Capabilities and Routines in New Organizations: Evidence from the Field

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Emerging organizational research has proposed increasingly nuanced links between capabilities and routines, which in turn play vital roles in organizational survival and prosperity. We draw on prior work to define capabilities as involving some consistency in potential *outcomes* in a particular domain. This contrasts with routines, which involve consistency in *processes*. We report results of an inductive study of patterns linking capabilities and routines in 60 young firms, drawing on 1,725 transcript pages. Many capabilities arose through deliberate design or combinations of existing routines. In rare cases organizations repeatedly improvised in a particular area and thereby sustained capabilities that did not rely on consistent routines in the relevant action domain. We also found several ways in which organizational capabilities sometimes harmed overall organizational performance, although in some cases the organizations learned from harmful capabilities. Routines arose from multiple sources. We highlight three forms of "making do" with routines available from varied sources, all forms of bricolage. Finally, routines played several roles in organizational transformation in addition to their contribution to inertia. The paper suggests that we can theoretically distinguish capabilities from routines even as they are intertwined over time in organizations, and that improvisation and bricolage play roles in organizational entrepreneurial learning.

Key Words: Capabilities, Routines, Improvisation, Entrepreneurship, Organizational Learning

Organizational and strategy theorists have increasingly emphasized the critical roles of organizational routines and capabilities in organizational survival, adaptation, and performance. Vital strands in the behavioral theory of the firm, theories of organizational learning, internal organizational evolution, and evolutionary economics all highlight that organizational routines allow organizations to harvest the value of experience by codifying and stabilizing activities and cognitions (Cyert and March 1992[1963], Feldman and Pentland 2003, Levitt and March 1988, Nelson and Winter 1982). Strategy researchers have also probed routines as a potentially key strategic element (Knott 2003) while developing the crucial concept of organizational capabilities. Theories of dynamic capabilities, the resource based view of the firm, and recent entrepreneurship research highlight that capabilities can play a core role in organizational survival and competitive advantage (Aldrich and Ruef 2006, Carpenter et al. 2001, Eisenhardt and Martin 2000, Helfat and Peteraf 2003, Sapienza et al. 2006).

Not surprisingly, many visions of capabilities, routines, and their links to each other can be found in the wide array of literatures that build on these core concepts. At the same time, work that directly describes the evolution of specific capabilities and routines over time remains somewhat rare. In this paper, we embrace the premise that capabilities and routines represent key constructs in organizational studies, and we explore emerging views of their link to each other and to organizational outcomes. We first review definitional aspects of these key constructs. We then probe dynamics of the links among capabilities, routines, and organizational outcomes using data from a sample of 60 new firms.

Before tackling our field exploration, we reviewed work on capabilities and routines, and we found several important developing theoretical frontiers. These emerging lines of work suggest non-obvious but important possibilities in the relationships among capabilities, routines, and organization-level outcomes. For example, some authors have proposed that capabilities may not always be composed of routines (Dosi et al. 2000, Washington and Zajac 2005). Further, at least two important lines of work suggest that in some cases organizational capabilities may not improve overall organizational performance. One emphasizes that capabilities may simply not be worth the resources needed to sustain them (Ethiraj et al. 2005, Winter 2003), while the resource based view of the firm implies that

capabilities, like any resource, must be valuable, rare, and non-imitable to have sustained value to the organization as a whole (Knott 2003, Wernerfelt 1984).

Turning to routines, careful descriptive work indicates that routines may arise not just from the distillation of an organization's own direct experience or from simple replication of other organizations' routines, the two most common premises regarding origins of organizational routines (Dosi et al. 2000, Miner 1990). Finally, important current work implies that routines can play an important role in organizational change through their own partial transformation or unintended outcomes (Feldman and Pentland 2003, Miner 1990). This complements traditional views of routines as either engines of inertia or as stable elements that are selectively retained in internal evolutionary processes (Baum and Singh 1994, Burgelman 1983, Miner 1991).

These emerging refinements of premises about capabilities and routines underscored the potential value of probing links among capabilities, routines, and organizational outcomes in very new organizations using fine-grained data. By definition, a new organization cannot start with a set of organization-specific routines and capabilities drawn from its own direct experience. Thus, new organizations provide an especially promising context for untangling relationships that are hard to infer when studying long-established firms with large numbers of capabilities, routines, and complex causal pathways that effect overall performance (March and Sutton 1997).

Defining capabilities and routines. Although our study is inductive, we grounded our work in a careful review of prior definitions and research related to capabilities and routines. Appendix 1 lists sample definitions of capabilities in a variety of papers, and Appendix 2 shows sample definitions of routines. We wanted to extract from these definitions core features of each construct that did not make assumptions about antecedents or consequences within the definition itself. Including these elements makes it difficult to develop the best causal theory about the origins and impact of capabilities and routines.

Once one strips these and other correlates, many definitions of capabilities emphasize the issue of dependable or predictable potential *results* of activities, as seen in phrases such as "processes to effect a

desired end" (Amit and Schoemaker 1993, p. 35), "options for producing significant outcomes of a particular type" (Winter 2000, p. 983), or "achieving a particular end result" (Helfat and Peteraf 2003, p. 999) in Appendix 1. Thus, consistent outcomes are one primitive feature of many definitions of capabilities even if other traits are also ascribed to capabilities.

Focusing on these core features, we developed the working definition of capability provided in the first section of Table 1: "An organization has a capability when it can execute a specific activity with results above a threshold level and can sustain that performance level." We assume that the threshold of domain performance and the reliability of outcomes are typically socially defined and context-dependent. Having capabilities in manufacturing might imply one level of production volume for a small start-up or family firm but a different level for multinational companies such as IBM and Dell. A capability may or may not be deployed. Consistent with dictionary definitions of capability (e.g., *The American Heritage Dictionary of the English Language*, 2000) and with prior use in psychology, capabilities may exist as latent or as potential (Paulhus and Martin 1997). Further, organizational capabilities make performance highly likely but not guaranteed in a particular domain. A firm has organizational distribution capabilities, for example, if it can reliably deliver its products to users at a reasonable speed and cost. These distribution capabilities, however, do not exclude the possibility of occasional mishandling or delay in delivery.

Definitions of routines also often involve assumptions about their origins, but probing for a core feature, we found an emphasis on consistency of potential *activity* rather than dependability of potential *outcome.* Phrases such as "a repetitive pattern of activity" (Nelson and Winter 1982, p. 97), "repeated patterns of behavior" (Feldman 2000, p. 611), and "routines are organizational meta-habits (Hodgson and Knudsen 2004)" underscore this issue. Our working definition for a routine is "a coordinated repetitive set of organizational activities" (Miner 1991, p. 773) as shown in the second part of Table 1. Conceptually, we include in this definition both the actual activities (the "performative" version of the routine) and the shared representation of that activity (the "ostensive" version of the routine) (Feldman and Pentland 2003). Empirically, however, we focus in this paper on the patterns of consistent activity, or performative

routines. The requirement for repetitive activity rules out interesting one-time actions; the requirement for coordination prescribes collective behaviors, ruling out individual habits.

Insert Table 1 about here

Clearly, these definitions leave open for empirical investigation important questions about where capabilities and routines come from rather than assuming them in advance. In addition, these definitions leave open the possibility that an activity can be both a routine and a capability. A regular set of activities in recruitment and employee selection that typically produces good results for the organization would be both an organizational routine and a capability in the area of human resources. These definitions also leave open the possibility that some organizational elements may represent only a capability or only a routine, the first issue where we hope to contribute to emerging insight.

Links between organizational capabilities and routines. Cyert and March (1992[1963]) argued that standard operating procedures function as the default driver of much organizational behavior. In roughly the same period, Penrose (1959) argued that organizational resources play a key role in strategies and outcomes, and flagged capabilities as the capacity to effectively deploy resources. In the last four decades, theorists in several traditions developed related but expanded notions of capabilities' links to organizational routines. Early work on capabilities and routines often did not make sharp distinctions between the two constructs. Based primarily on theoretical reasoning or observation of established firms, much current work assumes that capabilities consist of combinations of pre-existing routines, a natural assumption when one observes only established firms, in which many capabilities have been observed to consist primarily of established routines (Collis 1994, Dosi et al. 2000, Helfat and Peteraf 2003, Maritan and Brush 2003, Szulanski 1996, Winter 2003).

Some key definitions make this explicit, e.g., Winter (2000, p. 983) writes that "An *organizational capability* is a high-level routine (or collections of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type." Appendix 1 provides samples of other definitions of capabilities that involve routines to some degree. Building on this premise, much important work focuses

on the transmission or creation of routines because they are seen as the basis for capabilities that in turn shape organizational survival and prosperity (Knott 2003). This vision often takes for granted that organizational routines serve as the building blocks from which organizations construct several layers of capabilities, implying that routines precede capabilities and that capabilities cannot exist in new organizations until after routines are created or acquired (Nelson and Winter 1982). This informal premise does not appear to be based on observation of processes through which capabilities and routines become intertwined, however, nor does it ask whether capabilities could exist that do not depend on bundles of routines. Even if capabilities do consist primarily of routines in mature firms, we cannot assume that it always holds true.

Recent studies have hinted that routines may not be the only route to capabilities. Dosi et al. (2000, p. 4) argue that "…it is basically well said that 'routines are the building blocks of capabilities'—although routines are not the *only* building blocks of capabilities," leaving the door open to additional forms or elements in capabilities. Dosi et al. (2000) point out that artifacts such as software programs or physical devices may represent important building blocks of capabilities, but they are not in and of themselves organizational routines. In our study, we take a step back and trace pathways through which some routines and capabilities became intertwined in new firms, and we examine whether capabilities are, in fact, always constructed from routines.

To foreshadow our results, our observations support the emerging perspective that the creation of organizational capabilities can involve several very different processes (Bingham and Eisenhardt 2005, Dougherty 2001, Helfat and Peteraf 2003, Sapienza et al. 2006, Washington and Zajac 2005, Zollo and Winter 2002). We describe two distinctly different migration paths through which routines and capabilities may become linked. One maps closely to the usual premise by showing organizations constructing capabilities from routines. The other, however, struck us as more surprising. We found that organizational improvisation, defined as "deliberately and materially fusing the design and execution of a novel production" (Miner et al. 2001, p. 314), can occasionally form an important foundation for a capability. In some instances, organizations followed an initial improvisational activity with repeated

improvisational episodes in the absence of supporting routines in the main domain of activity. In repeated improvisation, the organization improvises again in the same domain of activity. It cannot repeat the same actions across the episodes because improvisation requires some level of novelty. Instead, the organization improvises again in the same domain and—for there to be a capability—produces an outcome above a threshold performance level in each episode even though the actions themselves vary. Our findings imply that just because one eventually observes a routinized capability in an established firm does not mean that it was purposefully built out of the routines that currently support it or that it always relied on routinized activity in that domain.

Given the importance of improvisation to our findings, we provide a definition and further details regarding improvisation in the third part of Table 1, along with examples from our study setting. Organization-level improvisation occurs when an organization "deliberately and materially" fuses "the design and execution of a novel production" (Miner et al. 2001, p. 314). The organization designs a novel activity at the same time it executes it, as in the familiar musical example where an artist composes a new melody during the very act of playing the melody. Organizational improvisation has been shown to play roles in new product development (Dougherty 1990 1992, Eisenhardt and Tabrizi 1996, Miner et al. 2001, Vera and Crossan 2005), emergencies (Weick 1993) and conflict situations (Alinsky 1969, Preston 1991). Importantly, improvisation requires some degree of true novelty, although there may be different degrees of novelty over a set of improvisational activities. The improvising firm may also draw on routinized fragments—as when a musician might use "riffs" from known songs as part of an original melody—but the total pattern of the activity must contain some novelty either in individual elements or in the pattern created (Crossan and Sorrenti 1997, Kamoche et al. 2002, Weick 1998). In the metaphor of musical improvisation, there can be a novel melody, chord sequence, or rhythmic pattern even if the individual notes, beats, or small subroutines are not novel.

Organizational capabilities and overall organizational performance. Contemporary research emphasizes that organizational capabilities can drive both operational success and long-term adaptation (Galunic and Eisenhardt 2001, Helfat and Peteraf 2003, Zollo and Winter 2002). Interesting prior work

has assumed that capabilities generally enhance organization-level performance or create organizational-level "value" (Grant 1996, Makadok 2001). For example, Zaheer and Bell (2005) presented evidence that a firm's innovative capabilities enhanced its market share in the Canadian mutual fund industry.

Although much work assumes by definition that capabilities enhance organizational performance, important empirical and conceptual work offers a more nuanced viewpoint (e.g., Ethiraj et al. 2005, Haas and Hansen 2005, Winter 2003). Consistent with their prediction that capabilities may vary in their impact on overall performance, Ethiraj et al. (2005) found different performance effects for distinct capabilities in the software industry. Dougherty (1992) and others (Miner et al. 2001) described how locally useful product development capabilities can fail to produce useful firm-wide outcomes because these capabilities require the presence of other capabilities (Gavetti and Levinthal 2000). Greve (1996) has shown that execution of a given radio format can have organization level value in one context but not in another. Zollo and Winter (2002) argued theoretically that creating and maintaining capabilities may cost more than their net overall value. More broadly, the resource based view of the firm framework implies that capabilities—if they are seen as resources—must themselves be valuable, rare, and hard to imitate to provide sustained competitive advantage in competitive settings (Knott 2003). This framework clearly implies that a given capability may or may not have long-term value to the organization as a whole. Nonetheless, much of the work proposing that capabilities may have conditional effects on overall performance remains primarily theoretical or implied by the resource based view without extensive empirical examination. We explore the question further by investigating early capabilities and whether the same capability can shift its impact on organizational performance over time.

To anticipate our findings, our field data point to instances where organizations have capabilities that do not improve overall performance, even with careful planning and development of a focal capability. Further, we found that the same capability could sometimes produce short term harm but long term value, as the organization was sometimes able to learn from the deployment of harmful capabilities, consistent with theories of internal learning from failures (Sitkin 1992). Finally, we found evidence that organizations could fall into an improvisational competency trap, which occurs when an organization

keeps improvising when it would be better off planning and routinizing action (Miner et al. 2001, Baker et al. 2003). We also observed, however, that organizations can escape this trap through later creating routines to support capabilities previously supported through repeated improvisation.

Origins of routines and organizational transformation. Much of the important work on routines emphasizes how they arise from one of two main sources. One important stream of work envisions them as emerging patterns of action, often tacit and even unintentional, arising from the organization's own experience (Cohen and Bacdayan 1994, Hutchins 1991). Another stream of work emphasizes how routines can move from organization to organization in genealogical inheritance (Klepper and Sleeper 2005, Phillips 2005) or through active vicarious learning (Greve 1998, Haunschild and Miner 1997, Ingram and Baum 1997, McEvily and Marcus 2005). Recent qualitative work has increasingly flagged variations on these themes, arguing that routines may arise through combinations or additional processes (Rura and Miner 2002), underscoring the potential value of examining their origins in new organizations.

Regardless of their origins, organizational routines offer an important element of stability in organizations. Routines provide efficiency (Argote 1999) and continuity (Becker 2004), allowing predictability in active organizational life (Cohen et al. 1996). In these frameworks, routines play a key role by reducing variability in organizational behavior (Becker 2004, Berger and Luckmann 1967). Individual routines drive inertia and sustain continuity in behavior or even mental templates (Feldman 2000). Theorists also argue that stable routines provide the substrate for adaptation: the organization selectively retains apparently fruitful routines, a form of trial and error learning (Aldrich and Ruef 2006, Baum and Singh 1994, Burgelman 1983, Miner 1990, Nelson and Winter 1982).

Recent work has gone past the traditional emphasis on the inertia of routines to claim that parts of individual routines may themselves morph over time, even when key activities remain consistent (Edmondson et al. 2001, Feldman and Pentland 2003). Feldman and Pentland (2003) describe cases in which aspects of a routine shift over time, as when a dormitory routine for "moving in day" takes on different features from year to year. This intriguing work opens the door to careful investigation of whether routines may represent an engine of intended or unintended organizational transformation.

We did not attempt a comprehensive map of all origins and outcomes of routines in our study, but rather we probed for different ways routines arose and paid attention to whether or not they played a role beyond simple inertia and consistency of action. To foreshadow our results, the new firms we studied clearly revealed multiple sources of routines, some of which go beyond the standard processes of internal routine development and routine importation. The firms imported routines not only from other organizations and contexts, but they combined routines from inside and outside the firm, and also applied routines to very new contexts. On reflection, we concluded that a unifying lens for many of these activities is the process of bricolage, which we define in the fourth part of Table 1 as "making do by applying combinations of the resources at hand to new problems and opportunities" (Baker and Nelson 2005, p. 333).

Recent studies of bricolage in organizations have focused in part on the processes of using objects at hand such as equipment or physical materials for new combinations in products or services. In this study, we observed bricolage in the combination and application to new challenges of organizational routines themselves. While some micro processes of deploying old routines in new contexts are explored in existing literature, integrating them under the construct of bricolage helps merge previously disconnected work into a single theoretical lens. Organizational bricolage speaks to the source and nature of resources a firm deploys in a given situation, implying that the firm uses combinations of what is readily available to it rather than relying or waiting on acquisition of inputs that are exactly fitting. Bricolage may be planned well in advance, so that it does not necessarily involve improvisation. Improvisation often involves bricolage since the improviser must create during execution, but the improviser may also develop entirely new elements.

When we assessed how new routines derived from multiple sources, we found that some routines produced unintended organizational outcomes and transformations. Some familiar routines generated unexpected harm when deployed in the new firm's context. Some new routines arose through political compromise between stakeholders, producing novel combinations of activity or ideas. Such hybrid routines could have initially harmful results but also could produce unexpected beneficial impact later.

Finally, some new firms adapted old routines to quite novel ends. We observed cases where this first produced useful outcomes and later generated separate long term unexpected benefits.

RESEARCH METHODS

We structured our study according to established procedures for grounded theory-building inductive research (Denzin and Lincoln 1998, Glaser 1978, Miles and Huberman 1994). The procedures of grounded theory are especially appropriate when researchers believe that a strong or central body of theory can be usefully elaborated through intensive assessment of richly detailed qualitative data (Edmondson and McManus 2006, Lee et al. 1999). Our goal was to help advance theory about relationships between routines, capabilities, and organizational performance. We first describe the sample and data collection efforts that produced our data and then outline our analytic procedures.

Sample

This study is part of a broad multi-year examination of the emergence of patterned organizational behaviors in 60 young knowledge-based firms located in a single county home to a large Midwestern research university. In order to control variation due to industry heterogeneity and still develop an adequate sampling frame, we focused on three industries known to contain startups in the area: the Biotechnology & Drug sector (SIC 283), Information Technology (IT) industry (SIC 737), and Research, Development, and Testing Services (SIC 873). We created our sampling frame from three primary sources: the Dun & Bradstreet database; a list of firms called *Creating High-Tech Business Growth* published by a university group tasked with nurturing relations between the university and industry*;* and the *Directory of High Technology Companies* published by a local utility company. We supplemented these published sources by reviewing our list of firms with local experts and professional service providers who had information about new firms at their earliest stages.

We eliminated from our sampling frame any firm that was more than five years old because we wanted to be able to interview respondents about events from the firms' earliest days. We eliminated subsidiaries of other firms because we wanted to avoid the possibility that the patterns of behavior we saw in the firms were mandated by parent organizations. The resulting sampling frame was a list of 125 firms

meeting our criteria. We began randomly sampling firms from the list until we were able to schedule and conduct interviews with one or more founders at each of 60 firms. In all, we selected 69 firms from the list: despite repeated attempts we were unable to make contact with three firms, and six refused to participate. Table 2 summarizes the sample of firms with which we conducted interviews. Unsurprisingly, given the important role of the university in science and technology sectors of the local economy, almost half of the firms in our sample had been started by people with some connection to the university at the time the firm began operations.

Insert Table 2 about here

Data Collection

We conducted pilot interviews to improve our protocol and to study how the interview materials affected respondents' reporting behavior. This allowed us to refine protocols for formal semi-structured interviews that began with open-ended questions, then moved toward standardized probes, and included written instruments completed by the respondents during and after the interviews (Lofland and Lofland 1995). A project team member telephoned each firm, introduced us as university researchers investigating management activities in knowledge-based start-ups, and scheduled a time to visit the firm.

The focus of the interviews was on various events—which the respondents perceived as defining important moments in the firms' histories—and on what the firms were doing before, during, and after these events. We gently shaped the direction of the interviews, but we allowed and encouraged the respondents to tell us about as many events as they wished in whatever manner they wished (Lofland and Lofland 1995). Although our questions and written instruments indirectly gathered information on the pattern of firms' behaviors surrounding the events founders described, nothing in our questions asked about the development of routines or capabilities in any direct way. At least two and sometimes more members of the project team conducted each interview, with one member guiding the interview and the other taking notes and asking occasional clarifying questions. A typical interview lasted 2.5-3 hours, with some—based on founders' desire to tell us about their firms—lasting much longer. A professional

transcription service transcribed all interviews.

Founders of knowledge-based young firms are typically involved in all key aspects of the business and, consequently, have firsthand knowledge of their firm's day-to-day activities. Our interviewees usually offered very detailed responses to our questions and provided detailed timelines and histories for their firms. We encouraged respondents to refer to their own archival records for clarification and documentation when necessary. We collected detailed information on such aspects of business operations as product development and hiring, as well as on specific individuals who were not employed by the firms but were reported as having influenced the founders in the strategic development or day-to-day operations of the firm. The interview and documentation process generated 1,725 pages of transcripts. The transcripts, field notes, supporting questionnaires, and related documents we assembled provide a rich and varied set of descriptions of firm processes, histories, and networks.

Although retrospective bias by informants could have threatened the quality of our data, we minimized this possibility by studying only young firms, asking informants to describe specific events, and avoiding hidden cues. We did not use the word "routine" or "capability" in our interviews and consistently described our project as general exploratory research on knowledge-based new ventures. Nonetheless, and due in part to the desire of respondents to tell us about their firm's early struggles, our transcripts and field notes contain rich data allowing us to explore concrete patterns and processes related to the creation and change of organizational routines and capabilities (Denzin and Lincoln 1998, Strauss and Corbin 1998). Rather than providing detailed information on the frequency distributions of the constructs on which we focused, our data provide concrete and detailed descriptions that put distinctive form and patterns of interrelationships among routines, capabilities, and organizational performance into clear relief against the background of commonplace premises in prior research.

Data Analysis

We used a highly iterative process of grounded theory development (Denzin and Lincoln 1998, Eisenhardt 1989, Strauss and Corbin 1998), creating a dialogue between concepts and data that we

describe below (Ragin 1987). The process of continuous comparison between the data and our developing theory involved multiple team members reading the transcripts more than a dozen times, and over 200 meetings and conversations involving two or more members. The process was further strengthened by our application of a two-layer replication logic (Eisenhardt 1989, Yin 1984), whereby 39 firms with more than one founder were used to develop theoretical patterns and processes related to routines and capabilities, and then these patterns and processes were reviewed in the remaining 21 firms with only a single founder. The overlapping form of iterative data examination occurred through ongoing reviews and discussions of transcripts and other data over a period of more than 30 months.

Our process started with a flexible framework for organizing the relevant data based on the three generic research questions. Using this framework, two members of the team independently read notes and transcripts and wrote short cases summaries reflecting rudimentary patterns from the first batch of five transcripts. After exchanging and discussing their interpretations, the two brought both convergent and divergent ideas to a weekly project meeting. The rudimentary patterns were discussed and the third team member who was deliberately skipping the early reading would take a devil's advocate role to challenge the observations, following a "courtroom" procedure where discussion focuses on concrete facts and events rather than personal speculation (Eisenhardt 1989). Whenever inspired by quotations in transcripts or remarks in discussion, we would then turn to the original transcripts and scrutinize the qualitative data to probe the early research ideas further. Upon a sense of saturation on the first 5 transcripts, we moved to the next 5 transcripts and repeated the same procedures. Meanwhile, we kept updating and refining our analytical framework and construct definitions along the way.

This conservative process lasted over 12 months as we went through the first layer of 39 transcripts at a pace of 4-6 transcripts each time. Throughout the process, unsurprisingly, we witnessed twists and turns in our investigation, scrutinizing and resolving divergent observations. Through iterative examination of our data and critical exchange among team members, we converged upon a small set of promising theoretical patterns and processes as inputs for the follow-up 'replication' stage which dealt with the remaining 21 transcripts.

The replication process lasted over 18 months, resulting in significant refinement of the original themes derived in the first stage. The replication process enhanced our confidence about the validity and plausibility of our findings. Throughout this process, we supplemented the internal devil's advocate within the project team with external scholars and doctoral students by presenting our ongoing work for public scrutiny at research conferences and seminars. Eventually, a limited number of patterns and processes withstood this iterative cycle and are reported here.

FINDINGS

Routines and Capabilities

Consistent with prior studies (e.g., Dosi et al. 2000, Nelson and Winter 1982, Teece et al. 1997, Winter 2003), we observed that a portfolio of routines often formed the basis on which firms created organizational capabilities. We also observed, however, a rare but distinctly different pattern in which some capabilities in the firms we studied apparently *preceded* their supporting routines. In this section, we examine two migration paths: one in which routines preceded the capabilities they support; and one in which capabilities, sustained through improvisation, preceded their supporting routines. Table 3 summarizes the two migration paths.

Insert Table 3 about here

Migration path I: The deployment of routines into new capabilities. In one familiar narrative in the capabilities literature, an organization combines elements of routines and builds them into new capabilities (Winter 2003). *GovSoft* followed this pattern quite closely. It planned and executed routines and combined these routines to build a new core capability in selling and providing cutting edge real-time IT support to a variety of government agencies. Expecting rapid sales growth, *GovSoft* established a separate budget for its IT support division and invested a significant amount of start-up capital and training resources to create and assemble relevant routines into a coherent service package that included a website hosting service, a web-based live technology support system, and a proprietary search engine for querying records across different government agencies: "So we spent, you know, for example, we put

together a whole help desk process… [O]perationally, that took a lot of time and thought" (*GovSoft* 13:33).

In this case, the firm deliberately created routines and assembled them into an IT service capability. They researched and defined the capability they thought the market required, specified the required routines and resources to create the capability, deployed the resources, developed the routines, and put it all together in a coordinated set of activities that came very close to matching the capability they had imagined and designed, reliably meeting or exceeding the required performance thresholds: "We had a solution that directly addresses gaps in getting the right information at the right time into the hands of law enforcement and other government officials" (*GovSoft* notes). *GovSoft* deployed the IT support capability with two local police departments and received very positive feedback on the performance of its service capability, "… [T]hey love us. And they think we're wonderful and they really like what they've got … I just talked to those guys the other day and they, you know, it was about getting a reference for something and they said, you know, you don't even have to ask, just put us down. So, I mean, they really, they do like us a lot" (*GovSoft* 14:28).

ChemPro, an environmentally progressive, five-person biochemical company, followed the same migration path but with a different approach. Instead of developing routines internally, it adopted and combined routines from firms at which founders had previously worked in order to create a national distribution capability. *ChemPro* first signed distribution agreements—copied from prior employers—that granted each distributor exclusive rights in a two-hundred-mile radius territory, and the privilege to buy products at a discount rate of 45 percent. Distributors were obliged to carry adequate inventories and provide technical support to end users in the specified geographic zones. Early efforts went smoothly, and *ChemPro* replicated the same routines across multiple geographic areas, forming the capability through these routines. After it "spent the first two years really putting together a nice distributor program" (*ChemPro* 16:34), *ChemPro* had created the capability to distribute its products nationally, deploying consistent sets of routines across a network of more than 30 independent distributors covering all major target markets. Table 3 indicates the specific steps of this migration path.

Migration path II: Capabilities that precede supporting routines. Much more rarely, we found cases where firms also eventually end up with capabilities supported by organizational routines, but the development sequence of routines and capabilities was opposite to that described above. Instead of building capabilities upon routines, firms following Path II first created an emergent capability by improvising a solution to a problem or opportunity, then sustained and recognized the capability through repeated improvisational activity, and only much later backfilled the capability with supporting routines that supplanted the improvisational activity. In some cases, firms never backfilled the capability with routines, an outcome we discuss in more detail below.

In path II, improvisation could be vitally important to the development of crucial capabilities for which firms lacked component routines. For example, shortly after founding, *FastSoft* contracted to complete a major software development project in just five weeks. The founders assumed they could exploit the firm's limited existing capabilities by combining them with a commercial "grid generation" software package, but the commercial software did not work as expected. The contract was one of the firm's "first big projects" and "so we knew our reputation was kind of on the line here" (*FastSoft* 15:1). In a case of design converging with execution, the firm improvised a solution for this crisis:

> "[W]e decided, okay, we're going to have to write our own software … I spent the next 24 hours straight writing a software package that was completely hard coded for one specific case. I had sort of an idea how we could do something. And it was not going to solve our big problem for us, but I take the small problem and said, okay, we need to know if this is going to work. And coding through the whole night to get this thing, and then the next day we tried it out and it worked" (*FastSoft* 14:6).

After the improvised solution succeeded, the firm shifted its attention to other priorities and did not realize that they had launched a firm capability in "grid generation." The emergent capability was brought to the surface later when the firm encountered another project involving "grid generation" tasks. The firm improvised again, using as a referent the kernel of what they had written for the first project but creating a new design for the project by working around the clock once more. Through this repeated improvisation, the firm recognized that they could reliably generate new software products improvising designs around the artifact of their original improvisational activity, a small specific set of software code. In effect, they recognized a budding organizational capability: "It worked on a very similar small-scale

problem. So that's sort of when we knew that that's what we needed to do to make that work" (*FastSoft* 14:12).

FastSoft realized the full value of this emergent capability through a repeated series of improvisational episodes as the firm took on more projects utilizing this capability to generate novel solutions to grid-related problems. Although members of the founding team found the improvisational process exhilarating, they eventually became aware of a need to improve their efficiency: "I tried (reminding) these guys. It's sort of problem when you spend that much time working on it" (*FastSoft* 14:26). Following this awareness, *FastSoft* deliberately backfilled the improvisational process with routines "over a period of about a year" (*FastSoft* 14:26). The firm maneuvered resources and explicitly designed "grid generation" routines which supplanted its reliance on repeated improvisation and supported the further development of this core capability: "[T]hat is what we now use for making grids. And then a large part of the work that we get now is because we have that software … We use it every week, at least once a week, every week" (*FastSoft* 14:18). Thus, the core technical capability originally built through improvisation preceded the routines that were eventually developed to support its use.

In another case, *CloneRight,* a farm animal cloning start-up, faced the challenge of quickly creating the first clone of an important species of farm animal. Early on, they attempted—without success—to enlist outside expertise in animal breeding to demonstrate the soundness of their core cloning technology. Embarrassing early difficulties included the premature announcement of an animal pregnancy that had inadvertently resulted from natural reproductive processes rather than from cloning. After this incident, the firm improvised. Rejecting both continued reliance on outside expertise and the alternative of engaging in lengthy "off-line" experiments to design appropriate reproductive techniques, *CloneRight* instead decided to develop its own cloning capability:

> **"**It wasn't working. There had been some miscommunication of facts and basically we had to become, we knew when we entered the arrangement we were not specialists in the area of [animal] reproduction, so we sought one out, and what we thought was supposed to be. Turned out we had to become reproduction specialists. And so when we had to we rolled up our sleeves and we became such" (*CloneRight* 8:24).

In a convergence of design and execution, *CloneRight* combined their fundamental science and laboratory expertise with real-time hands-on control over both the implanted cells and the birthmother,

creating a novel cloning technique as they executed it, which resulted in the birth of a healthy cloned animal and great celebration. As one founder described, "Number one, it was a great team effort. It really excited everyone in the company that we were able to step up to the plate and internally solve a problem and make it work. It was pretty exciting to see the milestone that we achieved" (*CloneRight* 10:31). *CloneRight* was funded by a major pharmaceutical company, which had set up three milestones toward demonstrating the feasibility of a new mechanism for generating therapeutic proteins through cloning. Therefore, in addition to symbolic rewards, this first success resulted in receipt of a $1 million check.

CloneRight continued to rely on improvisation as the basis for its cloning capability, scrambling to meet the other two distinct but related milestones. The firm engaged in both "a lot of fine tuning" and "some radical thinking," and through "making it up as they went along" actions, it "basically kind of threw out the dogma that had been out there before about how things should work" (*CloneRight* 7:24). Further extending the emergent capability from the first improvisation, *CloneRight* improvised solutions to the next two milestone challenges, generating another million dollars for each: "We had … three key milestones from that relationship. Number one, the first cloned (animal) we got a million dollars. The second milestone was the first transgenic cloned (animal), we got another million dollars. And then the last was the first knockout (animal) where we correctly genetically modified a sugar molecule was another million dollar … So we were rolling, cruising" (*CloneRight* 10:34).

While the emergent cloning capability was revealed and sustained through repeated improvisation, *CloneRight* had not pursued a concerted routinization effort until their research funding spiraled down later on, and they needed to find a new source of revenue. As one founder described, "So I've been disappointed, not by the performance of the team that we have here scientifically, because we have met every challenge and we've exceeded expectations and we've kept pace with the world. Unfortunately, I believe that funding has not kept pace with (*CloneRight*)'s abilities" (*CloneRight* 13:11). Seeking opportunities to generate new revenues out of the cloning capability, *CloneRight* landed a licensing deal with a large regional breeding company. At this point, however, it faced the new challenge of teaching the breeding company that had licensed the technology how to make the cloning process work

as part of a production process. In response to this challenge, *CloneRight* took the capability it had sustained through repeated improvisation and created organizational routines that supplanted their continued reliance on improvisation and allowed them to transfer cloning process routines to the breeding company.

Capabilities and Overall Organizational Performance

By definition, capabilities in each organization meant that they could generate good outcomes in a particular domain with a degree of predictability (Helfat and Peteraf 2003, Henderson and Cockburn 1994). The total organizational performance impact of the capabilities we observed varied, however, from strongly positive to negative or even irrelevant. Because cases where capabilities have a positive impact in a specific domain and on the whole organization are non-problematic, we focus on cases where a capability might not contribute to overall organizational prosperity. *GovSoft*, for example, discovered to its surprise—and regretted—that the deliberate creation of its core capability in customer service was not well-suited for much slower actual growth than they had anticipated: "Well, I mean, we have some customers, but not enough to warrant this elaborate process that we put together" (*GovSoft* 13:32).

Unfortunately, the company didn't recognize until its start-up capital was depleted that sales growth would be slow. *GovSoft* cut expenses and struggled to survive, finally deciding to outsource the IT support capability it had spent so much time and effort developing. This, in essence, meant they switched to a different business model. As the founder describes it, "[W]e're not going to be a hosting company, we're not going to be a service provider. We're going to develop products and then sell those products through other channels" (*GovSoft* 14:19). The shedding of IT support capability proved to be crucial for both short-term survival and long-term growth for *GovSoft*, and the founder believes that the strategic redirection "was the right one, definitely, and I think ultimately it's going to be borne out" (*GovSoft* 16:1). In summary, *GovSoft* dropped a costly capability even though the capability itself was technically sound and able to deliver at or above its intended performance threshold. The primary benefit that *GovSoft* experienced from developing and deploying the capability consisted of the lessons the process imparted about the feasibility and value of an alternative business model.

Similarly, shortly after *ChemPro* developed its distribution network as described earlier, founders realized that the national distribution capability they had created generated only very thin profit margins because of both the large discounts demanded by distributors and the ongoing costs of supporting the extensive network. As a founder noted, "If you learn from experience, or if it's a mistake, putting that many distributors on was a mistake on our part. Initially, it sounded good" (*ChemPro* 13:13). The situation changed after *ChemPro*'s distributors occasionally ran out of stock. Because distributor stockouts could completely stop production for a small end user business and lose loyal customers for *ChemPro*, it had to ship directly to end-users. The firm also jumped in to fill the gap with direct shipping and technical support, engaging end users as a couple of distributors retired or pursued other businesses. Much to its surprise, as *ChemPro* lost distributors and began providing service directly to customers, profits improved even on temporarily declining revenues. Recognizing a superior business model, *ChemPro* then rapidly dismantled its national distributor network and built direct-to-customer capabilities: "Well, at one time we had thirty-one distributors. Now we have three" (*ChemPro* 13:1). *ChemPro's* carefully developed national distribution capability proved destructive to its bottom line. The problems did, however, allow the firm to discover a superior distribution model. Thus an initial capability in national distribution turned out not to provide sufficient overall organizational performance value to be retained, but it did provide a learning experience that led to a different overall business strategy.

Capabilities leading to negative organization-level performance were not limited to those that were developed on a foundation of routines. In some cases, capabilities developed initially through improvisation also failed to have good organization-level impact because they trapped firms in an improvisational loop that inhibited the routinization of critical organizational activities. *MeaTech*, a faculty start-up, developed highly sophisticated liquid measurement instruments. Through real-time interaction with potential clients such as major gas companies, *MeaTech* was capable of repeatedly improvising clever solutions that addressed unusual technical requirements. The founders attempted to create a business that generated substantial revenues off of a basic product line. The improvised customization capability, however, seemed to inhibit *MeaTech* from designing and executing general

purpose products valuable to more than just the client who made the initial request for customization. Over five years, *MeaTech* produced and delivered only a very small number of instruments and the founding team was forced to close the business.

In these three instances, the firms possessed capabilities based on either routines or improvisation, but these capabilities did not translate into positive effects on overall organizational performance. In some cases, even well-functioning organizational capabilities directly reduced overall performance.

Origins of Routines and Organizational Transformation in New Ventures

The organizations we studied frequently drew on preexisting routines that were readily available to them from a variety of sources, rather than attempting to search for or design routines that were specifically fitted to the new organization's task environment. Given this tendency to combine routines available from several sources, we adopted the lens of bricolage, which emphasizes making use of resources at hand in new ways.

In the firms we studied, the relevant resources "at hand" for bricolage often included routines known to the founding team from prior employment and routines proffered by members of the firms' social networks. In addition, incipient routines deployed for one purpose were sometimes repeated to serve distinctly different purposes in the same firm. We describe three patterns of bricolage activity—genealogical, interactive and generative bricolage—that we observed produced the routines in use in our firms. These are not mutually exclusive or exhaustive, but illustrate how even within the same firms, routines arose through multiple routes. We also found that, in some cases, routines served not as sources of inertia, but as transformational engines that sometimes created unintended organization-level outcomes. Table 4 lays out the three illustrative bricolage patterns and examples from our sample.

Insert Table 4 about here

Genealogical bricolage. Established routines from prior organizations in which founding team members had worked were imported to construct many of the routines we observed in new firms. In the context of university related start-ups, for example, firms often imported and combined university

administrative and research routines. This allowed start-ups without prior entrepreneurial or business experience to begin operations, and it resulted in the founding team running the new business similar to the way in which their university laboratories operated.

"Genealogical bricolage" refers to the process when firms directly borrow combinations of routines from prior organizations without specifically adapting them in any substantial way. Genealogical bricolage was often a simple and apparently effective way to deploy routines rapidly when the founding team knew the old routines well and when new firms operated in environments similar to the prior organizations from which replicated routines originated. *MedPro*'s early collective routines for developing product portfolios encompassed of research idea generation and evaluation. It started with a founding academic scientist importing university lab routines into the new firm, following a pattern of generating new product ideas by, "…sitting at a desk and a computer and just typing out five or six, seven concepts basically of products. They were agricultural, they were pharmaceuticals, they were nutraceuticals, etc. And I made a binder that was divided up into seven. And each one was a product that had a description what it was, a description of what kind of patent protection either we had or would be required" (*MedPro* 1:22). The rest of the founding team would then evaluate these ideas following routines they borrowed from capital budgeting processes they had followed as employees in other firms. Combining such routines generated via genealogical bricolage may bridge procedural gaps and facilitate operations in new firms.

Genealogical bricolage sometimes triggered unexpected organizational outcomes, however, especially when the prior organizational environment differed greatly from the new firm's environment. Members of one founding team, for example, had worked in a music business founded a software consulting firm. In the music business, they had learned routines that incorporated Web-based promotion and the use of clients' and partners' intellectual property as teasers to attract new clients. Taking these routines for granted and without questioning their appropriateness in the new software consulting context, they used a potential partner's intellectual property on their new firm's website. This resulted, to their great surprise, in a devastating lawsuit.

Interactive bricolage. New firms also constructed routines by combining elements of routines brought to the firm by members of its network of partners, investors, formal advisors, bankers, suppliers, customers, and other stakeholders. Again, rather than seeking out new contacts for specific expertise or searching for other sources of routines, the firms relied on sources they already knew. When they combined varied sources, or outside source with their own experience, we label this "interactive bricolage."

Interactive bricolage often worked quite smoothly, but in some cases—especially those involving teams including scientist and non-scientist founders in our sample—integration of routines into the firm created confusion and struggle. At *MedPro*, the firm was founded to exploit four patents for which the scientist inventor perceived multiple related product applications in the pharmaceutical industry, including a promising cancer drug. As we noted above, early genealogical bricolage allowed the firm to directly apply combinations of routine from prior organizations to shape firm operations. Over time, however, some conflict emerged with the increasing influence of outside investors. The scientist pushed for the company to follow the routine that had worked well in his prior laboratory setting: setting up projects for pursuing multiple promising research paths simultaneously, "… keeping essentially like a progress report of each of those … either three or four project areas that were, and it was sort of … a race" (*MedPro*, 7:14). Other members of the team, his three investors and business partners, pushed an alternative "refining" routine that the investors viewed as taken for granted in such ventures: this routine required that the firm select only one or a small number of early projects based on technical feasibility and marketability, without regard to their scientific "coolness" or long term potential. The intent of this routine was to focus the firm's resources on exploiting relatively easy applications and use this to generate equity financing to develop other applications to the point of commercial viability.

For four years, the organization's scientists continued generating and pushing multiple simultaneous paths, and although the managers and investors did not fund them all, the firm continued expending substantial resources on each of several projects. In the scientist's words, "So I thought well, okay, so maybe, I'm not a table slammer or anything like that, but I continued to be fairly strongly, we

need to develop these. This product right here, you're telling me this is a billion dollar market. We can't just let that sit" (*MedPro* 7:23). None of the projects produced through the scientific parallel exploration routine reached the stage where it could be commercialized, an outcome that was seen as favoring the investors' and partners' arguments. The product that showed most promise at the end of this period, however, was not the one that *any* of the founding team members would initially have chosen. This suggested the dangers of focusing too early.

Around this time, with four years of experience in the firm, the scientists began to appreciate the potential value of the routines supporting the refining process while the business-trained partners started to perceive value in the routines nurturing multiple simultaneous paths. In an act of compromise and synthesis, they created a new routine in which the most promising short-term projects would carry the primary scientific focus while other applications received some—but much less—attention and investment. Under this overall organization-level business/science hybrid routine, the firm successfully applied its patents to treat a specific medical condition resulting from chemotherapy, allowing them to pursue substantial new funding. In this instance, then, the organization tried importing routines from other organizations, but through internal struggle accidentally developed a hybrid new product development strategy specific to this organization. The new hybrid approach led to better outcomes than the initial routines that it fused. In effect, the internal struggle over which product development routine to follow led to a period of de facto experimentation. This in turn revealed both the possibility and value of a new hybrid routine.

Generative bricolage. Despite their newness, firms in our sample also created routines by drawing on their own limited collective experience as a firm. We focus here on one intriguing pattern in which founders deliberately created new routines by extending combinations of existing routines to new and distinctly different activity domains, rather than searching for or designing routines specifically for the new activities, a process we label "generative bricolage."

In several cases, founding teams started their businesses with technical or scientific expertise but with little or no business experience and few useful business contacts. When these teams crudely

extended existing routines to deal with business challenges, the familiar routines could fail in obvious ways (e.g. when they attempted to extend grant-application routines to non-grant revenue generation), but they sometimes instead created useful and idiosyncratic routines. *CloNet*, a firm founded by software engineers with little business experience, had no routines for billing customers who requested small or simple services. The founding team did not ask someone to help them develop a billing routine, nor did they buy billing and accounting software. Instead, they combined their limited resources at hand (knowledge of web design and incipient routines for dealing with customer requests) to develop an idiosyncratic web-based routine for billing minor customers for minor requests. "[W]e would never have said that if a client's going to call you once a month for $200, that's not worth your time. Instead we developed a system to make it very efficient to capture that $200 . . . You do what they need, hit a button on their web page. They get billed, period, end of story" (*CloNet* 7:23). This became their standard routine for all but their largest contracts.

In a later phase, the founders ended up using the information generated and captured by this system to make strategic and market-segmentation decisions. They reported that their ad hoc billing procedure gave them a competitive advantage over their local competitors because it provided data they could use to design strategies. Thus the generative bricolage in this case not only produced short-term planned value in terms of their billing procedure, but it also provided an unanticipated tool for strategic planning in the firm that they believed had long-term strategic value.

DISCUSSION

We grounded our inductive study by first distilling out common assumptions about origins and impacts of routines from their definitions. We offered a definition of capabilities that requires consistency of good outcomes above an arbitrary level. In contrast, we propose a definition of routines that requires some consistency in activities, regardless of outcome. In this framework, an organizational element may represent both a capability and a routine, but can also represent only one or the other. These definitions build on important prior work, but they open the door to more systematic study of the antecedents and consequences of capabilities and routines. They may help us advance systematic quantitative empirical

research because they imply criteria that can be used to distinguish routines and capabilities.

Building on this definitional framework, we identified key emerging themes about capabilities and routines. Capabilities may not always come from routines, and they may have varying impact on overall organizational performance. Routines may also come from varied places and play non-obvious roles in organizational change. We consider below implications of our findings for these themes.

Organizational Capabilities as Bundles of Routines

Our results were consistent with the emerging perspective that creation of organizational capabilities can involve several different processes (Ahuja and Katila 2004, Bingham and Eisenhardt 2005, Dougherty 2001, Helfat and Peteraf 2003, Nonaka 1994, Sapienza et al. 2006, Zollo and Winter 2002). *CloneRight*'s renewal of its cloning approaches and *ChemPro*'s capability changes provided concrete exemplars of Helfat and Peteraf's (2003) capability transformation. *CloneRight*, *ChemPro and FastSoft* revealed the learning processes as experience accumulation, knowledge articulation, and knowledge codification, as anticipated by Zollo and Winter (2002). Our observations suggest, however, that field-level processes can follow much more convoluted paths than the orderly sequential build-up of stages described by Helfat and Peteraf (2003) and Zollo and Winter (2002). Most important, our findings uncovered specific migration paths between routines and capabilities, and they pinpointed how organizational capabilities can precede organizational routines.

This counterintuitive finding deserves careful explication to ensure it is not simply an artifact of definitional ambiguity. Recall that both *FastSoft*'s programming and *CloneRight*'s animal cloning procedures produced reliable levels of performance in a particular domain, confirming those as organizational capabilities. Each firm, however, improvised repeatedly to produce reliable outcomes in a particular type of activity without routinizing the activities themselves. Recall, too, that *FastSoft* and *CloneRight* later backfilled their improvised capabilities with deliberately created routines, such that they eventually did have capabilities consisting of routines. *MeaTech*, however, failed to backfill, underscoring that backfilling need not inevitably occur, and revealing the potential for an improvisational competency trap.

What do these findings mean for more general theories of capability development and organizational change? Organizations may enact routines that are not capabilities, such as prescribed action sequences designed merely to keep order or constrain behavior. They can also deploy capabilities that are not routines, as described here. Further, improvisation itself represents a distinct capability, a finding reported in prior empirical work (Baker et al. 2003, Miner et al. 2001) but appearing in more varied settings in this study. Importantly, we observed that improvisational capabilities can provide the reliability in execution that is central to organizational capabilities and that is often assumed to require robust supporting routines. In some cases, firms invested time and resources to backfill capabilities with routinized supporting activities only after observing the outcomes of individual or repeated improvisation. Similarly, Miner et al. (2001) found firms that deliberately observed outcomes of improvisational activity in product development and selectively institutionalized only a few formal product lines or improvised processes. Collective creativity and imagination play a key role in improvisation, and routinization may involve deliberate creation of new supporting activities, not just codification of current activities. The total process we observed, then, goes beyond mechanical visions of capabilities as assemblies of routines that gradually accrue from prior experience, and highlights the value of further research on the imaginative creation of components of capabilities.

Dynamic capabilities. Our findings offer a promising lens for debates concerning dynamic capabilities. As shown in Appendix 2, scholars have defined dynamic capabilities in several ways. Like Winter (2003) and Eisenhardt and Martin (2000), we conclude that the empirical evidence coupled with careful definitions reveals that the construct of dynamic capabilities is not inherently tautological and does offer useful theoretical value, but that it presents dangers if not carefully specified. Distinguishing capabilities and routines may help with this effort. Any firm with procedures or norms for research and development has innovation routines using our approach. Only firms whose research or product development activities produce reliably good outcomes above a threshold level, however, would be defined as having dynamic capabilities. This distinction helps avoid the danger of defining any organization with a new product development process as having dynamic capability in that domain, and it

suggests appropriate steps to measure routines and capabilities in systematic empirical work.

Our observations that some capabilities in specific domains did not advance overall organizational performance are consistent with Winter's (2003) reminder that developing systematic dynamic capabilities can be expensive, cannot be justified in some settings, and do not represent a "free lunch" that will provide a universal solution for strategic management. The specific paths we observed suggested an intermediate state between totally "ad hoc problem solving" (Winter 2003, p. 992) and the development of costly, highly elaborated, and routinized change systems, such as highly formalized R&D, product development, and acquisition systems. Improvisational capabilities represent a half-way point where the organization maintains a generic improvisational competency in dealing with situations effectively on an ad hoc basis. Organizations can deliberately seek such intermediate capabilities, as when armies train guerilla units to use real-time information to create new strategies on the field (Moorman and Miner 1998). On the other hand, such improvisational capabilities may be even more difficult or expensive to develop than traditional dynamic capabilities, a question worthy of further investigation.

Capabilities and Overall Organizational Performance

Our investigation revealed several instances in which firms developed capabilities that did not enhance organization-level performance. *ChemPro*'s distribution system and *GovSoft*'s IT support system, for example, clearly led to quite good levels of performance in their specific domains, but these capabilities eventually harmed overall organizational performance. These observations support and extend recent work that points to potentially heterogeneous effects of capabilities on overall organization level performance (Winter 2003). Greve (1996) highlighted that capabilities, in the form of radio format, lead to varying firm performance under different contexts. Further, Ethiraj et al. (2005) provided evidence that capabilities make different marginal contributions to firm performance using evidence on software projects and Haas and Hansen (2005) reported that highly experienced teams were more likely than inexperienced teams to lose sales bids if they deployed organizational capabilities of information-sharing, showing that some capabilities can even harm overall performance. Prior work offers three ways in which capabilities can fail to advance overall organizational performance: (1) incompatibility with other

capabilities or viable strategies (Adler et al. 1999, Gavetti and Levinthal 2000, Teece 1986); (2) excessive costs (Winter 2003); and (3) "competency traps" in which positive performance from repeated deployment of an inferior capability inhibits the development of superior capability over time (Dougherty 1992, Leonard-Barton 1992, Levinthal and March 1993, March 1991).

Our examples exhibited all three sources of potential harm. Most of our exemplars did not end up providing overall organizational performance during our study period. Some may also have faced long term challenges in terms of scarcity or ease of imitation, but were dropped or altered before those became crucial issues. Our findings also highlight an additional type of competency trap to which new firms may be vulnerable. Recall that *MeaTech* improvised to solve gas companies' specific problems, but it was subsequently unable to create and execute plans even when ongoing improvisation was not a sustainable way to compete. Miner et al. (2001) described how improvisation could drive out experimentation while Baker et al. (2003) described other new firms that could not escape improvisational competency traps. Our study, however, revealed an antidote: the ability to backfill new routines after repeatedly improvising successfully in a given area, as *FastSoft* and *CloneRight* were able to do. While earlier studies warn about the dangers of over reliance on improvisation, our results indicate that repeated improvisation, tamed by firms' intentional backfill, can be an important source of capabilities.

Our findings also indicated that harmful capabilities can nonetheless produce unplanned value, providing additional insight to the current literature on learning from failure (Sitkin 1992). As previously noted, *ChemPro* accidentally discovered a better distribution strategy than its dealer network while *GovSoft* learned to modify its business model away from competing based on customer support. These results underscore the potential value of future research both on conditions under which capabilities do and do not offer immediate value and on conditions when less than optimal capabilities serve as valuable experiments (Miner et al. 2001).

Modes of Routine Emergence and Routines as Engines of Change

Cohen and Bacdayan (1994) offered crucial evidence of the formation of routines in a stylized organization of card players, and Hutchins (1991) convincingly described how a coordination routine and

sub-routines emerged when a team navigated a ship into harbor after its navigation equipment broke. Other work treats routines as an organizational 'gene' that transfers through different organizations (Phillips 2005). More recent research has begun to emphasize that organizations also may intentionally design routines, as when firms perform total quality reviews, undertake reengineering, or hire consultants to redesign manufacturing processes (Helfat and Peteraf 2003). Our exemplars support these standard assumptions about the origins of routines but also describe additional mixtures of processes that generate routines in new firms. We describe three interesting *sub-patterns*: genealogical, interactive and generative bricolage, as illustrated in Table 4. Our examples also reveal three distinct s*ources* of routines: external (prior firms, and ongoing encounters with other organizations), internal (the firm's own experience), and combined sources. Finally, the exemplars also reveal three major *processes:* automatic importing/development, selective importation/retention, and imaginative creation of new routines. Taken as a whole, our findings support the emerging understanding that organizations often build routines from varied but familiar sources, but they also sometimes deliberately select and design routines, making them an instrument of both intended and unintended consistency of action.

The study also contributes to the emerging and more nuanced understanding of the role of organizational routines in organizational change and innovation (Feldman and Pentland 2003). As noted above, some routines at one level specifically seek to influence change at other levels, as when organizations have search routines (Cyert and March 1992[1963], Gavetti and Levinthal 2000), or more concretely, new product development routines or research and development routines (Dougherty 1992 2001, Hargadon and Sutton 1997). Nonetheless, theory generally assumes that except for these important but specialized routines for innovation, routines generally serve to reduce variability in organizational behavior and outcomes (Becker 2004, Cohen et al. 1996).

In contrast, our findings support claims that routines themselves can serve as important organizational transformational agents. The prosperity of *ChemPro* and *GovSoft* increased when they substituted different stable routines for their previous—and also stable—distribution and IT support routines. These cases illustrate how selective importing or retention of apparently useful routines can

provide an engine of adaptation (Burgelman 1983, Miner 1990 1991). Our examples also point to ways that applying routines to new challenges can influence organization-level outcomes. *CloNet's* use of its billing procedure to acquire data they used in long term strategic planning, for example, illustrates a positive organizational outcome from an effort to apply combinations of existing routines to a new challenge. The processes we described contribute to the emerging understanding of a richer set of roles that routines play than the central but somewhat narrow role organizational scholars have previously attributed to them.

Study Limitations

This study remains exploratory. We limited our observations to the processes of routine and capability generation in new firms. In our interviews, we asked about general firm history and unexpected events. We did not ask about routines and capabilities, but rather explored them later during transcript review. This reduced the chance that our pattern of findings arose from efforts by respondents to answer in socially accepted ways, but it may also mean that we missed other activities and behavioral patterns that did not spontaneously appear in the interviews. Accordingly, the generalizability of our tentative findings must be viewed with care, and future research can usefully explore whether our findings appear robust.

The firms we observed were "knowledge-intensive," that is, they shared a marked dependence upon intellectual skills and products and relatively low capital intensity. This feature strengthens our confidence that our findings generalize to other knowledge-based firms, but it also makes it more likely that focal firms possessed unusually high potential for creative development of capabilities. Further research could fruitfully examine capability development in less knowledge-intensive firms. Finally, the nature of our data permits us to describe observed processes and ideas about causal processes, but additional work is needed to test our causal predictions.

Implications for Other Literatures

These limitations notwithstanding, our findings offer interesting implications for theories of entrepreneurship, improvisation and bricolage, and organizational learning.

Entrepreneurship. One important strand in the entrepreneurship literature sees entrepreneurship as a sequential process of opportunity recognition, evaluation, and exploitation (Eckhardt and Shane 2003). In an alternative strand, opportunities do not necessarily precede entrepreneurial action and are partially created through action (Baker et al. 2005, Carter et al. 1996, Gartner et al. 1992). Our study offers some support for the second perspective. In the case of *GovSoft*, for example, activities during the exploitation phase for one broad opportunity changed the nature of the opportunity itself. This is a common occurrence in new firms formed to exploit new-to-the-world platform technologies, and recent evidence suggests that it is present more broadly across start-ups (Gartner et al. 2003). Our study advances this more behavioral framework by describing distinct sub-processes that would not be predicted by the opportunity-evaluation-exploitation lens.

Improvisation and bricolage. Table 5 summarizes some of the conceptual features of bricolage and improvisation that informed our study. Some prior studies have noted improvisational processes within the technical development of products (e.g., Dougherty 1990 1992, Miner et al. 2001). Our findings provide additional insight that improvisation is not just a marginal activity for tactical purposes but may also represent one crucial path to long-term organizational capabilities. Our study also underscores that improvisation carries both risks and benefits. Prior work has noted that improvisational capabilities can drive out other useful and deliberate activity (Miner et al. 2001, Baker et al. 2003). Our study reveals that firms sometimes overcome this danger by later creating routines to undergird capabilities built on repeated improvisation. In the area of bricolage, our study emphasizes routines as an object of organizational bricolage, expanding prior work that has focused on inputs such as physical material and "ideational" resources (Baker and Nelson 2005, Garud and Karnoe 2003, Levi-Strauss 1967). Using the bricolage framework offers a useful theoretical umbrella to incorporate existing work on the origins of routines. Finally, our study illuminates differences and relationships between improvisation and bricolage, as shown in Table 5. As with capabilities and routines, the two constructs are theoretically distinct, but a given activity may involve both. An improvising organization may be especially likely to

engage in bricolage since by definition it cannot have fully planned in advance the resources it will need (Garud and Karnoe 2003, Miner et al. 2001, Vera and Crossan 2005).

Insert Table 5 about here

Organizational learning. Our study begins to fill in unanswered questions about the origins of the standard operating procedures or routines that lie at the heart of the behavioral theory of the firm (Cyert and March 1992[1963]) and many later models of organizational learning. It also advances the nascent literature on entrepreneurial learning. This area explores the interaction of theories of entrepreneurship and theories of organizational learning, but most work has focused on personal learning by individual entrepreneurs (Gompers et al. 2005, Harrison and Leitch 2005, Warren 2004). Capability development represents an especially crucial organization-level learning process for new organizations (Sapienza et al. 2006). Many new firms begin with inadequate resources and incomplete capabilities (Aldrich and Ruef 2006, Cope 2005). The smaller size of many new firms may enhance the probability of repeated organizational improvisation as one source of later capabilities. It may also make related switching of business models more feasible. We speculate that firms that lack skillful improvisation may not be able to follow the migration path from improvisation to routine-based capabilities. Improvisation-based capability development, then, represents an important frontier for research on organizational entrepreneurial learning.

CONCLUSION

Our investigation of the origins, dynamics, and performance impact of routines and capabilities in new firms led to a simple proposed distinction between capabilities and routines that may have promise for ongoing research on these important phenomena. It also generated interesting findings about the development of capabilities and routines, as well as their impact on organization-level performance and change. Our exploration of these issues suggests promising adjustments of standard assumptions about routines and capabilities. In addition, our findings provide explicit descriptions of related micro processes that may well play essential roles in the creation, emergence, and prosperity of new organizations.

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TABLE 1: Key Constructs and Definitions

Constructs	Definition	Features	Comments and field quotes
Organizational capability	An organization has a capability if it can execute a specific activity with results above a threshold performance level and can sustain that performance level (consistent with Helfat and Peteraf 2003).	*Reliable outcomes*	A capability is dependable in its outcome—high likelihood of performing well in a particular domain if the situation requires it.
		Threshold	A context-dependent threshold of performance in a particular domain is a necessary feature of any capability. In contrast, the definition of routines does not imply any particular level of expected performance impact.
		Potential	A capability may exist as latent or as potential—it may or may not be deployed.
			Field examples of organizational capabilities: Product development: "We just kind of rolled it into the solution package type of thing. Let's make it something that we can deliver the same every time for a certain price" (*ModTech* 9:4).
			Task management: "And so basically what we've done this year is automated, and then after we did it we did a job, the same job two weeks later … we went out and did a job one hundred percent flawless" (*SouOne* 17:32).
			E-commerce: "… able to take those products that are advertised in these advertisements and present them through the Web for sale … We do not stock any inventory. When the order comes in it goes directly to the manufacturer …" (*ForNet* 2:32).
Organizational routine	An organizational routine is "a coordinated, repetitive set of organizational activities (Miner 1991, p. 773)."	*Repetitive activities*	A routine involves repeated activity, distinct from inspired one-time action. A performative routine refers to the execution; an ostensive routine refers to the conceptualization of the activities (Feldman and Pentland 2003).
		Coordinated	Routines coordinate the activities of multiple people. While one individual may enact particular behaviors as part of a routine, individual habits do not constitute organizational routines.
			Field examples of organizational routines: Hiring: "When we hired … we put (the candidates) on the computer, did a skills test. We had (the candidates) run through a series of tests on how to do a spreadsheet, how to write a document, how to save things" (*CasTech* 8:21).
			Meeting: "Every Monday morning at 8:30 we have an executive meeting" (*SurCon* 21:15).
			Technical Support: "… the process at the time was (technicians) call here and let us know that they were on site and then when they finished they'd call us a let us know" (*SouOne* 10:16).

Organizational improvisation	Organizational improvisation occurs when an organization "deliberately and materially fusing the design and execution of a novel production (Miner et al. 2001, p. 314)."	*Substantive convergence*	Improvisation involves fusion of design and execution. The substantive convergence of design and execution implies not only that design and execution happen at the same time, but that execution informs the design as the design informs the execution.
		Novel	Because the activity is being designed as it is executed, improvisation implies some degree of novelty (Miner et al. 2001). A second improvisation would require different actions within the episode. Field examples of improvisation in new firms: Marketing: "… just got on the phone and called some people and … Really pretty quickly just went for it. We wrote it up after the fact" (*AgeTech* 11:11). Financing: "And we're making this crap up as we go down there, we pitch, we blow them away, you know" (*AgeTech* 23:26). Fixing product: "We were crashing communications and police networks around the country … We brought in tiers of people … the original guy came back and tried to fix it under threat of being heavily sued. He, I think, was not able to. Actually, he said that he didn't know what was wrong. Eventually we just found this other guy who was able to do it. I mean, there was never a process" (*SchSoft* 4:34).
Organizational bricolage	Organizational bricolage occurs when an organization "makes do by applying combinations of the resources at hand to new problems and opportunities (Baker and Nelson 2005, p. 333)."	*Resources at hand*	Bricolage emphasizes the reliance on the existing elements at hand, some of which may be hidden or non-obvious resources. In this study, what were "at hand" included routines from prior employers, from social networks, and from incipient routines built within the new firm for other purposes.
		Making do	Bricolage focuses on action and active engagement with problems or opportunities rather than lingering over questions of whether a workable routine can be created from what is at hand.
		Recombination	Bricolage involves reuse of existing routine elements for different purposes than those for which they were originally intended. Field examples of bricolage in new firms: Product development: "What usually happens in individual sales like that, when you go and it's like a single investigator researcher kind of stuff, the researcher ends up making do with what he's got. We've done that all the time" (*PieBio* 26:29). Work schedule: *PieBio* is a university startup with a casual style in terms of work schedule. However, with the involvement of network member a routine of work schedule was gradually established and integrated into the routine system, "So he started trying to get us off the university, sort of extension of the university research lab attitude. People had to get work on time. We had a timeline to get something done. That was the first time. So in the Spring of 2001, we started thinking like a company" (*PieBio* 22:32).

TABLE 2: Descriptive Summary of Sample

Type	Year of Founding	Number of Employees	# of Founders	Length of Transcripts	University Startup
Software	1999	5	1	45	N
Internet	1998	5	2	43	N
Electronics	1996	7	1	29	N
Software	1999	7	1	23	Y
Instrument	1980	3	1	16	Y
Biotech	1997	2	2	12	Y
Biotech	1984	7	4	16	Y
Biotech	2000	5	2	41	Y
Software	1996	5	4	37	Y
Recycling	1999	9	2	24	Y
Coating	1996	5	1	34	N
Internet	1996	14	4	31	N
Software	1996	4	1	18	Y
Biotech	2001	8	2	16	Y
Engineering Consulting	1997	4	6	26	Y
Internet	1999	7	1	28	Y
Internet	1995	6	3	30	N
Engineering Consulting	1997	13	1	27	Y
Software	1997	3	1	30	Y
IT Consulting	1996	22	1	36	N
Engineering Consulting	1998	2	2	16	N
Engineering Consulting	1996	6	6	11	Y
Software	1999	5	1	33	N
Internet	1999	3	3	36	N
Internet	1999	10	2	19	N
Biotech	1998	35	4	31	N
Internet	1998	6	2	23	N
Internet	1998	18	3	42	N
Biotech	1997	30	3	20	N
Internet	1995	6	1	41	N
Internet	2000	22	5	44	N
Software	1996	7	3	52	N
IT Consulting	1998	3	3	27	N
IT Consulting	1999	1	1	33	N
Biotech	1998	6	1	26	Y
IT Consulting	2001	4	3	27	N
IT Service	1998	3	2	26	N
Biotech	1990	1	1	16	Y
IT Consulting	2000	4	4	37	N
Biotech	1998	4	4	21	Y
Biotech	1997	4	4	20	Y
Biotech	1995	36	3	17	Y
IT Consulting	1999	52	1	27	N
Optical Fiber	1999	3	1	27	N
Internet	1996	8	1	39	N
Internet	2000	3	3	31	N
IT Consulting	1995	2	2	20	N
IT Consulting	1999	3	3	42	N
Biotech	1997	11	3	31	Y
Software	1996	2	3	42	N
Biotech	1997	3	3	18	Y
Software	1996	12	2	31	Y
Biotech	1996	11	3	40	Y
IT Consulting	1996	54	2	26	N
Electronics	1995	55	1	12	Y
Engineering Consulting	2000	10	1	36	N
Internet	1997	17	5	36	N
IT Consulting	1997	49	1	42	N
Biomedical Equipment	1991	135	2	21	Y
Software	1996	5	2	24	N
TOTAL				1725 (pages)	

TABLE 3: Migration Paths Between Routines and Capabilities

Migration path	Step 1	Step 2	Step 3
Migration path I	Creation of routines by planning, practice or replication Field examples: *GovSoft* planned and budgeted for new routines for IT support service, including web hosting, web-based technology support, and search engine.	Assemble, replicate, or expand routines into capability in specific domain. Field examples: *GovSoft* assembled the IT support routines into an IT service capability: "We had a solution that directly addresses gaps in getting the right information at the right time into the hands of law enforcement and other government officials" (*GovSoft* notes).	Deployment or non-deployment of the capability. Field examples: *GovSoft* Deployed the IT service capability to two local police departments, and received very positive feedback on the performance of its service capability.
	ChemPro created distribution routines drawing on prior firms, setting up standard distribution agreements with local distributors.	*ChemPro* replicated the local distribution routines across multiple geographic areas, to develop a national distribution capability.	*ChemPro* deployed the distribution capability and it ran smoothly.
Migration path II	Create an emergent capability by improvising a solution to a problem or opportunity Field examples: *FastSoft* improvised a 'grid generation' capability while facing a crisis of failing software, "… I spent the next 24 hours straight writing a software package that was completely hard coded for one specific case … And coding through the whole night to get this thing, and then the next day we tried it out and it worked" (*FastSoft* 14:6). The firm was not aware of the emergent capability after the first improvisational episode.	Sustain and recognize the capability through repeated improvisation Field examples: After the improvised solution worked, *FastSoft* tried improvising again on another project. Through the repeated improvisation the firm recognized the new organizational capability of "grid generation." The discovery of the new capability did not drive an immediate routinization of the process.	Backfill the capability with supporting routines that supplant the improvisation Field examples: *FastSoft* continued improvisation until one founder initiated the backfilling process. *FastSoft* planned and routinized the "grid generation" process, and eventually created taken-for-granted routines for its use: "That is what we now use for making grids … We use it every week, at least once a week, every week" (*FastSoft* 14:18).

	CloneRight improvised after a failed collaboration with consultants, "Turned out we had to become reproduction specialists. And so when we had to we rolled up our sleeves and we became such" (*CloneRight* 8:27). The initial improvisation created a cloning capability, resulting in receipt of a $1M check.	*CloneRight* continued to rely on improvisation for meeting the other two distinct but related milestones. *CloneRight* improvised solutions for both challenges, and the emergent cloning capability was revealed and sustained through repeated improvisation.	Due to declining research funds, *CloneRight* started developing routines to replace improvisation in order to sell and transfer the cloning capability. After setting up a licensing agreement with a breeding company, *CloneRight* took the cloning capability it had sustained through repeated improvisational activities and created organizational routines that supplanted the firm's continued reliance on improvisation.

TABLE 4: Three Modes of Organizational Bricolage

Mode of bricolage	Field notes regarding different bricolage processes	Inputs	Processes
Genealogical bricolage	Cyber imported hiring routines learned from previous employer and applied them directly to the new firm, with little reflection on the difference in operating environment between the prior organization and the new firm, e.g. "… while I was at (prior employer) I probably hired 60 people and fired 50. It just was part of my job, to find sales rep that could go out and represent (prior employer). So I thought I was really good at it, you know? … (At current firm) it was completely up to them. Here's the goal. Do it. I'm certainly here to help and support and train, but it's up to you to meet that goal" (*Cyber* 6:32). All founders of *CarDev* were working at a research center at the University before they started the new firm. They directly imported and combined the marketing routines from the research center, putting together a catalog and company contact list for marketing purposes. "So initially (we) tried to have the software picked up by other distributors … a lot of the initial get-it-picked-up stuff was some process from the University … We kind of wanted to do this to begin with" (*CarDev* 3:32). Scientists at *BioExp* imported and recombined routines oriented toward getting SBIR grants, including proposal development and application routines, learned from a prior research organization. They relied heavily on the SBIR grant application routines from the prior organization, and failed to develop any specific routines on product development other than fulfilling the one-time SBIR grant requirement.	Routines from prior organizations.	Genealogical process of recombination. Directly apply combination of routines from prior employer to the new firm. Little reflection on the assumption and fitting of the various routine elements, and little deliberate adaptation or alteration of prior routines before applying them to the new firm.
Interactive bricolage	*LuhNet* is a software consulting firm which signed a big contract with a major customer which required strict process records and documents. By closely specifying their documents procedural requirements, the key customer implicitly transferred some elements of their organizational routine into the startup, "They wanted really detailed status reports like, you know, how much time did you spend on each component of this fixed bid, you know, how much time you think is left, and if that left exceeds the fixed bid amount, you know, why? Like every week we were doing this stuff and it was a pain, but, you know, it's kind of good in a way so that it gives us an idea of what some people want to see" (*LuhNet* 4:29). *HeaTech*, a biotech start-up partnering with pharmaceutical firms, combined routines from a variety of advisors to construct firm-specific routines to smoothen and simplify transactions. They noted, "When you don't have that expertise	Routines from existing network members	Import routines from network members and apply them to local context.

	yourself, it feels, you depend on somebody who says, 'oh, yeah, this is how it always occurs, yeah, it's a pain in the rear, or, you know, this is unusual, you should be careful.' And just to be able to say, here's a contract that a major pharmaceutical sent to us, what is our standard response" (*HeaTech* 8:14)? As a result, "Within the first year, we knew which contract items we would accept and reject, and almost all contracts are negotiated in-house" (*HeaTech* 10:21). *BraBio* was started by an academic scientist, who drew on his social ties for building strict recruiting procedures, including specific hiring criteria and a standard two-and-half hour job interview with multiple interviewers involved.		
Generative bricolage	*CloNet* was founded by software engineers with no routines for billing customers who requested small or simple services. The firm combined their knowledge of web design and incipient routines for customer support to develop an idiosyncratic web-based routine for billing minor customers for minor requests. *AgeTech* developed a company web site originally for the purpose of information portal. With the Internet bubble, the firm combined and extended its incipient routines for web design to develop a web-based distribution routine, "… we sort of fell into the dot com. We never even considered ourselves a dot com. We just were a business that sort of had this kind of cool web site" (*AgeTech* 17:11).	Incipient routines created for other purposes	Recombine incipient routines and extend them to new domains or contexts.

TABLE 5: Organizational Improvisation versus Organizational Bricolage

Characteristics	Organizational improvisation	Organizational bricolage
The nature of the concept	Emphasizes the inseparability of design and execution of a performance or production. "Making it up as you go along."	Emphasizes to the sources and nature of resources used.
Extent of substantive convergence	Assumes substantive convergence between design and execution. Actor must design the pattern and enact the pattern in the same activity.	Substantive convergence is not a necessary feature as organizations may carefully design the action in advance of executing it.
Extent of temporal convergence	Implies temporal convergence as design and execution also converge in time.	An actor may plan ahead to enact bricolage.
Scope of resources	Not limited to resources readily at hand. Can create "new-to-the–world" elements during improvisation. Bricolage may occur often however, because while improvising firm may draw on close by resources.	Limited to resources readily at hand.
Typical link to preexisting routines	Preexisting routines do not constitute improvisation; there must be some degree of novelty in the design.	Bricolage often involves recombination of preexisting routine elements.
Quality of knowledge generated	May generate "new-to-the-world" novelty.	Must involve by definition use of preexisting routines. May be less likely to generate new to world novelty.
Relationship to the other construct	Improvisation increases the chances that bricolage will occur because there is less time to obtain appropriate resources in advance.	Bricolage may also sometimes produce improvisation, particularly when the resources at hand did not behave as anticipated.

APPENDIX 1: Definitions of Capability (Including Capacities)

Source	Text
Barney (1991, p. 44)	Capabilities are those organizational characteristics that 'enable an organization to *conceive, choose and implement strategies*.'
Stalk, Evans, and Shulman (1992, p. 62)	A capability is a set of business processes strategically understood.
Amit and Schoemaker (1993, p. 35)	Capabilities refer to a firm's capacity to deploy resources, usually in combination, using organizational processes, *to effect a desired end*.
Collis (1994, p. 145)	Organizational capabilities: the socially complex routines that *determine the efficiency with which firms physically transform inputs into outputs*.
Grant (1996, p. 377)	Organizational capability: a firm's ability *to perform repeatedly a productive task* which relates either directly or indirectly to a firm's capacity for creating value through affecting the transformation of inputs into outputs.
Szulanski (1996, p. 28)	Organizational capability as best practice. Practice refers to the organization's routine use of knowledge and often has a tacit component, embedded partly in individual skills and partly in collaborative social arrangements.
Dosi, Nelson, and Winter (2000, p. 4)	Capabilities involve organizational activity and the exercise of capability is typically repetitious in substantial part. Routines are units or 'chunks' of organized activity with a repetitive character. Hence, it is basically well said that 'routines are the building blocks of capabilities'—although routines are not the *only* building blocks of capabilities.
Winter (2000, p. 983)	An organizational capability is a high-level routine (or collections of routine) that, together with its implementing input flows, *confers upon an organization's management a set of decision options for producing significant outputs of a particular type.*
Makadok (2001, p. 389)	A capability is defined as a special type of resource – specifically, an organizationally embedded nontransferable firm-specific resource whose purpose is *to improve the productivity* of the other resources possessed by the firm.
Maritan (2001, p. 514)	A capability is defined as a firm's capacity to deploy its assets, tangible or intangible, *to perform* a task or activity to improve performance.
Helfat and Peteraf (2003, p. 999)	An organizational capability refers to the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, *for the purpose of achieving a particular end result*.
Special Forms of Capabilities	
Teece, Pisano, and Shuen (1997, p. 516)	*Dynamic capabilities*: firm's ability to integrate, build, and reconfigure internal and external competences *to address rapidly changing environments.*
Eisenhardt and Martin (2000, p. 1107)	*Dynamic capabilities* are the antecedent organizational and strategic routines by which managers alter their resource base—acquire and

Source	Text
	shed resources, integrate them together, and recombine them—to *generate new value-creating strategies*.
Galunic and Eisenhardt (2001, p. 754)	*Dynamic capabilities* are the organizational and strategic processes by which managers manipulate resources into new productive assets in the context of changing markets.
Zollo and Winter (2002, p. 340)	A *dynamic capability* is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating *routines in pursuit of improved effectiveness*.
Cohen and Levinthal (1990, p. 128)	*Absorptive capacity*: the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends.
Zahra and George (2002, p. 186)	*Absorptive capacity*: a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability.
Kogut and Zander (1992, p. 391)	*Combinative capabilities*: the intersection of the capability of the firm to exploit its knowledge and the unexplored potential of the technology.
Leonard-Barton (1992, p. 113)	*Core capabilities*: the knowledge set that distinguishes and *provides a competitive advantage.*
Henderson and Cockburn (1994, p. 66)	The '*architectural competence*' of an organization allows it *to make use of its component competencies:* to integrate them together in new and flexible ways and to develop new architectural and component competencies as they are required.

APPENDIX 2: Definitions of Organizational Routines

Source	Text
Nelson and Winter (1982, p. 97)	'We use 'routine' in a highly flexible way, much as 'program' (or, indeed, 'routine') is used in discussion of computer programming. *It may refer to a repetitive pattern of activity in an entire organization,* to an individual skill, or as an adjective, to the smooth uneventful effectiveness of such an organizational or individual performance.'
Levitt and March (1988, p. 517)	'The generic term 'routines' includes the *forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate.* It also includes *the structure of beliefs, frameworks, paradigms, codes, cultures, and knowledge* that buttress, elaborate, and contradict the formal routines. Routines are independent of the individual actors who execute them and are capable of surviving considerable turnover in individuals.'
Feldman (1989, p. 136)	Organizational routines are 'complex *sets of interlocking behaviors* held in place through common agreement on the relevant roles and expectations.'
Gersick and Hackman (1990, p. 69)	'A habitual routine exists when a group *repeatedly exhibits a functionally similar pattern of behavior in a given stimulus situation without explicitly selecting it over alternative ways of behaving*.'
Miner (1991, p. 378)	'I define an organizational routine as a *coordinated, repetitive set of organizational activities*.'
Pentland and Rueter (1994, p. 490-491)	'The set of possible performances for a particular task, described in part by a grammar… An organizational routine is not a single pattern but, rather, *set of possible patterns*—enabled and constrained by a variety of organizational, social, physical, and cognitive structures—from which *organizational members enact particular performances*.'
Cohen and Bacdayan (1994, p. 406)	'By 'organizational routines' we mean *patterned sequences of learned behavior* involving multiple actors who are linked by relations of communication and/or authority.'
Scott (1995, p. 54)	'Routines are carriers that rely on *patterned actions* that reflect the tacit knowledge of actors—*deeply* ingrained habits and procedures based on inarticulated knowledge and beliefs.'
Cohen et al. (1996, p. 683)	'A routine is an *executable capability* for repeated performance in some context that has been learned by an organization in response to selective pressures.'
Weick (1996, p. 165)	'Organizational response systems which emphasize relatively constant responding are called organizational routines. These basic building blocks represent efficient tools designed to transform variable inputs into less variable outputs through a *standardized sequence of operations*.'
Feldman (2000, p. 611)	'…routines are *repeated patterns of behavior* that are bound by rules and customs and that do not change very much from one interaction to another.'
Hodgson and Knudsen (2004, p. 289)	'Routines are *organizational meta-habits*, existing on a substrate of habituated individuals in a social structure.'