions, before being framed around competitiveness. Regarding the technology conception, the focus initially was on Java specifications declaring opensource Java software incompatible, then on Java certification and Java branding, before being superseded by a focus on Java's innovativeness. The legitimation conception was initially framed around protecting incumbents, then around protecting developers and customers from vendor lock-in, before being framed around community-building and opportunities for developers and customers. Initially, complementarities existed between business, technology, and legitimation conceptions where each was reinforcing the other. However, with Sun allowing opensource Java software and its normative leverage increasingly challenged, changes were reinforcing each other.

The core conceptions common to theorizations endorsing the opensource Java model remained stable over time. The business and technology conceptions were framed around competitiveness and innovativeness, both of Java products and the Java standard vis-à-vis rivaling programming standards while the legitimation conception emphasized community- and opportunities for developers and customers. As an outcome of opensource adoption, the commoditizing market further reinforced the complementarities competitiveness, innovativeness and community-building of opensource approaches.

The identification of discursive strategies highlights how theorizations were embedded in prevailing understandings. Regarding the commercial opensource model, proponents repeatedly employed the discursive strategies of *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying barriers to adoption. Initially, amid opensource-hostile environment, proponents also employed the discursive strategies of *Reframing*, by educating about the new model and addressing reservations, and of *Self-promotion*, by enrolling a marginalized position to attract consenters.

Regarding Sun's proprietary Java model, proponents repeatedly employed the discursive strategy of *Identification* but along changing predications: initially, by linking

the widely approved Java compatibility promise to Sun's proprietary Java control and later by linking the widely shared concern about Java innovativeness to Sun's opensource model. Proponents also employed the discursive strategies of *Self-expansion*, by implying that developers and customers widely approve Sun's proprietary Java model, and of *Containment*, by downplaying threats to existing revenues and emphasizing benefits of the change. In addition, both proponents and opponents of Sun's proprietary Java model employed the discursive strategies of *Totalizing*, by declaring either Java compatibility or Java innovativeness as the overriding concern, and of *Dismissal*, by pitching the supported project against the project of opponents.

In the last phase, proponents of the opensource Java model employed the discursive strategies of *Identification*, by linking innovativeness to opensource approaches, and of *Containment*, by downplaying threats to existing revenues while emphasizing benefits of the change. Particularly the shift from linking Sun's Java model first to proprietary control and then to the opensource model shows how theorizations change over time.

6. Discussion

The present study investigated two research questions: (1) *Are there discernible patterns of discursive action through which participants in an organizational field theorize institutional change,* and (2) *What are the implications of theorizations for mobilizing support and realizing change projects?*

Regarding the first question, on an aggregate and more abstract level, the present study identified the emergence of a new model, its contestation as it began threatening the status quo, and convergence on the new model establishing it as the new status quo. The cycle of discursive emergence, contestation, and convergence is also evident on more granular levels, such as the organizational level, and at more granular time intervals, such as within a phase. In the first section, the following discussion presents a generic cycle of discursive construction that appears to drive the interplay of stability and change at different levels or time horizons.

Regarding the second question, the present study found endogenous institutional change to be the consequence of theorizations aimed at shaping the trajectories of institutionalization in the field. Proponents of the new model successfully linked a new business model to a new social model. Evidence suggests that a focus only on the new business model had not attracted the momentum to shield it against powerful incumbents. At the same time, the new social model became increasingly attractive because the new business model proved its commercial viability. However, the process of establishing the new model was not self-evident as incumbents actively sought to deter its success. In the second section, the discussion presents the process of institutional change from a practice perspective highlighting the interplay between stability and change.

The third section revisits the paradox of embedded agency in light of the above findings. Here, the practice perspective is able to explain why and how different logics were maintained, which provides a more differentiated view on homogeneity and differences among actors. Finally, the fourth section discusses the merits of the discourse methodology developed and validated in the present study. When individual statements are systematically retrieved in a field, linking discursive action, discourse, and institutional outcomes allows tracing institutionalization processes.

Theorization of change: Shaping trajectories of institutionalization

Theorization was broadly defined as the elaborate conceptualization of an espoused project expressing the adopted logic and aimed at shaping prevailing rules and expectations in the field. Successful theorization mobilizes collective action and shifts power differentials in favor of the espoused model or practice. This requires a broader sociopolitical process through which existing rules are contested and prevailing expectations questioned. The theorization of the opportunities and of the means to exploit them translates local innovations into more widely acceptable ends supported by larger groups (Greenwood, Hinings, and Suddaby 2002). Hargrave and Van de Ven emphasized the legitimation aspect of theorization, which occurs when key actors start endorsing or adopting the new model or practice (2004: 312). They differentiated between cognitive legitimacy, which refers to the acceptance and appropriateness of proposed changes, and sociopolitical legitimacy, which refers to the endorsement and enforcement of key stakeholders in the field. Competing theorizations reflecting different and often opposing theorizations vie for dominance in a field (Lounsbury, Ventresca, and Hirsch 2003). The articulation of interests and their discursive contestation in the field drive institutionalization processes (Suddaby and Greenwood 2005).

Discourses are carriers of *competing theorizations* about pertinent issues that shape institutionalization trajectories in the field. As the discourse on opensource Java software emerged, it was dominated by opensource firms and groups theorizing the new business and social model. After Lutris cited Sun's Java restrictions for withdrawing its opensource product, the momentum behind the discourse grew forcing changes in the Java standard allowing opensource Java software. Subsequently, Sun engaged heavily in the discourse on opensource Java software in an attempt to convince customers and developers about the merits of proprietary control. At the same time, powerful incumbents also became weary of Sun's grip over the common standard and promoted opensourcing the Java standard. Both sides put forward arguments explaining why their views are reasonable from a business, technological and user perspective. Between early 2004 and 2005, the trajectory of institutionalization was left open as no common ground was found. A similar situation occurred earlier before Sun conceded to allow opensource Java software. In these critical periods, *institutionalization trajectories are shaped as competing theorizations are contested and evaluated.*

Figure 8 exhibits a generic cycle of discursive emergence, contestation, and convergence showing the impact of discourse on institutionalization trajectories in the field (DECC generic cycle). *Emergence* of a counter-discourse occurs in an institutionalized field where incumbents benefit from the status quo and are able to deter innovative newcomers from succeeding. As would be expected, the counter-discourse is dominated by proponents of the new model attempting to reconstruct prevailing rules and expectations by establishing a new logic that in turn shapes views of actors in the field. *Contestation* occurs, when the counter-discourse is able to establish proto-institutions, that is, "institutions in the making ... [with] the potential to become full-fledged institutions" (Lawrence, Hardy, and Phillips 2002: 283). An example is regulative change of the Java standard in order to allow opensource Java software and the underlying shift in normative expectations. The ascendance and momentum of new proto-institutions triggers responses aimed at defending existing institutions and their underlying rules and expectations. A period of conflict characterized by high ambiguity about institutionalization trajectories ensues. *Convergence* of views results only if all key actors are able to agree on a basic layout, which may completely reject the new or the old model or adopt a hybrid approach. Thus, in the discursive process of institutionalization, *contestation is a decisive stage*.

The DECC model represents a generic cycle that can be observed in the present study on multiple levels, such as the team, organization, or field-level, and at multiple time-horizons, such as within a phase or across phases. For example, regarding multiple levels, the *emergence* of the commercial opensource model led to its *contestation* within opensource teams as ideology and profit-orientations clashed, within incumbent firm Sun as opponents and proponents disagreed, and within the field, which is the focal level in the present study. Eventually, *convergence* among the key players at each level fueled the momentum behind the commercial opensource model. Regarding multiple time-horizons, in the first phase, the *emergence* of the opensource application server led to *contestation* with Sun invoking Java restrictions, followed by *convergence* towards allowing opensource Java software. Similarly, the *emergence* of legal opensource Java software led to *contestation* with Sun preempting JBoss from Java certification, followed by *convergence* towards certifying JBoss. Moving from a within-phase to an across-phase time-horizon, emergence, contestation, and convergence are mirrored by the three phases. The DECC model thus represents a generic cycle of discursive institutionalization that is evident both on multiple levels and across multiple time-horizons.
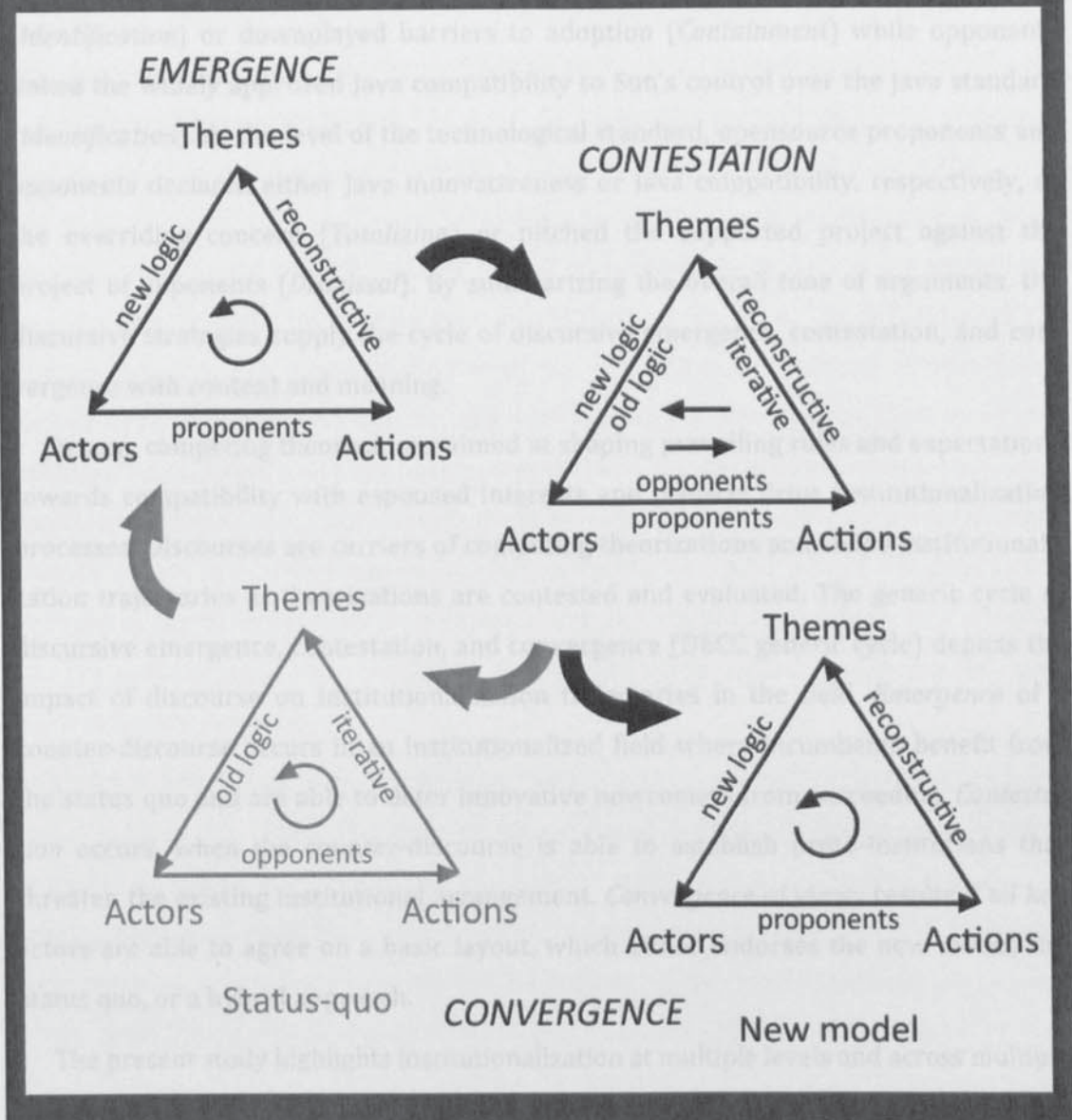
Figure 8: Discursive emergence, contestation, convergence and impact on institutionalization trajectories

The discursive strategies identified in the analysis of discursive action summarize how discursive emergence, contestation, and convergence actually occurred. These discursive strategies and actions can be linked to outcomes at multiple levels, such as the team or organizational level or the field level. For example, at the team or organizational level, opensource firms Microstate, Lutris and JBoss primarily employed the discursive strategies of *Identification*, by linking innovativeness to the opensource approach, and of *Self-promotion*, by enrolling a marginalized position to attract developers alienated by the proprietary approach. They were thus able to attract capable

developers to work on the opensource application server. At the level of the organizational field, opensource proponents repeatedly linked the new model to innovativeness (*Identification*) or downplayed barriers to adoption (*Containment*) while opponents linked the widely approved Java compatibility to Sun's control over the Java standard (*Identification*). At the level of the technological standard, opensource proponents and opponents declared either Java innovativeness or Java compatibility, respectively, as the overriding concern (*Totalizing*) or pitched the supported project against the project of opponents (*Dismissal*). By summarizing the overall tone of arguments, the discursive strategies supply the cycle of discursive emergence, contestation, and convergence with content and meaning.

In sum, competing theorizations aimed at shaping prevailing rules and expectations towards compatibility with espoused interests and projects drive institutionalization processes. Discourses are carriers of competing theorizations and shape institutionalization trajectories as theorizations are contested and evaluated. The generic cycle of discursive emergence, contestation, and convergence (DECC generic cycle) depicts the impact of discourse on institutionalization trajectories in the field. *Emergence* of a counter-discourse occurs in an institutionalized field where incumbents benefit from the status quo and are able to deter innovative newcomers from succeeding. *Contestation* occurs, when the counter-discourse is able to establish proto-institutions that threaten the existing institutional arrangement. *Convergence* of views results if all key actors are able to agree on a basic layout, which either endorses the new model, the status quo, or a hybrid approach.

The present study highlights institutionalization at multiple levels and across multiple time-horizons. The DECC model abstracts and represents a generic cycle that can be observed in the present study on multiple levels, such as the team, organization, or field-level, and at multiple time-horizons, such as within a phase or across phases. Similarly, discursive strategies and actions can be linked to outcomes at multiple levels, such as the team or organizational level or the field level. By summarizing the overall tone of arguments, the discursive strategies identified in the analysis illuminate how the cycle of discursive emergence, contestation, and convergence actually occurred. Taken together, the generic cycle of discursive institutionalization depicted by the DECC model combined with the discursive strategies shows how theorizations constructed and shaped the institutionalization trajectories in the Java application server field.

Endogenous change: Emergence of new social and business models

The Java application server field was initially dominated by few incumbent firms able to extract large profit premiums. At the time when the new entrants introduced a disruptive business model in the field, incumbents occupied powerful positions able to maintain or create entry barriers. The case thus directly addresses the problem of how, in the absence of external shocks, innovative and substantially new models and practices are established in a field if incumbents benefit from the status quo and are able to deter innovative newcomers from succeeding. The institutional argument suggests that compatibility with the prevailing institutional structure enhances organizational profitability and survivability. In the present case, however, profitability and survivability of once powerful and market-leading incumbents deteriorated as they sought aggressively to deter new entrants. Some incumbents were able to regain leadership but only after adopting the new model. No significant changes in the external environment occurred that could explain these field dynamics. The present study thus highlights the *paradox of embedded agency* and also provides tentative answers.

Endogenous change through the introduction and promotion of new business *and* social models can create the urgency for profound changes to existing models and practices in a field. The commercial opensource model was a new business model for making money off software while the opensource Java model was a new social model for governing a worldwide standard. The success of the business model and of the social model was reciprocally interlinked and mutually dependent on each other. For example, consulting firm Lutris withdrew its opensource product after pressure from incumbents. In contrast, start-up JBoss actively created and collaborated with opensource communities around its opensource product thereby preempting incumbents from legal action. Indeed, pressure from the opensource communities led to changes in the software standard that legalized opensource Java software. At the same time, the increasing commercial viability of open source and the support by big corporations in turn legitimated the social model and freed it from early stigmas. The comparison between Lutris and JBoss suggests that without the momentum behind the new social model in the field, the new business model would have failed. Therefore, it was the *co-emergence of a new social and a new business model* in the field that promoted institutional change.

The findings largely confirm the five to six stages of institutional change identified in the extant literature. The process of institutional change started with an (1) endogenous change stimuli leading to the (2) emergence of a new model whose (3) viability is contested requiring (4) theorization of the new model aimed at (5) embedding new conceptions and (6) legitimating the new model within the prevailing institutional structure (Greenwood, Hinings, and Suddaby 2002). However, the analysis of discursive structure and even more the analysis of discursive action highlight the open-endedness of the process. For example, after newcomer Lutris withdrew from the new model citing pressure by incumbents, the viability of the new model was seriously endangered. That the commercial opensource model made it beyond Stage Four had much to do with JBoss founder Marc Fleury. Regarding the opensource Java model, Stage Four was already evident in 1998 but it took another eight years before Java was opensourced. This suggests that, in order to inform practitioners, process models must be investigated along a practice perspective that focuses on discursive and other actions of key participants.

The process of institutional change from a practice perspective summarizes the stages based on the interplay between stability and change. From this perspective, the process starts with (1) *Experimentation* leading to the (2) *Marginalization* of the new model by incumbents, which nurtures the (3) *Counter-Discourse* aimed at theorizing the new model. Successful theorization establishes proto-institutions, that is, "institutions in the making ... [with] the potential to become full-fledged institutions" (Lawrence, Hardy, and Phillips 2002: 283). An example is regulative change of the Java standard in order to allow opensource Java software and the underlying shift in normative expectations. The ascendance and momentum of new proto-institutions thus triggers (4) *Containment* aimed at defending existing institutions and their underlying rules and expectations. If this fails, (5) *Diffusion* of the new model and its associated proto-institutions proceeds unhindered leading to its (6) institutionalization as *Status quo*. Figure 9 depicts the process schematically with the three dimensions thematic scope, time, and numerical frequency referring to, respectively, the number of supportive themes, the temporal endurance of themes, and to numerical frequency as described in Chapter Four.

The initial *experimentation* with opensource application servers proved successful and promoted opensource vis-à-vis proprietary approaches. But opponents were able to mount regulatory barriers thereby *marginalizing* opensource competitors. However, attempts to disparage opensource competitors promoted the opensource-supportive *counter-discourse* forcing opponents onto the defensive. Attempts to enroll normative

barriers by preempting opensource competitors from widely endorsed Java certification *contained* widespread adoption of opensource solutions. Despite these barriers, market approval led to field-wide *diffusion* of the new model. Within an increasingly commoditizing market, the competitive advantage of the opensource model further reinforced its institutionalization as a viable approach in effect becoming the new *status quo* in the field. Actors' theorization and subsequent mobilization played a decisive role in turning the trajectory of institutionalization towards compatibility with the new model. In contrast to linear process models of institutional change, the present study highlights the interplay between proponents and opponents of the new model and the role of conflict and contestation in institutionalization processes.

| Schematic view | Process of institutional change from a practice perspective |

Status quo

Diffusion

Containment

Mobilization

Marginalization

Experimentation

Institutionalization

Supporters

Time

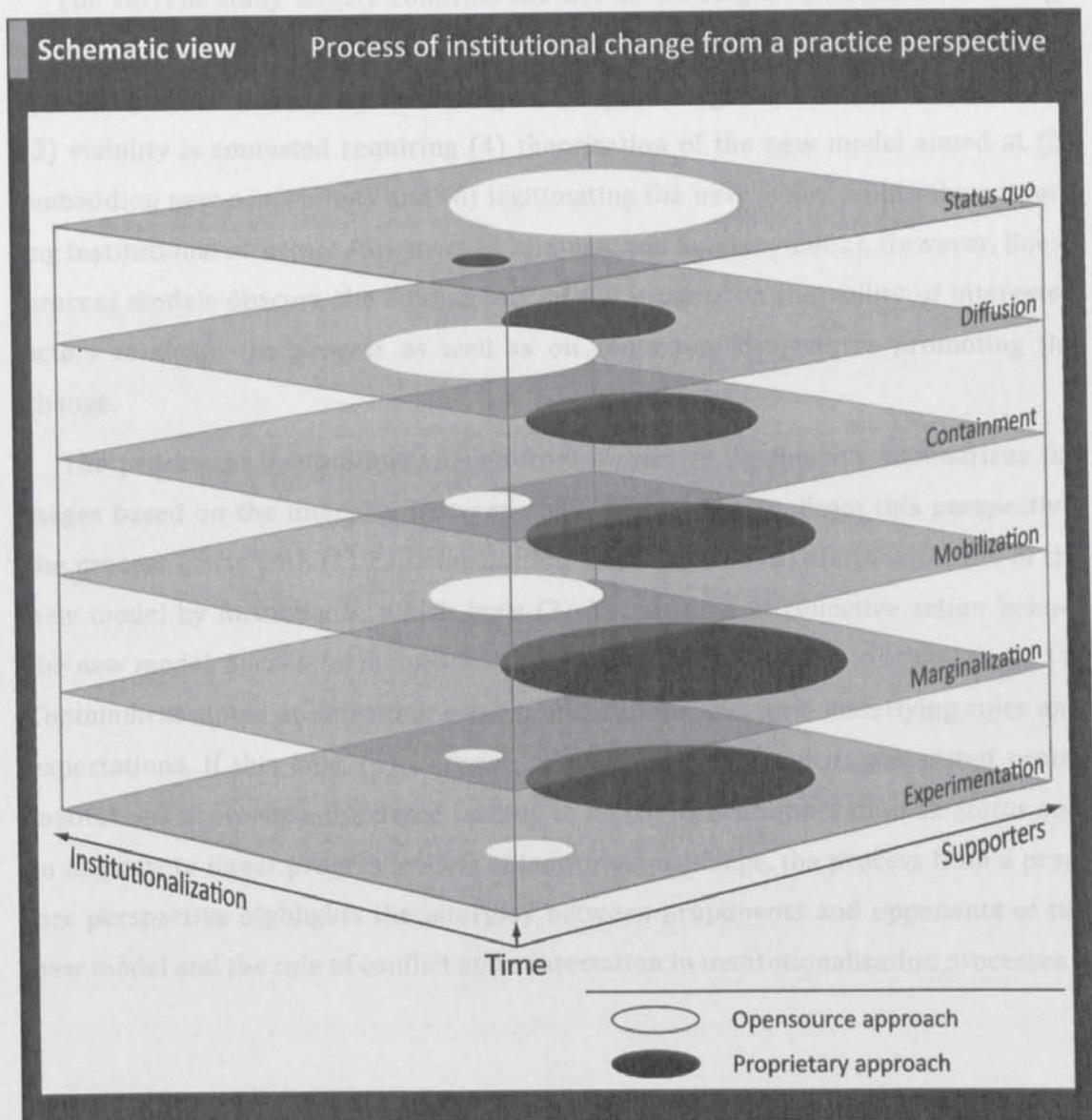Opensource approach

Proprietary approach

Figure 9: Schematic view on the process of institutional change from a practice perspective

In sum, the Java application server field was initially dominated by few incumbent firms able to extract large profit premiums. At the time when the new entrants introduced a disruptive business model in the field, incumbents occupied powerful positions able to maintain or create entry barriers. However, despite these barriers, the new model defined the new status quo in the field. The present study thus highlights the *paradox of embedded agency* and also provides tentative answers. The case on institutional change in the Java application server field demonstrates that the *co-emergence of a new social and a new business model* promoted endogenous institutional change in the field.

The current study largely confirms the five to six stages of institutional change identified in the extant literature. The process of institutional change started with an (1) endogenous change stimuli leading to the (2) emergence of a new model whose (3) viability is contested requiring (4) theorization of the new model aimed at (5) embedding new conceptions and (6) legitimating the new model within the prevailing institutional structure (Greenwood, Hinings, and Suddaby 2002). However, linear process models obscure the contingency of the process on the ability of interested actors to shape the process as well as on contextual conjectures promoting the change.

The process of institutional change from a practice perspective summarizes the stages based on the interplay between stability and change. From this perspective, the process starts with (1) *Experimentation* leading to the (2) *Marginalization* of the new model by incumbents, which fuels (3) *Mobilization* of collective action behind the new model. Successful mobilization establishes proto-institutions that trigger (4) *Containment* aimed at defending existing institutions and their underlying rules and expectations. If this fails, (5) *Diffusion* of the new model and its associated proto-institutions proceeds unhindered leading to its (6) institutionalization as *Status quo*. In contrast to linear process models of institutional change, the process from a practice perspective highlights the interplay between proponents and opponents of the new model and the role of conflict and contestation in institutionalization processes.

Institutional stability and change: A matter of analytical granularity

The Java application server field co-developed with interrelated fields, such as those of server hardware or database systems. Incumbents who dominated these adjacent fields applied their business logic to the application server. The application server operates in the background connecting enterprise applications and was, at the time, considered not very appealing to opensource communities who were rallying around software that was closer to the user, such as Linux. Over time, however, inexpensive personal computers were able to replace expensive server hardware while ever more components of enterprise computing, such as databases, were opensourced. The enterprise computing infrastructure, once the domain of large corporations, found its way into smaller companies and all the way down to individual developers' computers. As the application server moved closer to the user, the need to freely modify the software increased, which added momentum behind the opensource model in enterprise computing. Meanwhile, some incumbents, such as BEA, remained wedded to the idea that enterprise computing is 'high-end' and thus no business for opensource projects. The *move of enterprise computing to the user transformed the business logic in the field*, but some players remained wedded to the status quo.

The analysis of discursive actions demonstrated that opponents of the new model endorsed the existing business logic because they rationalized it as more viable. For example, Sun argued that opensourcing the Java standard would allow large companies to introduce and diffuse vendor-specific innovations that would compromise Java's compatibility promise. Even Marc Fleury, whose commercial opensource model around JBoss was seen as disruptive force in the field, thought that opensourcing the Java standard would be harmful. At the same time, powerful opensource group Apache announced developing an opensource version of Java with IBM's support and independent of Sun. Other incumbents and opensource groups welcomed the move. At least by then, opensourcing Java seemed inevitable. Yet, not only incumbent Sun but also opensource start-up JBoss viewed the move more as a threat than an opportunity. At the same time, both Sun and JBoss felt the pressure of IBM successfully collaborating with opensource communities. Overall, players who exerted competitive pressure (e.g. JBoss initially, IBM later) emphasized opportunities of change while players who experienced competitive pressure (e.g. BEA initially, JBoss later) emphasized the threats of profound change.

The transformation of the business logic in the field can be linked to the move of enterprise computing from the domain of few large corporations to the opensource domain dominated by developers and users. The development is most evident in the evolution of the legitimation conception behind Sun's Java governance. Initially, Sun legitimated its proprietary control over the Java standard by the need to ensure Java's compatibility but also to protect the high-end market from low-cost competitors. In the second phase, Sun also focused on ensuring Java's compatibility but positioned itself as steward of the Java community emphasizing the benefits for small firms and individual developers by preventing large vendor lock-in. In the final phase, Sun opensourced the Java standard emphasizing innovation *and* compatibility while positioning itself as the natural steward of the Java opensource communities. The move was welcomed by the Java community while financial and investor communities questioned the rationale. The only constant in the transformation of Java governance is Sun's eagerness to play a leading role in the standard. Meanwhile, critics from both the developer and financial communities have long warned of the tensions between managing a common standard and a profitable business.

The practice perspective with its focus on discursive actions and business activities is able to explain why and how different logics were maintained. The analysis of discursive actions through which interests are mobilized is consistent with a growing body of practice research that examines practice through a discursive lens, with discourse taken in a broad sense of that word (e.g. Jarzabkowski and Spee 2009; Vaara et al 2004). For example, some incumbents, most notably BEA and Sun, remained attached to the existing business logic and were only able to incrementally adapt by passively reacting to issues as they arose. Other incumbents, such as IBM, were able to incrementally adapt by proactively anticipating issues and shaping the development of the field. Moreover, conduct of opensource newcomers also differed considerably. When looking at the interests and practices of various players, the field is far from homogenous. Yet from the perspective of the organizational field, homogeneity among incumbents and among new entrants introducing the new model is most evident. But the present case demonstrates that the success of the new model only exposed the differences and latent tensions among incumbents, which in turn promoted the new model.

In sum, the case of the Java application server field illuminates how *institutional stability* operates, with actors actively attempting to stabilize the existing logic, and how *institutional fragility* occurs, with actors exposing latent tensions to exploit new

opportunities. For example, conduct by BEA and Sun highlights the role of past experiences and understandings imprinting trajectories of thought and action during institutionalization processes (Alvesson and Kärreman 2001; Heracleous and Barrett 2001; Patriotta 2003). At the same time, successful mobilization by opensource proponents or the tensions among major incumbents shows how theorizations introduce a new logic that destabilizes the status quo (Hargrave and Van de Ven 2004; Suddaby and Greenwood 2005).

In addition, analysis exhibits the links between local activities, such as experimenting with or promoting the opensource model, and field-level outcomes, such as legalizing opensource Java software. It thus demonstrates how institutional structure comprises a *nested system* involving multiple loosely coupled levels (Holm 1995). Moreover, the field's transformation became self-reinforcing and closely linked to similar developments in interrelated fields, thus illuminating the *relational argument* and the disruptive dynamics of interrelated changes (Rouse 2001: 195). Finally, the practice perspective is able to explain why and how different logics were maintained by focusing on actual discursive actions and business activities. This provides a more differentiated view on homogeneity and differences among actors and addresses the *paradox of embedded agency*: embeddedness and institutionalization is never completely self-referential as latent contradictions promote new interpretations.

Analyzing institutionalization: From context to practice via discourse

Analyzing change processes in management and organization studies must be able to account for the interplay of systemic relations and human interaction over time, for both continuity *and* change, and for the role time in change processes (Pettigrew, Woodman, and Cameron 2001). This poses at least five empirical challenges that the discourse methodology of the present study addresses: (1) multi-level constitution of institutionalization, (2) temporal interplay between context and action, (3) reinforcing complementarities of institutionalization, and (4) relationship between sequencing of action and receptivity to change. Finally, (5) tracing the discourse on change supplies evidence of institutionalization, because "the 'logic' of institutions ... [is observable only] in the way these are treated in reflection about them" (Berger and Luckmann 1966: 82). This section outlines how the analysis addresses these empirical challenges through a structural analysis as well as an in-depth analysis of discursive action.

Theorization is operationalized as the set of themes supporting either the commercial opensource model, Sun's Java model, or the opensource Java model. This operationalization requires assigning descriptive themes to the statements of key participants (Gumperz 1982 [1999]), which are developed through an open coding approach (Glaser and Strauss 1967). Each theme thus reflects how a statement addressed a contested issue or event by constructing a common goal or interest and the rationale for pursuing it, employing a rhetoric that underlines the endorsed point of view. The analysis of discursive structure traces the relative prominence of themes over time and identifies shifts in the discursive patterns that coalesced with regulatory and normative changes precipitating further changes in the prevailing institutional structure. The analysis of discursive action shows that statements endorsed or disparaged practices and how statements constructed the respective theorization along business, technology, and legitimation conceptions. Identifying discursive strategies, which present the overall tone of arguments employed by proponents and opponents, illuminates how the discursive construction of theorizations actually occurred. Studying discourse and discursive action accounts for the interplay of institutionalization and human action where continuity *or* change is the outcome of establishing trajectories of institutionalization.

Phases are operationalized as periods between three critical turning points: (1) Sun allowing opensource Java software in March 2002, (2) incumbents adopting opensource application servers starting in May 2005, and (3) Sun announcing to opensource Java in May 2006. Context is operationalized as the major events based on source reference volume while action is operationalized as statements made by key participants. The analysis of discursive structure is thus able to link shifts in the broader context to shifts in the thematic pattern, the viewpoints of participants, and the prevalent action orientations over time. The concatenation of events precipitated by interrelated antecedent events demonstrates that reinforcing dynamics operate both ways, promoting either continuity or change. It also exemplifies the systemic relations that operate to produce unintended consequences that protagonists did not fully anticipate (Knorr-Cetina 1988). In addition, the analysis of discursive action identifies discursive strategies that summarize the overall tone of arguments advanced by participants.

Table 18 summarizes how changing contexts, represented by the major events, are constituted by practices in the field and how the interplay between contexts and practices is translated or mediated by discourse and discursive actions. Each phase can be cha-

racterized along an issue triggering conflict and a response leading to an outcome over time. This development is mirrored by the discursive structure of each phase, which in turn is constituted by discursive actions of key participants. These actions are linked to what major player did during a phase. The analysis is thus able to link practices to statements and to investigate statements not only as individual accounts of what happened, but also as constitutive of the discourse and ultimately of institutionalization trajectories. For example, Sun using restrictions to curb opensource competition is evident in statements by Sun officials. These statements are not only accounts of Sun's position but also actively shaped the discourse on opensource Java software. Sun presented itself as steward of the Java standard, which some incumbents (and their corporate customers) welcomed. This represented the status quo in the discourse on opensource Java and is one reason why the Java standard was not opensourced much earlier, as some of Sun's closest partners demanded. Therefore, when individual statements are systematically retrieved in a field, *linking discursive action, discourse, and institutional outcomes allows tracing institutionalization processes.*

The *multi-level constitution of institutionalization* is evident in theorization and subsequent mobilization affecting the single organization, the field involving multiple organizations, and the Java standard covering multiple fields. The *temporal interplay between context and action* is evident within each phase and across the three phases. The DECC model presents the generic process observed in the present study on multiple levels, such as the team, organization, or field-level and at multiple time-horizons, such as within a phase or across phases. The *reinforcing complementarities of institutionalization* are evident in the business, technological, and legitimation conceptions enrolled in theorizations. For example, in the theorization of the commercial opensource model, cost advantage, technological innovation, and community-building were compatible with and thus reinforcing each other. The *relationship between sequencing of action and receptivity to change* is evident in the relationship between theorization and adoption of the espoused project. For example, JBoss became involved in the discourse on opensource Java software as Lutris began questioning the viability of the new model citing Java restrictions and reservations in the field. Finally, *tracing the discourse on change* enables investigating how institutions are constructed through processes of negotiation and contestation over plausible interpretations and appropriate courses of action (Mohr 1998).

Analyzing institutionalization	Linking contexts to practices via discourse	
	Experimentation phase	**Disruption phase**	**Adjustment phase**
	Issue		
Contexts	Experimentation with a commercial opensource model	Proliferation of the commercial opensource model	Field-wide convergence on the opensource model
	Conflict		
	Restrictions prohibiting commercial opensource Java	Certification contains commercial opensource Java	proprietary Java model inhibits Java's innovativeness
	Response		
	Bottom-up movement for opensource Java software	Tensions between Sun and JBoss and among incumbents	IBM supports independent opensource Java standard
	Outcome		
	Sun allows commercial opensource Java software	Incumbents adopt opensource application servers	Sun opensources its Java standard
Structure	*Themes*		
	Commercial open source & opening proprietary Java model	Commercial open source & proprietary Java model	Commercial open source & opensource Java model
	Actors		
	Prominence of opensource firms and groups	Prominence of incumbents, retreat of opensource firms	Incumbents prominent, opensource firms growing
	Orientations		
	Dominance of reconstructive orientation	Prevalence of reconstructive, growing iterative orientation	Strong dominance of reconstructive orientation
Action	*Opensource-supportive strategies*		
	Educating about benefits of the opensource model	Downplaying barriers to opensource adoption	Tying innovativeness to the opensource model
	Linking innovativeness to the opensource model	Declaring innovativeness as overriding concern	Tying innovation and compatibility to opensource Java
	Opensource-skeptic strategies		
	Tying compatibility of Java software to Sun's control	Declaring compatibility as overriding concern	
Practices	*Interaction cycles*		
	Newcomers adopt a commercial opensource model	Newcomers and incumbents extend opensource model	Key firms compete on commercial opensource model
	Sun uses restrictions to curb opensource competition	Sun uses branding to curb opensource proliferation	Sun emphasizes Java compatibility over innovativeness
	Opensource proponents mount pressure against Sun	JBoss creates momentum behind opensource model	Major incumbents promote opensource Java standard

Table 18: Linking contexts through discursive structure and action to practices in the field

In sum, analyzing change processes in management and organization studies poses at least five empirical challenges that the discourse methodology of the present study addresses: (1) multi-level constitution of institutionalization, (2) temporal interplay between context and action, (3) reinforcing complementarities of institutionalization, (4) relationship between sequencing of action and receptivity to change, and (5) tracing the discourse on change. Theorization is operationalized as the set of themes supporting one of the competing theorizations. Phases are operationalized as periods between three critical turning points; context is operationalized as the major events based on source reference volume while action is operationalized as statements made by key participants. The analysis was able to address these empirical challenges through a structural analysis as well as an in-depth analysis of discursive action.

By accounting for the five empirical challenges, studying discourse and discursive action is able to account for the interplay of institutionalization and human action where continuity *or* change is the outcome of establishing corresponding trajectories of institutionalization. It allows demonstrating how changing contexts are constituted by practices in the field and how the interplay between contexts and practices is translated or mediated by discourse and discursive actions. Therefore, when individual statements are systematically retrieved in a field, *linking discursive action, discourse, and institutional outcomes allows tracing institutionalization processes.*

7. Conclusion

How are innovative and potentially disruptive new approaches established if incumbent organizations benefit from the status quo and are powerful enough to prevent disruptive change? The topic is critical because it addresses the question of how organizations and industries innovate to reinvigorate growth despite the prevalence of structural and cognitive barriers that inhibit innovations from succeeding.

The present study reviewed the literature on institutionalization and institutional change to conclude that self-reinforcing dynamics operate both ways, promoting either stability or change. The review outlined the practice perspective and the concept of institutional entrepreneurship in order to address the *paradox of embedded agency*. Investigating the actual practices of key actors provides a differentiated understanding of embeddedness that highlights the active and interested accomplishment of complying with prevailing rules and expectations. This interested conduct "is not to suggest, however, a return to the rational actor model" but, rather, demonstrates the ability "to work with institutionally-defined logics of effect or appropriateness" (Lawrence and Suddaby 2006: 219). Indeed, such conduct may be completely irrational amid compelling evidence that compliance with the status quo proves to be more harmful than change. In any case, if embeddedness is an active accomplishment, it can fail to produce the desired effects. Embeddedness is therefore always incomplete and open to falsification. From this perspective, the paradox of embedded agency primarily points to a deficit in cognitively accepting a change in underlying currents.

The objective of the present study is to address the topic through a case study on institutional change in the Java application server field. Here, business practices and models were already well established among incumbents with critical market areas allocated to few dominant firms. Fringe players started experimenting with a new business approach of selling services around freely available opensource application servers. The prospect of competing with freely available software threatened the business model of incumbent firms. However, while some incumbents started to embrace the new model and proved its success, others remained wedded to the status quo while experiencing market share loss and harsh negative reactions from the financial markets. For example, when powerful opensource group Apache announced developing an opensource ver-

sion of Java with IBM's support, opensourcing Java seemed almost inevitable. Yet, not only incumbent Sun but also opensource start-up JBoss viewed the move more as a threat than an opportunity. Overall, players who experienced competitive pressure (e.g. BEA initially, JBoss later) emphasized the threats of profound change. At this point, the paradox of embedded agency translates into an actively accomplished problem of perception and action.

The case of institutional change in the Java application server field demonstrates how interested actors constructed institutionalization outcomes by either endorsing change or the status quo. The case thus illuminates how institutional change in the Java application server field was *made* – not predetermined. The practice perspective provides more detailed insights into the actual activities through which interested actors attempt to shape the trajectories of institutional change and institutionalization outcomes. Analysis demonstrates how institutionalization is constituted in "micro-experience [and that] it is the numerical, temporal and spatial aggregations of such experience which make up the macrosociological level of analysis" (Giddens 1984: 140). Yet, a focus on micro-experiences as constitutive of institutionalization processes remains empirically under-investigated. While conceptualizing the production of meaning as integral to institutions, most empirical studies on institutional change do not investigate in any detail the actual production of meaning in concrete action contexts (Zilber 2002).

In addition, longitudinal analyses that trace the process of institutionalization as it is discursively constructed by key participants remain rare (Heracleous and Barrett 2001). Yet, a longitudinal analysis is needed in order to account for institutionalization processes as they unfold over time (Heracleous and Hendry 2000). An analysis of discourse and discursive action is particularly warranted because institutionalization and institutional logics are only accessible in discursive reflections about them (Berger and Luckmann 1966). The discourse methodology of the present study demonstrates that interested actors not only draw on discursive structures to embed new models and practices but that their discursive action also constitutes discourses that shape prevailing rules and expectations. Through a longitudinal analysis of institutionalization processes, this research not only demonstrated *that* interested actors discursively shape processes of institutionalization but also *how* this occurs in practice.

Contribution

The present study demonstrated how interested actors were able to shape institutionalization trajectories through cogent theorization and subsequent mobilization. One key finding of the present study therefore is that theorizations shaped prevailing rules and expectations towards compatibility with the new model. However, empirical analyses of institutional change have yet to move more closely to a focus on microexperiences as constitutive of institutionalization processes. All too often, the focus remains on identifying exogenous or endogenous *mechanisms* as instigators of change without further elaborating how these mechanisms operate to promote or inhibit institutional change. For example, to explain disruptive change processes in institutionalized fields, existing process models of institutional change rely on an "internal logic of contradiction" (DiMaggio 1988: 13) or on external "environmental jolts" (Meyer, Brooks, and Goes 1990: 102). However, external 'jolts' reduce human actors to stimuli-response automata while structural contradiction and differentiated social positions are part and parcel of any social structure (Giddens 1984: 193, 83). Structural contradiction therfore cannot *per se* explain institutional change (Leblebici et al. 1991).

The analysis demonstrated *how* and *under what conditions* interested actors mobilized support. The change process was characterized by ongoing conflict and contestation. For example, following the initial success of the new model, both in terms of prominent themes as well as of market share, incumbents disparaged the new model and seriously threatened its viability. Proponents were able to promote the new model through cogent theorization in favor of change. By employing a practice perspective, the analysis of discursive action was able to identify subtleties that otherwise would have been missed, such as the shift of allegiance among incumbents as well as new entrants.

The literature review on institutionalization and institutional change started with the institutional argument and conceptualized institutional change consistent with it. The institutional argument posits that institutionalization creates "institutions [that] are now experienced as possessing a reality of their own ... an *objective reality*" (Berger and Luckmann 1966: 76, added emphasis). While the institutional argument posits that prevailing rules and expectations define what are deemed plausible interpretations and appropriate courses of action, it implies ever increasing returns to conformity and thus fails to account for the possibility of institutional change (Oliver 1991). However, explaining institutional change by relaxing the institutional argument raises the ques-

tion why institutional theory is needed in the first place (Leblebici et al. 1991). If institutions are not experienced as possessing an objective reality, that is, if prevailing rules and expectations can be self-reflectively discarded at will and flouted without negative sanctions, then deviations and disruptive innovations undermining vested interests should proliferate untrammeled.

The present case demonstrates that incumbents do promote institutional change if they perceive benefits in doing so (Kraatz and Zajac 1996). However, at least initially, powerful incumbents were defending the status quo. The interesting cases are those where institutional stability is reinforced and inhibits disruptive innovations and institutional change. Indeed, "it is *these* instances of action that need to be understood if we are to resolve the paradox of embedded agency" (Greenwood and Suddaby 2006: 30, original emphasis). Therefore, an explanation of institutional change should not relax the institutional argument. Instead, institutional change is conceptualized consistent with the institutional argument by attending to the level of actual practices within which the tension between conformity and uniqueness plays out and is resolved. Here, the focus shifts from what happens *to* institutions over time to a focus on the *role* of institutions as resources drawn upon by interested actors.

Investigating processes of institutional change from a practice perspective demonstrates how interested actors recognize and are able to exploit new opportunities. If not actively seized by interested actors, new opportunities remain latent and defy exploitation. For example, Greenwood and Hinings (1996) identified normative pressures as constraining organizational change and interest-driven and political dynamics as producing change. However, the extent to which actors were actually able to influence the prevailing institutional structure was not conceptualized. Similarly, while emphasizing that institutional rules and expectations inform action, Barley and Tolbert (1997) argued that actors are able to assess and revise their conduct. But the conditions under which actors are able to make revisions (critical number of actors making the revision under a contextual change) remain analytically vague.

In a nutshell, the present study contributes to the extant literature by demonstrating how institutionalization can be studied on the level of meaning production and how interested actors shape institutionalization trajectories through cogent theorization. The practice perspective provides more detailed insights into the actual activities through which institutional entrepreneurs attempt to shape the trajectories of institutional change and field-level outcomes.

Implications

Implications for Theory

The present study demonstrates *how* actors embedded in prevailing institutional structures are able to conceive disruptive changes and, more importantly, *why* they would so. Institutional change in the Java application server field occurred because peripheral actors actively exploited opportunities to advance their status and were less constrained than incumbents to experiment with more disruptive innovations (Leblebici et al. 1991). The success of new entrants pressured incumbents to adopt the new model thus reinforcing its field-wide institutionalization.

The case study on the Java application server field demonstrates that the two counter-balancing dynamics of institutional stability and fragility coalesce to promote either continuity or change. Institutionalization is thus an aggregate outcome of how the two counter-balancing dynamics play out over time. Hence, the degree of institutionalization is a relative indicator if structural contradiction continuously operates in social systems (Giddens 1984). The analysis in the present study demonstrates why, given both stability-enforcing *as well as* change-inducing dynamics, the new model initially almost failed and how discursive actions of interested actors shaped ongoing institutionalization processes. The DECC model of discursive emergence, contestation, and convergence represents the generic cycle of the interplay between stability and change.

Studies on the process of institutional change should place more emphasis on the interplay of stability and change, because it is the dynamic between the two currents that determines whether or not a change project succeeds. Often criticism of one extreme, such as institutional isomorphism and homogeneity, is replaced by another extreme, such as institutional entrepreneurship and change. In the present case, the success of the commercial opensource model in the field had occurred at a slower pace or not at all if JBoss had followed Lutris in abandoning its opensource application server. Without the commercial success of the opensource model, the prospects of opensourcing the Java standard would have been less clear. The case attests to both, the barriers that prevent new entrants from innovating and the ability of entrepreneurs to shape institutional outcomes.

With this caveat in mind, the present study contributes to the concept of institutional entrepreneurship in the following ways. First, institutional entrepreneurship requires organized actors able to draw on and mobilize collective action. In this sense,

Marc Fleury of JBoss was an exemplary entrepreneur because he was able to organize a movement around JBoss and its commercial opensource model. He combined a new social model, the opensource approach, with a new business model. In retrospect, it was the combination of a new social and a new business model that created the momentum to overcome the status quo. Second, institutional entrepreneurship requires organized actors "with sufficient resources" to envision and promote new models and practices (DiMaggio 1988: 14). While Fleury may have been a particularly exposed actor, other participants likewise acted as institutional entrepreneurs. Particularly Jason Hunter of Apache, Mike Loukides of O'Reilly Media, and Jonathan Schwartz of Sun were drawing on their privileged positions in order to promote the opensource model in the field. Finally, institutional entrepreneurship requires pursuing interests to exploit new opportunities. JBoss and later IBM had tangible commercial interests in promoting the opensource model while others had a more general interest in seeing open source succeed. Institutional entrepreneurship thus required multi-stakeholder cooperation and cogent theorization of the new business and social model.

In sum, the present study demonstrates *how* actors embedded in prevailing institutional structures are able to conceive disruptive changes and, more importantly, *why* they would so. The discursive cycle of emergence, contestation, and convergence represented by the DECC model accounts for both stability-enforcing *as well as* change-inducing dynamics. Institutional entrepreneurs are in a position to conceive of and pursuit disruptive changes, but they are constrained by stability-enforcing dynamics. The case attests to both, the barriers that prevent new entrants from innovating and the ability of entrepreneurs to shape institutional outcomes. In order to overcome the status quo, institutional entrepreneurship required multi-stakeholder cooperation and cogent theorization of the new business and social model. In addition, the discourse methodology presents a new way for systematically analyzing online data for tracing institutionalization processes as they occur in the field. The multi-level perspective demonstrates that interested actors not only draw on discursive structures to embed new models but that, by so doing, they also constitutes discursive structures that shape prevailing rules and expectations. Through a longitudinal analysis of institutionalization processes, this research not only demonstrated *that* institutional change occurs but also *how* interested actors discursively shape processes of institutionalization.

Implications for Policy and Practice

The DECC model provides the level of abstraction that practitioners may need for making sense of change processes and for identifying where and how to start intervening in change processes. Change champions are reminded that potentially disruptive innovations will not sail smoothly, but are likely to encounter resistance. Institutional entrepreneurship is a way to make the status quo receptive to disruptive innovations.

Regarding technology change, reform in organizations or policy areas requires theorizing and communicating a reinforcing set of conceptions along business, technology, and legitimation aspects. Proponents of projects must not lose sight of the fact that despite technical complexities, the more significant issues pertain to adequate theorization of unique benefits, reinforcing technological features, and bases of legitimation for mobilizing support behind the project. It is crucial to anticipate and address potential counter-arguments from the very first phase of any innovation process.

Regarding common standards, astute entrepreneurs are needed to adopt or modify common standards. Negotiating, converging on and implementing technological standards is a conflict-laden and time-intensive process requiring a pragmatic stance: coalitions are needed to reach agreements but these coalitions should remain flexible in order to shift allegiances when conflicts between partners arise that undermine more substantial competencies in other areas. This requires effective and interdisciplinary leadership capable of recognizing emerging and potentially irreconcilable contradictions, setting priorities, and responding swiftly to changing contingencies.

Limitations and Further Research

The findings are reliable and valid for the present case if employing the same discourse methodology. However, findings from the case study of the Java application server field may not apply to other cases and even apparently similar cases warrant in-depth investigation as outlined in this research. However, given a sufficient range of similar studies, salient propositions may be derived that could open the possibility of developing one or more meaningful hypotheses amenable to empirical validation or falsification. Future research should investigate the interplay of discursive emergence, contestation, and convergence because it appears to be decisive as to whether or not the widespread adoption of a new model succeeds within a field.

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