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STRATEGIC OPTIONS FOR THE PHARMACEUTICAL INDUSTRY IN TIMES OF CHALLENGE AND CHANGE

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“It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.” **Charles Darwin**

0. ABSTRACT

The dissertation aims to enhance our understanding of how firms develop new strategies or adapt existing ones to manage challenges and change in their environment. It focuses on the pharmaceutical industry, as it appears to be a suitable context to study strategy due to several changes undergoing in industry's surrounding environment. Decreasing R&D productivity, increasing pressure from generic drug competitors and governmental initiatives to decrease healthcare expenditure, as well as massive unmet patient needs are few examples of the conditions, in which pharmaceutical firms are operating the past few years. Although existing literature proposes different frameworks to deal with similar challenges, a more dynamic model is necessary to address strategy in times of challenge and change. Drawing on the tripartite structure of dynamic capabilities, i.e., sensing opportunities, seizing opportunities and managing threats, to theoretically frame the dissertation's insights, I contribute to innovation and organizational learning theories. This cumulative dissertation includes three empirical studies, which explore different capacities of the dynamic capability framework (Teece 2007). In particular, the first study sheds light on the role of corporate venturing activities of large biopharmaceutical firms in early-stage innovation in biotechnology, as a process for firms to sense new opportunities. Study 2 contributes to Teece's framework by proposing stakeholder-based learning as a dynamic capability for firms to seize opportunities and manage threats. I study stakeholder-based learning through augmented product innovation in the pharmaceutical industry. Lastly, the third study focuses on the third capacity of dynamic capabilities, i.e., managing threats (transformation). The study not only discusses how pharmaceutical firms manage external changes that can potentially threaten their competitive advantage, but it also provides a thorough investigation of the reasons and the process of such changes. The dissertation holds theoretical and practical implications on strategic and organizational issues.

0. ZUSAMMENFASSUNG

Ziel dieser kumulativen Dissertation ist es, das Verständnis darüber zu erweitern, wie Unternehmen – getrieben durch Veränderungen und Herausforderungen in ihrem Umfeld – neue Strategien entwickeln oder vorhandene anpassen. Das dynamische und von Veränderung geprägte Umfeld der pharmazeutischen Industrie bietet einen geeigneten Kontext für die Untersuchung möglicher Strategien: sinkende F&E Produktivität, zunehmender Druck durch Generika, staatliche Initiativen zur Kostensenkung im Gesundheitswesen sowie zunehmend unerfüllte Patientenbedürfnisse sind nur wenige Beispiele für die Veränderungen und Herausforderungen, denen die Unternehmen in den letzten Jahren ausgesetzt waren.
Die bestehenden Modelle, die von der Literatur vorgeschlagen werden, um ähnliche Bedingungen zu bewältigen, reichen nicht aus, um die gesamte Komplexität der Situation zu erfassen. Ein dynamischeres Model wird benötigt, das sich mit Strategien in Zeiten zunehmender Herausforderungen und Veränderungen befasst. Gestützt auf die dreigliedrige Struktur des *Dynamic Capabilities Ansatzes* – *Sensing* von Veränderung und Chancen, *Seizing* von Chancen und Umgang mit Risiken – liefert diese Dissertation einen Beitrag zu den bestehenden Theorien in den Bereichen Innovation und organisatorisches Lernen. Diese kumulative Dissertation umfasst drei empirische Studien, die jeweils unterschiedliche Eigenschaften des *Dynamic Capabilities Ansatzes* analysieren (Teece 2007). Die erste Studie untersucht die Bedeutung von *Corporate Venturing Aktivitäten* für grosse biopharmazeutische Unternehmen. Solche Aktivitäten ermöglichen es Unternehmen, besonders in der Frühphase von Innovationen, Veränderung und Chancen wahrzunehmen. Die zweite Studie erweitert Teece's *Dynamic Capabilites Ansatz*, indem sie Stakeholder-basiertes Lernen als eine *Dynamic Capability* zum Aufgreifen von Chancen und dem Umgang mit Risiken vorschlägt. Sie untersucht Stakeholder-basiertes Lernen durch erweiterte Produktinnovation in der pharmazeutischen Industrie. Die letzte Studie konzentriert sich auf die dritte *Dynamic Capability*, den Umgang mit Risiken (Transformation). Sie untersucht, wie pharmazeutische Unternehmen auf externe Veränderungen reagieren, die eine potenzielle Bedrohung für ihre Konkurrenzfähigkeit darstellen. Zudem bietet sie auch eine genaue Analyse der Ursachen und Prozesse solcher externen Veränderungen. Zusammenfassend liefert diese Dissertation theoretische und praktische Implikationen für strategische und organisatorische Fragestellungen, wie beispielsweise Innovation, organisationales Lernen und institutionellem Wandel.

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1 INTRODUCTION

Strategy as a concept, plan or discipline has engrossed scholars, managers and organizations for many decades. Successful positioning and timely operational effectiveness have timely been characterized as necessary but insufficient practices to achieve the much coveted competitive advantage (Porter 1996), and thus cannot be referred to strategies per se. However, even the most fundamental definitions of strategy, such as "creating and maintaining a competitive advantage in each and every area of business" (Porter 1980), seem outmoded, as companies and organizations and the way they do business have nowadays changed dramatically. Global competition, economic crisis, stricter regulations, environmental issues, rapidly changing technologies and customer needs and expectations, inorganic transformation of industries as well as increased entrepreneurial activities are a few conditions that compel strategists to redefine their way of thinking and acting.

Creating new opportunities, managing threats or adapting to radical changes fatigues firms, organizations and individuals. Established firms and experienced managers at different hierarchical levels, even if they recognize the need and know the methods to tackle changes in their internal and external environment often fail to respond in a timely manner, or effectively (Tripsas and Gavetti 2000; Tripsas 1997; Kaplan 2008). Among numerous fundamental questions studied in the strategy field is the question, How do firms achieve and sustain competitive advantage? (e.g., Barney 1991; Teece, Pisano, and Shuen 1997; Porter 1985). The resource-based theory (Penrose 1959; Wernerfelt 1984; Barney 1991; Peteraf 1993), the knowledge-based theory (Grant 1996; Nonaka 1994; Kogut and Zander 1992; Nonaka and von Krogh 2009; McEvily and Chakravarthy 2002) and dynamic capabilities perspective (Teece, Pisano, and Shuen 1997; Teece, Pisano, and Shuen 1997; Helfat and Peteraf 2003;

Helfat et al. 2007) are examples of theoretical frameworks that provide guides towards the creation and sustainability of competitive advantage. The creation and protection of valuable, rare, inimitable and non-substitutable resources, including knowledge as a superior resource of the firm, together with the development and employment of unique capabilities constitute processes that lead to competitive advantage and superior firm performance (Eisenhardt and Martin 2000; Amit and Schoemaker 1993; Zott 2003; Bharadwaj 2000; DeCarolis and Deeds 1999; Teece 2007). To understand how organizations identify and respond to strategic change, an in-depth analysis of organizational and managerial processes is necessary, such as alliances and acquisitions, knowledge management, organizational learning and innovation (Helfat et al. 2007).

Innovation, both radical and incremental, is generally accepted as an important strategic objective of firms and organizations. Innovative behavior and the performance of a firm depend not only on internal resources and capabilities, but also on its external environment. In other words, the locus of innovation is not always found inside a firm's boundaries. When the boundaries between firm and external environment become porous, new ideas and knowledge flow in and out of the firm, creating opportunities and redefining innovative processes as *open* (Chesbrough 2003a; Chesbrough, Vanhaverbeke, and West 2006).

Scholars suggest that there is a need for dual or multilevel capabilities to achieve and balance radical and incremental innovations calling them explorative and exploitative (Levinthal and March 1981; March 1991; Cohen and Levinthal 1990; Benner and Tushman 2003) capabilities or dynamic capabilities[1] for sensing and seizing opportunities and managing threats (transformation) (Teece 2007; Augier and

[1] Dynamic capability is the *capacity of an organization to purposefully create, extend, or modify its resource base* (Helfat et al. 2007, 4).

Teece 2009). Despite the vast number of studies exploring and proposing strategies to achieve the above-mentioned objectives, there is a continuous call for industries and firms to learn how to more effectively identify threatening conditions and how to successfully alter their strategies (for example innovation, product offering, business model, enterprise boundaries, organizational structures) in times of challenge and change.

Against this background, the dissertation provides three studies aiming to contribute to this ongoing need for new and adaptive strategies to deal with changes in firms' environments. The (bio)pharmaceutical industry has served as the research setting for all studies in the dissertation. There are multiple reasons for this choice. An industry often characterized as being in a class of its own (Stremersch and Van Dyck 2009), it is considered the most science-based and highly regulated compared to any other industry. It has faced considerable challenges in the past few years, such as declining R&D and innovation returns causing diminishing productivity, loss of revenues due to numerous blockbuster patents expiring, declining profitability due to increased clinical trial demands, more demanding regulatory filing requirements and post-approval safety requirements, as well as pricing pressure stemming from governmental mandates, ageing population, and higher competitive intensity (e.g., Kessel 2011; Paul et al. 2010). These challenges have significant ramifications for the industry's operations, strategic planning, structure, and business model. The traditional linear model proves to be insufficient in these changing times (Munos 2009), while attempts to reduce costs and increase productivity (e.g., M&As, expansion to emerging markets, shift to neglected diseases and orphan drugs) are falling short. The greater the firms, in terms of size and stakes, the greater are also the

challenges they face. Thus, the industry players that appear to be more in need are the larger pharmaceutical corporations.

In view of this changing environment, the pharmaceutical industry is a suitable context for the study of how firms change or adapt their strategies to cope with many challenges. To do this, I draw on Teece's framework of dynamic capabilities (2007) to investigate different approaches for sensing opportunities, seizing opportunities and managing threats. In particular, the first two studies of the dissertation focus on different types of innovation as a way to sense and seize opportunities and manage threats, whereas the third study goes one step back to investigate why and how change happens in the industry and what pharmaceutical firms do to manage this change (as a potential threat).

Corporate venturing as a form of open innovation is the subject of the first study, which I link to the capacity of sensing opportunities. Firms pursue new technological or business opportunities by performing strategic investments in entrepreneurial targets such as startups or buyouts. Corporate venturing, defined as "the set of organizational systems, processes and practices that focus on creating businesses in existing or new fields, markets or industries – using internal and external means" (Narayanan, Yang, and Zahra 2009, 59), appears to be in its "golden age[2]". It is one of the most intensively growing strategies moving towards a more open and collaborative model (Battistini, Hacklin, and Baschera 2013) that creates value for both early stage entrepreneurial firms and large corporations. In this first study, we observe a rising supply of corporate venturing capital[3] (CVC) in the biopharmaceutical industry, as well as increasing demand for CVC from biotech

[2] http://www.penews.com/today/index/content/4068295507/

[3] Equity investments made by non-financial corporations in start-up companies, for strategic and financial purposes (Maula 2001; Narayanan, Yang, and Zahra 2009)

entrepreneurs, and identify the new principles adopted by pharmaceutical corporations that characterize their corporate venturing activities and lead to remodeling of the traditional linear innovation model in the industry. We further contribute to an ongoing discussion on open innovation in large pharmaceutical companies (Hunter and Stephens 2010; Bianchi et al. 2011; Munos 2010; Strauss 2010; Schuhmacher et al. 2013; Douglas et al. 2010) and elaborate implications for entrepreneurs in evaluating future collaborations with corporate venturing funds.

The second study explores augmented product innovation as a strategy to not only seize opportunities, but also to manage threats. Augmented products have product or service characteristics that surpass generic features expected by targeted customers (Levitt 1981; Levitt 1980; Grönroos 1990), hence, augmented product innovations can be customer-benefit-creating extensions to the core product, which include services and features to improve quality, search, accessibility, use, handling, compatibility and others (Payne and Holt 2001). We emphasize the role of organizational learning from external sources and, in particular, from a set of stakeholders embedded in a firm's surrounding environment, including competitors, regulators, allies and users. We specifically ask how firms learn to develop successful augmented products within a context of multiple stakeholders. Despite the multiplicity and complexity of actors in the pharmaceutical industry, innovation literature within the industry has so far focused on product innovation and competition (Roberts 1999; Cockburn, Henderson, and Stern 2000), organizational learning, capabilities, and knowledge (Nerkar and Roberts 2004; Bierly and Chakrabarti 1996; Yeoh and Roth 1999; DeCarolis and Deeds 1999; Sosa 2009; Bruni and Verona 2009), and development costs (DiMasi, Hansen, and Grabowski 2003; Kola and Landis 2004), whereas learning from stakeholders has received little

attention. The study contributes to the product innovation and learning literature (e.g., Fu, Diez, and Schiller 2013; Narver, Slater, and MacLachlan 2004; Baker and Sinkula 2007; Morgan and Berthon 2008; Yannopoulos, Auh, and Menguc 2012) and stakeholder theory (Freeman et al. 2010; Agle et al. 2008; Talke and Hultink 2010; Daboub and Calton 2002; Roloff 2008).

The third study focuses on the third capacity of dynamic capabilities, i.e., managing threats (transformation). The study not only discusses how pharmaceutical firms manage external changes that can potentially threaten their competitive advantage, but it also provides a thorough investigation of the reasons and the process of such changes. I employ neo-institutional theory (Friedland and Alford 1991; Scott 2001; Scott 2008; Greenwood et al. 2008; Lounsbury 2001) to study change in the highly regulated and complex organizational field of Alzheimer's disease treatment. In particular, the study asks why and how institutional logics (Thornton and Ocasio 1999; Thornton and Ocasio 2008; Thornton, Ocasio, and Lounsbury 2012) shift in this field and under what conditions institutional entrepreneurship (Garud, Hardy, and Maguire 2007; Battilana, Leca, and Boxenbaum 2009; Hardy and Maguire 2008; Perkmann and Spicer 2007) leads to institutional change or not. Treating Alzheimer's disease is a rather convoluted process due to the complex needs of patients and their caregivers and the absence of an effective pharmacological treatment. As a result, some doctors and researchers have turned their interest into non-pharmacological treatments. The study investigates the evolution of institutional logics in this multilevel field (professions, communities, state, market), identifies four institutional logics and tracks their shift over time. Moreover, it explains how context affects the behavior of institutional entrepreneurs and under what conditions institutional entrepreneurs succeed or fail in enacting institutional change.

This cumulative dissertation offers a better understanding of strategies adopted by firms in times of challenge and change. First, it includes an introductory chapter and a chapter presenting the theoretical background of the three studies. It then provides summaries of the three studies focusing on research design, methods and contributions. Lastly, the dissertation concludes with implications for theory and practice and discusses limitations and possible avenues of further research. The full research articles and a list of reviewed papers on dynamic capabilities framework follow the bibliography chapter (Appendices 6.1-4).

2 THEORETICAL BACKGROUND

This chapter includes the theoretical framing of the dissertation based on the framework of dynamic capabilities, which categorizes different strategic approaches firms follow to identify and react to change, namely open innovation through corporate venturing, augmented product innovation by means of stakeholder-based learning and strategic transformation to respond to institutional change.

2.1 Dynamic capabilities framework: sensing and seizing opportunities, managing threats

Over the past 15 years, dynamic capabilities[4] have been extensively studied, criticized and reviewed. The dynamic capabilities framework has emerged as an answer to a call for more dynamic models to study firms (Teece and Pisano 1994; Teece, Pisano, and Shuen 1997). In contrast to the main thrust of the resource-based view, the

[4] Dynamic capabilities are challenging to conceptualize and operationalize, covering complex classifications of organizational routines (Zollo and Winter 2002) to simple rules (Eisenhardt and Sull 2001). The challenge stems from the multiple levels of conceptualization of capabilities as either operating routines or high-level behavioral patterns in the coordination and structuring of resource bundles that characterize a firm and influence its performance. However, as Easterby-Smith and colleagues (2009) emphasize the ambiguities in definitions also allows flexibility when addressing new managerial challenges. Moreover, scholars recognize the blurry between dynamic and operational capabilities despite their lucid difference in ‘purposes and indented outcome’ (Helfat and Winter 2011, 1245).

dynamic capability framework holds that management scholars needed a framework to explain how firms' responsiveness and innovativeness become timely, rapid, and flexible in dynamic markets. Based on a review and synthesis of the literature, Barreto offered a definition that captures this thrust: "A dynamic capability is the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base" (Barreto 2010, 271; see also Di Stefano, Peteraf, and Verona 2010). Easterby-Smith and colleagues concluded that dynamic capabilities are higher-level capabilities, which enable 'knowledge gathering and sharing, continual updating of the operational processes, interaction with the environment, and decision-making evaluations' (Easterby-Smith, Lyles, and Peteraf 2009, S7). Many authors have come to share the view that dynamic capabilities are higher order firm-level capabilities (Winter 2003; Zahra, Sapienza, and Davidsson 2006; Barreto 2010; Heimeriks, Schijven, and Gates 2012) categorized according to the activities they perform, such as coordination, learning, and reconfiguration (Teece, Pisano, and Shuen 1997); integration, reconfiguration, and gaining and release of resources (Eisenhardt and Brown 1999); or sensing, seizing, and managing threats (Teece 2007). At a higher level, Augier and Teece (2009) suggested that dynamic capabilities have a tripartite structure: 1) the capability to sense opportunities; 2) the capacity to seize opportunities; and 3) the capacity[5] to manage threats through combination, recombination, and reconfiguration of assets inside and outside the firm's boundaries. More specifically, *sensing* is defined as the capability to identify, filter, shape, and calibrate opportunities; *seizing* includes firm structures, procedures, designs, and

[5] Teece refers to this third capacity of managing threats as transformation or reconfiguration. For simplicity reasons, I use only the term transformation instead of reconfiguration throughout the dissertation, considering them, however, 'equal'.

incentives for seizing opportunities, while *transforming* or *managing threats* comprises continuous alignment and realignment of tangible and intangible assets. Processes to guide internal R&D and select new technologies, to draw on scientific and technological developments from external sources, to identify market segments, altering customer needs and tap user-, supplier-, and complementary innovations constitute micro-foundations of sensing (Teece 2007, 1326). Similarly, processes to delineate customer solutions and business models, to select decision-making protocols and enterprise boundaries to enable management of complements and control of platforms and to build loyalty and commitment are the suggested micro-foundations of seizing opportunities (Teece 2007, 1334). Finally, decentralization and near decomposability (e.g., embracing open innovation), co-specialization, governance and knowledge management include processes to manage threats (Teece 2007, 1340).

Despite a general consensus around Teece's framework, authors have tried to extend it and provide more refined sources and processes of dynamic capabilities, which eventually lead to sustainable competitive advantage. For example, well-developed transactive memory organizational systems can build up dynamic capabilities through building new knowledge assets and reconfiguring and integrating existing ones (Argote and Ren 2012). However, most of the micro-foundations mentioned are located inside organizational and firm boundaries, thus, a need for including external factors as antecedents of dynamic capabilities is highlighted (Winter 2003; Ambrosini and Bowman 2009; Protogerou, Caloghirou, and Lioukas 2012; Eisenhardt and Martin 2000). Competitive intensity, for instance, has been proven to be an enabling external factor in fulfilling dynamic capabilities' purposes (Wilden et al. 2013). Furthermore, complexity, uncertainty, munificence in external

environments, as well as path dependencies are other external factors enabling or inhibiting dynamic capabilities' aspirations (Ambrosini and Bowman 2009).

To summarize, dynamic capabilities appears to be an appropriate theoretical framework to study how firms identify and respond to changes in their external environment. Innovation and organizational learning, for example, are pointed out as dynamic processes instrumental in creating and sustaining competitive advantage. The dissertation contributes to this literature by specifying exact types of innovation and learning dynamic processes and by offering a thorough explanation of change as an enhancing external factor of dynamic capabilities performance.

2.2 Open innovation and corporate venturing

Innovation is decisive for the success, growth and survival of organizations and it is inextricably connected with knowledge creation and learning. Firms need to look for and assimilate new knowledge into their current knowledge base (Chiang and Hung 2010) to be able to innovate. Internal knowledge is often insufficient to create new ideas and opportunities for successful innovation, especially in the past few years, due to the increasing complexity of technology, fast-moving business environments and more demanding and sophisticated customers. Managers have acknowledged the value of searching knowledge beyond a firm's office walls and internal R&D labs and, thus, turned their attention to external sources of innovation. In parallel, management scholars (Chesbrough 2003b; von Hippel 2005; von Hippel and von Krogh 2003; von Krogh, Spaeth, and Lakhani 2003; Gassmann 2006; Dahlander and Gann 2010) have extensively studied these types of innovation activities that span firm boundaries, since the introduction of the term *open innovation* by Henry Chesbrough in 2003.

Open innovation opposes the traditional closed innovation model, in which managers heavily invest in internal R&D and enhance the internal knowledge base by hiring "the industry's smartest people" (Chesbrough 2003a, 36). Firm profitability and competitive advantage depend exclusively on internally developed ideas, strictly controlled intellectual property and reinvestment of the generated profits in new innovative activities. In contrast, "open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology" (Chesbrough, Vanhaverbeke, and West 2006, 1). This type of practices offers firms more flexibility and access to a broader range of innovation sources (e.g., universities, competitors, SMEs, startups, users) compared to their own limited knowledge repository. However, this openness, apart from being very beneficial to a firm's innovative performance (Laursen and Salter 2006; Chiang and Hung 2010), can also present several challenges concerning increased complexity due to multiplicity of actors, the protection of knowledge, even if created externally or in collaboration with external actors, and the appropriation of innovation returns (Laursen and Salter 2014; West and Gallagher 2006; Mortara and Minshall 2011). Nevertheless, the advantages of partaking in open innovation endeavors are nowadays irrefutable and research has concentrated more on how to better manage and implement openness in innovation (e.g., Gambardella and Panico 2014; Felin and Zenger 2014).

One way to categorize open innovation activities is the firm's process perspective (Enkel, Gassmann, and Chesbrough 2009; Chesbrough, Vanhaverbeke, and West 2006), in which three main processes are recognized, namely outside-in

(integration of external knowledge to own knowledge base), inside-out (externalization of own knowledge and innovation; out-licensing, corporate venture activities, new ventures, spin-offs) and coupled process (co-creation of innovation, collaborative open innovation through alliances and joint ventures). In particular, corporate venturing as an example of an open innovation process is receiving increasing attention among practitioners and scholars (Battistini, Hacklin, and Baschera 2013). Battistini and co- authors recognize corporate venturing as one of the fastest-growing strategies towards open innovation. In the past few years there has been an increase in corporate venturing initiatives (Dushnitsky 2011; Battistini, Hacklin, and Baschera 2013) from large corporations in various industrial sectors, showing their need to sense and pursue new opportunities and create new options (markets, technologies, etc.). Corporate venturing not only helps firms to benefit from early involvement in leading-edge technologies and new business opportunities (sensing opportunities), it also comprises a flexible investment vehicle, which allows step by step investments and reduces the risk of large upfront spending. Corporations able to establish effective and sophisticated venture capital units exhibit dynamic strategic behavior that deserves further investigation, especially in industrial sectors that seem to be in greater need of dynamic changes. A sector that appears to participate actively in and profit significantly from this shift in investment practices, from internal R&D to external entrepreneurial ventures, is the life sciences sectors, including the biopharmaceutical industry (Booth and Salehizadeh 2011).

In this dissertation, I categorize corporate venturing, a form of open innovation, as a sensing dynamic capability, since it allows firms to identify new technological and business opportunities, filter them in multiple investment rounds and shape them using firms' own knowledge and resources. Study 1 explores the role

of corporate venturing for early stage innovation in the biopharmaceutical industry in order to better understand corporate strategic investments in the biotech market.

2.3 Augmented product innovation and learning from stakeholders

Sensing and pursuing new opportunities both internally and externally are a firm's first steps towards creating profit and a competitive advantage. Seizing such opportunities and managing emergent threats (transformation) are important conditions for sustainable growth, conservation of evolutionary fitness (Helfat *et al.*, 2007) and evasion of undesirable path-dependencies based on prior strategies (Vergne and Durand 2010). The first two capabilities of Teece's framework are often associated with (or even emanate from) the processes of exploration and exploitation (e.g., March 1991; Benner and Tushman 2003; Gilsing and Nooteboom 2006). Successful firms operate with ambidexterity, balancing exploration of new knowledge and exploitation of existing knowledge (He and Wong 2004; Gupta, Smith, and Shalley 2006; O'Reilly and Tushman 2004; Gibson and Birkinshaw 2004). The dynamic capabilities framework takes the exploration-exploitation perspective one step further by emphasizing the ability of firms to sustain their competitive advantage not only by being ambidextrous, but also by developing strategies that facilitate all three phases of dynamic capabilities. Thus, to have an overview and deep understanding of adaptive strategies in times of challenge and change, it is necessary to thoroughly explore the activities involving such strategies and identify enabling conditions for their success.

The introduction of new products usually marks the outcome of innovation, including sensing, seizing, and transforming. In the pharmaceutical industry, product innovation includes a very long and costly process of sensing new opportunities, i.e., identifying novel drug candidates and proving their efficacy and safety. When this

phase succeeds and a company launches a new product, the company should be prepared to seize (or exploit) this opportunity and manage inevitable threats with the patent cliff being only one example. Thus, the necessary capabilities may aim at several asset alignment and realignment activities (Teece 2007), such as extending to new markets and customer segments; prolonging product lifecycles by changing and improving product features; countering patent expiration by building entry barriers; managing serendipitous scientific discoveries; and/or adapting to changing customer needs and demography and regulatory mandates.

Certain innovations in the pharmaceutical industry do not touch upon the core product, such as the drug itself, but, nevertheless create substantial benefit for patients and caregivers in terms improved application, lower dosage, more cost-effective treatments, etc. An appropriate term to describe such innovations is augmented product innovations, which represent customer-benefit-creating extensions to the core product (Levitt 1981; Levitt 1980; Tersine and Hummingbird 1995; Payne and Holt 2001) including services and features to improve search, access, handling, compatibility and more. Given the complexity of the pharmaceutical industry, in terms of the presence of multiple actors in innovation, manufacturing, marketing and other operational functions, as well as the importance of the regulatory regime in the markets for pharmaceuticals, a better understanding of external factors influencing the success or not of augmented product innovation is necessary. For example, augmented products have product or service characteristics that surpass the generic features expected by users. It is reasonable to assume that the manufacturer needs to learn and understand the needs and expectations of those customers to identify relevant product elements, knowledge and resources that enable augmented innovation. Moreover, augmented product innovation may also be exposed to

constraints, in particular regulations that, in turn, may strongly affect its eventual launch and success in the market (Garriga, von Krogh, and Spaeth 2013). The complexity of these learning processes increases as the sources of learning are not only external to the organization but also great in number, creating an intricate net of stakeholders that influences the decisions and actions of the organization.

Both internal and external learning processes comprise different learning activities (Tucker, Nembhard, and Edmondson 2007), such as learning from own experience, team meetings, experiments and learning through competitive intelligence, while engaging with external partners and other stakeholders. In external learning, firms seek outside their boundaries new knowledge and novel ideas. External learning involves the acquisition (and/or imitation), processing, and integration of knowledge from other organizations (Lane and Lubatkin 1998; Bierly and Chakrabarti 1996; Powell, Koput, and Smith-Doerr 1996). Kessler et al. (2000) identified three sources of external learning in product development: customers, competitors and other organizations (Kessler, Bierly, and Gopalakrishnan 2000). Organizations can learn *vicariously* (e.g., Bandura 1977; Bresman 2010; Bingham and Davis 2012) by observing others without direct contact or by directly transferring knowledge from other organizations (*inter-organizational learning*) (e.g., Easterby-Smith, Lyles, and Tsang 2008; Dyer and Nobeoka 2000). Following a marketing perspective, scholars have identified two (different) types of learning: *adaptive* and *generative* (e.g., Day 1994; Adams, Day, and Dougherty 1998; Baker and Sinkula 2007; Baker and Sinkula 2005; Slater and Narver 1998; Morgan and Berthon 2008). Adaptive learning is a responsive and customer-led type of learning, which inspires only incremental innovation. In contrast, generative learning is a proactive/leading-the-customer type of learning, associated with radical innovation. Despite the

numerous studies on external learning (vicarious, inter-organizational) and learning from the customers and market (adaptive, generative), no work to date has examined cases of product innovation where, due to times of challenge and change, firms invest resources in augmented product innovation relying on learning from multiple stakeholders.

Against this background, this dissertation seeks to explore the role of learning from stakeholders as a dynamic capability that allows pharmaceutical firms to seize opportunities and manage threats, while developing and launching augmented products (study 2).

2.4 Transformation and institutional change

Transformation, defined as the ability to combine, recombine and reconfigure existing assets inside and outside firm's boundaries (Teece 2007; Augier and Teece 2009), is critical to a firm's response to threats such as shifts in a product's market demand. Knowledge reconfiguration, for example, is a key capability that allows a firm to "keep the new product pipeline filled" and to achieve continuous product innovation (Verona and Ravasi 2003, 579). I refer to this third capability of Teece's framework as the transformational capability.

Since massed streams of activities affect a firm's capability to counter threats and make adaptations necessary to meet changes in the environment, the transformational capability may be significant for the theoretical framework of dynamic capability and, thus, deserves further attention. Transformational capabilities cover threat-response activities and firm processes such as reorganization (Karim 2009), redeployment (Capron 1998; Helfat and Peteraf 2003), recombination,

continuous alignment and realignment of assets (Teece 2007), and patching (Eisenhardt and Brown 1999). Ambrosini and colleagues suggest that these third-level dynamic capabilities include processes internal or external to the firm that have an impact, not necessarily positive, on firm performance (Ambrosini, Bowman, and Collier, 2009; Ambrosini and Bowman, 2009). Furthermore, Katkalo and his co-authors suggest that firms can both capture and create value through transformational capabilities: value is created by 'achieving recombinations' of assets, technology and product innovations, firm infrastructure and strategy; whereas value is captured while 'managing threats, honing the business model, or developing new complements' (Katkalo, Pitelis, and Teece, 2010).

Business unit reorganization, for instance, may positively impact future innovation under certain conditions (Karim 2009). This can happen through recombination of resources and capabilities (Kogut and Zander 1992) or recombination of acquired units and (in some cases) a merger of acquisitions into internal units (Karim 2006). Scholars emphasize the mediating role of organizational learning in successful reorganization, since organizational learning both leads to dynamic capabilities and is a dynamic capability itself (Zollo and Winter 2002). Similarly, numerous organizational transformation and organizational change studies (for a complete list see Dixon, Meyer, and Day 2010) draw on dynamic capabilities and organizational learning to explore the different processes that lead to transformation of organizations. Scholars suggest that a prerequisite for transformation is "to create an awareness in the organization of a *need to change*, such as to decouple members from their old routines" (Dixon, Meyer, and Day 2010, 422). This break with the past, as the authors call it, constitutes the first stage of organizational transformation and significantly depends on the organization's

embeddedness in old institutions (among other things). The much-desired sustainable competitive advantage will eventually be achieved through more processes of exploitation and deployment (stage II) and exploration and innovation (stage III). Having already explored processes of innovation and learning, this dissertation goes one step back to investigate why and how firms and organizations realize the need to change and transform.

To do this, I employ institutional theory to study the reasons and the process of institutional change. A central issue in institutional theory, which is responsible for the evolution of 'old' institutionalism to neo-institutionalism, is the *paradox of embedded agency* (Garud, Hardy, and Maguire 2007; Powell and DiMaggio 1991). 'Old' institutionalism defines institutional contexts as rationalized myths influencing organizations subject to institutional pressures. Organizations become isomorphic through adaptation and imitation in order to gain legitimacy and survive. Institutionalized practices must obey rules, norms, standards and contracts and therefore are taken for granted and are resistant to change (Greenwood et al. 2008). Such rules impact organizations and actors as *logics* that span organizational fields and are both symbolic and material, defined as "socially constructed, historical patterns of cultural symbols and material practices, including assumptions, values, and beliefs by which individuals and organizations provide meaning to their daily activity, organize time and space, and reproduce their lives and experience" (Thornton and Ocasio 1999, 804; Thornton, Ocasio, and Lounsbury 2012, 2; Greenwood et al. 2008, 101). Rationalizing and legitimizing these logics are ongoing efforts to maintain stability in organizations and functions as a guide to individual behavior to the point that individual preferences and choices need to be understood within the larger historical and material setting the institution provides (Meyer and Rowan 1977;

Powell and DiMaggio 1991; Seo and Creed 2002). Authors distinguish aspects of the performance of a routine where the performance is the specific action by an individual at a specific time and place (Pentland and Feldman 2005). Actors, who, conscious of their actions and the consequences of their actions, change routines that can involve minute aberrations of structural features of organizations. The interplay of institutional logics that determine behavior and the actor's choices and performances has raised the following question and led to the puzzle of embedded agency: *How can actors change their practices and adopt new ways of doing things, if institutions determine their preferences and often structure their cognition?*

The dissertation draws on two fundamental perspectives of neo-institutional theory addressing this puzzle, namely *institutional logics* (Greenwood et al. 2009; Nigam and Ocasio 2010; Thornton and Ocasio 1999; Thornton and Ocasio 2008; Thornton, Ocasio, and Lounsbury 2012) and *institutional entrepreneurship* (Garud, Hardy, and Maguire 2007; Lounsbury and Crumley 2007; Perkmann and Spicer 2007; Battilana, Leca, and Boxenbaum 2009; Leca, Battilana, and Boxenbaum 2008). Study 3 contributes to the capacity of managing threats by explaining why and how firms integrating institutional entrepreneurs in their investment portfolio and transforming their business model accordingly to manage a potential future threat.

2.5 Overview of theoretical backgrounds

The dissertation includes three studies aiming to contribute to the continuous need of firms for new and adaptive strategies to deal with changes in their environment. Drawing on the theoretical framework of dynamic capabilities, I focus on the following main processes: (1) corporate venturing as a form of open innovation that allows firms to sense new opportunities; (2) stakeholder-based learning as a fundamental capability for the success of augmented product innovations that enable firms to seize existing opportunities and manage threats; (3) integrating complementary logics and institutional entrepreneurs, which results in organizational transformation and reorganization, as a key strategic approach to manage threats. The three capacities of the framework are not isolated from each other, but co-exist and complement each other. For example, new opportunities found after a sensing process, such as corporate venturing, could eventually be used to manage threats. Similarly, a firm, in order to identify institutional entrepreneurs and integrate them in an existing innovation model, should explore its environment to sense these opportunities or threats. In summary, the dissertation focuses on one to two of the capacities in each study and offers a comprehensive picture of the dynamic capability framework.

Dynamic capabilities (DC)			
Study	**Sensing**	**Seizing**	**Managing threats/ transforming**
1	Corporate venturing (open innovation)		
2		Stakeholder-based learning (augmented product innovation)	
3			Integrating complementary logics and institutional entrepreneurs (reorganization/organizational transformation)
Contribution to DC framework	Corporate venturing proves to be an important dynamic capability for biopharmaceutical firms to sense new opportunities outside of their boundaries and allows firms to sustain competitive advantage by providing access to leading-edge technologies, new markets and business opportunities.	Pharmaceutical firms launch augmented products in an attempt to maintain and increase market share (seize opportunities): they exloit existing resources in order to better serve patients and other stakeholders. Study 2 shows successful and less successful instances of augmented product innovation, where stakeholder-based learning, as a dynamic capability plays a significant role.	Study 2: Learning to navigate a regulatory environment by successfully augmenting products implies not only an understanding of stakeholder needs but a timely execution of options created as part of the augmented product innovation process. In this way, firms are able to manage threats such as generic entry after patent loss and increasing competition.
			Study 3: Pharmaceutical firms can manage the potential threat of non-pharmacological treatments and preventive interventions (institutional entrepreneurs) by integrating them in their business model. They do this by reorganizing and transforming business units and product offering.

Table 1: Overview of and links between theoretical backgrounds

3 SUMMARIES OF STUDIES

An overview of the three studies of the dissertation is presented in Table 2, in which I summarize the content of the studies, my individual contribution, as well as the publication status and conference appearance of the papers.

Study	1	2	3
Title	**The Changing Face of Corporate Venturing in Biotechnology**	**Augmented product innovation against Alzheimer's disease: the foundational role of stakeloder-based learning**	**When the drugs don't work: hybridization of logics in institutional entrepreneurship**
Co-authors	Georg von Krogh, Boris Battistini, Pius Baschera	Stefan Haefliger, Georg von Krogh	-
Keywords	Corporate venturing, open innovation, biopharmaceutical industry, bioentrepreneurship	Organizational learning, external learning, product innovation, stakeholder theory, pharmaceutical industry	Institutional change, institutional logics, institutional entreprenurship, pharmacological and non-pharmacological treatments
Research question	How is the role of corporate venturing redefined in the biopharmaceutical industry and what should bioentrepreneurs consider about corporate venture capital?	How do firms learn to develop successful augmented products within a context of multiple stakeholders?	How do context and individuals (institutional entrepreneurs) interact to bring about institutional change in a highly regulated and complex context, where multiple actors co-exist?
Context	Biopharmaceutical and biotech industry	Pharmaceutical industry; drug development for Alzheimer's disease (AD)	Organizational field for the treatment of Alzheimer's disease
Data & method(s)	Primary data collection using survey methodology and semi-structured interviews	Primary (semi-structured interviews) and secondary data collection (qualitative & quantitative) using case study methodology and theory building	Primary (semi-structured interviews) and archival data collection using text multiple case study methodology & document analysis; theory building
Key findings	Today's corporate venturing initiatives reflect past learning in this field by and an improved understanding of venture capital dynamics. Six new principles by CVC units. Implications for entrepreneurs in biotechnology.	Theoretical framework of stakeholder-based learning (vicarious, inter-organizational and user-embedded learning). Propositions for successful augmented product innovation.User-embedded learning and timing as critical enabling factors.	Field conditions, shift in institutional logics and actor's behavior as enabling conditions for institutional entrepreneurship and change. Dual role of social position of actors in the process. Complementary institutional logics (hybrids oflogics can co-exist). Institutional entrepreneurship is contingent to hybridization of institutional logics. Firms manage the potential threat of institutional entrepreneurship by integrating it in the existing business model.
Individual contribution	Participated in research design, literature review, data analysis, manuscript writing and revision	Participated in research design, literature review, data collection and analysis, manuscript writing	Research design, literature review, data collection and analysis, manuscript writing
Presentation in conferences	-	31st Strategic Management Society Annual Conference 2011, Miami 27th European Group of Organizational Studies Colloquium 2011, Gothenburg Informs Annual Meeting 2011, Charlotte 72nd Annual Meeting of the Academy of Management 2012, Boston 29th European Group of Organizational Studies Colloquium, Montreal 13th European Academy of Management Annual Conference, Istanbul	32nd Strategic Management Society Annual Conference, Prague
Publication status	Published in Nature Biotechnology **30**, 911–915 (2012)	Submitted to British Journal of Management	To be submitted to Social Science and Medicine

Table 2: Overview of studies

3.1 Study 1

The changing face of corporate venturing in biotechnology
Georg von Krogh, Boris Battistini, Fotini Pachidou, Pius Baschera. *Nature Biotechnology* **30**, 911–915 (2012)

This study is motivated by several important observations. First, the changing phase in which the pharmaceutical industry has lately entered due to several challenges such as R&D decreasing productivity and diminishing returns, the increasing number of blockbusters going off-patent and intensive competitiveness leading to pricing pressure. As a result, drug development is slowly abandoning the traditional linear, closed model and adopting a more open innovation model. Second, we have observed a rise of corporate venturing activities (an aggregate of $3 billion in investment rounds) from large biopharmaceutical corporations in smaller, early stage biotech firms and an increase in the number of corporate venture units in large corporations. This increase has also been accompanied by significantly higher profitability in life science industries compared to other technological sectors.

In pursuing new venture opportunities and leading-edge technologies, biopharmaceutical firms have shifted their focus of interest towards biotech ventures, giving a boost to the strategic essence of corporate venturing. At the same time, the economic downturn has negatively influenced the market for new private venture capital funds, which resulted in their shifting investments away from the risky early-stage financing of biotech startups into later-stage opportunities and existing portfolios. Against this background, this study explores the role of corporate venture activities for early stage innovation in the biopharmaceutical industry, in order to better understand corporate strategic investments in the biotech market.

We isolated an industry sub-sample of ten high-profile venture units at biopharmaceutical corporations (e.g., Roche, Merck Serono, Novartis,

GlaxoSmithKline) from a global study (Corporate Venturing Research Initiative) of leading corporate venture units (n = 48) following a systematic, multiphase research design that includes primary data collection using survey methodology and expert interviews.

The study shows that today's corporate venturing initiatives reflect past learning in this field and an improved understanding of venture capital dynamics. More than two-thirds of the corporate venture units we examined reported remarkable changes. Many of these changes are indicative of the transparency of funding, organizational structure, and the venture capital practices of newly established venturing. Larger and more sophisticated corporate venture units participate more actively in syndicates and deliver greater value to co-investors and entrepreneurs. Moreover, innovative fund concepts are launched to complement well established venturing efforts. Our research revealed the six new principles consistently adopted by the firms in our sample that are redefining today's corporate venturing: strong mandate from top management, horizontal and vertical autonomy, focus and discipline in investment strategy, external legitimacy and active involvement, value-based incentives and systematic use of performance metrics. Finally, we conclude with implications for biotech entrepreneurs to improve their understanding of corporate venture capital and highlight the importance of corporate strategic investments as an alternative financing way.

3.2 Study 2

Augmented product innovation against Alzheimer's disease: The foundational role of stakeholder-based learning

Fotini Pachidou, Stefan Haefliger, Georg von Krogh

(submitted to *British Journal of Management*; under review)

In this study, following recent developments in the field of organizational learning, we explore how external contexts (multiple stakeholders) may be integrated into organizational learning processes. This integration relies on timely activities involving stakeholders in every step of innovation from idea generation to product launch. Based on an extensive empirical study of stakeholders and products in the area of Alzheimer's disease (AD), we develop a theoretical framework of stakeholder-based learning (Figure 1) and the concept of "user-embedded learning" (UeL) as a specific type of external organizational learning.

Firms innovate based on existing products by 1) generating ideas through interaction and learning from stakeholders, 2) holding these ideas as options depending on internal and external conditions, 3) executing the options in a timely manner under conditions of market uncertainty and competition and, finally, 4) generating new ideas or improving the previous ones after evaluating the market performance of the products in a post-execution phase through stakeholder engagement. User-embedded learning complements vicarious and inter-organizational learning in constituting what we term stakeholder-based learning. Members of an organization expose themselves to experiences made by and through various product users (patients, caregivers, physicians). Through user-embedded learning, the firm accesses in-depth, tacit knowledge held by product users (behavior, illness, and treatment effectiveness). We show that although vicarious and inter-organizational

learning play an important role in product development, they are not sufficient for successful product launches.

The study illustrates how stakeholder learning operates in augmented product innovation, a special form of incremental innovation. This type of learning, embedded also in users, enables firms to understand latent customer needs, manage threats, and adapt to changes in their surrounding environment. AD represents a challenging environment for pharmaceutical firms due to a lack of efficient treatment and patent protection loss of all existing drugs. For the past ten years, firms have relied on augmented products that build on the active ingredient of existing medication. The success or failure of these products depends on learning from and with stakeholders, where time plays a critical role.

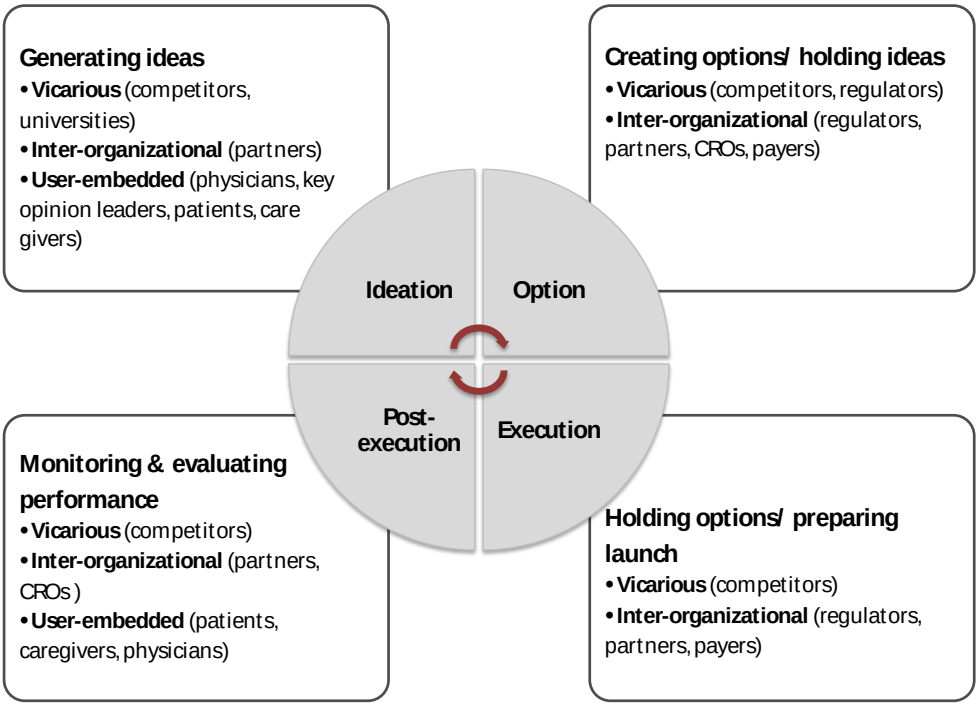

Figure 1: The process of stakeholder-based learning

3.3 Study 3

When the drugs don't work: Hybridization of logics in institutional entrepreneurship
Fotini Pachidou (to be submitted to *Social Science and Medicine*)

The objective of this study is to explore why and how institutional change happens in a highly regulated and complex organizational field, i.e., the field of Alzheimer's disease treatment. Despite the efforts pharmaceutical firms make to improve existing pharmacological treatments by interacting more actively with stakeholders and users (study 2), the treatment of Alzheimer's disease remains a serious burden for all actors involved in this field. As a result, there is an increase in popularity (among physicians, scientists and patients) of non-pharmacological treatments aiming to alleviate several symptoms of the disease, which indicates a change in the perception of treating such severe diseases. Drawing on the theoretical framework of institutional logics, I explain the reasons and evolution of this change. An extensive analysis of archival and primary data leads to identification of four different logics in the studied organizational field (Table 3), as well as to an explanation of why logics shifted over time.

Institutional order (actors) / **Institutional logic**	Market/ corporation (Pharmacies/ pharmaceutical firms)	Profession (Physicians, medical scientists)	Community (AD associations)	State (Regulators)	Other communities (e.g., alternative medicine, other scientists)
'Curing' professionalism		x			
'Caring' professionalism		x			x
'The business of cure'	x	x	x	x	x
'The business of care'		x	x		x

Table 3: Institutional logics in AD treatment at multiple levels

A shift from ‘curing’ to ‘caring’ allowed actors in the field to develop and legitimate advanced non-pharmacological interventions that either compete with or complement existing drug treatments, and can eventually pose threats to the pharmaceutical industry. To enhance our understanding of individuals’ contribution in institutional change, I combine institutional logics framework with institutional entrepreneurship drawing on the comparison of different cases of institutional entrepreneurs in Switzerland. Based on in-depth analysis of semi-structured interviews and archival data using multiple case study methodology, I inductively develop a theoretical framework of institutional entrepreneurship in which enabling conditions and the implementation process of change is presented (Figure 2). The results of the analysis show that hybridization of logics (blending dimensions of different logics; in AD treatment caring professionalism blended with business-like logics) plays a key role in the success of institutional entrepreneurship and ultimately in the occurrence of institutional change. Furthermore, the study shows that several pharmaceutical firms do not remain passive in this change. They take institutional entrepreneurs seriously into account by integrating them in their investment portfolio and transforming their business model accordingly to manage a potential future threat.

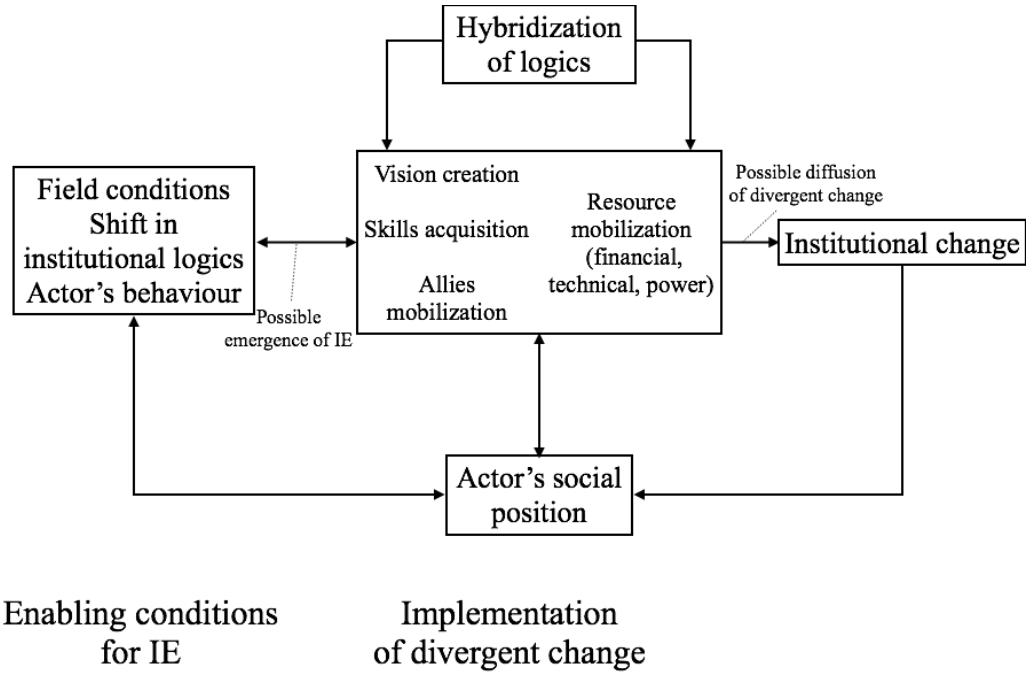

Figure 2: The process of institutional entrepreneurship (though hybridization of institutional logics

4 DISCUSSION AND CONCLUSION

This dissertation contributes an answer to the ceaseless need of firms for strategies to create new opportunities, manage threats or adapt to radical changes. A suitable modus operandi to study and analyze such strategies is the theoretical framework of dynamic capabilities (Teece, 2007). Each study component of the dissertation adds new knowledge to one or more of the three capacities of the framework, i.e., sensing opportunities, seizing opportunities and managing threats.

4.1 Theoretical implications

The contribution of the dissertation to strategy literature is threefold. First, it augments innovation studies in a dual way. Study 1 sheds light on the role of corporate venturing activities of large biopharmaceutical firms in early-stage innovation in biotechnology. The findings of the study provide an explanation to the

observed increase of corporate venturing initiatives from large corporations (Dushnitsky 2011; Battistini, Hacklin, and Baschera 2013) seeking new technology and market opportunities. Corporations perceive and perform venturing activities differently compared to previous years. They act in accordance with new principles that include value-based incentives aligned with internal and external strategic interests. Hence, corporate venturing proves to be an important dynamic capability for firms to sense new opportunities in the surrounding environment with the ultimate purpose of sustaining their competitive advantage. This finding is in line with the beneficial role of open innovation in a firm's innovative performance and profitability (Laursen and Salter 2006; Chiang and Hung 2010). The establishment of more sophisticated venture capital units combines absorptive and innovative capacities, which comprise key knowledge dynamic capacities in open innovation (Lichtenthaler and Lichtenthaler 2009). Accordingly, corporate venturing well suits to the sensing capacity of Teece's framework. In sum, study 1 contributes to the open innovation literature by exhibiting the benefits of corporate venturing for large pharmaceutical companies, as well as for bioentrepreneurs.

Moreover, the dissertation extends product innovation studies by employing a multi-stakeholder perspective (Driessen and Hillebrand 2013; Talke and Hultink 2010) addressing a recent call in research. I do this by studying augmented product innovation, a special form of incremental innovation (study 2). Such augmented features may improve the products ability to satisfy latent, unmet customer needs and, at the same time, sustain or increase firm profitability by extending product life cycles (seizing opportunities and managing threats). Study 2 provides propositions for successful augmented product innovation, where learning from stakeholders plays a decisive role.

This brings us to the second main contribution of the dissertation related to organizational learning literature (Argote 2011; Argote and Miron-Spektor 2011; Antonacopoulou and Chiva 2007) by studying the different external learning activities of firms using the lens of stakeholder theory (Freeman et al. 2010; Freeman 1984). Stakeholder-based learning is defined as a change in the organization's knowledge resulting from stakeholder interaction, constituted by vicarious, inter-organizational and user-embedded learning. Consequently, study 2 extends prior work on external learning (Kessler, Bierly, and Gopalakrishnan 2000; Bierly and Chakrabarti 1996; Bresman 2010) by identifying and untangling the mechanisms of user-embedded learning. The results show that although vicarious (Bandura 1977; Baum, Li, and Usher 2000; Bresman 2010; Bingham and Davis 2012) and inter-organizational learning (Pisano 1994; Powell, Koput, and Smith-Doerr 1996; Lane and Lubatkin 1998; Easterby-Smith, Lyles, and Tsang 2008) have been extensively studied in the existing literature, learning embedded in the users' context has not been treated as a distinct type of external learning. Firms engage with lead users to create and develop new ideas for innovations (Franke, von Hippel, and Schreier 2006; von Hippel 2005). In complex, high regulated and mature contexts, learning from users is essential for firms to understand latent needs and acquire "sticky information" (von Hippel 1994) that enables them to develop successful augmented products. A secondary contribution of study 2 is to the theoretical work on stakeholder dialogues (Payne and Calton 2004; Daboub and Calton 2002; Roloff 2008) in complex contexts by specifying the organizational learning processes involved. Lastly, study 2 contributes to Teece's framework by proposing stakeholder-based learning as a dynamic capability for firms to seize opportunities and manage threats.

The first step before developing new strategies or adapting existing ones to manage threats (i.e., transforming: the third capacity of dynamic capabilities at Teece's framework) is for firms to understand why such a challenge emerged and how they can better manage it. Thus, the third main contribution of the dissertation is to explain why and how change happens in highly regulated and complex fields. Study 3 contributes to the existing literature by tackling the paradox of embedded agency (Garud, Hardy, and Maguire 2007; Powell and DiMaggio 1991; Friedland and Alford 1991), specifically by extending the institutional entrepreneurship perspective as a mechanism of change (Garud, Hardy, and Maguire 2007; Lounsbury and Crumley 2007; Perkmann and Spicer 2007; Battilana, Leca, and Boxenbaum 2009; Leca, Battilana, and Boxenbaum 2008). The findings of the study show that institutional logics are not either dominant or competing, but they can also be complementary (hybrids can co-exist). The study, therefore, supports and extends the position that institutional logics do not have to necessarily conflict or compete with each other to bring about change (Lounsbury 2007; Herremans, Herschovis, and Bertels 2009; Reay and Hinings 2009; Marquis and Lounsbury 2007; Purdy and Gray 2009). Institutional change can occur even if logics are complementary or co-existing (Reay and Hinings 2009; Pache and Santos 2013; Harris and Holt 2013; McDonald et al. 2013), a condition that appears to be vital in cases of highly regulated and complex fields. Institutional entrepreneurs blend logics in order to change existing institutional structures and arrangements (transformational institutional change). Study 3 proposes a theoretical framework, in which institutional entrepreneurship is contingent on hybridization of institutional logics or, in other words, to a blending of apparently competing logics.

4.2 Implications for practice

The dissertation depicts a set of strategies that can be employed by pharmaceutical firms to adapt to and manage change in their environment. Several implications for managers are derived from the study. The pharmaceutical industry is being remodeled, adopting a more open model of innovation. The top management of large corporations has realized the need to look for new technologies and business opportunities outside of firm boundaries. As a result, more effective corporate venture units have been established having a more active and stable role in syndicated venture deals, which often include formerly competitors. Managers are encouraged to participate in such deals not only to benefit from open innovation returns, but also to reduce the investment risk. At the same time, entrepreneurial ventures have access to valuable financial resources and highly specialized market knowledge of the big players in the industry. Study 1 recognizes the lack of understanding and misperception (often reasonable) of biotech entrepreneurs towards corporate venture capital, and offers bioentrepreneurs critical points for consideration when receiving financing from corporate strategic investors.

Moreover, the dissertation emphasizes the role of external learning in innovation. A particular type of stakeholder-based learning, embedded in users, enables firms to understand latent customer needs, meet threats, and adapt to changes. The findings of study 2 suggests to managers that observing competitive behavior and investing in options pays off. Fast execution (launch), once an option has been achieved (drug approval), proves to be beneficial for product market performance, allowing the firm to reap first-mover advantages. One advantage might be lower risks compared to first-mover advantages in phases of exploration, because customers (patients and caregivers) have come to expect the functions performed. In addition,

managers should engage with stakeholders throughout the product lifecycle because there is a very important link between a firm's learning processes and market impact. Many activities, such as communication, direct interaction, sponsorship of scientific studies, and education play a role in successful augmented product launches.

The examination of organizational learning is well suited to the context of augmented products in the pharmaceutical industry, with a focus on the therapeutic area of AD, an area in which, for over a decade, pharmaceutical firms have been struggling to sustain and improve the performance of their existing products. Augmented product innovation appears to be an effective strategy for firms to cope with competitive pressure from generic manufactures, as augmented products prolong patent protection and increase profitability. Additionally, product augmentations satisfy unmet needs for safety and convenience. However, the success of these augmentations is subject to timing and learning from a context of multiple stakeholders, factors that managers have to consider early enough in strategic planning and decision-making.

Study 2 also provides implications for policy makers. Whereas health authorities may focus very closely on the core products, i.e., active ingredients/medications, our study supports the argument that the benefits to patients and caregivers may differ widely across products and their augmented variations. Augmented products that increase safety and convenience may greatly advance the benefits for patients and caregivers. This is an insight that prompts the question of whether health policy should be favorable to augmented products. Today, in the countries studied, there are few attempts to differentiate between the core product, the original substance, and augmented products at the policy level. Policy makers thus must consider information at the patient level when making decisions.

This study shows links between patent expiry and augmented product innovation, two dynamics within the scope of influence for policymakers who may wish to consider jointly the regulation of intellectual property and the regulation of market access under welfare criteria.

Lastly, by studying the process of institutional change (study 3) important practical implications have emerged. Technological progress and the combination of innovative technologies (outside of traditional medicine and drug discovery, e.g., gamification in healthcare) seem to be a key enabling factor of institutional entrepreneurship. Firms and the industry have to take institutional entrepreneurs seriously into account and change/reconfigure their business model accordingly to manage a potential future threat. Most pharmaceutical giants already operate a separate diagnostic unit (often as an independent subsidiary company), but business units incorporating the new technologies are necessary. Some have already emerged in the form of personalized medicine units or tailored therapeutics, e-health and mobile health units at Roche, Novartis, Eli Lilly, Bayer and others or technology firms entering and growing in healthcare (e.g., Philips and GE).

In the case of AD treatment we observe a transformational change, where the market is changing its business model and product offering. Pharmaceutical firms are not only interested in selling drugs, but intend to incorporate in their portfolio non-pharmacological solutions, such as *serious gaming*. Institutional entrepreneurship blends together institutional logics and promotes change. Lastly, policy makers and communities should take into account the shift in logics (from cure to care) and the need to incorporate patient's voices and alternative solutions in their agenda.

4.3 Limitations and future research

The dissertation has some limitations. First, the first study follows a cross-sectional design, providing a snapshot of the studied phenomena and lacking proof of causality that a longitudinal design could offer. I suggest future researchers study corporate venturing investments and activities over time, in order to provide a more comprehensive view of the process and its effects on firm resources and knowledge. Despite the representativeness of our sub-sample, the study focuses only on large corporations operating a corporate venturing unit. Given an increase in corporate venturing investments and syndicated deals also involving smaller players, future studies should include a larger and more diverse sample of companies that could improve our knowledge in (if and) how corporate venturing models differ.

Second, the process model and propositions formulated in the second study need to be tested quantitatively. Further, the number of markets analyzed limits our study in augmented product innovation and stakeholder-based learning. Future research should compare the results across other markets in more countries. Moreover, other industries should be examined to uncover the extent to which stakeholder-based learning unfolds and is being applied along the same process. It will also be critical to measure the timing of these activities and detect differences across industries. Considering the importance of use-embedded learning in the success of augmented product innovations, I suggest future researchers investigate ways to improve this type of learning and make it less costly for firms.

Finally, study 3 uses inductive resign that might limit its findings due to conceptual boundaries and generalizations. Moreover, the primary data were collected in a specific context and a single country, Switzerland, despite observing the same shift in institutional logics as the one observed in global level. The proposed process

model should be empirically tested in more contexts and by employing a deductive research design. There is undoubtedly more space for researchers to further extend and provide a more fine-grained model of institutional entrepreneurship. Future research should focus on how new technologies, like virtual reality, serious gaming, and mobile applications affect the business model of the pharmaceutical industry and how the industry could better integrate them in its model.

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6 APPENDIX

6.1 Study 1: The changing face of corporate venturing in biotech

Georg von Krogh, Boris Battistini, Fotini Pachidou, Pius Baschera

It is matchmaking time for biotech ventures and pharmaceutical firms, and the facilitator is corporate venturing. The pharmaceutical industry currently faces a number of unprecedented challenges: declining productivity of R&D, patent cliffs for many established block-buster drugs, intense competition in generics and biosimilars, and pricing pressure from national governments leading to margins and profitability spiraling downwards. Product development is being remodeled from a closed, sequential, and linear approach, to an open and collaborative model with new research and development partners. Corporate venturing has emerged as one of the most prominent strategies for opening up innovation to external ideas and knowledge. Corporate venturing is the practice of establishing a unit with the mandate to make strategic investments in entrepreneurial ventures. Corporate venturing leverages capital surplus generated through traditional revenue streams to create options for future product pipelines, to enable access to innovative compounds, and to share the costs of risky early-stage development with external partners.

For the industry, corporate venture investing is entering a new era of opportunity, with activities accounting for an aggregate $3 billion of investment rounds and the recent establishment of venture funds at Merck, Boehringer Ingelheim, Baxter (see, for example, *Nat. Biotech*. **27**, 403-404). Only over the last 18 months – from 01/01/2011 to 06/30/2012– data from NVCA/PwC[1] suggests that corporate venture capital funds were involved in the 19.4% of all deals in the biotech sector, with $495 million invested out of the total $6.4 billion. The increased of deal-making

is also signaled by the presence of four corporate venture arms in top 20 of the most active venture capital investors as ranked by number of 2011 financings[2].

Coinciding with perfect timing, biotech ventures in Europe, the United States, China, and India have emerged with critical research performance and promising drug design or business models, but they are starved of fresh capital[3,4]. While biotechnology has been one of the most active areas for venture capital (VC) investments – measured by deals and equity invested[1]– the harsh reality facing biotech entrepreneurs today is a shrinking traditional VC market and growing competition to secure funding.

In spite of consistently above-average returns on biotech ventures[5], a number of traditional VC funds are shifting their investments away from the high-risk, early-stage financing of biotech startups, into later-stage opportunities and existing portfolios. The fewer VC funds that specialize early-stage biotech investments have consequently become increasingly more selective and unable to meet the increased demand for patient capital[2]. These developments make pharma-induced corporate venture funds ever more important. Traditionally less sensitive to fluctuations in financial markets than firms in many other industries (e.g., construction), healthcare and biotechnology firms have emerged as cash-rich investors with an appetite for new ventures deals. However, biotech entrepreneurs have traditionally been skeptical about striking deals with corporate venture units whose decision making has been often been slow and riddled with bureaucratic procedures, and whose goals have been ambiguous, investment objectives unclear, or staying power with new ventures interrupted by sudden changes in top management. Corporate venturing units have often been perceived by biotech entrepreneurs and traditional investors as having a "corporate" rather than a "venture-" mindset[6], reflecting both their typical corporate

incentive schemes and their peripheral participation in deal structuring and the VC communities.

Motivated by the timely supply and demand for corporate venture capital in biotechnology, we conducted a global study/review of leading corporate venture units (n.=48) (*Corporate Venturing Research Initiative* at ETH Zurich in collaboration with Bain & Company), which adopted a systematic, multi-phase research design including primary data collection using survey methodology and expert interviews and an industry sub-sample of ten high-profile venture units at corporations such as Roche, Merck Serono, Novartis, and GlaxoSmithKline (GSK). Based on this study, we found what can best be described as "*the changing face of corporate venturing*": six new principles of corporate venturing that reflect past learning in this field by pharmaceutical firms and an improved understanding of biotech ventures. We also propose criteria for biotech entrepreneurs by which to judge the appropriateness of partnering with a corporate venture fund.

Towards New Principles

More than two-thirds of the established corporate venture units we examined reported substantial changes over the last decade in their structure, strategic scope and human capital. Many of these changes are reflected in the transparency of funding, organization structure, and the VC-like practices of *newly established* venturing initiatives such as the $134 million "evergreen" venture fund of Boehringer Ingelheim launched in 2010 or the $50 million Strategic Investment Group (SIG), Shire's venture capital arm.

Pharmaceutical firms have developed larger and more sophisticated venture units, which today take a more active role in syndicates and deliver greater value to co-investors and entrepreneurs. In fact, we have observed a number of remarkable syndicated venture capital deal including one or more corporate venture arms (**Table 1**). The contribution of corporate venture capital investment to the syndicate is twofold: financial resources and highly specialized market knowledge of the pharmaceutical industry, which can be of decisive importance in an exit environment driven by strategic deals and acquisitions. Indeed, according to a recent report by Burrill & Company[7], which examined all 5,100 rounds of therapeutic venture investments made between 2000 and 2011, companies that received corporate venture funding were found to be more likely to achieve a successful exit –via IPO and M&A– and to enter into licensing or collaboration agreements.

Table 1: Syndicated deals with at least one corporate venture arm among the investors, 2009-2012*					
Company	**Location**	**Date**	**Round**	**Round Size ($m)**	**Venture Investors****
Aileron Therapeutics	US	6/8/09	D	40	**Lilly Ventures**, Excel Medical Ventures, **SR One, Roche Venture Fund**, Apple Tree Partners, **Novartis Venture Funds**
Epizyme	US	12/8/09	B	40	New Enterprise Associates, Bay City Capital, **Amgen Ventures, , Astellas Venture Management,** MPM Capital, Kleiner Perkins Caufield, Byers
Neuro Therapeutics Pharma	US	5/20/10	B	43	Fidelity Biosiences, MPM Capital, **SR One, Pfizer Venture Investments, Novo Ventures**, Thomas McNerney & Partners
Syntaxin	UK	11/11/10	C	29	**Ipsen, GSK, J&J Development Corporation, Lundbeckfond Ventures**, Abingworth, Life Sciences Partners, Seventure Partners, Quest for Growth
Genocea Biosciences	US	2/1/11	B	35	**SR One, J&J Development Corporation,** MP Healthcare Venture Management, Skyline Ventures, Auriga Partners, Cycad Group, Alexandria Real Estate Equities, Lux Capital Management, Polaris Venture Partners, Morningside Ventures
Symphogen	Denmark	6/1/11	undisclosed	131	**Novo Ventures**, PKA, Essex Woodlands Health Ventures
Nimbus Discovery	US	6/28/11	A	24	**SR One, Lilly Ventures**, Atlas Venture, Bill Gates
Atlas Genetics	UK	7/1/11	B	27.6	**Novartis Venture Funds,** Consort Medical, **J&J Development Corporation,** BB Biotech Ventures, Life Sciences Partners, YFM Equity Partners, Braveheart Investment Group, Crescent Seedcorn Fund, Wyvern Asset Management
DVS Sciences	Canada	7/1/11	A	14.6	**Pfizer Venture Investments**, **Roche Venture Fun**d, 5AM Ventures, Mohr Davidow, Ontario Institute for Cancer Research
Creabilis	Luxembourg	10/1/11	B	20	**Abbott Biotech Ventures**, NeoMed, Sofinnova Partners
Imagen Biotech	US	10/1/11	A	40	**Novo Ventures,** SV life Sciences, Fidelity Biosciences
Celladon	US	5/1/12	D	53	Enterprise Partners Venture Capital, GBS Venture Partners, H&Q Healthcare Investors, Hambrecht & Quist Capital Management, **J&J Development Corporation, Lundbeckfond Ventures**, MPM Capital, **Novartis Venture Funds, Pfizer Venture Investments**, Venrock Associates, an undisclosed investor.
Sutro Biopharma	US	5/8/12	C	36.5	Skyline ventures, L**illy Ventures, Amgen Ventures**, SV Life Sciences, Alta Partners
PhaseBio Pharmaceuticals	US	7/31/12	B	23.2	New Enterprise Associates, **Astellas Venture Management, J&J Development Corporation**, Hatteras Venture Partners, Fletcher Spaght Ventures
Auxogyn	US	7/1/12	B	18	**SR One**, Kleiner Perkins Caufield & Byers, TPG Biotech, **Merck Serono Ventures**

*Up to 9/1/12.

The corporate venture arms are indicated by **boldface type.

Source: Global Corporate Venturing (London) and Corporate Venturing Research Initiative (Zurich).

Table 1: Syndicated deals with at least one corporate venture arm among investors, 2009-2012

We have also seen innovative fund concepts launched to complement well-established venturing efforts. Novartis BioVentures Ltd. created an alternative venturing vehicle, the $200 million Option Fund, with the scope to provide seed

capital to highly innovative ventures during their earliest stages. The Option Fund, a limited-scope seed fund that also provides non-dilutive investments in a secondary development project in return for a limited option right, represents a prime example of a new business model in biotech corporate venturing[8]. Lilly Ventures launched the innovative Mirror Portfolio that integrates three independent venture funds for external molecule developments and, thus, allows cost- and profit-sharing deals with a variety of external partners. Corporate venturing is also internationalizing. Earlier this year, Takeda reorganized its corporate research-funding unit Takeda Research Investment into Takeda Ventures with the purpose of expanding its external venture activities outside of Japan and to provide competitive intelligence on emerging technologies.

We agree with several authors that pharmaceutical firms currently face extraordinary opportunities to leverage corporate venturing in remodeling their innovation and investment practices[9]. However, in order to succeed, corporate venturing itself should abandon the traditional corporate mindset and become a partner on an equal footing with biotech ventures and other early-stage investors. Our research revealed the six new principles consistently adopted by the firms in our sample, which are redefining today's corporate venturing.

1. Develop a strong mandate. In the past, pharmaceutical firms tended to change their venture strategy every few years. Corporate venture units were often short-lived and their investment programs lacked credibility. Prior research has shown that the average lifespan of corporate venturing programs is currently approximately four years, with more than 40 per cent active for longer, compared to the average duration of 2.5 years in the previous decade[10]. Dwindling mandates by firms generated antagonistic perceptions among entrepreneurs and in the investor community and

resulted in negative repercussions on performance such as inadequate access to high-quality deal flow. Today, most pharmaceutical firms take a long-term view of equity investments by providing a *strong mandate* to corporate venturing units from the executive team and board of directors. Several corporate venture funds used to report to the firm's Head of R&D, but today the fund reports directly to the CEO. Consistently, in our sample, the majority of the corporate venture units report directly to the executive team (50%) including the CEO, or to the Chief Strategy Officer (20%). A strong mandate and the involvement of senior management ensure faster decisions, consistency of approach, and follow-through on commitments on behalf of the corporate parent towards co-investors and biotech ventures.

2. Focus venturing and secure discipline on the investment strategy

Corporate venture units take a variety of approaches for venture investing, ranging from a largely return-based approach to a more strategic orientation. The approach chosen can be expected to importantly influence the investment objectives in place. We have observed, in our sample, that an increasing number of corporate venturing units, report having *multiple investment objectives*. While financial returns are consistently considered *sine qua non*, three other objectives emerge as important: providing a window on technology/market trends, developing strategic relationships, and accessing breakthrough technology (**Fig. 1**).

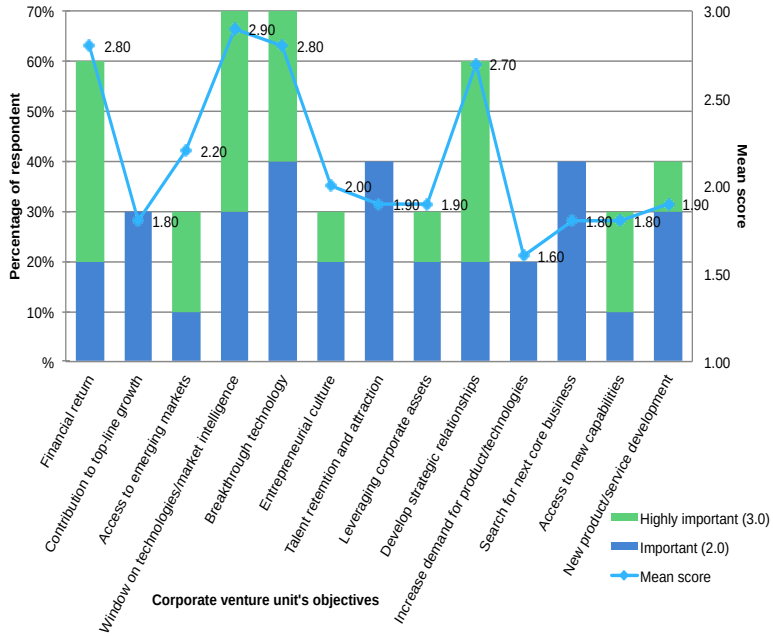
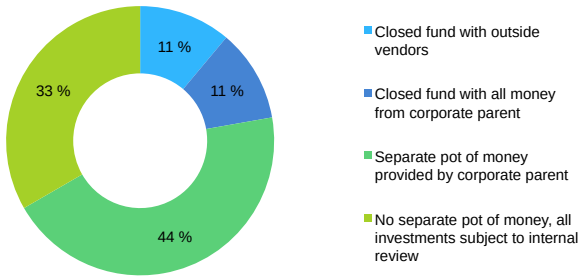


Figure 1: Percentage of importance and frequency (mean score; min=1, max=3.0) of investment objectives

For corporate venture units whose mandate includes to be strategically relevant, creating value for the parent firm, the investment objectives need to follow a disciplined execution approach ensuring effective compliance with investment criteria and to be consistent with the broader innovation agenda[11], e.g., for new therapeutic areas. For example, Merck Serono Ventures, the $60 million fund of the Germany-based pharmaceutical company, has a clear focus on investing in therapeutic areas with a considerable strategic overlap with the corporate parent. To ensure a fit between the firm and its investments, the newly established Boehringer Ingelheim Venture Fund decided to define a clear scope limiting its investments to six target areas, including new generation vaccines and new biological entities. In such cases, the role of the fund is to *complement*, rather than substitute, existing approaches of the firm (e.g., R&D, licensing, and research collaborations). Overall, a focused investment strategy reduces the goal ambiguity that hampered corporate venturing of the past.

3. Ensure autonomy. Successful corporate venturing in our sample relies on *autonomous governance structures*. Our study indicates that pharmaceutical firms are increasingly structuring their venturing effort as a separate fund (**Fig. 2a**).

a



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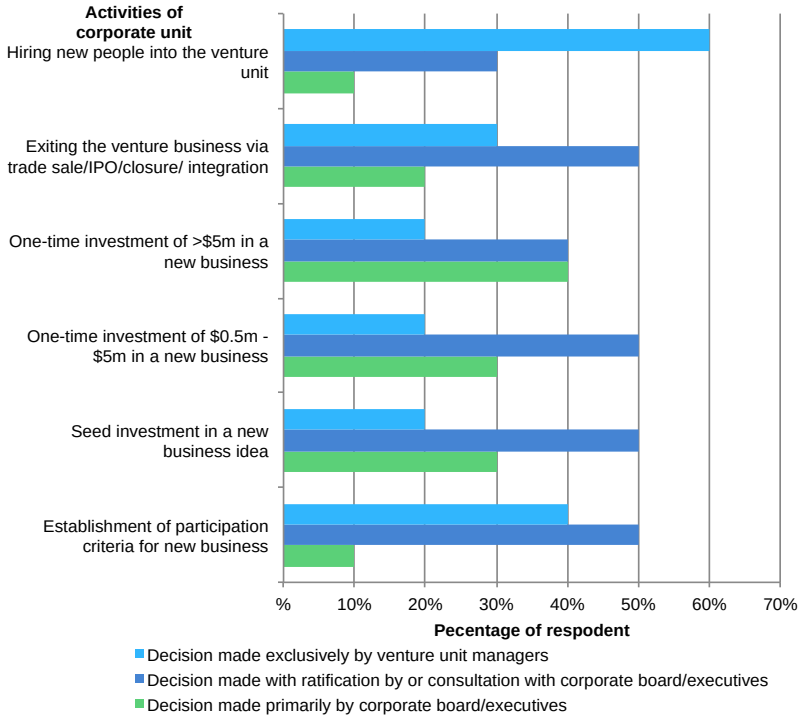


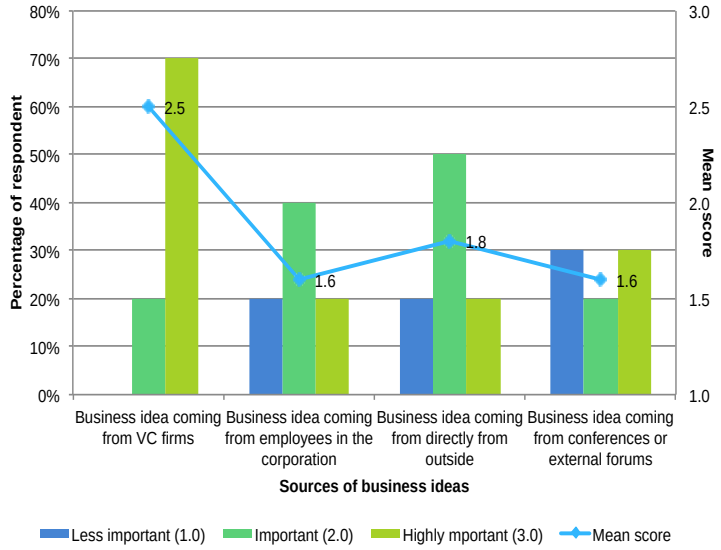
Figure 2: (a) Percentage of respondents (%) of forms of unit financing. (b) Frequency (%) of decision makers regarding the corporate venture unit's activities

Three-quarters of the corporate venture units enjoy financial autonomy with either a separate budget i.e., not subject to internal review (44%) or a closed fund structure (22%). Moreover, the management of the venturing activities and strategic investments show considerable decision-making autonomy (**Fig. 2b**). While most of

the newly established corporate venture units had an autonomous governance structure from the beginning, other firms have reorganized their corporate venturing efforts along the same lines. A prominent example is the 2009 spinout of Lilly Ventures, the venture capital arm of Eli Lilly & Co., founded in 2001. Overall, most venture units today independently decide on strategic investments and portfolio development, limiting internal conflicts of interest and the short-term performance requirements which had troubled corporate venturing of the past.

4. Secure external legitimacy and active involvement. For corporate venture units it is crucial to be embedded in the VC investor community. Building and sustaining relationships with VCs enable such units to identify opportunities. The respondents in our sample considered the community the single most valuable source of high-volume, high-quality deal flow (Fig. 3), much more so, for example, than the firm itself.

a



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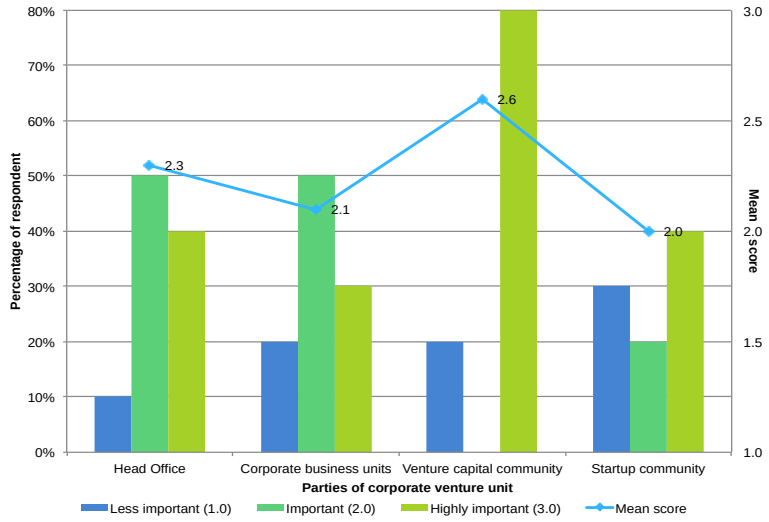

Figure 3: (a) Importance of the relationship with different parties for the corporate venture unit. (b) Importance of sources for obtaining new business ideas/business proposals

However, achieving *external legitimacy* in the VC community has never been an easy task for corporate venture units. Venture capitalists historically regarded such units as unreliable partners and unable to contribute to the effective functioning of syndication networks. The lack of long-term commitment, multiple strategic objectives, slow decision making, often exacerbated by complex corporate processes and substantial differences in the focus on financial returns, were frequently reported reasons why VCs were cautious about syndicating deals with corporate venture units. However, during the past few years, pharmaceutical firms appear to have learned their lessons. Our study shows that corporate venture units have been moving away from a passive investor role with limited involvement to become a sophisticated investment partner capable of participating in larger and more prominent syndication. In fact, 90% of the surveyed firms indicated more than two partners involved for a typical external investment of their venture unit. Often, units even lead or co-lead financing rounds. Today, corporate ventures are involved in the development of their portfolio startups, frequently (up to 60%) taking board seats and proactively leveraging extensive corporate resources to create value for biotech startups and the independent

VCs. For example, SR One publically states that they align with other investors, and do not require specific product rights or options in their investments.

***5. Create value-based incentives*.** Traditionally, professionals in corporate venture units were rewarded with flat-rate salaries, like most corporate management. Despite evidence pointing to the positive effect of performance-related compensation schemes on venturing activities[12], pharmaceutical firms were particularly hesitant to adopt such measures due to cultural and structural barriers. In our study, we found value-based incentives to be a component of the overall compensation package in corporate venturing units. While a flat-rate corporate salary is largely adopted (62%), the use of value-based incentives, especially for senior professionals, applies to 38% of the sample (notably, 32% adopted bonuses based on financial *and* strategic performance). The increased use of performance-related incentives may have a positive effect on interest alignment, external recruitment, and talent retention. More importantly, the new incentive schemes should enable better alignment with interests held more widely by investors in the VC community.

6. Install performance metrics. Our study uncovered a systematic use of multiple *performance metrics*. Most firms (90%) not only adopt a broad range of key performance indicators (KPIs), including metrics for financial and strategic returns (Fig. 4), but they also define performance-management-related target values (70%).

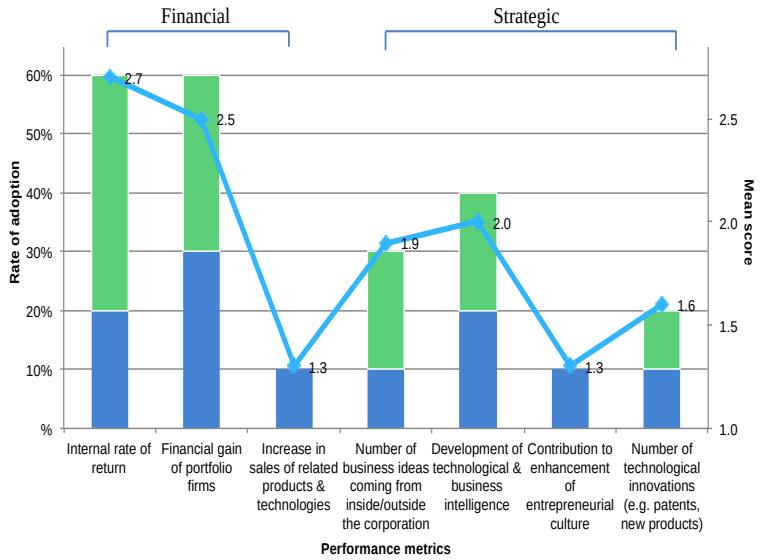

Figure 4: Rate of adoption (%) of performance measures (by type)

The KPIs are particularly important to improve clarity on goals and alignment with the strategic objective of the venturing initiative. For example, the Novo Nordisk Biotech Fund uses a broad set of criteria to evaluate their investments, including the strength of the venture's management team, the IP positions, the quality of the science and technology, and the financial positions. The overall venture unit performance is additionally evaluated on a 2x2 matrix plotting the financial value (e.g., initial investment corporate to fair market value = yield) against strategic value (number of collaborations or impact on corporate business). The use of KPIs serves as an important feedback mechanism to capture (and demonstrate) the value created by the venturing activities, moving beyond the assessment of performance on the basis of traditional measures such as the number of deals screened or made. With a coherent range of effective KPIs in place, today's corporate venture units are better positioned to balance their financial orientation on the internal rate of return and financial gain of portfolio startups with the innovation and growth targets of the parent firm.

To summarize, our study reveals that the corporate venturing practice of pharmaceutical firms towards biotech ventures has substantially evolved during recent

years. The pharmaceutical firms are increasingly implementing the six principles that allow them to overcome the limitations of the past. In the process, these firms are becoming reliable and professional investors, able to partner more equitably with external VCs and biotech ventures. Accordingly, pharmaceutical firms have moved beyond the decision of whether or not to engage in venturing to shape the best governance, models, and practices. The changing face of corporate venturing involves a shift from *if* to *how*.

What biotech entrepreneurs should consider about corporate venturing

At a time where the market for traditional venture financing is dwindling with VC funds refocusing their investments away from early-stage biotech startups, it is particularly opportune for biotech entrepreneurs to consider corporate investors as an alternative route to finance. For many biotech entrepreneurs, however, corporate venturing is the least understood (and appreciated) form of venture capital. While some entrepreneurs appear to be overwhelmingly concerned about potential conflict of interests or IP protection, our study finds that many of the traditional worries are often misplaced. Biotech entrepreneurs should consider four aspects of corporate venturing when considering how to finance their startups.

First, corporate venture funds may provide biotech startups with strategic benefits beyond investment capital. These include the opportunity to access technology, research knowledge and capacity, drug development expertise, marketing competence, and (often) a global presence. Pharmaceutical firms often help facilitate the identification of valuable commercial applications. In essence, biotech entrepreneurs should look for a strategic fit between their technology and research

capabilities and the therapeutic and/or technological areas of the pharmaceutical firm with which they would like to work. For example, while some funds only invest in science–based ventures, other funds such as Lilly Ventures invest in healthcare-enabling technologies and business models such as the innovation consultancy Innocentive. Another advantage is brand recognition of the large firm. The venture's association with a strong brand is likely to signal quality and to increase its visibility, channeling the attention of top-tier investors for subsequent rounds of financing.

Second, corporate venture units are most often part of large established organizations that perhaps are slow and bureaucratic, but also resilient. During the last economic downturn, while the market for traditional VC funding was curtailed, existing corporate venture funds kept their size with several new initiatives being added, highlighting a change in the strategy of pharmaceutical firms compared to previous VC cycles. The evidence on the longevity of the corporate venture programs suggests that, contrary to common perceptions, the reliability and level of engagement of the pharmaceutical firms is, at least, comparable to traditional VC funds.

Third, corporate venturing should not be considered on the basis of the expectation of receiving a valuation significantly higher than the average valuation of independent VCs. This is nothing but a misconception. Rather, biotech entrepreneurs should consider that the backing of a corporate venture unit is more likely to lead to successful exits (acquisitions and IPOs), higher post-money valuation, and longer-term valuation measures[13].

Fourth, biotech entrepreneurs should ask for appropriate firewalls between the evaluation team of the corporate venture unit and the parent company in order to prevent the unsolicited "spill-over" of sensitive information about strategy or technology to the parent firm. Compliance with such practice is also in the interest of

venture units. SR One and Takeda Ventures, for example, maintain a tight firewall policy on confidential items received from portfolio companies or an investment opportunity under review.

Conclusion

At a turning point in the evolution of the pharmaceutical industry, corporate venturing is playing an increasingly important role in financing the development of early-stage innovation in biotechnology. Today's corporate venturing has a new face, - and it is more attractive for biotech ventures and the VC community. Corporations have learned from past mistakes and today play an essential role in the sustainability of the biotech ecosystem, advancing the future of pharmaceutical innovation and biotech entrepreneurship.

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6.2 Study 2: Augmented product innovation against Alzheimer's disease: The foundational role of stakeholder-based learning

Fotini Pachidou, Stefan Haefliger, Georg von Krogh

Abstract

Following recent developments in the field of organizational learning, we explore how external contexts (multiple stakeholders) may be integrated into organizational learning processes. This integration relies on timely activities involving stakeholders in every step of innovation from idea generation to product launch. Based on an extensive empirical study of stakeholders and products in the area of Alzheimer's disease (AD), we develop the concept of "user-embedded learning" (UeL) as a specific type of external organizational learning. UeL complements vicarious and inter-organizational learning in constituting what we term stakeholder-based learning. Members of an organization expose themselves to experiences made by and through various product users (patients, caregivers, physicians). Through this user-embedded learning, the firm accesses in-depth, tacit knowledge held by product users (behavior, illness, and treatment effectiveness). We show that although vicarious and inter-organizational learning play an important role in product development, they are not sufficient for successful product launches. The focus of the current work is on how UeL operates in augmented product innovation, a special form of incremental innovation. AD represents a challenging environment for pharmaceutical firms due to a lack of an established cure and patent protection loss of all existing drugs. For the past ten years, firms have relied on augmented products that build on the active ingredient of existing medication. The success or failure of these products depends on the learning with stakeholders, where time plays a critical role. The present study holds implications for scholarship in organizational learning and stakeholder theory as well as for managers and policy makers.

Introduction

The objective of the current study is to inductively develop a theoretical framework of stakeholder-based learning in augmented product innovation based on the in-depth analysis of rich data and descriptions of stakeholder learning within the Alzheimer Disease segment of the pharmaceutical industry. The creation and application of knowledge is key for a firm to innovate (e.g., Nonaka 1994; Spender 1994; Grant

1996). Firms rely on the intense collection of information about competitors, new technologies, and changes in customer needs and preferences. For example, firms collect information from customers to gauge the benefits these customers derive from newly launched products (McKee 1992). "New product development today is all about learning and integrating the learning into current and future superior customer solutions in a timely manner" (Bstieler and Hemmert 2010, 496). Researchers have identified different types and mechanisms of learning depending on customer needs (known vs. latent) and innovation type (incremental vs. radical) (e.g., McKee 1992; Fiol and Lyles 1985; March 1991; Adams, Day, and Dougherty 1998; Day 1994; Narver, Slater, and MacLachlan 2004; Baker and Sinkula 2007; Bierly and Chakrabarti 1996; Kang, Morris, and Snell 2007; Morgan and Berthon 2008; Yannopoulos, Auh, and Menguc 2012). Incremental innovation satisfies needs already known to firms, such as those of existing customers, who express themselves through customer surveys and other instruments of market research (adaptive or exploitative learning) (Adams, Day, and Dougherty 1998; O'Connor 1998; Baker and Sinkula 2005; Baker and Sinkula 2007). In contrast, radical innovation mostly addresses latent needs, which are unknown to innovators and customers. Some level of direct interaction between firm and customers is necessary to explore needs and adapt to them (explorative or generative learning) (Morgan and Berthon 2008; Bstieler and Hemmert 2010; Yannopoulos, Auh, and Menguc 2012).

We argue that there are cases of incremental product innovation where needs of customers/users are latent and difficult to express and where the hitherto studied learning mechanisms do not suffice for creating new successful products. Product augmentation is a particular form of incremental innovation that adds new features to the product core (Levitt 1981; Levitt 1980; Grönroos 1990; Payne and Holt 2001) to

improve accessibility, handling, compatibility and more. Augmented products have product or service characteristics that surpass the generic features expected by users. The firm must learn and understand the needs and expectations of these customers to identify relevant product elements, knowledge, and resources. Like radical innovation, augmented product innovation may also be exposed to constraints, e.g., regulation, that impacts the organization's decision to launch the product and the product's ultimate success in the market. The complexity of learning in product innovation increases with the number of stakeholders, who appear as new sources of knowledge outside the organization's boundaries. Scholars have been traditionally studying the relationship of learning and incremental innovation by focusing mainly on the market and existing customers: "listening to the market, …addressing existing demand" (O'Connor 1998, 152). The involvement of more stakeholders in new product development than customers alone has been recognized in the literature (e.g., McQuater et al. 1998; Elias, Cavana, and Jackson 2002; Driessen and Hillebrand 2013; Hall and Martin 2005; Talke and Hultink 2010). However, the role of stakeholders when a product already exists but the needs remain latent has so far received no attention. We explore external learning (types and mechanisms) involving multiple stakeholders engaged in each step of product development and launch by investigating successful and unsuccessful cases of augmented product launches in the pharmaceutical industry. We ask how firms learn to develop successful augmented products that satisfy latent customer needs within a context of multiple stakeholders.

We examine this research problem in the pharmaceutical industry. Pharmaceutical firms may fail to develop radical innovations for a number of reasons, including serendipity in research, lack of technological breakthroughs, or, as frequently seen in many therapeutic areas, lack of success in clinical trials. Existing

research on innovation within this industry has tended to focus on product innovation and competition (Roberts 1999; Cockburn, Henderson, and Stern 2000), organizational learning, capabilities, and knowledge (Nerkar and Roberts 2004; Bierly and Chakrabarti 1996; Yeoh and Roth 1999; DeCarolis and Deeds 1999), and development costs (DiMasi, Hansen, and Grabowski 2003; Kola and Landis 2004). With respect to organizational learning, most researchers emphasize internal, experiential learning or learning from research and development alliances (inter-organizational) (Pisano 1994; Powell, Koput, and Smith-Doerr 1996; Lane and Lubatkin 1998; Hess and Rothaermel 2011), whereas learning from other stakeholders (e.g., patients, caregivers, physicians) receives little interest. In addition, despite the significant number of studies on innovation in the pharmaceutical industry, none -to the best of our knowledge- has focused on augmented product innovations. Research on "me-toos" or "follow-up" and "ever-greening" drugs, i.e., product-line extensions, have centered on pricing policies, cost evaluation, patent strategies and IP issues (e.g., Whitehead, Jackson and Kempner 2008; DiMasi and Paquette 2004; Pekarsky 2010; Sherry and Teece 2004). How the industry defends and leverages patents and exclusivity rights has received considerable attention in the strategy and marketing literature, if mostly in studies focusing on intellectual property rights (e.g., Raasch 2009; Siebert and von Graevenitz 2010; Reitzig, Henkel, and Schneider 2010; Ellison and Ellison 2011). If product augmentations are considered an approach to adapt to "steady changes" (Winter and Nelson 1982) in the industry, assuming that firms in general are subject to "bounded rationality," a firm manages this change by learning from experience and innovating routines (Foss 2003; Pavitt 2002). However, the intense regulation of the pharmaceutical industry and the heterogeneity of firms and stakeholders (hospitals, insurers, doctors, patient organizations, patients, etc.) pose

specific challenges to the introduction of new products to the market. Internal knowledge and experience may not be sufficient to address and successfully manage these challenges. Therefore, our study focuses on the knowledge necessary to develop these product augmentations and the learning mechanisms that lead to successful augmented products considering the complexity of the environment.

Identifying the role of learning from multiple stakeholders when developing successful augmented products that satisfy latent customer needs is not only urgently important for scholarship on product innovation but also practically relevant. In the current paper, we offer to managers a view that stakeholders constitute sources of knowledge critical to augmented product development. We also show how successful learning from these sources may unfold. Given the gap in the literature, we employ an inductive research to explore how stakeholder-based learning shapes augmented product innovation. The study pays particular attention to the timing of learning outside of firm boundaries by including stakeholders in all phases of augmented product innovation in the therapeutic area of Alzheimer's Disease (AD).

Theoretical Background

Radical and incremental innovation: The role learning

Innovation and new product development have often served as fields for studying organizational learning (e.g., Bierly and Chakrabarti 1996; Goffin and Koners 2011; Fu, Diez, and Schiller 2013), (Adams, Day, and Dougherty 1998; Attewell 1992; Cohen and Levinthal 1990; Garriga, von Krogh, and Spaeth 2013; Laursen and Salter 2006). Scholars have tended to distinguish between different types and mechanisms of learning, assuming innovation to be either radical or incremental. Different studies

originating from the marketing, cognitive or behavioral theory literatures have made relevant categorizations (see Table 1).

		Innovation		Examples of studies
		Incremental	Radical	
	Innovation practice	Responsive/ customer-led/ exploitation	Proactive/ leading-the-customer/ exploration	
	Learning	single-loop	double-loop	McKee (1992), Fiol and Lyles (1985), Argyris and Schon (1978)
Marketing perspective/market orientation		adaptive	generative	Day (1994), Adams, Day, and Dougherty (1998), Baker and Sinkula (2005, 2007), Slater and Narver (1995, 1998)
Behavioral theory perspective		exploitative	explorative	March, (1991), Bierly and Chakrabarti (1996), Levinthal and March (1993), Atuahene-Gima et al. (2005), Kang et al. (2007)
Combined perspectives				Morgan and Berthon (2008), Yannopoulos et al. (2012)
	Mode	Indirect	Direct	
	Market/customer needs	Known, manifest	Unknown, latent, difficult to express	
	Impact on organization	No change of mental models and current paradigms, no need of interaction, no source of sustainable advantage, short-term effects on performance	Change of norms and technologies, new mental models and paradigms, long term effects on new product performance, source of sustainable advantage	
	Mechanisms	Refinement and deepening of existing knowledge, traditional, conventional activities of learning, like market research, customer surveys	Interactive activities, lead-user relationships, continuous experimenting, selective partnering	

Table 1: Types and characteristics of learning based on innovation type

Despite differences in perspective, all studies conclude that incremental innovations (product modifications, line extensions, etc.) respond to known customer needs (e.g., Day 1994; Adams, Day, and Dougherty 1998; William E. Baker and Sinkula 2007; Slater and Narver 1995; Kang, Morris, and Snell 2007; Levinthal and March 1993; Bierly and Chakrabarti 1996; March 1991; Morgan and Berthon 2008; Yannopoulos, Auh, and Menguc 2012; see Table 1 for more). Known needs are easily expressed by customers and have patently expressed solutions. These needs are constantly monitored and measured by firms, and their satisfaction is a source of competitive advantage (responsive market orientation-adaptive learning) (Narver, Slater, and MacLachlan 2004). Information on customers' expressed needs is captured by methods such as customer surveys, which remove the need for firms to interact directly with them. More interactive engagement (proactive market orientation-generative learning) is key to the success of radical innovations, which

satisfy latent needs (O'Connor 1998; Baker and Sinkula 2005; Narver, Slater, and MacLachlan 2004). Innovators discover latent needs through such unconventional approaches as "video crews and cameras in …households", " …monitor(ing) data on customer complaints, product returns, and warranty claims", "work(ing) closely with lead users" (Narver, Slater, and MacLachlan 2004, 336). However, recent research has shown that this type of interactive engagement is more important for incremental innovations (Fu, Diez, and Schiller 2013).

We believe that this ambiguity rests on a few fundamental assumptions. First, scholars conjecture that incremental innovations satisfy only manifest needs, whereas radical innovations respond to latent, unexpressed needs. Second, firms follow less interactive or indirect mechanisms when they target incremental innovations, whereas radical innovations demand a high intensity of interaction and direct contact with the firms' complex environment. Next, the existing literature focuses mainly on the market (customer, competition), disregarding the impact of other important external actors on innovation. The literature review leads to the question of which learning processes should dominate, absent radical innovation, when customer needs are latent, difficult to express or even sense and unknown not only to the firm but also to a broader set of stakeholders involved in innovation (customers, users, suppliers, regulators and other stakeholders). An innovation considered incremental for the firm might be radical for the user, and vice versa. Do all stakeholders agree on the radicalness of an innovation? By focusing on latent needs, learning, and radical innovation, the literature may perhaps gloss over the cases of incremental product innovation that satisfy latent needs and thus require more direct interaction with an organization's environment. The fact that these needs lie dormant when distant from

the organization's environment may demand less traditional (i.e., more explorative) mechanisms of learning.

Our paper intends to explore empirically the types of learning and their mechanisms in the case of product innovations where customer needs are latent but the changes in the product are incremental. For this reason, we choose to study augmented product innovation (Levitt, 1981; Levitt, 1980; Grönroos, 1990; Payne and Holt, 2001), a concept that adds new features to the product core to improve such functions as accessibility, handling and compatibility. We continue our review of organizational learning based on their sources and mechanisms. Being interested in latent customer needs, we focus on external learning.

Learning from external sources

In external learning, firms seek outside their boundaries new knowledge and novel ideas. This learning involves the acquisition, processing, and integration of knowledge from other organizations and positively impacts the focal firm's innovativeness (Powell, Koput, and Smith-Doerr 1996; Laursen and Salter 2006; Garriga, von Krogh, and Spaeth 2013). Kessler et al. (2000) identified three sources of external learning in product development: customers, competitors and other organizations. Organizations may learn indirectly - vicariously - from the experience of any of these sources or by directly transferring knowledge from them (Kessler, Bierly, and Gopalakrishnan 2000). Lane and Lubatkin (1998) explain three ways for learning external knowledge: passively (reading books, journals, attending seminars and receiving consultancy), actively (bench-marking, competitor intelligence) and interactively. The first two provide explicit knowledge, whereas an interactive mode of learning provides access to rare and complex (tacit) knowledge: 'the how and

why.' Scholars have identified two basic types of external learning depending on the mode (direct or indirect/passive, active or interactive) and the source of learning: vicarious and inter-organizational. A short review of selected definitions and related mechanisms are presented in Table 2.

External learning	Definitions	Mechanisms
Vicarious	Learning by observing others without direct contact (Bandura, 1977)	Gathering information about key advisors, observing the work of others to extract lessons, discussing with external people to learn about best practices or failures in similar tasks (Bresman, 2010). Replicating a competitors behavior, ceasing behavior after observing other firms failure after pursuing that behavior and enganging in the same actions as competitors but in a different way (Bingham and Davis, 2012)
	'Vicarious learning…occurs through vicarious or symbolic processes as opposed to direct experience: An observer learns from the behavior and consequences experienced by a model rather than from outcomes stemming from his or her own performance attempts" (Gioia and Manz, 1985)	
	Learning by imitating others' actions to various degrees (Baum, 2000)	
	Learning from others with prior or concurrent similar experiences about key aspects of a task (Bresman, 2010)	
	Occuring when firms alter their behavior in response to the behavior of other firms (Srinivasan et al., 2007)	
Inter-organizational	Knowledge transfer between (at least) two organizations (Dyer and Nobeoka (2000), Dyer and Hatch (2004), Easterby-Smith, Lyles and Tsang (2008), Hardy, Phillips and Lawrence (2003))	Strategic alliances, joint ventures, VCS, collabotarive R&D processes, training, planned socializing activities, transferring experienced personnel, providing documents, blueprints or hardware, both formal and informal interactions between individuals and groups of the organizations (Oliver (2001), Powell et al. (1996), Hess and Rothaermel (2011), Easterby-Smith et al. (2008) and others)
	Learning through face-to-face interaction between allies and partners, to whom knowledge is embedded (Lane and Lubatkin, 1998)	

Table 2: Type and mechanisms of external learning

Vicarious learning is learning by observing others without direct contact (Bandura 1977) and employs passive methods of observation and inference to create new knowledge. Because vicarious learning occurs only indirectly, it would be more apt to exploitative strategies or incremental innovations based on the findings of existing studies (see Table 1). However, a recent study by Bingham and Davis 2012 relates vicarious learning to exploration, which reveals a need for further investigation. In contrast, *inter-organizational learning* occurs when knowledge is transferred between (at least) two organizations (Easterby-Smith, Lyles, and Tsang 2008; Dyer and Nobeoka 2000). This type of learning is vital in early stages of innovation (exploration), when firms tend to be more open to new ideas and knowledge (Oliver 2001). Whereas several studies explain in depth learning from

competitors, other organizations and networks, there is less said about the exact types and mechanisms of learning from multiple stakeholders, particularly when their needs are latent and the traditional indirect or passive mechanisms, proposed by scholars so far, may fail to produce lessons for innovation.

Customers, consumers and users represent invaluable sources of knowledge (e.g., Chesbrough 2007; von Hippel 2005; Laursen and Salter 2006)[6]. Traditionally, the literature has seen these groups to be a source of knowledge necessary to develop successful marketing strategies and increase profitability. Foss, Laursen and Pedersen (2011) studied the new organizational practices necessary to "positively influence the sourcing of knowledge from external parties, such as users and customers, and its subsequent exploitation for innovation" (Foss, Laursen, and Pedersen 2010, 995). Whereas the paper remains silent on the details of the interaction between the firm, users, consumers and customers, the authors call for further investigation of organizations' (formal and informal) responses to multiple sources of external knowledge (a wider range of stakeholders).

Notwithstanding the body of research on external learning (vicarious, inter-organizational) and learning from the market (adaptive or exploitative, generative or explorative), no work to date has examined cases of product innovation where, due to the inability to generate breakthrough innovations, firms invest resources in augmented product innovation relying on learning from stakeholders. It is meaningful to ask how organizations learn from different stakeholders and consequently untangle the relevant mechanisms of learning. Moreover, we ask the following: what is the impact of lessons learned for decision-making about augmented product launches?

[6] In contrast, marketing studies often concern what consumers learn from specific marketing functions such as advertising, promotion and branding (e.g., Hoch and Ha 1986; Villas-Boas 2004; Van Osselaer and Alba 2000), which they call consumer learning.

Before doing so, we briefly review stakeholder theory as it relates to innovation and organizational learning issues.

Stakeholder theory

Stakeholder theory drew attention among researchers and theorists in 1984 after the publishing of Freeman's influential book, *Strategic management: a Stakeholder approach*. Freeman defined stakeholders as "any group and individual who can affect or is affected by the achievement of the organization's objectives" (Freeman 1984, 46). How an organization is related to its stakeholders and how this relationship is better managed comprise key questions in stakeholder theory and touch on issues concerning ethics, social corporate responsibility, sustainability, ethics of capitalism, etc. (Freeman et al. 2010). Scholars have studied the relationship between a firm and its stakeholders from different perspectives. From a descriptive view, stakeholder theory is used to describe and explain the nature and activities of firms (Donaldson and Preston 1995). In the normative view, managers are morally obliged to their stakeholders, and stakeholders have a legitimate say in managers' activities and decisions. In this view, the ethical dimension of the firm-stakeholders relationship is salient (e.g., Donaldson and Preston 1995; Mitchell, Agle, and Wood 1997). An instrumental view refers simply to firms dealing with stakeholders' interests that have an impact on the firms' activities and objectives (e.g., Jones 1995) (for an extensive review and debate on stakeholder theory see Agle et al. 2008).

Stakeholder theory has been various business disciplines and management subjects such as strategic management, finance, accounting, marketing, human resources and operation research (Freeman et al. 2010). A basic argument is that firms can and must learn from their external stakeholders. The establishment of strategic direction, scenario planning, and creating strategic alternatives in firm decision-making is relevant to strategic management, where collective learning and learning from stakeholders are crucial. Current research has shifted its focus from how to manage

stakeholders to how stakeholders influence strategies and decision-making (Murillo-Luna, Garcés-Ayerbe, and Rivera-Torres 2008; Sharma and Henriques 2005; Rodgers and Gago 2004).

With the exception of a considerable body of marketing studies (e.g., Polonsky 1996; Payne, Ballantyne, and Christopher 2005; Polonsky, Schuppisser, and Beldona 2002; Grinstein and Goldman 2011; Podnar and Jancic 2006; Murphy et al. 2005) and very few studies on product and process development (McQuater et al. 1998; Elias, Cavana, and Jackson 2002; Driessen and Hillebrand 2013; Hall and Martin 2005; Talke and Hultink 2010), researchers have shown little interest in learning from stakeholders to understand latent needs and difficult-to-express demands. Talke and Hultink (2010), for example, highlighted the need to manage efficiently diffusion barriers related to multiple stakeholders for firms to achieve successful product launches. The authors found that this need is amplified in highly uncertain and ambiguous contexts and defined communication with each group of stakeholder as a key activity for the careful management of diffusion barriers. We believe that what organizations learn through these communication activities and how exactly these activities happen deserve further investigation.

Roloff studied different stakeholder dialogues and found that when firms belong to complex and challenging stakeholder groups, they follow an issue-focused type of stakeholder management. This issue (e.g., how to solve a shared problem such as the treatment of a disease) affects their relationships with societal groups and organizations. Organization-focused dialogues between a firm and its stakeholders may attend to more strategic and long-term objectives and consider welfare criteria for both the focal organization and the stakeholders (Roloff 2008, 245). However, the learning processes emerging in the context of stakeholders have not been the topic of further study. Correspondingly, there is only a vague understanding of how firm-

stakeholder dialogue may become the basis for solving an issue or even leading to positive long-term outcomes of strategic action.

Similarly, Daboub and Calton (2002) have proposed that dialogue emerging between firm and stakeholder enables "the disaggregation of ethical responsibility in business", leading the firm to manage ethical dilemmas in "messy, contested, pluralist problem domains". "Joint learning" is a characteristic of multi-stakeholder dialogues essential to confronting ethical issues, as "different perspectives on the shared problem as well as preconceptions about relationships between "selves" and "others" are tested and recast" (Daboub and Calton 2002, 96). Their paper, however, remains silent on organizational learning involved in the process. After identifying the gap of in-depth empirical studies in issues where stakeholder learning is salient, we intend to disentangle the learning processes and mechanisms among multiple stakeholders to solve an issue shared between an organization and its stakeholder context. Among the numerous questions about dialogic process, Payne and Calton (2004) raise the issue of when dialogues between firm and stakeholders are effective and what are the learning outcomes for those involved (Payne and Calton 2004). For this reason, we intend not only to disentangle the associated learning mechanisms but also to link them to performance as perceived by stakeholders themselves, as well as the actual performance in the market.

Study Design

Industry background

The pharmaceutical industry is relatively mature and one of the most complex and highly regulated industries; as a result, a medicine requires 8 to 12 years, on average, to reach the market after the discovery of its active ingredient. Extensions and reformulations of existing drugs refer to pharmaceutical products consisting of the same active ingredient but launched in a new strength, dosage form or route of administration. In this case, the core product remains the same, whereas its augmented product characteristics change. In this context, the examination of augmented product innovations from a strategic perspective appears worthwhile for further research. Pharmaceutical firms pursue augmentations of their products for life-cycle management, i.e., extending patents to fight the consequences of the so-called patent cliff, managing changes in the firms' environment, such as shifts in demand or higher competition, and satisfying unmet needs due to low drug efficiency, low compliance and side effects. Our paper studies how pharmaceutical firms learn from their stakeholders by studying unique cases of successful and unsuccessful augmentations of pharmaceutical products for treating symptoms of Alzheimer's Disease (AD).

Research context and data

Alzheimer's is a fatal disease of the brain and the sixth leading cause of death worldwide (Alzheimer's Association).[7] It affects two percent of the global population and over five million people in the United States alone. In the AD segment of the pharmaceutical industry, firms sustain and grow their business despite the fact that there have been no successful discoveries of new drugs for over ten years. Therefore, although AD has attracted significant investments from major pharmaceutical firms

[7] http://www.alz.org/alzheimers_disease_facts_and_figures.asp#key (accessed 24 February, 2014).

(e.g., Eli Lilly, Pfizer, J&J), it has also been a meager environment for innovation, with most promising new drug candidates failing phase III of clinical trials (*The Lancet,* 2010; Mangialasche *et al*. 2010). The lack of a proven cure and the high complexity of patient requirements in old age create major challenges and pressure from stakeholders on the pharmaceutical firm. Firms must consider the needs of not only patients, who often have difficulties expressing them (latent needs), but also these patients' caregivers (family members, nurses) and physicians who must administer the drug and supervise the treatment. In addition, several firms have had to confront the expiration of patents, which tends to be followed by a sharp decline in drug-related revenues due to the arrival of generic alternatives on the market.

We examine detailed empirical data on activities around the development of augmented symptomatic drugs for AD, which allows us to relate firm activities of product augmentations and stakeholder-based learning to performance in the product market. The products comprise augmented features of mature drugs that have been on the market for at least ten years, in different forms. We examine approved drugs for AD in countries on three continents (U.S. for North America, Switzerland for Europe and Japan for Asia). We selected AD because of its sizeable market, the lack of discovery of new active ingredients, necessary and complex stakeholder involvement, broad relevance to patient latent needs and their caregivers, and emerging threats in terms of patent expiry and competitive pressure. To remain competitive in the market, firms have also developed several augmented AD drugs, providing an ideal empirical context for studying learning in a complex context of stakeholders. Our sample consists of the relevant pharmaceutical firms (see Box 1) and the complete set of existing approved medications for AD in three countries: the United States, Japan, and Switzerland.

Eisai/Pfizer and Aricept. Developed by Eisai in Japan and co-marketed with Pfizer in 1997, Aricept was the first AChEI of its generation and the most prescribed AD drug worldwide. Available in film-coated tablets (FCT) and orodispersible tablets (ODT) in 5mg and 10mg doses, it is administered once a day with or without food. Aricept ODT (the United States) or Aricept Evess (Switzerland, UK, and other European countries) comprise a solid unit dosage form, which disintegrates in saliva in the mouth within a minute. In August 2010 a higher dose of Aricept (23mg) was approved for severe stages of AD and launched in USA. Moreover, Eisai developed and marketed two further oral formulations for Japan only—fine granules and a jelly form with a honey-lemon flavor. The patent on the active ingredient, donepezil, expired at the end of 2010.

Merz/Lundbeck/Forest Labs and Memantine. Memantine was developed by Merz Pharmaceuticals (brand name Axura) in Germany in 1982. Since 2004, the product has been co-marketed by Lundbeck (Ebixa) in Europe and Forest Laboratories (Namenda) in USA for the treatment of moderate to severe AD. Memantine is available as tablets (FCT) and oral drops. Its starting dose is a once-daily 5 mg, which is then increased in steps of 5mg at weekly intervals to a maximum of 20mg daily. Although memantine is an old drug, Merz managed to obtain patent protection for an additional medical use (Supplementary Protection Certificate) until 2014. The rationale is that memantine was not previously indicated for AD. (Due to the multiple brand names for memantine, for this product the active ingredient's name will be used to avoid confusion.)

Johnson& Johnson and Reminyl. Co-developed by Shire Pharmaceuticals and the Janssen Research Foundation and marketed globally since 2000 by the J&J group, Reminyl is the third AChEI—originally extracted from of snowdrop and narcissus bulbs. Reminyl (Razadyne in US) was first launched in simple tablet form (FCT) and oral liquid solution for twice-daily dosing. In 2006 extended-release capsules (ER-caps) of Reminyl were launched in the American and European markets. These capsules enabled once-daily administration of 8mg, 16mg, or 24mg galantamine. By the end of 2008, several generics of galantamine had appeared on USA market. The drug is still protected in Switzerland until 2015.

Novartis and Exelon. Produced and marketed globally since 1997 by Novartis, Exelon is a dual acetylcholinesterase and butyrylcholinesterase inhibitor available in three different forms—capsules, oral solution, and transdermal patches. Capsules (caps) and solutions are administered twice per day. In liquid form, the patient or the caregiver uses a syringe provided with the medication to measure the prescribed dose, which can be directly swallowed or mixed with water or other liquid. The patch is applied daily to the upper back, chest, or upper arm and releases either 4.6 mg or 9.5 mg of rivastigmine through the skin over 24 hours. The patent on rivastigmine expired in 2010.

Box 1: Firm and product description

Data collection

We collected data from different stakeholders involved in AD, focusing particularly on the pharmaceutical firms and their activities of product augmentations. To facilitate data presentation, we use codes for products, which indicate the firm and the number of product augmentation launched in chronological order. For example, Eisai/Pfizer_0 refers to the first simple tablet that Eisai launched in Japan and the US, and Pfizer in Europe. Eisai/Pfizer_2 refers to the fast-dissolving tablet, Eisai_2 refers to the granules produced in Japan, and so on. Accordingly, Novartis_0 is the first simple capsule launched, whereas Novartis_1 and Novartis_2 refer to the liquid formulation and the patch, respectively. For a detailed description see Table A1 in appendix.

Data gathering encompassed five activities. As our goal was to examine learning involving stakeholders engaged in the steps of product development, the study adopted a broad approach to data gathering that reduced the risk of omitting important details. First, one of the authors visited Japan and interviewed two key managers involved in the development of Aricept. The findings from these interviews supported the initial decision to sample products and firms in the AD segment to examine the research question. The initial set of questions also served as a basis for subsequent interviews. Second, desk research provided detailed data on the disease and the products, firms, and various stakeholders involved in the market. The main data sources on regulators were FDA, EMA, and Swissmedic[8] publications on product characteristics, letters and reports. Similarly, we collected and studied reports and scientific articles published by the American and Swiss Alzheimer's Associations, the Alzheimer Forum in Switzerland, and relevant press releases by the pharmaceutical firms. All these documents, together with articles published in business and financial journals, amount to over 2000 pages. Moreover, we collected and studied all the documentation about clinical trials (approximately 450) attached to the products in our sample.[9] On 16 November, 2010, one author participated in an event organized by the Swiss Alzheimer Association to educate and train caregivers and family members of AD patients. Presentations by neurologists, physicians treating AD patients, policy makers, and family members provided an understanding of the disease from the patients' and caregivers' perspectives.

Third, IMS Health Switzerland supplied empirical data on sales figures in the three countries that served to track firms' performance in product markets. These data

[8] American, European and Swiss drug authorization agencies.
[9] The registry called clinicaltrials.org is a 'results database of federally and privately supported clinical trials conducted in the United States and around the world.' See URL: www.clinicaltrials.gov (accessed February 24, 2014).

were gathered on all available products and their characteristics in terms of marketer (seller), core product (active ingredient), and form (product presentation). The data cover 14 products marketed by 13 different pharmaceutical firms[10] in 40 quarterly periods or 10 years (QRT/9/2000–QRT/6/2010). All products are marketed in various strengths and packages, which altogether constitute 188 final products in the three countries.

Fourth, we conducted semi-structured interviews with managers across hierarchical levels at Novartis and Pfizer in Switzerland to gain additional information on the firms, products, and markets and communication with stakeholders. The questions were adapted to the interviewee's background and position in the company. J&J and Merz did not respond to our request for interviews, and Lundbeck answered to our questions in written form. Finally, to limit any bias emerging from an emphasis on the firms' perspective, we enriched our data with a second round of interviews with "highly knowledgeable informants who view the focal phenomena from diverse perspectives" (Eisenhardt and Graebner, 2007, 28), i.e., physicians, pharmacists, patient organization representatives and managers of pharmaceutical companies not active in Alzheimer's market.

Desk research, pilot interviews in Japan, and the analysis of the sales data provided input to the development of the questionnaires for managers and stakeholders (physicians, university professors, patient organization —see in the Appendix) in these two interview rounds. Senior physicians and directors of memory clinics in Switzerland provided information relevant to the most important stakeholder groups and interests. We identified most of the interviewees at the sixth

[10] More firms are involved, in the development and marketing of Reminyl in UK and Ireland, such as Shire Pharmaceuticals, but we focus on the firms of our sample. Moreover, Reminyl is marketed as Razadyne in US, but we use only Reminyl as brand name for the sake of succinctness.

Symposium for Dementia and Neurodegeneration that occurred at the University Hospital, Zurich, on March 17, 2011. We asked the interviewees for their background and details on how their institution/clinic/hospital treats AD patients. We focused on treatment practices, preferences for existing drugs, and experiences related to patient and caregiver needs. The final part of the interview concerned the interaction and communication of the caregivers with the pharmaceutical industry and other stakeholders (insurance companies, national authorities, policy makers). Sources and types of data are summarized in Table 3.

Stakeholders	Examples	Data
Pharmaceutical firms	Eisai, Pfizer, Novartis, J&J, Merz, Forest Labs, generic manufacturers	Interviews, product sales in USA, Switzerland, Japan, archival data, clinical trial records, press releases and other secondary data
Regulators	FDA, Swissmedic, NICE	Archival data on product approval history, letters, guidelines
Physicians	University professors in neuroscience, geriatricians and physicians in university hospitals and memory clinics	Interviews, conference participation
Patients, caregivers	Patients, family members, nursing staff	Secondary data
Patient organizations	AD patient organization in Switzerland	Interview, reports, other secondary data

Table 3: Sources and type of data

Data analysis

The objective of the study is to inductively develop a theoretical framework of stakeholder-based learning in augmented product innovation. In this we draw on a grounded-theory approach (Glaser and Strauss, 1967; Strauss and Corbin, 1998; Gioia et al., 2012). We first constructed a case database (Yin, 2003) that allowed us to theorize based on multiple types of data. In moving from data to construct, we did open coding, which enabled the discovery of new constructs and their connections

over time pertaining to stakeholder-based learning (Corbin and Strauss, 1990, 60). First, we considered possible learning activities in drug development after studying relevant received literature and in combination with interviewees' responses (Eisenhardt 1989). We categorized these activities according to external learning literature and the source of learning, i.e., the type of external learning and stakeholder[11].

A prescreening of the data led us to identify a sequence of activities over time that constitutes drug augmentation. By using this collection of codes (i.e., ideation, option, execution, post-execution), we disentangled stakeholder-based learning and its relevant activities in individual cases. We also developed codes corresponding to "successful" and "less successful" unique cases or codes indicating positive or negative feedback on firms' activities from different stakeholders[12]. In this way, we could track the learning mechanisms of the firms in a context of multiple stakeholders, record the type of learning occurred, and ultimately observe the performance of learning from two different sources: stakeholders' perception of the augmented products and product sales.

The interviewees' frequent references to patient compliance issues (effectiveness, safety, convenience[13]) indicated that the augmentation process depends

[11] For example, in the case of vicarious learning from a competitor, we coded the relevant activity with the codes VL-COM. Or in the case of inter-organizational learning from an external partner, we coded the activity with IOL-SA (strategic alliance).

[12] First, we counted the positive and negative statements for all products in our analysis. If the addition was negative—i.e., more negative statements than positive or only negative statements—then the score for this product was 0, for example, *convenience for patient* for the Novartis_0 product according to our interviewers. In the case of a positive final number of statements, we made a scale between the minimum and the maximum number, divided by 3 and correlated the first segment with +, the second with ++ and the third with +++. For example, the Novartis_2 case received 19 final statements, which was the maximum number in the scale, which led this product to receive +++ in convenience.

[13] These three categories are also used by institutions, such as the National Institute for Health and Clinical Excellence (NICE) in the UK, which are responsible for evaluating pharmaceutical treatments and make recommendations according to drug cost-effectiveness and patient quality of life.

strongly on learning between the firm and its stakeholders. Relevant literature (e.g., healthcare institutional reports, clinical studies records) supported our coding and enriched the findings on this point. Overall, interviews were coded with Roman numerals, which are used throughout the presentation of results to link the emerging theory with the empirical evidence. All recorded interviews were transcribed, with two exceptions where recording was not allowed and only notes were taken. We used the software tool MAXQDA for text analysis to code the transcribed interviews. To enhance construct validity (Miles and Huberman, 1994), the data analysis followed five steps, as summarized in Box 2.

1. Tracking of associations between interviewees' statements and relevant codes that were first developed from pilot interviews and then revealed converging statements across interviews.
2. Comparison of coding data between key interviewees. For example, in the case of Novartis we compared statements by managers, product managers, and scientists (professor in pharmacology, pharmacist).
3. Triangulation of the findings with own observations of stakeholder-related information, and secondary data including informal discussions with caregivers and physicians at professional community events, Internet-based information, newspaper articles, Bloomberg data and press releases. Triangulation also covered interviews with other industry experts independent of the AD market and our sample's firms.
4. Within-case analysis of detailed write-ups generating unique case-related information (e.g. Novartis case, Eisai/Pfizer case). Within-case analysis of data allowed better management of the large volume of the data (firm and product characteristics, sales data, coding data, clinical studies) (Pettigrew, 1990; Eisenhardt, 1989).
5. Cross-case pattern search by developing and comparing constructs across the results from the within-case analysis. First, we listed the learning activities and linked them with type and source of learning. Then, we performed a scoring process for each product according to the three main categories from the coding of the data that prevailed in interviews (effectiveness, safety, convenience). Finally, this score was compared with the product market performance of the drugs to draw conclusions for the success or failure of the augmented products and identify patterns within the companies' activities.

Box 2: Data analysis

Results

Stakeholder-based learning in augmented product innovation

The study first revealed that stakeholder learning is captured as a change in the organization's knowledge as a result of stakeholder interaction. We identified three types of stakeholder learning based on the source and modality:

- *Vicarious learning* is learning by observing the behavior of stakeholders (e.g., competitors, research institutions) with no direct contact (corresponds to Bandura's definition).
- *Inter-organizational learning* occurs when a firm acquires new knowledge (directly or indirectly) through formal collaboration with another organization that belongs to the focal organization's context of stakeholders.
- *User-embedded learning* is learning from direct (e.g., patients) or indirect (e.g., caregivers, physicians) users by direct contact and interaction with them to acquire new tacit knowledge necessary to satisfy latent needs.

Before elaborating further on user-embedded learning as it emerged from our data, we present and explain in detail the process of augmented innovation in pharmaceutical industry by providing examples of learning mechanisms from different stakeholders.

Augmented product innovation process

We found a series of activities involving different types of external learning by engaging different stakeholders. Augmented product innovation may be described as a circular process with four phases (see Figure 1): ideation (generating ideas), option (achieving options), execution (executing an option) and post-execution (monitoring and evaluating the performance of the products in the market). Figure 1 outlines the types of stakeholder-based learning we found to occur in each phase and includes a few examples of stakeholders for each type. Ideation activities include R&D, marketing and other functions within the firm, which hold necessary knowledge on

existing markets, the active ingredient, formulations, distributions, etc. Ideation is mainly learning from one's own experience. Meanwhile, a firm receives and evaluates information that crosses its boundary. This first phase ends when a firm has established certainty of a "developable" augmented product in the form of first clinical confirmatory results. Management files the drug for approval, which marks the end of ideation (corresponds to the application date to a regulatory body, e.g., FDA or Swissmedic). When the regulator grants a license to the augmented product, the idea (development phase) becomes an option for the firm to pursue the further development of the augmented product toward the market. Therefore, the date of achieving the option is the approval date. When management decides to launch the product on the market, the option is executed (first day of launch). After the execution, the firms and the regulators observe the performance of the product in the market, each from different vantage points (sales, drug efficiency, cost-efficiency). Depending on the outcome of these observations, firms might initiate new learning activities to improve products' overall performance. Doing so would lead to a new ideation phase.

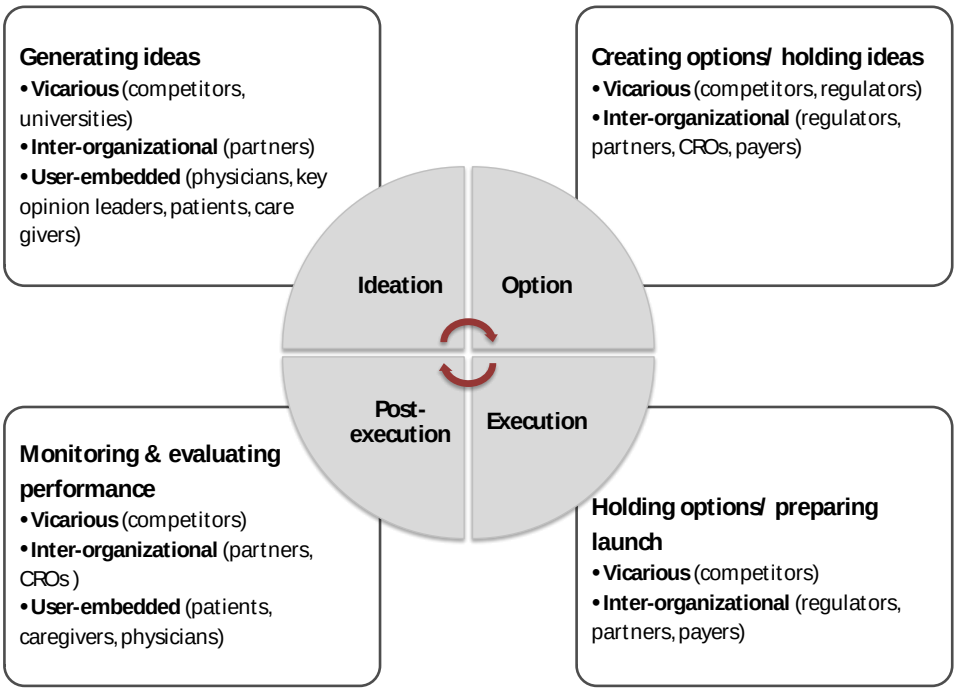

Figure 1: The process of stakeholder-based learning

A successful example of product augmentation at Novartis, the patch, coded as Novartis_2, may help to illustrate the process of stakeholder-based learning. Building on the same core product, the firm was required to deal with several issues threatening its share in the AD market. Novartis was not as fast as Eisai/Pfizer (Aricept) in launching its product Exelon. While the drug entered the Swiss market a few months later than Aricept, it took Novartis three years to bring Exelon to the US, allowing Eisai and Pfizer to retain market leadership positions. The first augmented product (Novartis_1, liquid solution) was launched in 1999 in the Swiss market, whereas Novartis was still waiting for approval in the US. This condition led Novartis to lose its first-mover advantage, and the twice-daily capsules of Exelon were constantly losing market share, particularly as competition from alternative products (Reminyl, memantine) began to increase (see Figures 2–3). The R&D and marketing departments were pressed to develop a solution that could enable Novartis to compete and counter negative feedback from stakeholders: lower effectiveness and safety (various and severe side effects), lower convenience both for patients and caregivers

compared to the once-daily, and a better tolerated pill by Eisai/Pfizer (interviews iv–vi, ix–xvi and xviii; see also Table 4). According to a technical project manager, Novartis developed the first prototype of the patch at a very early stage (interview xi):

"…I think it was already in place in the year 1995... I think the very first prototype [Exelon patch] I have seen it in 1995."

The firm held this idea for approximately 11 years, and in 2006, the leading product manager released a dossier with the approval application. The Exelon patch was launched in late 2007 in the US and early 2008 in Switzerland, and the execution of this option lent a significant boost to the firm's market share (Figures 4 and 5; page 120-121). Novartis achieved the option of this augmented product many years after its ideation, and the firm was ready to execute this option within a few months.

We observed that Novartis was able to develop the new technology quicker than its competitors, changing the formulation from oral (tablets) to transdermal (patch) delivery. For larger-scale manufacturing, the firm used an external alliance partner (interview ix). A recent investment by Novartis is a new patch measuring 15 cm^2 that contains a higher dose of the active ingredient. At the time of our data collection, this new augmented product was still in clinical trials[14], i.e., in the ideation phase. In September 2012 the product was approved by the FDA and launched in the US. The announcement was followed by a statement made by John Schall, Chief Executive Officer of the National Family Caregivers Association:

"From the caregiver's standpoint, a patch can be visual evidence to help see if their loved one has actually received their medication, so to have an additional option is important."[15]

As we learned from our interviews, this is a lesson learned when the first patch was already in the market; this knowledge was acquired mainly from caregivers and

[14] Clinical trial numbers: NCT00948766 (ACTION) and NCT01054755
[15] http://www.pharma.us.novartis.com/newsroom/pressreleases/132427.shtml

used by the firm to further promote the product to caregivers.

User-embedded learning (mechanisms and examples of activities)

The findings show a series of stakeholder-based learning activities; Novartis realized the need for developing a better product first from its diminishing sales and then from stakeholders' feedback. Learning activities included collecting information showing low safety and tolerance as well as dosing inconvenience (twice-per-day pill), observing competition (for example, Eisai and Pfizer launched a new pill that dissolved very quickly in the mouth) and evaluating competitors' decisions by engaging the right stakeholders. Looking at the activities and performance of the competitive augmented products, Novartis learned that imitation (vicarious learning) would not be sufficient to boost product sales. Novartis' advantage was its technical capability to develop a patch, but it needed to partner with another firm for large-scale production. To learn more about its failures and those of its competitors, as well as its unmet and latent needs, the company engaged stakeholders (market research, consulting key opinion leaders, interacting **directly** with patients, caregivers and doctors). These activities are distinct from those of vicarious and inter-organizational learning. Organizations directly engage and learn from stakeholders who use the product. This type of learning follows different mechanisms compared with learning from customers through self-reported surveys and traditional market research. Firms also engage these stakeholders without having any formal or contractual collaboration with them. User-embedded learning is more situated than vicarious learning and involves direct contact. In this type of learning, the firm and user share the context of behavior, which is important to the sharing of tacit knowledge.

Table 4 provides an overview of stakeholder-based learning activities (phase,

type of learning, source, mechanism) in the context of AD treatment. By comparing different examples, we illustrate what user-embedded learning is and why it is different from the other types. We explain it subsequently in greater detail.

Augmented product	External learning	Stakeholder	Phase	Example
Eisai/Pfizer_1 (liquid)	Vicarious	Competitor	Option	Competitor's similar products were unsuccessful. Liquid formulation cannot satisfy patient's needs nor facilitate caregivers.
Eisai/Pfizer_2 (ODT)	User-embedded	Patients, caregivers	Ideation	Patients refuse to swallow pills. Managers found them on the floor when visited patients in nursing homes. Managers learned from caregivers how resource consuming is to convince patients to take pills.
			Post-execution	Patients often choke even with their saliva. The fast dissolving pill is more convenient that the original, but problems still remain.
Eisai_1,2 (granules, jelly)	User-embedded	Patients, caregivers	Post-execution	It takes time to mix the granules with the food. Patients don't like the taste. Patients consider the jelly Aricept as dessert; the lemon-honey taste is more pleasant.
Eisai/Pfizer_3 (23mg)	Vicarious	Competitor	Ideation	With a stronger pill the segment of severe AD could be covered (break the monopoly of memantine in moderate to severe AD)
Novartis_1 (liquid)	Inter-organizational, vicarious	Physicians, pharmacists	All stages	A liquid formulation could enable the 'refusing-to-take-pills' problem, but liquid formulations are preferred only in specific countries. Data available from previous market research in other diseases
	User-embedded	Caregivers	Post-execution	Mixing liquid drops with water or a juice is often time-consuming. Bad taste can also be a drawback.

(continued from previous page)

Novartis_2 (patch)	Vicarious	Competitors	Ideation	Market sales from competitive augmented products prove that developing an other pill (fast dissolving or extended-release) will not satisfy unmet needs.
	Inter-organizational	Clinical research organizations (CROs)	Option, post-execution	Clinical studies showing the patch's benefits compared to the original product and competitive products.
	Vicarious	University hospital	Post-execution	Comparative study of patch combined with memantine (competitive drug) issued by a Korean university hospital
	User-embedded	Patient, physician, caregiver	Ideation, post-execution	Less side effects, no choking, no worries about taste. Caregivers save time, because they just have to stick the patch on the right part of the body once per day. With the patch doctors and nursing staff have control of a steady medication for 24h.
Eisai/Pfizer (weekly patch)	Vicarious	Competitor	Ideation	Imitating competitive successful augmented product
	User-embedded	Physicians, caregivers	Ideation	Doubts about the efficiency of a weekly patch. Patients need to shower. What about skin irritations? Is this product safe and efficacious?
	Inter-organizational	Regulator	Ideation	FDA announced the necessity of additional data to approve this augmented product. Application still pending.
	Inter-organizational	Partner	Ideation	Eisai/Pfizer needed the experience and knowledge of external partners to develop the Aricept patch.
J&J_1 (oral liquid)	Vicarious, inter-organizational	CROs, universities	Post-execution	Clinical trials and further research for possible treatment of other diseases and new applications are still ongoing. Learning can be inter-organizational, when the firm partners with universities or external CROs or vicarious, when the firm indirectly observes the results.
J&J_2 (extended-release)				
memantine_1 (liquid)	n.a. (limited data)			
memantine_2 (extended-release)	n.a. (limited data)			

Table 4: Examples of stakeholder-based learning and the emergence of user-embedded learning (UeL)

Pharmaceutical firms engage stakeholders (e.g., doctors, patients, regulators) before (during clinical trials or phase III) and after product launch (pharmacovigilance or phase IV). The findings show that based on feedback from stakeholders on

products, ideas, and options, firms obtain information to augment these products and further insights to guide augmented product innovation, marketing, and manufacturing. We found that before augmented product launch, pharmaceutical firms collect data through anonymous and independent market research companies or gather advice from doctors about issues related to existing products on the market (vicarious, inter-organizational learning). Patient safety and tolerability play an important role in terms of potential side-effects caused by the drugs (an issue particularly salient with rivastigmine, the active ingredient used by Novartis). Side effects represent an important focus of user-embedded learning in changing a product. In addition, doctors, patients, caregivers are sources of learning about a new application for the drug (another disease - off label use). Learning is embedded in a dual sense: achieved through observing users behaving in their natural context of treating or living through an illness. Learning is also oriented toward users, that is, finding solutions that may eventually alter the course or treatment of the illness and thus provide additional benefits to users.

Information from stakeholders also covers the convenience of drug administration; this applies to patients, caregivers and often physicians if they must administer the drug themselves. The role of caregivers is critical to the decision about how specific drugs should be delivered, given that AD patients become increasingly dependent on their caregivers. However, convenience and economic arguments connected to the amount of time and effort caregivers spend administering drugs depend on several factors, such as the stage of the illness, the combination of treatments the patient requires, the type of care institution (hospital, nursing home, patient's home), and the patient's social context. A drug's effectiveness, tolerability and convenience represent important information that the firm gathers and considers

when deciding for augment products. These three categories are always considered in post-launch market research.[16]

One example case is an initiative by Eisai, which developed the Aricept family of drugs, started to learn and manage stakeholders surrounding the patient. The company developed the vision of "human health care" (hhc), which encourages the firm's employees to adopt the perspective of patients and their families on treatment (the case is also described briefly in (Nonaka, Toyama, and Hirata, 2008; Nonaka and Toyama, 2005). One way to achieve this vision was to outplace employees in care homes, where they worked as caregivers, developed personal contact with patients, and were exposed to their problems. Through this process, Eisai development staff gained new insights into the nature of suffering faced by elderly people with AD. Eisai's employees realized that some patients found it difficult to swallow pills and often aggressively refused to take them. This knowledge, gained through user-embedded learning, stimulated a delivery innovation, a tablet (Eisai/Pfizer_2) that dissolves in the mouth within seconds. Eisai executed the option of this augmented product; however, in the US and Switzerland, this option did not solve the problem completely (interviews vi, xiii, xv, xvi and xviii), as demonstrated by low market penetration (see Table 5, Figures 4 and 5; page 119-121). However, the product is very successful in Japan, cannibalizing the sales of the original hard pill.

Patient compliance is influenced by economic, medical, psychological, and social factors as well as by the rationale, interpretations, and convictions of stakeholders (the patient, the patient's family, caregivers, doctors, insurance

[16] Before the launch of a drug, efficacy and safety measures are tested during the first three phases of the clinical trial. However, these measurements are limited due to the relatively small number of participants. Patient (and particularly caregiver) convenience is very rarely measured before product launch.

companies, hospitals, pharmaceutical firms, and state regulators). The patient compliance scores from our interviews represent these various stakeholder interpretations. Such interpretations as well as the changes of compliance assessments over time represent direct sources of user-embedded learning for pharmaceutical firms. Learning in these cases is interactive and happens either by establishing a formal collaboration with the relevant stakeholder (such as a regulator, representing inter-organizational learning) or by interacting directly with users (user-embedded learning). These assessments influence the decisions about which ideas to develop, which options to execute and, ultimately, what should be emphasized in stakeholder communications.

To summarize the findings thus far, we propose the following:

Proposition 1: *Vicarious and inter-organizational learning alone are necessary but not sufficient to develop augmented product innovations.*

Proposition 2a: *User-embedded learning enables firms to understand latent customer needs and access tacit knowledge to develop ideas for new augmented products.*

Proposition 2b: *Firms' involvement in user-embedded learning has a positive impact on the success of augmented product innovations.*

Table 5 (page 119) summarizes the patient compliance analysis and demonstrates the link between successful augmented product innovation and high scores with stakeholders.

Timing and competition

Whereas pharmaceutical companies seek to expand the life cycle of existing drugs, the story is more complex because it includes competitive dynamics and stakeholder-based learning. To capture these dynamics, we analyzed different events in terms of content and timing. Two findings emerged.

First, clinical studies –commissioned by the focal firms– reveal specific insights into the relative effectiveness, safety, and tolerability of the products on the market. Sponsors of these studies include universities as well as pharmaceutical firms. The registry clinicaltrials.gov lists 217 on Aricept (donepezil), 74 on Exelon (rivastigmine), 93 on Reminyl (galantamine) and 146 on memantine)[17]. The studies take place during the entire product lifecycle but for different reasons. For example, in the ideation phase, to prove the efficacy and safety of a new formulation, or to test a higher strength in another AD segment. After option or execution, the same drug could go through new clinical trials to study efficacy in a completely different disease. In a post-execution phase, head-to-head comparisons between rival drugs usually discuss safety and tolerability issues reported by patients[18]. These results were also used in promotion activities. Depending on the outcome of the studies and considering competitive dynamics and the product lifecycle (e.g., patent protection, exclusivity rights in different countries), R&D and product managers made decisions about developing and executing options for augmented products at specific times. These activities involved reading *relative* patient compliance effectively to reach decisions about what options to develop and execute before competitors do the same.

Second, augmented product innovation is phased in time, moving from ideas to options and execution, and, depending on post-execution learning, a new cycle of

[17] Number of clinical trials assessed on May 15, 2013 (http://www.clinicaltrials.gov)
[18] See, e.g., Farlow *et al.*, 2010; Winblad *et al.*, 2007; Woodruff-Pak *et al.*, 2006; Dantoine *et al.*, 2006; Sadowsky *et al.*, 2010.

ideation might be initiated. Our analysis shows that user-embedded learning usually occurs in the ideation and post-execution phases and, together with other stakeholder-based learning (vicarious, inter-organizational) in option generation as well as in execution, impacts the product's market performance. Figures 2 and 3 illustrate the timing of events that trigger phase changes in the lifecycle of Eisai/Pfizer and Novartis products in the US, such as option achievement, execution, main patent expiry, first generic application or launch, important clinical trials, and strategic alliances. The colored lines present the sales of the different augmented products in the respective market (2000-2010) (based on Figures 4 and 5; page 120 - 121).

Both cases reveal that the firms begin planning the development of their augmented products well ahead of the expiry date of their main patent (active ingredient). The ideation phase ends with the relevant application to FDA for the approval of the product and in most cases is planned so that the augmented product may be launched on the market just before the expiry of the main patent or the loss of previous products' exclusivity rights. Consider, for example, Novartis_2 (5, 10 cm^2 patch), Eisai/Pfizer_3 (23 mg tablet) and Novartis_3 (15 cm^2 patch). Whereas it usually takes 1-3 years to develop an option, execution occurs within a few months. If the augmented product obtains approval, the firms manage to sustain their competitive advantage (sales) for 3-5 years, depending on the strength of the new patent (3 years if it is just a new strength, 5 years if it is a new mechanism of delivery).

In the ideation phase, learning plays an important role in understanding stakeholders' needs and expectations. We find that when firms interact earlier with stakeholders, especially with users, they gain more time to devise their strategy of product augmentation. Learning is also important in later phases (especially after execution) to understand what went wrong in cases of failure (see Eisai/Pfizer_2,

Eisai/Pfizer_4, Novartis_1) or to plan the next move. The product augmentations by Eisai and Pfizer are indicative of the emerging patterns. Enjoying a first-mover advantage, the two firms prevailed in the market, having a relatively safe and efficacious drug. A total of 31% of clinical studies sponsored by the firms included combinative treatments with other drugs, whereas Eisai and Pfizer refrained from initiating comparative studies to prove superiority over competitive products. The drug has also been involved in many studies for new applications, such as schizophrenia, delirium, Down syndrome and autistic disorders.

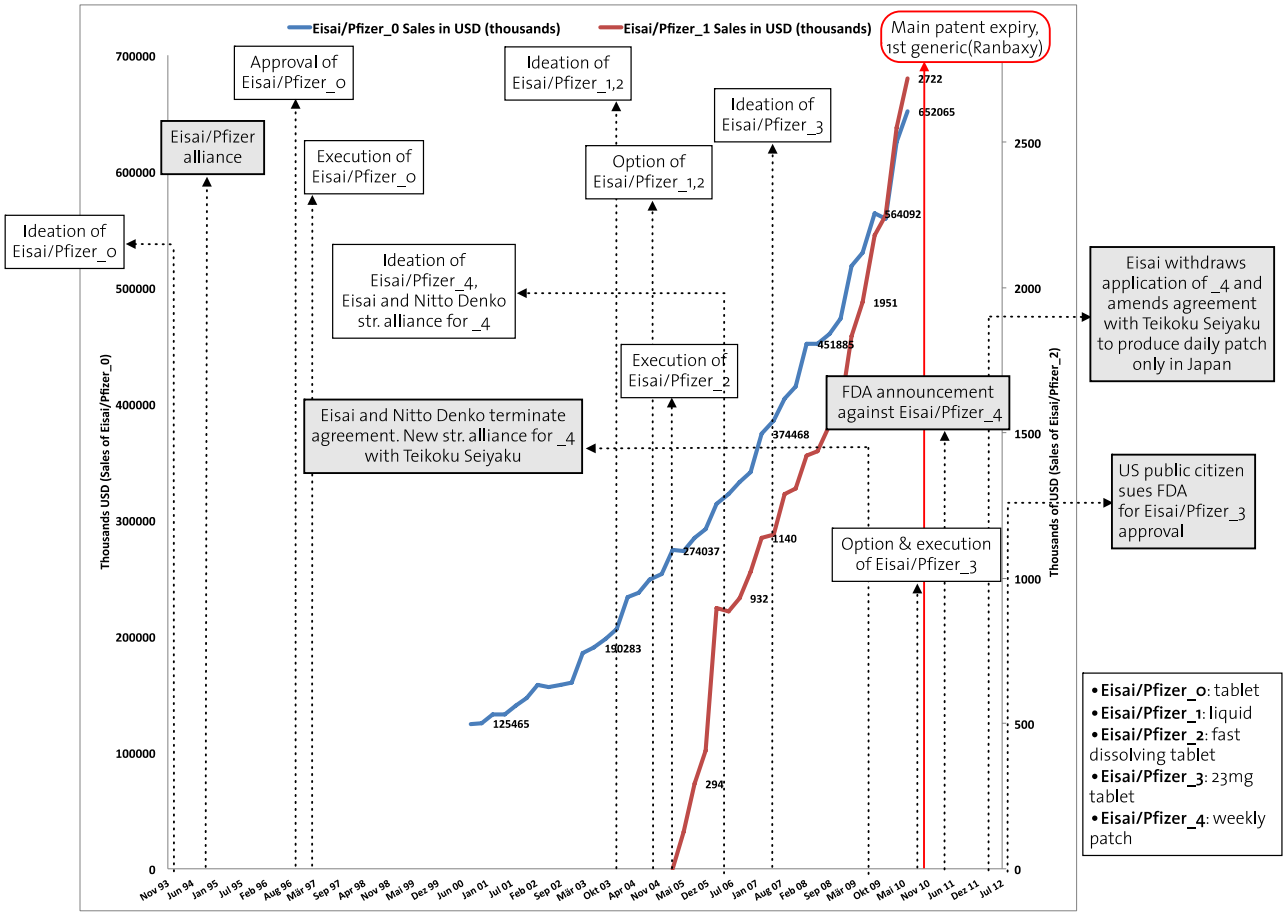

Figure 2: The timeline of augmented product innovation of Eisai/Pfizer in USA

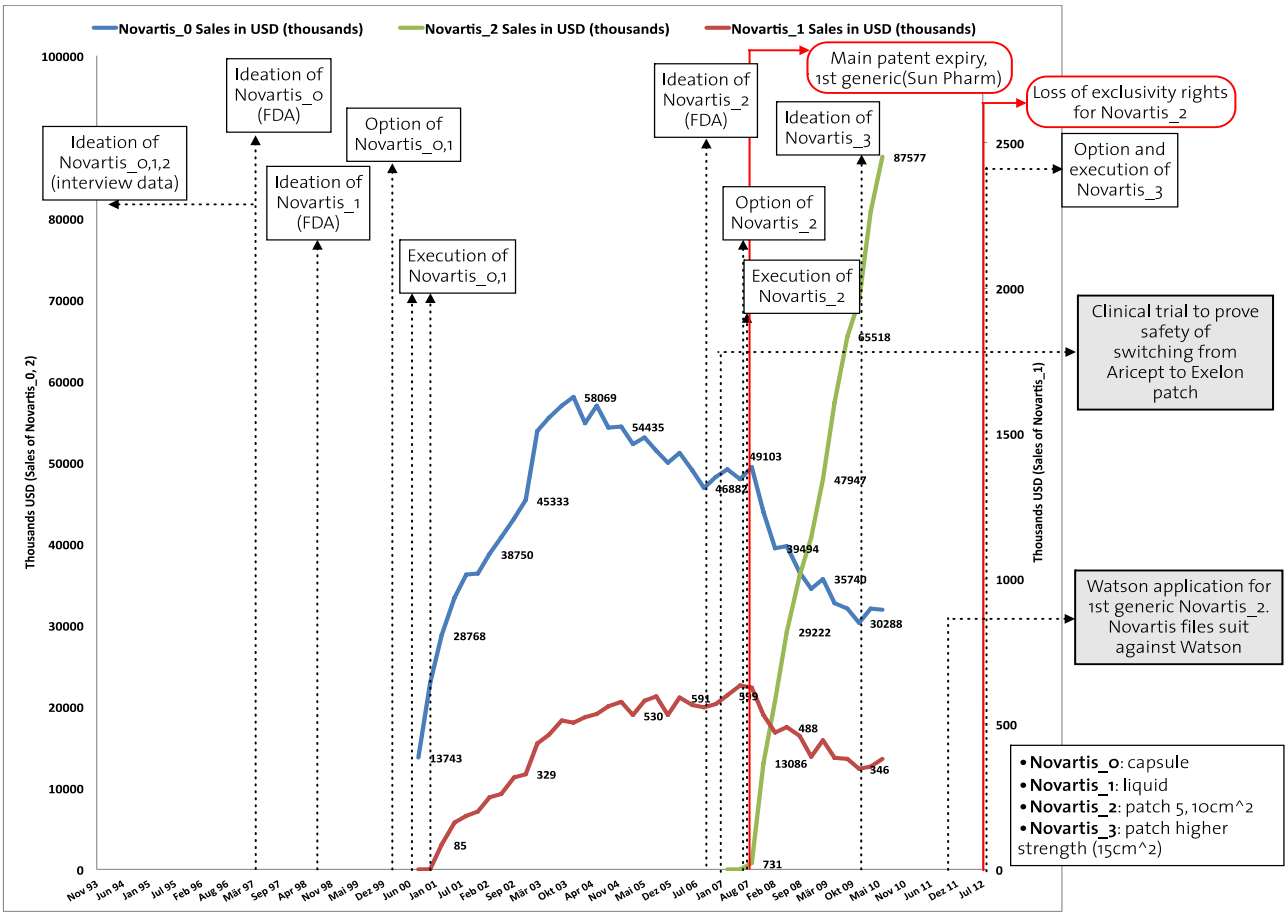

Figure 3: The timeline of augmented product innovation of Novartis in USA

The first augmented products (Eisai/Pfizer_1,2) were approved approximately 10 years after the ideation phase of the core product. However, only the option of Eisai/Pfizer_2 was executed. The liquid formulation (Eisai/Pfizer_1) never came to the market, especially because the same formulation by Novartis was unsuccessful in most large markets (vicarious learning: Table 4, interview vii). Eisai/Pfizer_2 did not have the expected sales apart from Japan, and one year later (May 2006), Eisai entered the ideation phase for Eisai/Pfizer_4, the controversial weekly patch. Novartis had started clinical trials on a daily patch in late 2003; therefore, Eisai's competitor was already ahead. In 2006, Eisai Japan made an agreement with the Japanese firm Nitto Denko, a specialist in manufacturing tapes, membranes and porous film products, for the joint development of the Aricept patch. Eisai terminated this

agreement in 2009 and the same day announced a new strategic alliance with Teikoku Pharma in the US. A year later, Teikoku filed an application (to achieve an option) for the Aricept weekly-dosage patch. However, FDA never approved this weekly patch. The story of this augmented product ends with Eisai and Pfizer withdrawing the application and amending their address Teikoku for the development of a daily patch only in Japan[19]. This decision was made 2 years after FDA's response letter. From our interview data (2010-2011), we learned that many stakeholders did not consider the weekly patch a fruitful idea. Comments from managers, physicians and caregivers were mostly negative, especially due to anticipated skin irritation and doubts about efficacy for an entire week. Access to this specific user-embedded knowledge would have saved valuable resources spent by these two companies between the ideation and final withdrawal of Eisai/Pfizer_4 six years later. Similarly, Novartis launched augmented products before the expiry of an important patent, e.g., Novartis_2 before Novartis_0 expired and Novartis_3 before Novartis_2. The findings suggest that this learning is a necessary condition for explaining success or failure of these products. User-embedded learning occurs mainly during the ideation and post-execution phases and is essential in combination with vicarious and inter-organizational learning activities for successful augmented product innovations.

A general pattern across the data is that generating ideas early, on average 3–6 years in advance of an option, emerges as a necessary condition to launch augmented products. In some extraordinary cases, we observe an exceptionally short cycle from idea to option, as in the cases of Eisai/Pfizer_1 and Eisai/Pfizer_2 (US). This short cycle may occur for several reasons: new technology is relatively easy to develop (e.g., a liquid formulation); the approval process is quicker, as there is no need for

[19] http://www.eisai.com/news/news201217.html

extended and costly additional clinical trials; and it is relatively quick and easy to adapt operational capabilities (e.g., manufacturing, marketing). In contrast, we see that the Aricept patch's cycle from idea to option lasted six years, ending with the withdrawal of the augmented product. This product augmentation was influenced by several external constraints, including difficulty in finding the right partner, regulatory burden, and users' reservation in embracing the product (interviews ix, xi, xv, xvi, xiii). All firms eventually face threats of patent expiration, increasing competition, and the need to sustain or improve performance through carefully timed incremental changes. The stepwise and "timely-witted" achievement of options and executions offers measures to gauge the market by gaining approval from authorities that depend on competitive dynamics in each market and insights gained from stakeholders. Based on the foregoing presentation of findings, we summarize as follows:

Proposition 3a: The pacing of each of the phases of augmented product innovation – extensive stakeholder-based learning before launch (long ideation, fast option and execution) – reduces the probability of failure of augmented products.

Proposition 3b: The pacing of each of the phases of augmented product innovation – extensive stakeholder-based learning before launch (long ideation, fast option and execution) – reduces the need for further learning in the post-execution phase.

Our analysis focuses on activities to develop augmented products based on core products; activities directed toward achieving approval for the augmented product, which is a necessary step preceding market launch; and, ultimately, the decision to sell the product on various markets characterized by different competitive dynamics. This process occurs under conditions where stakeholders engage with existing and new products and where some stakeholders also invest in studies to compare products across competing offers. Although user-embedded learning

activities occur mainly in ideation and post-launch, augmented product innovation considers learning embedded with users during all phases of innovation. In addition, the lessons learned by other stakeholders such as competitors, partners, and regulators, are necessary for the success of the next product augmentation cycle. Therefore, we summarize the following:

Proposition 4: Stakeholder-based learning in ideation, option creation, and launch decision positively impacts the success of augmented product innovations.

Discussion and conclusions

Theoretical contributions

Our paper makes several contributions to the literature. First, our findings relate to a recent call for employing a multi-stakeholder perspective in product innovation studies (Driessen and Hillebrand 2013; Talke and Hultink 2010; Hall and Martin 2005). We do this not by studying new product development that inevitably would lead to characterizations of innovation as incremental or radical. We choose to study augmented product innovation, a special form of incremental innovation, and thus seek to avoid trivializing the changes in peripheral characteristics of products. Such augmented features may improve the products ability to satisfy latent, unmet customer needs and, at the same time, sustain or increase firm profitability by extending product life cycles.

Second, existing theory has frequently connected exploitation with incremental innovations designed to satisfy expressed needs (Day, 1994; Adams et al., 1998; Baker and Sinkula 2005; Baker and Sinkula, 2007). The proposed learning mechanisms are indirect because customers are able to manifest needs and preferences (a customer-led philosophy). However, direct contact with external

sources is only necessary when the firm's objective is to generate breakthrough innovations (Morgan and Berthon 2008; Bstieler and Hemmert 2010; O'Connor 1998; Yannopoulos, Auh, and Menguc 2012). We show that there are cases of incremental innovations that seek to satisfy latent difficult-to-express needs. These needs may only truly be explored after the core product has been introduced to be market and in use for some duration of time. Therefore, for this type of innovation as well, the necessary mechanisms of learning are more direct and explorative. Our findings show that these types of external learning (vicarious, inter-organizational) are not sufficient (proposition 1). These findings are consistent with a recent study demonstrating that interactive learning contributes to incremental innovations in the electronics industry (Fu et., al, 2013).

Third, we contribute to the organizational learning literature (Argote 2011; Argote and Miron-Spektor 2011; Antonacopoulou and Chiva 2007) by studying different external learning activities of firms using the lens of stakeholder theory. We specify stakeholder-based learning and inductively develop a theoretical framework of stakeholder-based learning in augmented product innovation by identifying differential learning activities. Firms innovate based on existing products by 1) generating ideas through interaction and learning from stakeholders, 2) holding these ideas as options depending on internal and external conditions, 3) executing the options in a timely manner under conditions of market uncertainty and competition and, finally, 4) generating new ideas or improving the previous ones after evaluating the market performance of the products in a post-execution phase through stakeholder engagement. We extend prior work on external learning (Kessler, Bierly, and Gopalakrishnan 2000; Bierly and Chakrabarti 1996; Bresman 2010) by identifying and untangling the mechanisms of "user-embedded learning." We show that although

vicarious (Bandura 1977; Baum, Li, and Usher 2000; Bresman 2010; Bingham and Davis 2012) and inter-organizational learning (Pisano 1994; Powell, Koput, and Smith-Doerr 1996; Lane and Lubatkin 1998; Easterby-Smith, Lyles, and Tsang 2008) occupy a large body of research in organizational learning, learning embedded in the users' context has not been treated as a distinct type of external learning. Researchers have often highlighted the need to involve users in innovation processes. Users are innovators at the leading edge of product technology, when markets are by definition small and uncertain (von Hippel 2005). Firms engage with lead users to create and develop new ideas for innovations (e.g., Franke, von Hippel, and Schreier 2006). However, to the best of our knowledge, the process and activities of learning from embedded users and its impact on product innovation have not been thoroughly demonstrated and studied. We study these topics in a complex and mature industry showing that learning from users is necessary for firms to understand latent needs and acquire "sticky information" (von Hippel 1994) and thus develop testable concepts of augmented products (proposition 2a). As a result, as firms engage in user-embedded learning activities to a greater extent, their performance in developing and launching augmented products improves (proposition 2b). Kessler, Bierly and Gopalakrishnan (2000) have shown that when firms rely on these activities, the associated product development will be more costly, time consuming, and unable to sustain firms' competitive advantage. A contrary finding by Foss, Laursen, and Pedersen (2010), demonstrate that interactive activities with users have a positive impact on innovative performance. Our study covers the learning of interaction between different stakeholders in manifold situations, which has led to successful and less successful products that either sustained firm competitive advantage (e.g., Eisai/Pfizer) or helped others to regain profitability (e.g., Novartis). Whereas it is a "costly" form, user-

embedded learning provides the pharmaceutical firms with a potential source of competitive advantage. However, firms may reduce the need for further stakeholder-based learning in succeeding augmented products if they extensively embody these learning activities in the first ideation phase and combine them with well-prepared and fast execution of the gained option (proposition 3). Our results are in line with studies on patent expiration strategies in the pharmaceutical industry, where augmented product innovation (or line-extensions as a differentiation product strategy) is associated with brand market success (Hong et al. 2005) and considered "the best strategy for longer-term protection, boost sales and profit" (Raasch 2009, 294). In addition, they are creating additional barriers to competitor firm entry (Danzon and Furukawa 2011; Ellison and Ellison 2011). On the other hand, the strategies are "high-cost, long-tern planning, [and] must be ready for launch before patent expiry" (Raasch 2009, 294). We contribute to this literature by studying the "what" and "how" firms must learn to achieve these successful strategies.

Finally, our paper contributes to theoretical work on stakeholder dialogues (Payne and Calton 2004; Daboub and Calton 2002; Roloff 2008) in complex contexts by specifying the organizational learning processes involved. Stakeholder-based learning may become the basis for solving an issue or leading to other long-term, positive outcomes when considered in all phases of strategic action (proposition 4).

Managerial implications, limitations and future research

We found that a particular type of stakeholder-based learning, embedded in users, enables the firm to understand latent customer needs, meet threats, and adapt to changes in its environment. We demonstrate a longitudinal link between the firm's learning and its product market performance. The framework is based on extensive

and detailed data at the firm and product level in the market for Alzheimer's disease medication. In the following, we discuss the implications of our study for management practice and policy.

The examination of organizational learning is well suited to the context of augmented products in the pharmaceutical industry with a focus on the therapeutic area of AD, an area in which, for over a decade, pharmaceutical firms have been struggling to sustain and improve the performance of their existing products due to a lack of new active substances. With stable core products and competitive pressure to generate value vis-à-vis the threat of generics manufacture and increasing demands for safety and convenience, firms augment their products by introducing new forms of the same drug. However, the success of these augmentations is subject to factors such as timing and learning from a context of multiple stakeholders.

One implication for management is that observing competitive behavior and investing in options pay off. However, augmented products appear to benefit from fast execution once options have been chosen, allowing the firm to reap first-mover advantages. One advantage might be lower risks compared to first-mover advantages in phases of exploration because customers (patients and caregivers) have come to expect the functions performed. In addition, managers should engage with stakeholders throughout the product lifecycle because there is a very important link between a firm's learning processes and market impact. Many activities, such as communication, direct interaction, sponsorship of scientific studies, and education play a role in successful augmented product launches.

This study also has implications for policy makers. Whereas health authorities may focus very closely on the core products, i.e., active ingredients/medications, our study supports the argument that the benefits to patients and caregivers may differ

widely across products and their augmented variations. The case of Eisai's original pill shows that the active ingredient may not produce the desired effects because patients resist taking it. Augmented products such as patches and fast-dissolving tablets greatly advance the benefits for patients and caregivers. This is an insight that prompts the question of whether health policy should be favorable to augmented products. Today, in the countries studied, there are few attempts to differentiate between the core product, the original substance, and augmented products at the policy level. Policy makers thus must consider information at the patient level when making decisions.

This study shows links between patent expiration and augmented product innovation, two dynamics within the scope of influence for policymakers who may wish to consider jointly the regulation of intellectual property and the regulation of market access under welfare criteria.

Finally, our study is limited by the number of markets analyzed. Future research should compare the results across other markets in the Americas, Asia, and Europe. Moreover, other industries should be examined to uncover the extent to which stakeholder-based learning unfolds and is being applied along the same process. It will also be critical to measure the timing of these activities and detect differences across industries.

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Table 5: Augmented products, market performance and coding score

Case			USA and Switzerland							Coding score			
Firm	Product	Product code	Ideation	Option	Execution	Option	Execution	Market penetration		Effectiveness	Safety (tolerability)	Convenience	
				USA		Switzerland		USA	Switzerland			patient	caregiver
Eisai/ Pfizer	Aricept (donepezil)	Eisai/Pfizer_0	<1994	1996	1997	1997	1997	87% (2000)-58%(2010)	78% (2000)-48%(2010)	++	++	+	+
		Eisai/Pfizer_1	2003	2004	-	2007	-	-	-	-	-	-	-
		Eisai/Pfizer_2	2003	2004	2005	2005	2009	0.04%(2005)-0.24%(2010)	0.03%(2009)-0.5%(2010)	++	++	++	+
		Eisai/Pfizer_3	2007	2010	2010	-	-	-	-	-	-	-	-
Novartis	Exelon (rivastigmine)	Novartis_0	<1994	2000	2000	1997	1997	18.6%(2001)-4.6% (2008)-2.9%(2010)	21.4%(2000)-8% (2008)-5.8%(2010)	+	+	0	0
		Novartis_1	<1994	2000	2000	1999	1999	0.08%(2001)-0.03%(2010)	0.85%(2000)-0.1%(2010)	+	+	0	0
		Novartis_2	1995	2007	2007	2007	2008	3.9%(2008)-7.7%(2010)	4%(2008)-15%(2010)	++	++	+++	+++
J&J	Reminyl (galantamine)	J&J_0	1998	2001	2001	2000	2000	4.1%(2001)-0.05%(2010)	11%(2001)-0%(2010)	++	++	0	0
		J&J_1	1998	2001	2001	2000	-	<0.03% in average	-	-	-	-	-
		J&J_2	2003	2004	2005	2005	2005	1.1% (2005)-3.65%(2007)-0.1%(2010)	18% (2006)-12.6%(2010)	++	++	+	+
Merz, Lundbeck, Forest Labs	Memantine	memantine_0	2000	2003	2004	2003	2003	0.35%(2003)-28.8%(2010)	4.3%(2003)-17.8%(2010)	++	++	+	+
		memantine_1	2000	2005	2005	2003	2004	<0.06% in average	0.75% in average	++	+	+	+
		memantine_2	2005	2010	2010	-	-	-	-	-	-	-	-

Figure 4: Market share of all approved AD drugs in all marketed forms in USA (based on IMS data)

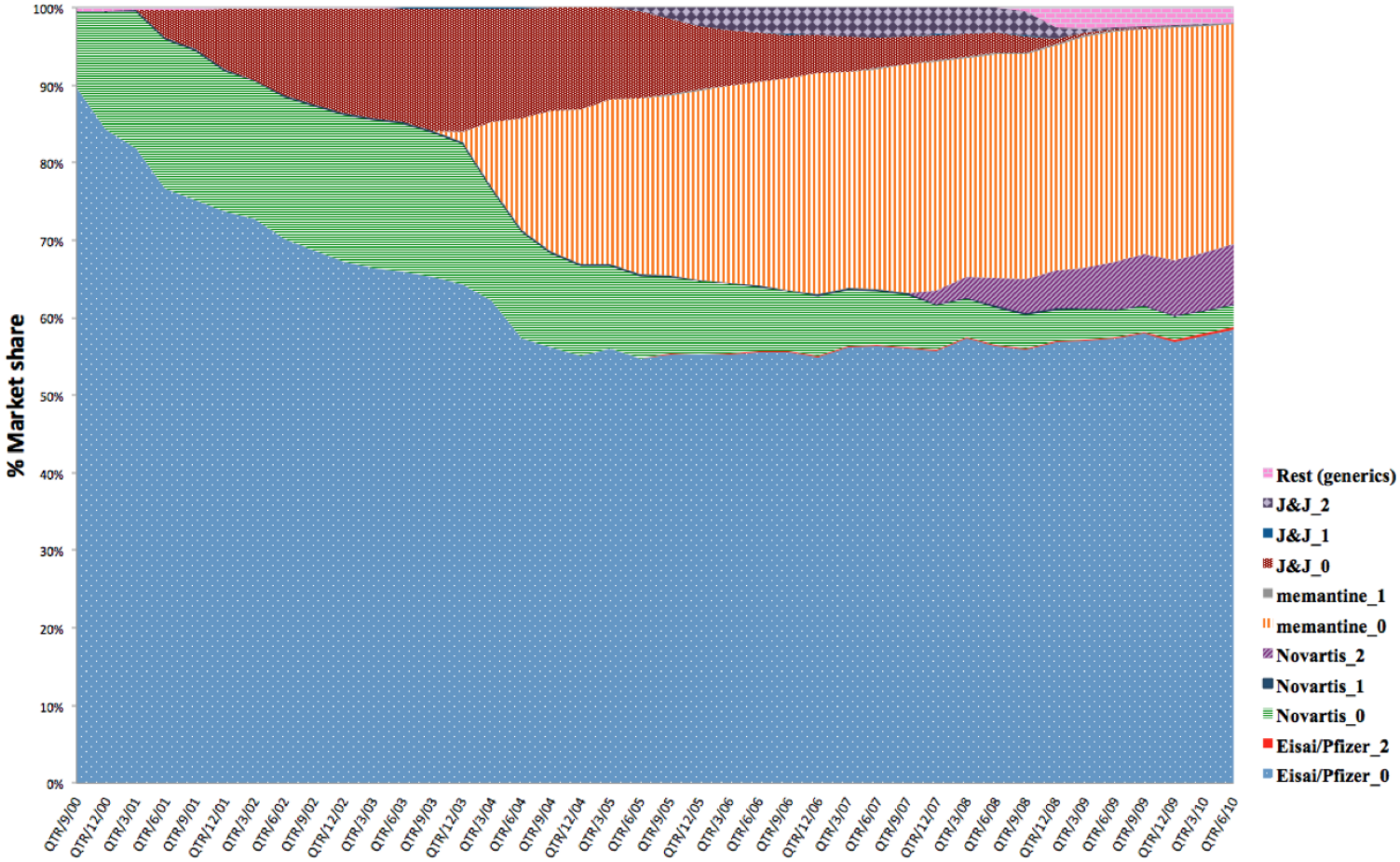
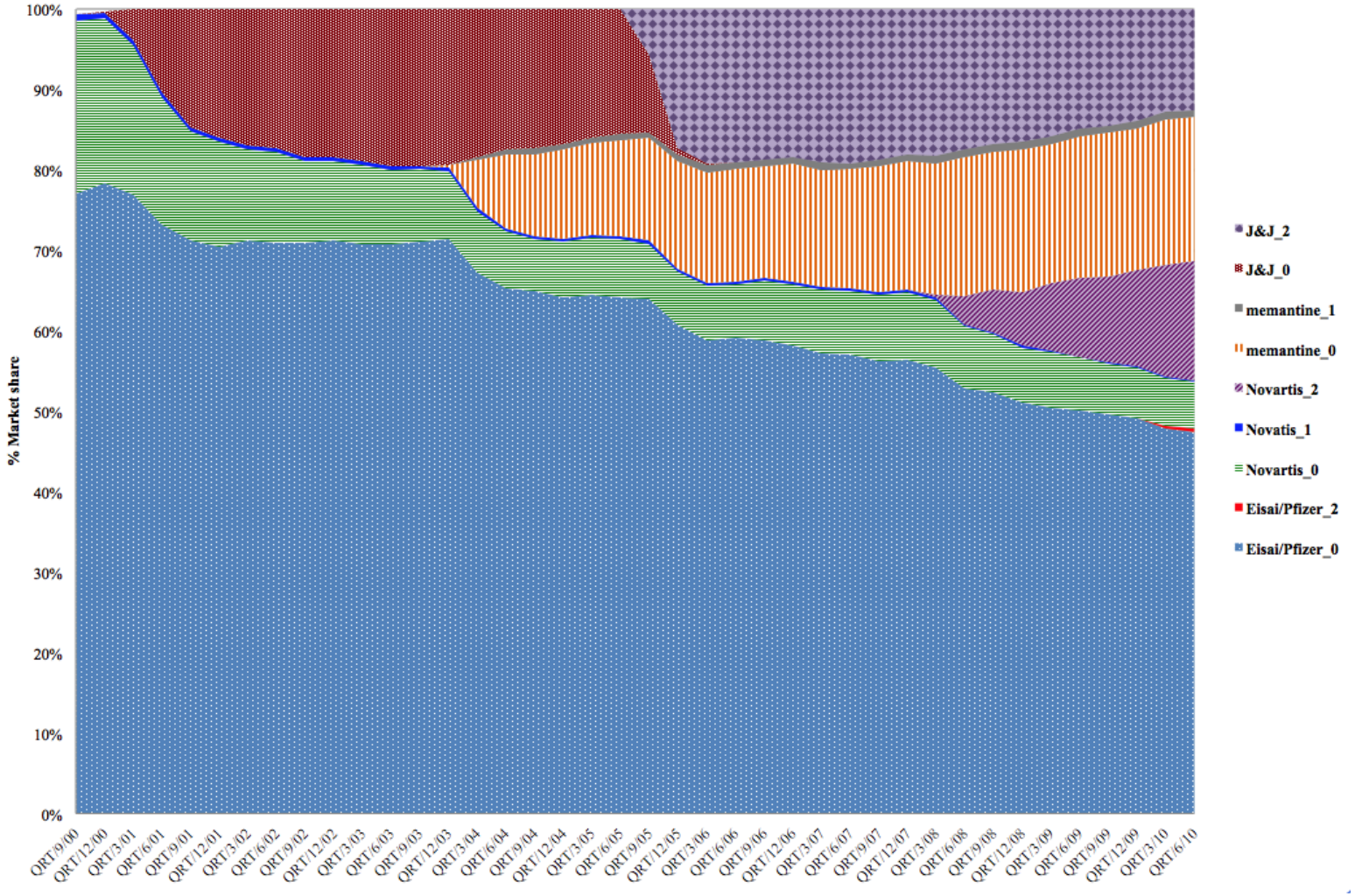


Figure 5: Market share of all approved AD drugs in all marketed forms in Switzerland (based on IMS data)



Appendix of study 2

Country	Marketer	Product	Core asset (API)	Form	Product Code
Japan	Eisai	Aricept	Donepezil	FCT	**Eisai/Pfizer_0**
				ODT	**Eisai/Pfizer_2**
				Granules	**Eisai_1**
				Jelly form	**Eisai_2**
Japan total	1	1	1	4	**4**
Switzerland	Pfizer	Aricept	Donepezil	FCT	**Eisai/Pfizer_0**
				ODT	**Eisai/Pfizer_1**
	Novartis	Exelon	Rivastigmine	Capsules	**Novartis_0**
				Oral liquid	**Novartis_1**
				Patch	**Novartis_2**
	J&J	Reminyl	Galantamine	FCT	**J&J_0**
				Extended-release capsules	**J&J_2**
	Lundbeck	Ebixa	Memantine	FCT	**memantine_0**
				Oral drops	**memantine_1**
	Merz	Axura	Memantine	FCT	**memantine_0**
				Oral drops	**memantine_1**
	Pfizer	Cognex	Tacrine	Capsules	**Pfizer_0**
Switzerland total	5	6	5	7	**12**

Country	Marketer	Product	Core asset (API)	Form	Product Code
USA	Eisai	Aricept	Donepezil	FCT	**Eisai/Pfizer_0**
				ODT	**Eisai/Pfizer_2**
				23mg tablet	**Eisai/Pfizer_3**
	Novartis	Exelon	Rivastigmine	Capsules	**Novartis_0**
				Oral liquid	**Novartis_1**
				Patch	**Novartis_2**
	Forest	Namenda	Memantine	FCT	**memantine_0**
				Oral liquid	**memantine_1**
				Extended-release capsules	**memantine_2**
	J&J	Reminyl/ Razadyne	Galantamine	FCT	**J&J_0**
				Oral liquid	**J&J_1**
				Extended-release capsules	**J&J_2**
	J&J	Galantamine J&J		FCT	**generic**
				Extended-release capsules	**generic**
	Myla	Galantamine Myla		FCT	**generic**
				Extended-release capsules	**generic**
	Teva	Galantamine Teva		FCT	**generic**
				Extended-release capsules	**generic**
	Watson	Galantamine WTSN		Extended-release capsules	**generic**
	Boehringer Ingel	Galantamine B.IN.		Oral liquid	**generic**
	Global Pharm Corp	Galantamine Gloa		Extended-release capsules	**generic**
	Shionogi Seiyaku	Cognex	Tacrine	Capsules	**generic**
	Novartis/ Sandoz	Rivastigmine NOVT	Rivastigmine	Capsules	**generic**
US total	10	12	5	7	**9**
Total sample	13	14	5	10	**15**

Table A1: Detailed description of sample

Interview number	Interview date	Company	Country	Profession	Duration	Face to face
i	25.02.2010	Eisai	Japan	Head of knowledge creation	64	x
ii	26.02.2010	Eisai	Japan	Project manager	48	x
iii	5.03.2010	Cantonal pharmacy Zurich	Switzerland	Director	33	x
iv	16.03.2010	Novartis	Switzerland	Project manager (R&D)	60	x
v	15.10.2010	Swiss AD Organisation	Switzerland	President of Swiss AD organisation	30	
vi	23.11.2010	Swiss pharmacy	Switzerland	Pharmasist	45	x
vii	30.11.2010	Pfizer	Switzerland	Product manager	57	x
viii	2.12.2010	Pharmaceutical department ETHZ	Switzerland	Professor	40	x
ix	17.02.2011	Novartis	Switzerland	Head of product global marketing	64	x
x	17.02.2011	Novartis	Switzerland	Technical project manager - Neuroscience	40	x
xi	28.03.2011	Novartis	Switzerland	Technical project manager - Formulation expert	75	x
xii	30.03.2011	Novartis	Switzerland	Global head OTM portfolio & project manager	65	x
xiii	7.04.2011	Private memory clinic Zurich	Switzerland	Head neurologist	45	x
xiv	11.04.2011	Memory clinic in public hospital	Switzerland	Geriatrician	25	x
xv	28.04.2011	University Hospital Zürich	Switzerland	Professor-Neuroscience, neurologist	31	x
xvi	02.05.2011	University Hospital Basel	Switzerland	Professor-Neuroscience, neurologist	58	x
xvii	19.05.2011	Roche	Switzerland	Global business analyst	32	x
xviii	31.05.2011	Gerontological center and memory clinic, Zurich	Switzerland	Head neurologist and geriatrician	62	x
xix	17.06.2011	Sanofi-Aventis	Switzerland	Customer specialist	32	x
xx	15.10.2011	Lundbeck	Switzerland	Customer specialist	*	

Table A2: Interview partners

6.3 Study 3: When the drugs don't work: Hybridization of logics in institutional entrepreneurship

Fotini Pachidou

Abstract

In this paper, I study institutional change in the highly regulated and complex field of Alzheimer's disease treatment, with a particular focus on why and how institutional logics shift in this field and under what conditions institutional entrepreneurship is successful or not. An extensive analysis of archival and primary data leads to the identification of four different logics in the organizational field studied, as well as to an explanation of why logics shifted over time. To determine how context and individuals (institutional entrepreneurs) interact to bring about institutional change in such a highly regulated and complex context, in which multiple actors and logics operate, I draw on a comparison of different cases of institutional entrepreneurs. As a result, a theoretical framework of institutional entrepreneurship is inductively developed, in which enabling conditions and the change process is presented. The results of the study derive that the hybridization of logics (blending dimensions of different logics) plays a key role in the success of institutional entrepreneurship and ultimately in the occurrence of institutional change. Implications for theory and practice are further discussed.

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Introduction

Common sense prescribes that when someone feels unwell, she goes to a general practitioner, describes her symptoms, and after medical examination and diagnosis, she receives a treatment (e.g., a pill) or simply medical advice. However, healthcare and the practice of medicine evolve, alter and adapt to new and various norms, rules and routines. Similarly, institutions and institutionalized practices undergo changes that affect the organizations and actors involved. Imagine a different scenario: a 60-year-old man visits his general practitioner for a regular check-up. The doctor, after some recommendations for the patient's nutrition, prescribes him a virtual reality game to enhance his cognitive and physical abilities and reduce the risk of declining memory. The game and all necessary equipment can be purchased from a regular electronics store, and the patient's insurance company will reimburse the cost. Is this scenario realistic, and if so, how does this change in logics –from prescribing a pill to prescribing a game- occur? Could such a shift in logics have a negative impact on the pharmaceutical industry? Neo-institutionalism serves as a suitable theory to address these issues, as it regards institutions in a manner that differs from that of traditional economics by explaining why and how institutions emerge within a given context (e.g., Friedland and Alford 1991; Scott 2001; Scott 2008; Greenwood et al. 2008; Lounsbury 2001). In particular, the theory maintains that beyond surviving and succeeding economically, organizations need to establish legitimacy within their institutional environment.

In the institutionalist tradition, rules impact organizations and actors as *logics* that span organizational fields[20] and are defined as "socially constructed, historical

[20] The organizational field is an aggregate of organizations that "constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products" (DiMaggio and Powell 1983, 148).

patterns of cultural symbols and material practices, including assumptions, values, and beliefs by which individuals and organizations provide meaning to their daily activity, organize time and space, and reproduce their lives and experience" (Thornton and Ocasio 1999, 804; Thornton, Ocasio, and Lounsbury 2012, 2; Greenwood et al. 2008, 101). Rationalizing and legitimizing these logics is the ongoing effort to maintain stability in organizations and function as a guide for individual behavior (Meyer and Rowan 1977; Powell and DiMaggio 1991; Seo and Creed 2002). Institutional theorists have long discussed the emergence of practices without apparent economic value (DiMaggio and Powell 1983; Meyer and Rowan 1977). Despite serious objections to the conceptualization of practice as an institution (MacIntyre 1981), neo-institutionalists have widely referred to certain institutions as practices (Lounsbury and Crumley 2007; Lounsbury 2001). From a practice perspective, authors distinguish aspects of the performance of a routine in which the performance is a specific action by an individual at a specific time and place (Pentland and Feldman 2005). Actors, who, conscious of their actions and the consequences of these actions, change routines that can involve minute aberrations in the structural features of organizations. The interplay of institutional logics that determine behavior and the actor's choices and performances in a practice perspective has become known as the *paradox of embedded agency* (Garud, Hardy, and Maguire 2007; Powell and DiMaggio 1991). If, indeed, institutions influence individual preferences and structure their cognition, how could actors change logics and adopt new ways of doing things?

A series of authors have addressed this paradox under the headings of *institutional logics* (Greenwood et al. 2009; Nigam and Ocasio 2010; Thornton and Ocasio 1999; Thornton and Ocasio 2008; Thornton, Ocasio, and Lounsbury 2012) and

institutional entrepreneurship (Garud, Hardy, and Maguire 2007; Lounsbury and Crumley 2007; Perkmann and Spicer 2007; Battilana, Leca, and Boxenbaum 2009; Leca, Battilana, and Boxenbaum 2008). Institutional logics theory conceptualizes society as an inter-institutional system, in which logics are culturally differentiated, fragmented and contradictory and therefore allow change to occur. Existing studies have primarily focused on competition among institutional logics due to geographical differences (Lounsbury 2007), differing responses to environmental concerns (Herremans, Herschovis, and Bertels 2009), resistance to new healthcare guidelines (Reay and Hinings 2009; Nigam and Ocasio 2010) or resistance to the consolidation of an industrial sector (Marquis and Lounsbury 2007). A subject that remains less explored is whether and how change is permitted in highly regulated and complex contexts, in which, despite the discrepant needs and wants of multiple actors, all actors must obey rigorous rules and regulations. Does change remain possible if rules and regulations remain unchanged and no radical change (e.g., crisis, jolt, technological disruption) has occurred?

The second perspective addressing the paradox of embedded agency is institutional entrepreneurship, which refers to the "activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones" (Maguire, Hardy and Lawrence, 2004: 657). Notwithstanding the numerous empirical studies drawing on this framework, it has also received considerable criticism due to its weakness in jointly addressing embedded agency and institutional pressures that affect agents' behavior, an overemphasized, heroic view of individuals, and the absence of a theory or unified framework of institutional entrepreneurship (Hardy and Maguire 2008; Battilana, Leca, and Boxenbaum 2009). Against this background, this study departs from

heroizing institutional entrepreneurs by viewing them as collective actors embedded in certain social contexts. Scholars remain uncertain whether institutional entrepreneurs create the conditions to transform institutions, change occurs as a consequence of a certain situation (crisis, reform, etc.) or whether it is due the interaction of both individuals and the situation (Thornton, Ocasio, and Lounsbury 2012). In other words, is institutional change induced by individuals, situational (contextual) factors or both? To this end, this empirical study asks: how do context and individuals (institutional entrepreneurs) interact to bring about institutional change in a highly regulated and complex context, in which multiple actors coexist and are bound by similar institutional arrangements?

One context, which operates within strict regulatory regimes that, in various and complex ways, affect the creation of economic and social value (Abraham and Reed 2002) is the pharmaceutical industry. I study an organizational field comprising various actors engaged in the treatment of patients suffering from Alzheimer's disease (AD). This field is characterized by high degrees of complexity and institutionalization and a long tradition of medical practice without effective treatments or consensus among multiple stakeholders. AD is recognized as one of the most severe health and social threats worldwide. Prevalence estimates, mortality and the cost of treatment and care are increasing rapidly. Existing medications are only symptomatic and limited in effectiveness. Initially promising new drugs have failed in clinical trials, resulting in the abandonment of the search for a cure on the part of leading pharmaceutical giants. While scientists are struggling with limited resources to better understand the disease and determine an effective, disease-modifying treatment, governments and health organizations speak of public health priorities, new policies, and more effective "health and social care systems informed and responsive

to this impending threat"[21]. Moreover, physicians and other actors involved in AD treatment are developing and offering alternative solutions to reduce the burden of the disease that either complement or compete against existing options.

I analyze this field of collective actors involved in the therapeutic area of AD as it undergoes a shift in institutional logics from 'cure' to 'care' that (again) begins to allow and endorse non-pharmacological treatments for the disease. This shift in logics implies a consequent institutional change rooted in the treatment of patients and allows me to formulate specific challenges for the pharmaceutical industry and derive managerial and policy implications regarding how to respond to these challenges. I do so by drawing on the two main perspectives of neo-institutionalism, i.e., institutional logics and institutional entrepreneurship. First, I explore and define existing logics by considering multiple levels (e.g., state, profession, market, corporation, community) and trace shifts in logics over time. The analysis of the activities of specific actors (at a micro level) allows me to uncover the logics that enact institutional entrepreneurship and the conditions under which change is possible or not. I highlight the role of *the hybridization of logics* (blending dimensions of different institutional logics) in achieving institutional change. In sum, by inductively studying the evolution of institutional logics and actor behavior in a certain context and multileveled field, I explain how the context interacts with institutional entrepreneurs and under what conditions institutional entrepreneurs succeed or fail in bringing about change.

[21] http://www.who.int/mental_health/publications/dementia_report_2012/en/ (accessed 14 February 2014)

Theoretical background

Institutional theory and change

DiMaggio's 1998 work opened Aeolus' bag for institutional theorists and inaugurated a multitude of studies on deinstitutionalization and institutional change. Challenging the persistence of historical institutionalism in homogenous contexts and organizations, he noted the need to include interests and agency when studying institutions (DiMaggio 1988; Dacin, Goodstein, and Scott 2002). Before proceeding to a further discussion of change, I consider it necessary to provide a few basic theses of historical institutionalism and neo-institutionalism and certain fundamental definitions.

According to the 'old' or historical institutionalism, institutional contexts are rationalized myths influencing those organizations subject to institutional pressures. Organizations become similar (isomorphic) through adaptation and imitation in an effort to gain legitimacy (social approval) and ensure their survival. Institutionalized practices must conform to instructional pressures (rules, norms, standards and contracts) and therefore are taken for granted and resistant to change (Greenwood et al. 2008). Beginning in 1980, scholars offered severe critiques of these theses and several questions, particularly concerning the concept of isomorphism. For example, how can a variety of organizations coexist within the same industry (Fombrun 1989). How do new organizations form and how do they acquire, manage and use legitimacy; how do institutional arrangements change (e.g., DiMaggio 1988; Oliver 1991)? Similar questions led to a blending of institutional theory with organization theory and the emergence of neo-institutionalism, the thesis of which could not be better described than as follows: "The new institutionalism in organization theory and sociology comprises a rejection of rational-actor models, an interest in institutions as

independent variables, a turn toward cognitive and cultural explanations, and an interest in properties of supra-individual units of analysis that cannot be reduced to aggregations or direct consequences of individuals' attributes or motives" (Powell and DiMaggio 1991, 8). In summary, the former perception of *institutions* can be summarized as "more-or-less taken-for-granted repetitive social behavior that is underpinned by normative systems and cognitive understandings that give meaning to social exchange and thus enable self-reproducing social order" (Greenwood et al. 2008, 4–5). In contrast, the new approach characterizes *institutions* as "social structures that have attained a high degree of resilience… composed of cultural-cognitive, normative, and regulative [22] elements that, together with associated activities and resources, provide stability and meaning to social life. Institutions are transmitted by various types of carriers, including symbolic systems, relational systems, routines, and artifacts. Institutions operate at different levels of jurisdiction, from the world system to localized interpersonal relationships. Institutions by definition connote stability but are subject to change processes, both incremental and discontinuous" (Scott 2001, 48).

Through various theoretical lenses (economics, sociology, cognitive theory), scholars have studied the arrangements necessary to ensure the stability and continuity of institutions in keeping with isomorphic change (Garud, Hardy, and Maguire 2007). However, isomorphism does not always persist in organizations. Actors can consciously change routines, rules and norms; variation can emerge within one environment, generating *competing logics* that provide a foundation for ongoing contestation and change (e.g., Lounsbury 2007; Lounsbury 2001; Marquis and

[22] Institutions are embedded in carriers (e.g., rules, laws, values, categories, schemata, governance and power systems, authorities, regimes, routines and artifacts) conceptualized as orthogonal to the three institutional pillars (regulative, normative and cultural-cognitive), generating a cross-classification of pillars and carriers (Scott 2001).

Lounsbury 2007). Institutionalists have striven to determine how non-isomorphic change occurs and how new institutional logics emerge. These questions are also confronted in the 'structure-agency' debate (Giddens 1984; Bourdieu 1977; Sewell 1992), and in institutional theory they form the so-called *paradox of embedded agency* (Friedland and Alford 1991; Seo and Creed 2002; Holm 1995; Powell and DiMaggio 1991). If, indeed, institutions influence individual preferences and in certain regions structure their cognition, how could actors change their practices and adopt new ways of doing things?

Institutional logics (Greenwood et al. 2009; Nigam and Ocasio 2010; Thornton and Ocasio 1999; Thornton and Ocasio 2008; Thornton, Ocasio, and Lounsbury 2012) and institutional entrepreneurship (Garud, Hardy, and Maguire 2007; Lounsbury and Crumley 2007; Perkmann and Spicer 2007; Battilana, Leca, and Boxenbaum 2009; Leca, Battilana, and Boxenbaum 2008) are two of the most widely employed concepts in addressing this paradox. The following section continues by reviewing these two perspectives to identify deficiencies that led to the paper's research question.

Institutional logics and change

Institutional logics, a key concept in institutional theory, comprise a meta-theoretical framework that explains, "how institutions, through their underlying logics of action, shape heterogeneity, stability and change in individuals and organizations" (Thornton and Ocasio 2008, 103). Numerous empirical studies have employed this framework to understand and explain change in a wide range of contexts, such as healthcare (Nigam and Ocasio 2010; Scott et al. 2000), French cuisine (Rao, Monin, and Durand 2003) or mutual funds and banking (Lounsbury 2007; Marquis and Lounsbury 2007). The

perspective or meta-theory of institutional logics addresses a fundamental problem of structure and agency in social sciences (Giddens 1984; Bourdieu 1977; Sewell 1992). The dilemma lies in the focus of scholars on how the social structure constrains action versus how individuals and organizations shape, perpetuate and transform institutions through their actions. In the seminal book "The Institutional logics perspective: A new approach to culture, structure, and process" (Thornton, Ocasio, and Lounsbury 2012), the authors describe in detail how institutional logics contribute to the debate over structure and agency and demonstrate the primacy of this perspective over others, such as structural isomorphism (DiMaggio and Powell 1983), the duality of social structure and action (Giddens 1984), and institutional entrepreneurship (DiMaggio 1988). The authors contend that the institutional logics perspective accepts a partial autonomy of actors from the social structure. This partial autonomy explains "how institutions constrain and enable individual and organizational actors, thus creating a theory of institutional stability and change" (Thornton, Ocasio, and Lounsbury 2012, 7) and comprises a premise of the embeddedness of agency (Friedland and Alford 1991). Institutions operate on three different levels - individuals, organizations and society, which are simultaneously embedded and decomposable. Their ability to decompose may lead to the decoupling and autonomy of the different institutional orders comprising the inter-institutional system [23]. Emerging contradictions and conflicts (in logics, interests and agency) between the various institutional orders allow for individual, organizational and societal partial autonomy. In summary, the advocates of the institutional logics perspective

[23] According to Friedland and Alford (1991), institutions are organized by institutional orders, such as religions, family, democracy, the bureaucratic state and capitalistic market, which together constitute the interinstitutional social system. The notion of institutional orders rejects isomorphism and accepts cultural heterogeneity and change in individual behavior and rationality depending on how individuals position themselves (their sense- and decision-making) within a particular institutional order. Similarly, different organizations generate organizational fields with values and behaviors guided and depending on different societal-level institutional orders.

(Friedland and Alford; Thornton, Ocasio and Lounsbury) explain institutional change by highlighting the role of culture and multiple logics, of which legitimacy or identity is only one element of culture and not the most dominant one, in contrast to isomorphism and other theories. Change may occur due to contradictions in logics and the decomposability between and within institutional orders, such as religions, families, communities, states, markets, professions and corporations (Thornton, Ocasio, and Lounsbury 2012).

Although the pioneers of institutional logics (Friedland and Alford 1991) primarily focused on changes in societal-level logics, recent research demands additional studies to contribute to understanding changes in logics on multiple levels, such as organizations, markets, industries, networks, geographic communities, and organizational fields (Thornton and Ocasio 2008). Logics exist on many different levels, and changes in one level can influence and alter another level's logics. Moreover, distinct institutional logics can coexist with none being particularly more dominant (Scott et al. 2000). Despite these observations, existing studies tend to focus on competition among alternative logics to study institutional change, employing a wide range of mechanisms to explore the impact of competing logics on change, such as environmental selection pressures, political disputes and social movements (Herremans, Herschovis, and Bertels 2009; Lounsbury 2005; Lounsbury 2007; Marquis and Lounsbury 2007; Nigam and Ocasio 2010; Reay and Hinings 2009). For example, competing logics can enable or hinder change, such as in the case of large, national banks acquiring smaller, local banks, which shared different institutional logics (Marquis and Lounsbury 2007). Similarly, differences between oil firms in perceiving corporate social responsibility and environmental concerns hindered the petroleum industry in Canada from establishing new norms for measuring and

reporting environmental performance, to conform with a new societal logic (Herremans, Herschovis, and Bertels 2009). Variances in the size, geographic location of operations and breadth of operations were among the factors that enabled resistance to change. Geographical differences also caused variations in the spread of contracts with independent professional money management firms in the U.S. mutual fund industry, as the old trustee, Boston logic, was gradually replaced by the (better) performance, New York logic (Lounsbury 2007). Moreover, power struggles between advocates of competing logics may enable change. Reay and Hinings (2009), for instance, studied the conflict between government and medical professionals in the Alberta health system, which drove a radical change. The government introduced a business-like healthcare logic, using its authority, legislative power and control over financial resources to better regulate healthcare and reduce costs. By altering regulations and rules, the government shifted the previously dominant logic from medical professionalism to business-like healthcare. However, what if logics do not truly compete, rules and regulations remain unchanged and no radical change occurs? Does change remain possible, in such cases? If so, how?

As we can observe from the previous examples, competing logics per se do not explain institutional change, but are instead either a reason for or consequence of the change, as a recent review highlights (Thornton and Ocasio 2008). In this paper, I address the abovementioned questions by studying the evolution of and shifts in institutional logics at the level of an organizational field, in which multiple actors coexist in a highly regulated context, no radical change occurs and strict regulatory regimes further hinder any potential change. By following the combined definition of Friedland and Alford and Thornton and Ocasio, I focus on logics that provide organizing principles for institutionalized practices in a disease treatment and care

field. I conceptualize this organizational field as a system of distinct but often-interacting organizations and actors engaged in the process of delivering (providing service to), regulating and financing the treatment of a specific disease (similar to Reay and Hinings 2009; Nigam and Ocasio 2010; McDonald et al. 2013; Harris and Holt 2013). I employ the meta-theory of institutional logics to study the context-specific processes of field actors possessing specific cultural beliefs and values expressed through the actors' decisions, actions and symbolic elements. This approach helps me to disentangle the logics of field participants and identify the precise logics of individuals who enact change. These individuals are often called institutional entrepreneurs in institutional theory, but thus far these two concepts are rarely employed in concert when studying change. In response to the call for further research in institutional logics, I examine how context-specific processes affect the actions of institutional entrepreneurs (Thornton, Ocasio, and Lounsbury 2012).

Institutional entrepreneurship and change

Institutional entrepreneurs have served as means to develop an understanding of the theoretical puzzle of embedded agency or simply to explain how institutional change occurs. Institutions change when actors equipped with sufficient resources seize opportunities to realize interests of high perceived (by them) value (DiMaggio 1988). Alternatively, institutional entrepreneurs are defined as "change agents who initiate divergent changes, that is, changes that break the institutional status quo in a field of activity and thereby possibly contribute to transforming existing institutions or creating new ones" (Battilana, Leca, and Boxenbaum 2009, 67). However, according to the authors, initiating a divergent change is not sufficient to qualify a change agent as an institutional entrepreneur. Active participation in the implementation of such a

change is what distinguishes the former agents from the latter. Moreover, institutional entrepreneurs involve themselves and implement change through different types of projects (interactional, technical, cultural), in which different activities occur and various skills are needed (political, analytical, cultural) (Perkmann and Spicer 2007). However, what remains unresolved is whether it is possible for institutional entrepreneurs "to change their emphasis from one type of project towards another one, and to acquire the necessary skills" (Perkmann and Spicer 2007, 1118) and under what conditions this is possible.

After studying the two most recent and comprehensive reviews of institutional entrepreneurship (Hardy and Maguire 2008; Battilana, Leca, and Boxenbaum 2009), I identified different approaches to the concept. First, there is a research stream suggesting that field-specific conditions enable individuals to take action and initiate change. Emerging fields with low institutionalization and greater uncertainty (Maguire, Hardy, and Lawrence 2004; Lawrence and Phillips 2004; David, Sine, and Haveman 2013; Kiss, Danis, and Cavusgil 2012; Garud, Jain, and Kumaraswamy 2002), for example, and mature organizational fields experiencing decline and destabilization (Greenwood and Suddaby 2006; Holm 1995; Child, Lu, and Tsai 2007) comprise the most favorable fields for institutional entrepreneurship. Second, other scholars highlight the social position (status, power, authority, multiple embeddedness, network memberships) and individual characteristics (reflexivity, visionary abilities, political skills and rhetoric) of institutional entrepreneurs as their source and means of enacting change (Mutch 2007; Dorado 2005; Rao, Monin, and Durand 2003; Rao, Morrill, and Zald 2000; Battilana, Leca, and Boxenbaum 2009). Both approaches have been criticized for failing to jointly address embedded agency and institutional pressures that affect agents' behavior, as well as for considering

institutional entrepreneurs to be "superheroes" or "Deus Ex Machina" (Battilana, Leca, and Boxenbaum 2009; Cooper, Ezzamel, and Willmott 2008). To address these issues, Battilana and co-authors developed a process model of institutional entrepreneurship, which comprises the third approach of the concept and an attempt to transform institutional entrepreneurship into a theoretical framework. Their model exhibits a dynamic relationship between field characteristics and the social positions of the actors enabling them, "despite institutional pressures towards stasis, to engage in the implementation of divergent change that involves the creation of a vision and the mobilization of allies" (Battilana, Leca, and Boxenbaum 2009, 86–87). These agents initiate and implement divergent changes that are hostile or in opposition to other actors' embeddedness. Their success is subject both to field characteristics (context or situation) and actors' social positions (the actor as an individual or organization). Success would imply the diffusion of divergent change, and as a result, institutional change, which impacts anew the two enabling factors of institutional entrepreneurship (field characteristics and actors' social). As the authors suggest, further research is necessary to provide "a more fine-grained understanding of the process".

Despite the numerous empirical studies employing the concept of institutional entrepreneurship, a theory has yet to be concretized and, as Thornton and Ocasio contend in their seminal work on institutional logics, "without a theory, it (institutional entrepreneurship) cannot sort out whether institutional change effects are due to the person or the situation or how the two interact" (Thornton, Ocasio, and Lounsbury 2012, 177). This study does not endeavor to develop a theory of institutional entrepreneurship, but rather combines the meta-theory of institutional

logics with the concept of institutional entrepreneurship and asks how and under what conditions individuals and organizations are able to shift logics and enact change.

Study design – research context and method

Research context - Alzheimer's treatment

The disease

Alzheimer's disease (AD) is a degenerative cerebral disease with neuropathological and neurochemical features and the most common type of dementia among the elderly. This chronic and progressive mental disorder affects cognitive abilities (memory, thinking, comprehension, learning, reasoning, judging); functional abilities (dressing, hygiene, shopping, managing money); behavior (agitation, aggressiveness, difficulty communicating) and has other symptoms such as depression, delusions, and hallucinations (Ballard et al. 2011). AD is the sixth leading cause of death, with more than five million persons suffering in the USA[24] alone and more than forty million persons affected worldwide. Studies estimate that these numbers will nearly double by 2030, and more than 135 million individuals of all ages will suffer from some type of dementia worldwide by 2050[25]. Global AD organizations report a total estimated worldwide cost of dementia of US$604 billion (2010). Approximately one third of this amount was spent in the USA alone, while in 2050 the expected cost will exceed one trillion dollars. In Switzerland, more than 110,000 individuals live with AD (2013), with the annual cost of care reaching SFR7 billion (US$7.9 billion)[26].

[24] http://www.alz.org/downloads/facts_figures_2013.pdf (accessed 14 February 2014)
[25] http://www.alz.co.uk/research/statistics (accessed 14 February 2014)
[26] http://www.alz.ch/index.php/zahlen-zur-demenz.html (accessed 14 February 2014)

Treatments: drug treatments and non-pharmacological interventions

No existing medications can cure AD; they merely slow its progression and palliate the symptoms. There are two types of drugs for treating AD pharmacologically: acetylcholinesterase (AChE) inhibitors (donepezil, rivastigmine, and galantamine) and a voltage-dependent NMDA receptor antagonist (memantine). Although the efficacy and safety of all four drugs has been demonstrated, they are only moderately effective in stabilizing or improving cognitive and functional symptoms for a few months. The existing pharmacological treatment has received a controversial reception among scientists, doctors and regulators (for more a more detailed overview, see Appendix A). In recent years, numerous studies have sought to develop a disease-modifying drug, a vaccine, or at least a more effective symptomatic treatment for the disease (e.g., Yiannopoulou and Papageorgiou 2013; Forlenza et al. 2011; Forlenza, Diniz, and Gattaz 2010; Forsberg et al. 2008; Ballatore, Lee, and Trojanowski 2007; Nordberg et al. 2010). The AD "market" has represented an environment with meager innovation, with most promising new drug candidates failing phase III of clinical trials (The Lancet 2010; Mangialasche et al. 2010). The lack of a proven cure and the high complexity of patient requirements in old age create major challenges and pressures from stakeholders on the pharmaceutical firms that offer symptomatic treatment. The firms involved in the organizational field under study (Pfizer, Eisai, Novartis, J&J, Forest, Merz and Lundbeck) have attempted to address these challenges by improving the efficiency and convenience of their products and better understanding the needs and mandates of stakeholders (Pachidou, Haefliger and von Krogh, 2014; work in progress). However, existing pharmacological treatment is declining in popularity among other actors in the field, an observation that is also reflected by this study's data. Moreover, the use of

antipsychotic drugs -very often off-label- to manage patients' agitation and behavioral problems has been a controversial issue, with scientists and physicians recommending alternative treatments (Ballard et al. 2011).

In the quest for better solutions, researchers and physicians have (re)turned to non-pharmacological treatments, combined with existing medications or not. Non-pharmacological treatments or social interventions are recognized as helpful and, to some extent, effective solutions for AD patients and their caregivers; however, the number and size of clinical studies are insufficient to secure the official approval of a non-pharmacological treatment. This does not imply that professionals and organizations do not recommend them. On the contrary, most scientific reviews on Alzheimer's treatment mention non-pharmacological solutions, albeit without analyzing them extensively. The World Alzheimer's Report 2011 attempts to arrive at a classification and evaluation of intervention strategies. Interventions are first categorized as pharmacological and non-pharmacological. In the latter category, a further distinction is made between interventions benefiting AD patients and caregivers (see Appendix A, Picture 1). Strategies to support and enhance cognition (reality orientation, cognitive stimulation, reminiscence therapy), psychological and psychosocial interventions and behavioral therapies (psychological therapies, counseling, support groups, legal and financial advice), as well as physical exercise, can be beneficial[27]. Examples include dance classes or music therapy, doll therapy, a sensor apron, warm drinks or a soothing bath (Maurer et al. 2006). Although some of these approaches might appear odd or even ridiculous, they exist. The evidence indicates that several non-pharmacological interventions must always precede, and

[27] http://www.alz.co.uk/research/world-report-2011

if/when necessary be combined with, pharmacologic interventions to maximize benefits (Livingston et al. 2005; Power 2010) and avoid drug overuse.

Methodology

I studied the history of Alzheimer's disease because of my interest in exploring a context characterized by high degrees of complexity and institutionalization and influenced by multiple institutional logics of actors. Given the gap in the existing literature on institutional change, in which a complex and highly regulated context interacts with individuals to initiate change, I employ qualitative case study methods (Yin 2003) to inductively develop a framework linking institutional logics with institutional entrepreneurship and change based on insights gleaned by actors embedded in this context. I identify these actors through an extensive review of textbooks and articles on the disease and interviews with experts in AD. As my research interest is to explore the interplay of context and individuals in institutional change, I drew on both the institutional logics and institutional entrepreneurship literatures to develop an appropriate methodology. In line with DiMaggio and Powell's (1983) definition of an organizational field, I conceptualize the field of Alzheimer's treatment as a system that constitutes a recognized area of organizational life including *suppliers* (pharmaceutical firms, health professionals such as geriatricians and other physicians, hospitals, memory clinics, etc.), *resource and product consumers* (patients and caregivers), *regulatory agents* (governments, policy makers, professional associations such as patient organizations and other health organizations) and *other organizations that produce similar products or services* (alternative medicine) (DiMaggio & Powell, 1983). I employed the concept of institutional order to categorize the actors embedded in this context (1).

Previous study of healthcare logics has identified two main (dominant) logics: *medical professionalism* and *business-like health care* (Reay and Hinings 2009; Currie and Guah 2007; Kitchener and Mertz 2012; Harris and Holt 2013; McDonald et al. 2013), stemming from the institutional orders of profession and the market, respectively (Thornton, Ocasio, and Lounsbury 2012). The organizing principles of professionalism include expert (e.g., doctor's) independence and leadership, a priority on patient care, a strong physician-patient relationship based on trust and ethics, and the delivery of superior, personalized care. In contrast, the business-like or market logic is associated with cost-efficient care and services; a 'do more with less' logic (Reay and Hinings 2009, 630). Care providers are obliged to follow explicit governmental guidelines, in which patients are considered units of a population and not individual cases. Preliminary desk research confirmed my initial observation that these types of logics (professionalism and business-like) also existed in AD treatment. Following further investigation into the history of the disease, I learned how different actors perceive and cope with the disease and whether and how this perception has changed over time. A detailed overview of historical events concerning AD is included in the Appendix (Table B5).

Adopting this general distinction of logics (professionalism vs. business-like logic) as a starting point, I analyze archival and secondary data to track the evolution of the disease and identify the precise institutional logics in AD treatment. This set of data consists of texts on the history of AD, scientific articles, association reports, conference proceedings and other texts to develop knowledge of how organizational fields and their actors behaved and evolved over time. In do doing, I was able to identify logics, observe their changes over time and understand the reason for these changes. A second set of primary data was collected in form of semi-structured

interviews. The reason for conducting the interviews was to locate institutional entrepreneurs in the treatment of AD. Due to resource limitations, data collection was only performed in three Swiss cities (Zurich, Bern and Basle). The choice of methods and analysis is in line with previous empirical research on institutional logics and entrepreneurship (e.g., Garud, Jain, and Kumaraswamy 2002; Reay and Hinings 2009; Maguire, Hardy, and Lawrence 2004).

Data collection and analysis

To identify and understand institutional logics in AD treatment, I reviewed approximately 70 peer-reviewed articles (Elsevier and Web of Knowledge databases) and textbooks. More than 260,000 peer-reviewed articles appear in the Web of Knowledge database when one searches for the word Alzheimer. Thus, my search focused on reviews and meta-analysis studies, which I identified using combined keywords such as Alzheimer, history, evolution, review, treatment, pharmacological, non-pharmacological and controversy. I also collected and coded reports and conference proceedings from the two largest AD organizations (Alzheimer's Association, Alzheimer's Disease International), as well as reports from national organizations (e.g., Switzerland, the UK), records of clinical studies (https://clinicaltrials.gov) and industry reports. All documents were both openly and thematically coded (Miles and Huberman 1994; Flick 2014). The categories used for thematic coding were institutional order, field actor, sources of legitimacy and authority, economic system, definition/interpretation of disease, treatment (pharma & non-pharma), recommendation for treatment and other open (in vivo) codes.

First, I categorized the data according to institutional orders. For example, a report published by a patient organization or an article presented in the organization's

annual conference was categorized under the heading of communities. Moreover, if a patient or caregiver was explaining her story in such a report, these data were classified as family/community data. Clinical studies and scientific research published by doctors and scientists involved in AD treatment we categorized under the institutional order of profession. Drug data, results from clinical trials performed by pharmaceutical firms, and firm reports and relevant newsletters were listed as corporation/ market data. Reports and appraisals by regulators, e.g., the FDA, NICE, were listed as state data. The following example clarifies how the overall constructs (types of logics) were derived from the data. The thematic categories in the coding of AD organization reports and conference proceedings were the year of publication, title of report and main focus, purpose and main finding. Notes on the number of pages in a report (indicative of the resources invested in a specific topic), on the images and illustrative material employed (e.g., happy or sad faces of patients, emotional or strictly scientific wording) were enhancing my examination of the data. Quotes referring to assumptions, actors' values and beliefs were coded as institutional logic components, according to their definition by Thornton, Ocasio and others. For example, if a report or a presentation focused on the cost-efficiency of a treatment, then this was coded as a measure of legitimization (logic component). If a scientist or doctor highlighted patient and caregiver satisfaction as his priority, this statement was coded as value. A perception and evaluation of a treatment was coded as belief. The thematic codes that emerged were further analyzed to identify possible patterns. Comparisons over time were important to identify the timing of and reasons for a shift in logics. By so doing, I was able to identify four different institutional logics based on the existing distinction between professionalism and business-like logic and the emerged 'curing' and 'caring' logics. The 'curing' logic was associated with codes,

such as ‘biomedical model’, ‘seek for cure’, ‘pharmacological treatment’, and similar, whereas ‘mixed’ treatments, including non-pharmacological, ‘patient-centric care’, ‘quality of care’, ‘prioritizing values and patient preferences’ and more constitute the ‘caring’ logic. To conduct the text analysis and coding, I used the software tool MAXQDA.

Table 1 presents a list of actors in the studied organizational field and the type of data collected. The results of the analysis are presented in the following section in tables 2 and 3.

Institutional order	Actors	Data
Profession	Physicians, scientists	Semi-structured interviews, clinical studies, textbooks
Community	Patient associations	Reports, conference proceedings, archival data
State	Regulators	Reports, appraisals, articles, newsletters
Corporation/ Market	Pharmaceutical firms	Drugs’ data, clinical studies, newsletters
Family, community	Patients, caregivers	Observations through online discussions and archived interviews
Profession, community	Other actors	Semi-structured interviews, archival data, textbooks, articles

Table 1: Data collection categorized by institutional order and field actor

After identifying the various institutional logics and uncovering the reasons for variations among them, the next step was to locate actors in the field, study their logics and identify institutional entrepreneurs among them. As mentioned above, this phase was conducted in three Swiss cities: Zurich, Basel, and Bern. I conducted semi-structured interviews with the principal physicians and/or geriatricians at three university hospitals and three memory clinics (two public and one private), as well as

with other actors (e.g., industry representative, Zurich Impact Hub representative). Moreover, observations and field notes served as additional data. These data were gathered during three events, namely a seminar organized by the Swiss Alzheimer Association for educating and supporting patients, professional caregivers and family members, a symposium on Dementia and Neurodegeneration at the University Hospital of Zurich, and a meeting organized for investors at the Gerontology and Rehabilitation unit of the University of Bern. Data collection and analysis were performed between 2011 and 2014.

Data from interviews and field notes were tape recorded (when allowed) and transcribed. All data, including memos and textual materials, were then analyzed, consistently using the comparative method and (open) coding paradigm of grounded theory (Glaser and Strauss 1967; Corbin and Strauss 1990). While analyzing primary and secondary data, I systematically sought to identify enabling conditions of institutional entrepreneurship to understand the social positions of the actors and how they participate in change implementation (if they did). Furthermore, I searched for examples of the impact of new or established actors in the treatment of AD to evaluate their contribution to changing the field. I identified links between institutional logics and institutional entrepreneurs' actions that played a role in changing the field to develop insights into how this process occurs. The findings of the study and the comparative cases studies, called the 'Zurich case', the 'Basel case' and the 'Bern case',[28] are presented below for illustrative purposes.

[28] The names of the cases are not intended to indicate that a particular logic is present throughout the cities of Zurich, Basel or Bern, but only in the specific case located in the corresponding city.

Findings

‘Curing’ and ‘caring’: institutional logics in AD treatment

The in-depth analyses of textbooks, articles, reports and other secondary data lead to the identification of two main logics in the treatment of Alzheimer’s: the ‘cure’ and the ‘care’ logic. The ‘cure’ logic refers to acquiring the necessary knowledge and resources to understand the cause of the disease, combat its symptoms and cure its sufferers. This logic is closely associated with science and biomedicine. Sciences such as neurobiology, genetics, molecular biology and their representatives place the disease at the center of attention and promise cures. The other logic emerging from the data is the ‘care’ logic, the center of which is not the disease itself but the patient. The objective is to care for the individuals affected by the disease, i.e., patients and caregivers. The ‘care’ logic does not exclude science, but it goes beyond laboratory science and promotes any approach able to improve patients’ and caregivers’ quality of life.

To untangle the different institutional logics encompassing Alzheimer’s disease, one should first understand the controversy concerning what the disease actually is. There is an ongoing debate over whether AD was discovered or invented (see, e.g., Fox 1989; Berrios 1990; Beard 2004; Chaufan et al. 2012). In 1906, Alois Alzheimer was noting his observations on a peculiar (“eigenartig”), serious, as he later called it, patient case presenting severe memory and cognitive impairment. A few years thereafter, Kraepelin to honor his pupil, Alzheimer, named the new disease after him. Historians contend that Alzheimer never stated having discovered a new disease. Despite this, what was initially simply termed senility was baptized Alzheimer’s disease and gradually became a massive threat. It is beyond this paper’s

scope to elaborate further on this debate or evaluate the two different 'sides', but I focus on understanding the debate's impact on the logics of the field in question.

Scholars believe that the founders of AD organizations, in their attempt to initiate a social movement and increase awareness of the disease, transformed "senility from a private family matter to a medical epidemic demanding public concern" (Beard 2004, 798). Although this transformation was highly beneficial with respect to resource collection and allocation and scientific developments, it had a less beneficial impact on the treatment and care of patients (Chaufan et al. 2012). Since 1980, when the first associations were founded, organizations and AD researchers, in an attempt to increase public awareness, (unintentionally) created the AD stigma and a fallacious public perception of AD patients. For nearly two decades (see Table B5 for historical events and tables C6-7), AD patients were depicted as pathetic victims, incapable of thinking, deciding, acting or representing themselves in discussions and movements concerning the disease. As a result, patients were excluded from conversations or any activities to secure their rights, a situation that began to gradually change after 2000. This stigma is being combated by the same organizations that 'helped' create it, but now in collaboration with patients and their caregivers (see, for example, report 2008 in Table C6 and report 2012 in Table C7).

The foundation of the first organizations sparked debates, supported fundraising, defended the rights of patients and caregivers and contributed financially and ethically to scientific breakthroughs. From the early 1980s and throughout the 1990s and 2000s, the need for a cure was emphasized. Before the development and introduction of the first anti-AD drug (tacrine), treatments were primarily non-pharmacological (e.g., dietary, outdoor activities and exercise, warm and mild baths), while drug treatment primarily included sedatives (Maurer et al. 2006) in severe

cases. The initially *caring* approach began to become a *curing* or *treating* approach as more and better drugs were approved, many promising drugs and a vaccine were in development and the number of diagnosed patients increased. The problem of AD was described as demographically, financially, socially and personally devastating, and the need to conquer it was systematically highlighted.

> *"…in the course of seeking to legitimize their grievances, advocates not only helped raise public awareness and earn the public's sympathy toward the problems of aging, they also helped boost a medical model of AD, one that characterized the condition as treatable, and even curable. The success and continuing hegemony of the biomedical model of AD even among advocates themselves in turn contributed to the notion of a "crisis" caused by an aging population that had to be avoided at all costs"*(Chaufan et al. 2012, 789)

This 'biomedical model' or 'cure model' represents one of the logics in AD treatment. I will refer to the contrasting approach as 'care model' or care logic. This distinction, combined with the professionalism (assist a few individuals substantially) versus market or business-like logic (aid the most individuals a little) leads to the four institutional logics as presented in tables 2 and 3.

Institutional order (actors) / **Institutional logic**	Market/ corporation (Pharmacies/ pharmaceutical firms)	Profession (Physicians, medical scientists)	Community (AD associations)	State (Regulators)	Other communities (e.g., alternative medicine, other scientists)
'Curing' professionalism		x			
'Caring' professionalism		x			x
'The business of cure'	x	x	x	x	x
'The business of care'		x	x		x

Table 2: Institutional logics in AD treatment at multiple levels

Professionalism and business logic are the most recognizable logics in medical practices and comprise logics distinct in principles and implementation, as in the case of AD treatment. The principles and manners in which these logics are actually implemented in practice are explained in Table 3. It is important to mention that these logics coexist and often complement one another. Despite the apparent differences, they do not directly compete with one another, an insight that motivates a further discussion on competing versus complementing logics and change.

Institutional logic	Actors	Principles	Implementation
'Curing' professionalism	medical professionals (geriatricians, neurologists, gerontologists, general physicians, and similar)	medical and technical excellence strictly scientific approach ('biomedical' model) science comes first	Strictly scientific and technical treatment of patients Challenging and comparing pharmacological treatments Drug prescription Professionals value ethics highly; they achieve and maintain high status and reputation in scientific and medical community Clinical researchers are interested in and updated with new medical/scientific developments Legitimacy through significant scientific results
'Caring' professionalism	medical professionals, alternative therapists, professionals offering non-pharmacological solutions	technical excellence but not strictly biomedical more humanitarian approach patient comes first	Pharmacological and non-pharmacological treatment, but avoiding unnecessary drug use (e.g., antipsychotic drugs) or stopping drug treatment in later stages, in case of severe side effects and/or polypharmachy Actors keep close relationship with patients and family members; they share ethical and altruistic values Actors are knowledgeable and updated with traditional and alternative medical solutions; open to try new approaches Actors achieve and maintain high status and reputation among patients Clinical researchers are also interested in non-pharmacological interventions Legitimacy through efficiency and patient satisfaction
'The business of cure'	all health care suppliers (industry, professionals, state, communities)	treatment according to governmental guidelines cost-efficiency guides actors' decisions regulated profit maximization for market and corporations	Prescription of drugs if and as long as they are cost-efficient Physicians are informed by responsible authorities and the market; their job finishes after diagnosis and providing a prescription Patients are offered treatment options only according to guidelines, no interest for individualized solutions, but population based strategies Patients are viewed as units or clients Legitimacy through cost-efficient solutions and increase in number of patients treated (treat more patients a little)
'The business of care'	all actors apart from pharmaceutical firms, pharmacies, self-dispensing doctors (producers & markerters of the 'biomedical' model)	care for more (the mass) no strict compliance to official guidelines profit maximization through customer satisfaction	Solutions are not necessarily cost-effective or scientifically proven (placebo effect accepted) Care services for patients and caregivers (pharmacological and non-pharmacological) while serving as many as possible without following necessarily strict guidelines Legitimacy through customer satisfaction (care for more patients a little)

Table 3: Actors, principles and implementation practices of institutional logics in AD treatment

The return to caring: why logics shift – why institutional change can occur

From the beginning of the 20th century, when senility was first registered as a disease and named after Alzheimer, until the foundation of the first AD associations circa 1980, the dominant logic was caring professionalism. Scientific progress remained in an embryonic stage, and treatment was primarily non-pharmacological and highly individualized, while drugs were dispensed in severe cases and for behavioral

symptoms. Caring was essentially the only available treatment due to absence of anti-dementia drugs, extremely limited number of diagnosed cases, and the low awareness of the disease. The curing logic, both professionalism and business-like, emerged after the 1980s and dominated the AD domain for the next three decades. As we can observe in Table 5 (appendix), from 1995 to 2010, the curing-biomedical model was very dominant and accompanied by increased awareness, the AD social movement, scientific and medical progress, and profitable pharmacological treatments. The stigma associated with AD emerged during this period, the disease was recognized as an epidemic and global crisis and initially promising clinical results failed to provide a cure. While none can deny that discovering a cure is the ultimate desire of all actors involved, several facts contribute to the return to the caring logic. Below I list these events:

- **Change in the associations' perceptions and frameworks**: associations began involving AD patients in debates, not strictly focusing on research funding and family support; curing and caring logics coexist, with curing represented by pharmacological treatments becoming an aspect of care and no longer the dominant logic. This began tentatively in the first years of the 2000s with the inclusion of real patient stories in AD reports, the inauguration of online fora and blogs, on which patients exchange information, ask and offer support, openly discuss issues such as legal rights, treatments, and relationship with doctors. Patients are not pictured as pathetic victims in associations' reports and websites but as happy-looking 'normal' elderly individuals (see tables 6-7).
- Patients, caregivers and scientists began **challenging medical authority** and **knowledge** (e.g., Selkoe 2011; Golde, Schneider, and Koo 2011; Gerald and

Ockert 2013; Chaufan et al. 2012; Power 2010; Moser 2008; Moser 2011); the 'magic pill' approach is being questioned and gradually fading. The new generation of elderly, the baby boomers, are now more open to speaking out, challenging, questioning, demanding information and using modern technology.

"Realities that were carefully kept apart, made invisible and absent by the pharmaceutical industry's ways of working with Alzheimer's are being made co-present, visible and real in the clinical consultation." (Moser 2008, 106)

"When I was diagnosed, the doctor basically gave me my medicine and said, 'Come back in six months and we'll talk again.'" (AlzAss Report_Townhall 2008)

"Healthcare professionals need to take us more seriously and most of all listen to our questions and concerns. Don't just shove another pill at us to get us out of the office – treat us as if we were their mother, father, sister, or brother." (AlzAss Report_Townhall 2008)

- **Change in the public perception of the disease**: attempts to reduce the stigma and shame associated with AD; from pathetic, incapable patients to still active, necessary participants in social movements (see Tables 6-7).
- **Change in the focus** of treatment, **from curative to preventing**; the association of AD with numerous lifestyle diseases such as obesity, diabetes, and heart disease. Changes in lifestyle (eating habits, physical activity) might reduce the risk of AD (prevention) (e.g., The Bern case interviews, Golde, Schneider, and Koo 2011; Khachaturian 2012).

"All the things that we know are bad for your heart turn out to be bad for your brain." Marilyn S. Albert, PhD; Johns Hopkins Medical Institutions

- **Progress in early diagnosis** enabling **change in the public perception** of AD patients; the social construction of the disease has changed thanks to early diagnosis; patients can speak for themselves, no longer as 'branding' for the

caregiver or the non-AD public, but for the patient himself. Advances in research (biomarker studies) demonstrating that it is necessary to intervene before symptoms appear.

- From *crisis* and *devastating disease* to **healthy aging**, **healthy brain** and **'new science'**.

" The new science has shifted the focus to the idea that there is value in a public health strategy of getting people to think about their brain and how they might alter their behavior to keep their brain healthy." Stephen McConnell, PhD Alzheimer's Association

" If you could give people information and tools that would delay the onset of cognitive impairment by a few years, you would be doing much to improve individuals' quality of life as well as improving society." Debra Cherry, PhD Alzheimer's Association

- **From cure back to care**; from **treat to prevent and early intervene**.

" The possibility of prevention in this area is so new and so exciting for families, individuals, and government." James Laditka, DA, PhD, MPA, University of South Carolina; The Healthy Brain Initiative 2006-2011, AlzAss & CDC reports

" If we maintain cognitive function over time, then we are more likely to be functionally independent." Marilyn Albert, PhD Johns Hopkins Medical Institutions; The Healthy Brain Initiative 2006-2011, AlzAss & CDC reports

In summary, several factors and events initiated and contributed to the transition from the curing to the caring logic. Disappointing existing treatments, an increase in failed clinical studies, uncertainty over future treatments, a shift of focus to early diagnosis and prevention, and a shift to a more humanitarian perspective on the disease and the patients shifted the center of attention from the disease itself to the individual (patient, caregiver). As a result, the caring institutional logic gained ground in the treatment of Alzheimer's disease. One of the traits of the caring logic is the emergence of new, non-pharmacological treatments. These treatments are developed

and promoted by professionals and communities, who can potentially represent institutional entrepreneurs and participate in institutional change. In the following section, I explain the process of institutional entrepreneurship by comparing successful and unsuccessful cases of institutional entrepreneurs.

Conditions for institutional entrepreneurship: Comparison of cases in Switzerland

Thus far, I have revealed why a shift from curing to caring occurred in the treatment of Alzheimer's disease in recent years. One effect of this shift is an increase in non-pharmacological treatments. Below, I discuss findings from cases of actors who support and provide non-pharmacological treatments to their patients. The cases were analyzed and compared based on constructs from the very generic model proposed by Battilana, Leca and Boxenbaum (2009), such as *enabling conditions*, actor's *social position*, *divergent change* and other central concepts of institutional logics theory, such as legitimacy and mobilization. Additional constructs emerged, e.g., *hybridization of logics* (which I explain below in greater detail), leading to an inductively developed, extended process model of institutional entrepreneurship (Figure 1), which explains the conditions under which agents are able to enact institutional change.

The Zurich case

In 2010 more than 107,000 individuals in Switzerland lived with AD or another form of dementia, with the cost of care exceeding 6.3 billion Swiss francs annually (7.5 billion dollars)[29]. There are 17,800 patients living in the canton of Zurich[30]. In most cases, when AD is diagnosed, medication is immediately prescribed, but the city of Zurich and, in particular, one of the memory clinics follows a different process. The opinion of the head neurologist of the gerontological center of the city of Zurich on treating AD pharmacologically reads:

"We are not as enthusiastic as we used to be, we say it is indicated to try this medication and then we also tell them [the patients] that if they want we can make the prescription. If the patients cannot live at home anymore and come to the nursing home we stop the medications (AChEI), too many side effects and no real effect. We try to keep as low as possible the neuroleptics, we prefer the non-anticholinergic antidepressants... I never prescribed memantine. Sometimes, if somebody has really severe behavioral disorders, we may try it. But I am not convinced. I don't see it."

Thus what they propose is a non-pharmacological intervention, namely SiL (Sozialmedizinische individuelle Lösungen), translated into English as '*social-medical individual solutions'*. The SiL project belongs to a series of projects and initiatives implemented by the City of Zurich to improve healthcare and promote innovative and patient-oriented solutions (Gesundheitsnetz 2025)[31]. The same physician asserts:

''AD patients don't suffer themselves, they remain human beings, they remain very interesting human beings … they change but they have the same personality, as you, you were not the same 10 years ago, and you won't be the same in 10 years from now.''

Their approach is to care for the AD patients in their own environment with the least possible medication prescribed. The patients continue their lives as before the diagnosis and care for themselves with assistance from their families and the SiL

[29] www.alz.ch
[30] http://www.alz-zuerich.ch
[31] http://www.gn2025.ch/verein-gesundheitsnetz-2025/

employees. These employees are highly qualified caregivers, specially trained to treat demented individuals, and visit patients regularly to assess the progression of the disease by evaluating their cognitive abilities and providing other necessary services. These services include cleaning the patients' homes and providing meals at least twice per day. The program is specifically designed to treat cases of individuals who live completely alone or for whom the family cannot offer help 24 hours per day. In these cases, the SiL employees first adapt the patient's home to the new reality. For example, they remove dangerous objects, interrupt any gas supply and replace it with less 'risky' heating; they also do not allow patients to drive (at least at severe stages of the disease). The patients live happy and satisfied lives in their homes, as caregivers report. The goal of this intervention, as the head of the SiL program reports, is to offer the best possible treatment to AD patients and delay patients' institutionalization in nursing homes or hospitals to the greatest extent possible. Institutionalization is very common in severe cases and quite costly to patients, families and the state (payers). The SiL program is partly covered by the patient's health insurance and the City of Zurich.

"So what the industry does: they have the AChI drugs, they change them a little, they make a patch, they made some modifications, because they go off patents and to stay in the market. But it doesn't help… On the other side there are the non-pharmaceutical measures. They can do a lot of good. If you modify the environment of AD patients, so that they are not in stress. So you take away things they cannot do anymore and let them do what they can do, make changes of course. Then they have a good quality of life, they stay stable for a long period of life. They don't get aggressive. You shouldn't take them away from their environment, you should put help into their environment, like the Spitex[32] *in Zürich (Household support) and with that you can do a lot of good… Then we made a new program that it is called SiL. There are 4 employees at SiL, 4 high-qualified caregivers, employed for the city of Zurich and they go there, clean up, 'machen die selbe psychometrische batterie', as all the memory clinics do in the whole german-speaking Switzerland. It's the CERAD-Batterie*[33]*. In this way patients receive care at their environment and the SiL*

[32] http://spitex.ch/ (assessed 28 March, 2014)
[33] the CERAD neuropsychological battery consists of seven subtests including the MMSE and three others which are adapted from the ADAS-Cog. These tests assess memory, language, praxis, and

caregivers organize the supervision by Spitex and any legal service when necessary. A legal representative, that by law has the same rights as the parents for children"

The Zurich case is an example of the 'caring' professionalism logic. It offers personalized, patient-centered solutions. Although the project was evaluated as significantly effective, it achieved limited awareness among physicians in Zurich. The results of a follow-up survey revealed that physicians acknowledged the need for such an intervention, but improved advocacy and advertising is necessary for its success.

The Zurich case is an unsuccessful case of institutional entrepreneurship. Although field characteristics (the lack of better pharmacological solutions, need for better care and individualized solutions) and actors' social positions served as enabling factors, no divergent change occurred due to unsuccessful implementation (vision creation, mobilization of allies behind the vision).

The Basel case

The City of Basel runs also its own division of the Alzheimer association[34], and as in that in Zurich, operates under the umbrella of the Swiss Alzheimer Association. However, in Basel, the university hospital authorities and the geriatric clinic's head doctor regard AD treatment differently, as in the case of Zurich described above. Physicians recommend and prescribe existing medication, but because they also believe that this is insufficient to cope with the symptoms of the disease, they offer a different, non-pharmaceutical intervention. Demented individuals, apart from cognitive impairment, also exhibit symptoms of physically frailty and mobility dysfunctions, such as reduced gait speed and functional mobility, loss of balance and others. As a result, they frequently experience falls with consequent bone fractures.

orientation. Because the tests were designed to characterize patients along different dimensions, there is no established algorithm for calculating a single dementia severity score.

[34] http://www.alzbb.ch/

Scientists have discovered that physical activity interventions in elders with dementia improve their physical performance[35]. In particular, clinicians in Switzerland reported a significant reduction in the fall rate of elderly persons after their participation in a multi-tasking, rhythmic movement intervention set to music (Gschwind et al. 2011; Trombetti et al. 2011). As a result, the geriatric clinic of Basel, as well as in Geneva, organizes dancing-based training classes for demented patients[36].

The head of the geriatric clinic at Basel's University hospital and professor at the University of Basel, explains

"it's the link between cognition and movement and it's very quickly changing, there is a lot of improvisation linked also to the teacher who has to be an excellent pianist. So those teachers they are sitting at the piano and they are playing a melody and then in fact the participants they have to move with the rhythm of the melody but depending on the melody, they know at this point, if the pianist is only playing with the right hand that means they only can do a movement with the music with the upper part of the body. Or if it's just the left hand, so it's just with the legs. If both hands, it's upper part and lower part. So, there is a lot of thinking, multitasking… And we did now this study, and I mean almost 300 participants just showing that it is working. So, I think that is really important."

Scientists and clinicians found that cognitive skills such as memory, planning activities or information processing decline in parallel with simple mobility activities such as walking. This finding can be used (and it is used in Switzerland) as a tool to forecast, if not diagnose, cognitive impairment. The team at the Basel clinic has performed clinical trials[37] and published several scientific papers (Bridenbaugh et al. 2013; Muehlbauer et al. 2012) focusing on mild cognitive impairment, mobility dysfunctions and healthy aging. One of the studies included 1,100 elderly, who were asked to walk on an electronic walkway. Then, they were asked to do the same while simultaneously performing a cognitive task, such as counting backwards by twos to

[35] http://www.alz.co.uk/research/world-report-2011
[36] http://www.alzbb.ch/pdf/memory-atelier.pdf
[37] Clinical trials identifiers: NCT01745263, NCT01539200, NCT01607736, NCT01046292

fifty. A 72-year old woman, despite performing relatively well in the first phase, lost her gait and walked abnormally while counting. Subsequently, additional tests revealed that she already suffered from cognitive impairment without being aware of it. These results, in conjunction with those of similar studies, were presented in 2012 at the Alzheimer's Association International Conference in Vancouver. A member of the Basel team said:

"…what we need is to use the information we have here and find a screening tool that physical therapists and doctors can use to red flag those who have a mobility problem. This should be basic. When your patient is in your office and you listen to their heart, it should be basic to see how they walk."[38]

The interviewee also explained that in his clinic, they hold salsa classes and use Dalcroze Rhythmic training to improve dual-tasking and reduce falling and mobility dysfunctions. The results are positive and have been published in several scientific journals (the method is termed 'the Basel motor-cognition dual-task paradigm'; Gschwind et al. 2013; Muehlbauer et al. 2012; Granacher et al. 2012; Beauchet et al. 2011; Theill et al. 2011) When the doctor was asked about the purpose of conducting these studies and dancing courses and whether he had considered profiting from the results, he answered:

"Well, I am not, you know, I am not a businessman in a way… I get of course patented and make money out of it, but I always think as soon as you want money for something it's a barrier. A barrier for implementation and I mean my main goal as a researcher, particularly as a university researcher is if I have a good result, I want to see afterwards in reality. So, to me most important is implementation of what I do or am doing in research… Then of course the university will take care of selling this to a company but then as long as these are interventions like doing sports like doing whatever, I mean there is no money in there."

The Basel case is another example of 'caring professionalism'. The team occasionally offers interventions beyond pharmacological treatment. They believe

[38] http://www.nytimes.com/2012/07/17/health/research/signs-of-cognitive-decline-and-alzheimers-are-seen-in-gait.html?pagewanted=all&_r=0 (assessed 28 March, 2014)

that drugs are necessary but insufficient. Symptoms such as falling and losing balance cannot be treated with existing drugs. Thus the team invests significant resources in non-pharmacological solutions. Clinical excellence, a vision of better care and a close patient-doctor relationship are their principles. They legitimize their work through scientific publications and community acceptance and recognition. Is this sufficient to consider them to be institutional entrepreneurs? Do they implement a divergent change? Most likely not, as the solutions they offer are complementary and do not threaten existing ones (pharmacological treatments). However, what both cases have in common is that they follow the same institutional logic, namely 'caring' professionalism.

The Bern case

In December 2013, Novartis, one of the manufacturers and marketers of an AD pharmacological treatment, published an article on its Swiss with the following title: 'Ein virtuelles Spiel im Kampf gegen Demenz' or in English 'A virtual game to fight dementia'[39]. The explained a scientist (Dr. Tarnanas) winning an entrepreneurship contest organized by Impact HUB in Zurich, an innovation lab and business incubator, and Novartis International. The official theme of the contest was healthy living. The prize was 34,000 Swiss francs, a working place at the HUB, and coaching for starting his own business. The company was established the next month (January 2014) and called Alterniity. The following is how he describes his product:

"Alterniity sells virtual reality serious gaming software for patients suffering from cognitive decline, particularly dementia and Alzheimer's disease. Our product is the first non- pharmaceutical, risk-free solution that has been scientifically proven to improve several aspects of cognition… our value proposition is to offer a non-invasive and risk-free solution fulfilling the need for "healthy aging," with a focus on

[39] http://www.novartis.ch/de/media/feature-story/2013-12-18_ein-virtuelles-spiel-im-kampf-gegen-demenz.shtml

improving and maintaining the brain fitness of both healthy and dementia-affected elderly people."

Dr. Tarnanas and his team are located in Bern, Switzerland at the ARTORG Research Center for Biomedical Engineering at the University of Bern. The solution is game software, which places a patient in a virtual reality environment, such as a kitchen, a living room, or ancient Athens or Rome. The patient must perform basic cognitive tasks that are transformed into imaginative and engaging 3D virtual exercises, which include physical interaction, interactive storytelling and social gaming aspects, which according to the creators, encourage repeat use. Dr. Tarnanas cites an example:

"Mrs. 'Virtual', aged 55 burned her food a lot of times recently although she was at home. She thinks it is too early to be experiencing a memory loss so she starts training with us. We put her at realistic 3D virtual environment where we ask her to actually prepare a virtual meal. We monitor her moves with our 3D sensor and realistically assess her cooking skills, which is the first ability affected at early dementia. We then train her by repeating the right process following the cognitive stimulation training strategies."

The 3D sensor is another innovative solution developed in Bern, which comprises an emotive hardware that creates a real-time behavioral database (measuring movement, temperature, mood and other patient characteristics) in realistic settings, which is the largest of its kind in the world and integrates multiple measures of the brain in a standardized manner. The software is based on 12 years of in-house research and three years of clinical studies (Giotakos, Tsirgogianni, and Tarnanas 2007; Laskaris et al. 2013; Nef et al. 2013; Tarnanas, Mouzakidis, and Schlee 2013; Tarnanas and Manos 2001; Tarnanas et al. 2014; Tarnanas, Laskaris, and Tsolaki 2012; Anderson-Hanley et al. 2012); it is patented (Harper et al.) and has proven beneficial in three distinct areas: very early AD screening (diagnosis), AD prevention and early intervention and, finally, delaying the progression of dementia.

The Bern case constitutes another example of the 'caring' professionalism logic, characterized by technical and clinical excellence and altruistic behavior. As a treatment for demented individuals, is strictly science-focused but non-pharmacological, and hence does not follow the traditional 'biomedical'/cure model. Moreover, it has been introduced as a personalized, patient-centered solution, one that is more safe and enjoyable (no side effects while being entertaining), and of lower cost compared to pharmacological treatments. Moreover, it represents an example of institutional entrepreneurship by contributing to a divergent change. The enabling field conditions remain identical to those in the previous cases: existing drugs that are not effective enough, no other promising pharmacological treatment in the future, a shift from curing professionalism to caring professionalism and from cure to prevention through healthy brain/aging. Dr. Tarnanas highlighted the preventive advantage of the game as follows:

"Even if there are drugs in the future that are able to cure dementia, you will still not need the drugs, if you are trained enough with virtual reality on how to build up your own mental power. The only limitation we have so far is that the current generation of elders is not so hardcore gamers, but this is changing and it's changing fast."

Regarding the social position of the main actor, he initially held relatively low status and reputation. His status and subject position improved over time due to positive scientific results, awards and community recognition in various countries, and further legitimization of his identity through more organized advocacy of the treatment (scientific proof, publications, patent, awards, preparing for FDA approval).

The institutional entrepreneur's social position only improved during and after the implementation of the divergent change; hence, well socially positioned actors do not necessarily enable institutional entrepreneurship and change. On the contrary, in the two previous cases, the actors enjoyed a better social position and higher status than the institutional entrepreneur in the third case. However, they did not succeed in

implementing and diffusing divergent change. Therefore, I suggest that social position is an antecedent or a consequence of institutional change.

Another interesting finding in the Bern case relates to the diffusion of divergent change, which is crucial for institutional change. The success of this diffusion also relies on the competitors' recognition and promotion of the new alterative treatment. A potential competitor, Novartis, sponsored the entrepreneurship contest, which Dr. Tarnanas and his team won. The contest was organized by a business incubator and entrepreneurship community in Zurich (Impact Hub Zurich) and the event manager explains:

"The Impact Hub Fellowship is always together with a partner organization and the partner organization pays it. They choose a topic of their interest, which has to be in the field of addressing social challenge…the choice of topic in this case was driven by Novartis, as healthy aging is core in their social corporate sustainability topics."

The winner receives financial and mentoring support from the partner organization (Novartis), as well as additional mentoring and networking support from the incubator. The event manager also explained that the topic of the contest was ultimately changed to healthy living to attract additional applicants; however, Novartis' primary goal was solutions for elderly people. Ultimately, the best project concerned aging, as the interviewee remarked. Why did his team win?

"First of all his presentation was very good. His idea was very scalable and it could have a really huge impact…and then he was also very convincing as a person, he is really driven by the idea and he wants to make it happen and of course the proof of concept that there is good research behind it... and his enthusiasm, his eyes sparkled."

The same enthusiasm was observed during all interviews with Dr. Tarnanas and observations of his work, in which principles of the caring professionalism logic were evident. However, in this case of institutional entrepreneurship -the only successful case of those studied- another interesting observation was made. In the

implementation and final diffusion of divergent change, a hybrid of two logics appeared: a blending of caring professionalism and business logic. In vision creation, skills acquisition and, partly, in the mobilization of allies (phases of divergent change implementation) the institutional entrepreneur follows the newly prevailing caring professionalism logic. Yet the resource mobilization (and partly that of allies) is characterized by business-like logic principles. The institutional entrepreneur's team had to not only demonstrate technical and clinical excellence but also cost-efficiency and profitability to attract support from other institutional actors, such as the state, regulators, other communities. For example, the team speaks of a profitable company after the second year, a constantly increasing number of users/clients and an exit strategy for the start-up:

"We are in a favorable position to cultivate a strategic partnership with Novartis International, a company we believe is interested in increasing their exposure to the emerging healthcare gaming industry, and who would benefit from adding Alterniity's suite of products to their portfolio in the future."

Additionally, another shift is observed regarding the type of project in which the institutional entrepreneur participated. Initially, the project was purely technical: a scientist attempting to prove the effectiveness of a new treatment. To do so, he acquired analytical skills at various universities, where he performed activities that entailed studying, analyzing, and designing (theorization). However, when he joined a more entrepreneurial field, more favorable to alternative solutions, i.e., a Swiss university and market, he focused on interactional activities, such as networking, resource mobilization and building a company. These latter interactional activities require political skills, which are more in accord with the business logic. This observation further supports the concept of logic hybridization.

The business logic complements the caring professionalism logic. This logic hybridization appears necessary for the diffusion of divergent change and the ultimate institutional change, i.e., the pharmaceutical industry supporting, promoting and eventually selling non-pharmacological treatments.

In summary, the following findings emerged from the cases studied:

Case	Enabling factors	Institutional logic	Outcome
Zurich	Unmet needs and dissatisfaction from existing solutions, shift in institutional logics from cure to care, social position of actors	Caring professionalism	No diffusion of divergent change mainly due to insufficient mobilization of allies
Basel	Unmet needs and dissatisfaction from existing solutions, shift in institutional logics from cure to care, social position of actors	Caring professionalism	Lack of interest in enacting a divergent change (their vision was to care for local patients, increase reputation among peers, raise funding for further research)
Bern	Unmet needs and dissatisfaction from existing solutions, shift in institutional logics from cure to care	Hybrid of caring professionalism and business logic	Hybridization of logics to diffuse divergent change and enact institutional change

Table 4: Cases of successful and unsuccessful institutional entrepreneurship

The process of institutional entrepreneurship: the role of the hybridization of institutional logics

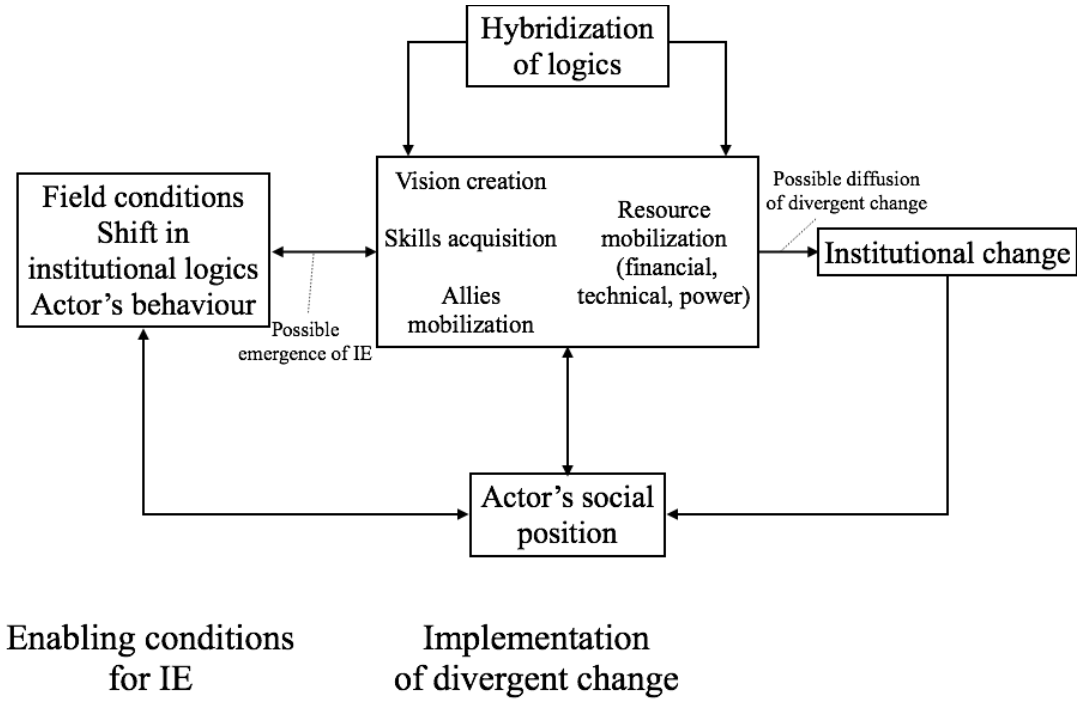

Figure 1: The process of institutional entrepreneurship (IE) though hybridization of institutional logics

Figure 1 presents a proposed framework for institutional entrepreneurship based on the insights gained from this study's findings and the generic model developed by Battilana, Leca and Boxenbaum (2009). The framework depicts institutional entrepreneurship as a vehicle that leads to institutional change. First, field conditions such as regulatory changes, crises, technological discontinuities, disruptive innovations or a lack of innovative solutions, massive unmet needs and public dissatisfaction comprise an enabling condition for institutional entrepreneurship. Then, an ongoing or completed shift in institutional logics serves as an antecedent of a potential divergent change that enables institutional entrepreneurs to initiate and promote this change. Finally, the behavior of actors involved in this specific context or situation can also enable or hinder change. For example, actors may not take

existing institutional arrangements for granted but question them, distance themselves and diverge. Alternatively, others might participate and contribute to a shift in institutional logics but have no interest in further involving themselves in a divergent change. Moreover, the social positions of actors (status, multiple embeddedness, power, authority, formal and socially constructed position) can play an enabling role, but it not a necessary condition for the emergence of institutional entrepreneurship. As explained above, social position changes over time, affects and is affected by the entire institutional entrepreneurship process; it can be a reason for or the result of change. This is why it appears to interact with all of the components of the suggested model.

When the conditions are sufficiently conducive, institutional entrepreneurs are likely to emerge and participate in the implementation of divergent change. Active participation in vision creation and advocacy, the acquisition of necessary skills and allies and resource mobilizations are crucial to the success of institutional entrepreneurship. In highly regulated institutions with multiple actors engaging in complex relationships, e.g., the treatment of a complex disease affecting an increasingly large population of patients and caregivers, professions, governments, the market and many other stakeholders, a new or alternative institutional logic is inevitably combined with an older or more dominant logic. Logics act as hybrids, complementing one another, to allow divergent change to diffuse throughout the field. As we can observe in the framework, there is a reciprocal relationship between field characteristics and other enabling conditions and the activities of institutional entrepreneurs during the implementation of divergent change. For example, in the case of Alzheimer's disease, the highly regulated context should not initially allow actors to operate differently. However, the conditions of this context, i.e., no effective

treatment, no promising drug treatment (cure) in the future and an increasing mass patient need, weaken previous assumptions ('treatments can by only pharmacological', 'a cure is needed'), and change the beliefs and values of actors (shift in institutional logics). Simultaneously, institutional entrepreneurs act to obtain legitimacy (scientific proof of alternative solutions, increase awareness), mobilize additional actors to participate in the change process (pharmaceutical firms invest in their solutions and exhibit interest in integrating them into their models), and improve their social positions. As a result, field conditions change, and the shift in logics is further enhanced. This suggests that change is not solely the result of a specific situation or individuals' actions. Instead, there is a continuous interplay between context and institutional entrepreneurs' behavior. Finally, the resulting institutional change will in return further affect the context and actors' behaviors and positions.

Discussion and conclusion

Implications for theory and practice

The aim of this paper was to contribute to understanding how occurs happens in highly regulated institutions, in which multiple actors coexist and interact. To do so, I explored the reasons, the conditions and the process of change in the organizational field of Alzheimer's disease. In the first stage, data collection and analysis, the main findings of the study were the identification of four institutional logics in AD treatment, namely 'curing' professionalism, 'caring' professionalism, 'business of cure' logic and 'business of care' logic. Subsequently, the study shed light on the evolution of and shifts in these logics over the last century (1906-2014), i.e., from caring prior to 1980 to curing until the first years of the 2000s and, finally, a return to caring throughout the last decade. Based on these findings and additional insights

garnered from the analysis of the comparative case studies, I inductively developed a framework that is more fine-grained than existing ones to explain how institutional change occurs by combining two fundamental perspectives of neo-institutional theory: institutional logics and institutional entrepreneurship.

Four contributions to theory are noteworthy. The study contributes to the existing literature by contributing another piece to the puzzle of embedded agency (Garud, Hardy, and Maguire 2007; Powell and DiMaggio 1991; Friedland and Alford 1991), specifically by extending the institutional entrepreneurship perspective as a mechanism for change (Garud, Hardy, and Maguire 2007; Lounsbury and Crumley 2007; Perkmann and Spicer 2007; Battilana, Leca, and Boxenbaum 2009; Leca, Battilana, and Boxenbaum 2008). The richer framework of institutional entrepreneurship suggests that institutional change is neither individually induced nor situational alone and provides an improved understanding of how change occurs.

First, it defines the enabling factors of institutional entrepreneurship in greater detail. Apart from favorable field conditions (in the case of AD: the lack of an effective treatment, recurring failures in clinical trials, an increasingly ageing population, governmental pressure for solutions), shift in institutional logics (from curing to caring) and actors' behaviors (e.g., actively supporting the shift to non-pharmacological treatments) are contributed.

Second, the actors' social positions –e.g., status, power and authority- is better situated in the model. It is not merely an enabling factor as it is presented in the model developed Battilana and co-authors. As one's social position can change during the process of institutional entrepreneurship, its improvement or worsening can affect the implementation and diffusion of divergent change. This is in line with existing studies suggesting that an actor's social position can influence not only how the actor realizes

a field and behaves in it (Bourdieu 1977) but also the actor's access to and control over the resources necessary to implement divergent change (Battilana 2011; Lawrence 1999). For example, the actors in the Zurich and Bern cases, despite being better socially positioned in their field (professors and leaders at university hospitals) and having better access to resources were unable to diffuse divergent change. In contrast, the institutional entrepreneur in the third case only improved his social position during the implementation of the process. This gave him access to more resources, better situated him within the network of other actors and enabled him to diffuse change.

Third, the extended process model suggests a reciprocal relationship between the context of institutional change and the behaviors and actions of institutional entrepreneurs. Changing conditions in a specific situation motivate actors to operate differently, reevaluate previous assumptions and change their values and beliefs. How they behave and what they finally do further enhances or weakens these changing conditions, which constitutes an interplay between the context and individuals who effect change. This finding provides a response to a recent question in the literature regarding "whether institutional change effects are due to the person or the situation or how the two interact" (Thornton, Ocasio, and Lounsbury 2012, 177).

Fourth, institutional logics are not only dominant or competing, but they can also be complementary (hybrids can coexist). The paper, therefore, supports and extends the position that institutional logics need not necessarily conflict or compete with one another to bring about change (Lounsbury 2007; Herremans, Herschovis, and Bertels 2009; Reay and Hinings 2009; Marquis and Lounsbury 2007; Purdy and Gray 2009). Institutional change can occur even if logics are complementary or coexisting (Reay and Hinings 2009; Pache and Santos 2013; Harris and Holt 2013;

McDonald et al. 2013), a condition that might be vital in cases of highly regulated and complex fields. This form of institutional change has been categorized as transformational in the literature (Thornton, Ocasio, and Lounsbury 2012), in opposition to developmental change, and this paper contributes to improving understandings of how this form of change occurs. Institutional entrepreneurs blend logics to change existing institutional structures and arrangements (transformational institutional change). The framework proposes that institutional entrepreneurship is contingent on the hybridization of institutional logics or, in other words, to a blending of apparently competing logics. Moreover, it is derived from the study's results that it is often necessary for institutional entrepreneurs to shift between projects (interactional, technical, cultural) when implementing change. For example, a technical problem that initially only requires analytical skills (Perkmann and Spicer, 2007) cannot lead to institutional change if it does not also become interactional, where political skills are imperative. This change in emphasis is associated with and further supports the concept of logic hybridization (caring professionalism blended with business-like logics to achieve change).

Furthermore, the paper has several significant practical implications for management. Technological progress and the combination of innovative technologies (outside of traditional medicine and drug discovery, e.g., gamification in healthcare) appear to be a key enabling factor for institutional entrepreneurship. Firms and the industry must seriously consider institutional entrepreneurs and change/reconfigure their business models accordingly to manage a potential future threat. Most large pharmaceutical firms already operate a separate diagnostic unit (often as an independent daughter company), but business units incorporating the new technologies are necessary. Such units have already emerged in the form of

personalized medicine units or tailored therapeutics, e-health and mobile health units at Roche, Novartis, Eli Lilly, Bayer and additional or technology firms entering and growing in healthcare (e.g., Philips and GE).

In the case of AD treatment, we observe a transformational change, in which the market is changing its business model and product offerings. Pharmaceutical firms are not only interested in selling drugs but also intend to incorporate non-pharmacological solutions into their portfolios, such as serious gaming. Institutional entrepreneurship combines institutional logics and promotes change. Finally, policy makers and communities should consider the shift in logics (from cure to care) and the need to incorporate patients' voice and alternative solutions into their agendas.

Limitations and further research

The paper inevitably suffers from several limitations. It employs an inductive resign that might limit the study's findings due to conceptual boundaries and generalizations. Moreover, the primary data were collected in a specific context and a single country, Switzerland, despite observing the same shift in institutional logics as that found in this study at the global level. The proposed process model should be empirically tested in more contexts and by employing a deductive research design. There is undoubtedly potential for researchers to further extend and provide a more fine-grained model of institutional entrepreneurship. Future research should focus on how new technologies, such as virtual reality, serious gaming, and mobile applications, affect the business model in the pharmaceutical industry and how the industry could better integrate them into its model.

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Appendix Study 3

Appendix B: Details about AD treatments

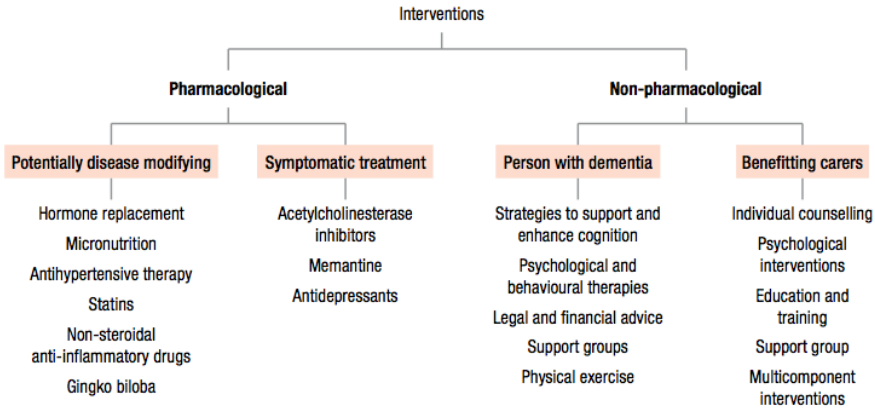
AD patients show a loss of brain cells that use the chemical compound acetylcholine as a neurotransmitter. As a result the brain is not able to deliver messages and the patients experience mental impairment. Donepezil (co-marketed by Eisai & Pfizer), rivastigmine (Novartis) and galantamine (J&J) prevent the metabolism of acetylcholine in the brain by using the enzyme acetylcholinesterase as a means of inhibition (AChE inhibitor). This leads to higher concentrations of acetylcholine in the nerve cells and consequently dampens AD symptoms. In patients with AD an excessive secretion of glutamate, a substance associated with cognition, further damages the brain. Memantine (Forest Labs, Merz, Lundbeck) reduces this excessive secretion by blocking NMDA glutamate receptors.

The existing pharmacological treatment has received controversial reception among scientists, doctors and regulators In March 2005, for instance, the UK National Institute for Clinical Excellence decided not to recommend the use of these drugs by NHS[40] patients due to low cost-effectiveness and proposed the withdrawal of these drugs. The decision was challenged by many other participants of the field, including patients, patient groups, doctors, and, of course, pharmaceutical firms with one of the latter pressing charges against NICE (Kmietowicz 2005; Dyer 2007). The court finally favored the suing drug maker (Eisai) and NICE had to reconsider previous decisions and recommendations. The final appraisal of NICE was published in 2011[41]. Despite the final positive recommendation, the committee highlights the *small but demonstrable clinical benefits* of the drugs. This is only an example of the controversy arisen by the use of existing pharmacological treatments. Nevertheless, the sales of all approved drugs in 2010 were more than one billion US dollars only in USA (IMS Health data) and more than four billion US dollars in the United States, United Kingdom, Germany, France, Italy, Spain and Japan. Yet revenues are decreasing (Gerald and Ockert 2013) and the initial growth rate of drugs sold (counting units) fell below the growth rate of diagnosed patients indicating a possible change in drug consumption behavior across several countries including the U.S. and Switzerland [42].

[40] National Health Service in England and Wales

[41] http://www.nice.org.uk/nicemedia/live/13419/53619/53619.pdf: The Committee concluded that overall, the AChE inhibitors donepezil, galantamine and rivastigmine had small but demonstrable clinical benefits and were cost-effective treatment options. The Committee concluded that there was insufficient evidence to differentiate between the AChE inhibitors in terms of cost effectiveness and that therefore the best use of NHS resources would be the technology with the lowest acquisition cost.

[42] The estimates are based on volume sales data from IMS Health and patient development estimates from: Alzheimer's Association Report, 2009-2012 Alzheimer's disease facts and figures, Alzheimer's Association, Alzheimer's & Dementia 5-8 (2009-2012); Ferri et al., Global prevalence of dementia: a Delphi consensus study, Lancet 2005; 366: 2112–17; Schweizerische Alzheimervereinigung, Prevalence of dementia in Switzerland (2011)



Picture B1: Classification of interventions
(http://www.alz.co.uk/research/WorldAlzheimerReport2011.pdf (assessed 28 March, 2014)

Important historical events in the field[43]

Year	Event
1906-1970	First discovery/ From senility to Alzheimer's disease
1906	Dr. Alois Alzheimer describes the 'odd and peculiar' case of August D., the first patient diagnosed with what was later known as Alzheimer's disease
1910	Dr. Kraepelin calls this 'odd and peculiar' case a separate disease and names it after his pupil, Alzheimer
1968	Development of measurement scale for assessing cognitive and functional decline in elderly
1974-1984	Organizing in non-profit associations. Mobilization for resources and awareness
1974	Establishment of National Institute on Aging (a primary federal agency to Alzheimer's research) as one of the National Institutes of Health
1979	Foundation of Alzheimer's Society in UK, a leading support and research charity association
1980	Foundation of Alzheimer's Association, a non-profit voluntary health organization, which focuses on care, support, and research for Alzheimer's disease
1984	Foundation of Alzheimer's Disease International, the international federation of all AD associations worldwide
1984-1995	Advances in understanding the disease. First drug launched to treat symptoms of the disease
1984-1987	Key scientific achievements in understanding nerve cell damage (beta-amyloid, tau-protein). Identification of deterministic Alzheimer's gene – link to Down syndrome

[43] Sources: http://www.alz.org/research/science/major_milestones_in_alzheimers.asp; (Chaufan et al. 2012; Selkoe 2011; Murna and Barbara 2008; Beard 2004; Konrad Maurer et al. 2006; Kitwood, Kitwood, and Tom 1997; K Maurer, Volk, and Gerbaldo 1997; Berrios 1990; Larkin 2001; Burns, Byrne, and Maurer 2002; Bertram and Tanzi 2008)

1987	First clinical trials of tacrine - the first promising symptomatic treatment
1993	FDA approves tacrine (the drug is today discontinued)
1994	The 21st of September is officially the World Alzheimer's Day
1995	First transgenic AD mouse models
1995-2001	New drugs in the market and a vaccine in clinical trials. Science and drug sales begin their exponential trajectory
1995	Foundation of Alzheimer Europe, an umbrella organization of 36 Alzheimer associations from 31 countries across Europe
1996	Foundation of Alzforum, a free-access web-based scientific community dedicated to understanding Alzheimer's disease and related disorders. The forum offers a unique database of studies, reports and other information about AD genes, biomarkers (launched in 2014), related proteins, non-genetic risk factors, antibodies, mutations, therapeutics, etc.
1997	Donepezil and rivastigmine are launched in USA and Switzerland, respectively
1999	Alzheimer's vaccine successful in mice
2000	Galantamine (a new AChEI extracted from plants) is launched in USA
2001	New US guidelines for AD released at the American Academy of Neurology annual meeting
2001-2010	Progress and hope despite disappointing clinical results. Efforts to increase public and governmental awareness. AD leading cause of death above 65
2003	AD vaccine trials stopped in phase IIa due to serious brain inflammation
2003	Alzheimer's Society in UK launches its online forum *Talking Point* with more than 35,000 members and 66, 000 threads today
2004	Pittsburgh Compound B proves to be a successful positron emission tomography imaging agent and a breakthrough development in early diagnosis and beta-amyloid detection. Memantine (the last approved drug) is launched in USA and Europe
2006	New promising drug candidate in clinical trials (e.g., bapineuzumab, solanezumab)
2007-2008	First anti-amyloid drug (Alzhemed) fails in phase III clinical trials. Another promising candidate (Flurizan) fails in a phase III

2010	AD as the 6th leading cause of death; establishment and release of AD clinical trial database; efforts to increase awareness and resources for further research
2010-future	AD announced as a global threat and top health priority. Governments set a new agenda for managing the new population aging crisis
2011	Obama signs National Alzheimer's Project Act (NAPA) into law - new criteria and guidelines for Alzheimer's disease diagnosis
2011	Alzheimer's Association launched AlzConnected, an online forum and blog for patients and caregivers
2012	Bapineuzumab and solanezumab fail in phase III clinical trials
2012	World Health Organizations with the support of Alzheimer's Association and other similar organizations recognize AD and dementia as a global health threat and a public health priority
2014	$122 million increase for AD from American Congress

Table B5: Alzheimer's disease over time

Appendix C: Presentation of a snapshot of the data

About 50 reports published by different associations were analyzed

Year	Reports	Purpose and main findings	Notes
2001	Communication Gap Between Primary Care Physicians and Caregivers	Communications between doctors and caregivers is problematic and needs to be improved (40 pages)	Focus on communication between doctors and family members. Opinion/involvement of **patients absent**
2002	African-Americans and Alzheimer's Disease: The Silent Epidemic	Identification of an emerging public health crisis among African-Americans. Call to action (accelarate research, increase awareness, develop and expand affordable, culturally appropriate services) (7p)	health **crisis**', **'epidemic**' additional funding request, 'unique presentation of AD in African Americans', ethnic & cultural bias
2002	Alzheimer's Cost to Business	Document the heavy burden of Alzheimer's disease on American businesses.In 2002, Alzheimer's disease will cost American businesses more than $61 billion – the equivalent of the net profits of the top ten Fortune 500 companies (29p)	Cost of family caregiving **too expensive for businesses.** Call for funding and support from businesses:"The Alzheimer's Association calls on the American business community to join us in an all-out effort to reverse the course of Alzheimer's disease **before it overwhelms us all**", "We have a **narrow window of time** –perhaps as little as 10 years – to find the answers", "adding **prescription drugs** and chronic care to Medicare to prevent the acute care crises"
2003	Alzheimer's Disease and Chronic Health Conditions: The Real Challenge for 21st Century Medicare	Demented beneficiaries too expensive for Medicare.Patients with AD usually duffer from more than one chronic diseases and this increases the cost. Patients are incapable of self-management due to impairment and loss memory. (9p)	'Alzheimer's disease is the **proverbial elephant** in Medicare's living room." Efforts to increase awareness in favor of AD compared to other chronic diseases."because of their impaired memory, judgment, and reasoning ability, beneficiaries with dementia **cannot manage or direct their own care**."
2004	Alzheimer's Disease and America's Fears Omnibus Survey Key Findings	Fear of Getting Alzheimer's Disease Vs. Taking Care of a Loved One with Alzheimer's Disease: equally feared. Care-givers fear much higher for non-caregivers (1p)	Distinction between "baby-boomers (40-59)" and non-"baby boomers"
2004	Families Care: Alzheimer's Caregiving in the United States	New evidence of the overwhelming challenges that AD caregivers confront day in and day out, as they struggle to meet the needs of their loved ones and to balance the competing demands of caregiving, work, and other family responsibilities. Policy recommendations, including extra finacial support (45p)	Focus on **family members** exclusively. "Families are the **heart and soul** of the health and long term care system"
2004	Hispanics/Latinos and Alzheimer's Disease	Higher risk among Hispanics/Latinos. Efforts to increase awareness and policy recommendations (reserach, community services, education, Medicare payment)(8p)	'a looming but unrecognized public **health crisis** in Hispanic/Latino communities in the United States", "the burden of disease..., particularly daughters and other female relatives,... strong sense of filial responsibility and the role of women in these communities"
2006	Early-Onset Report: A Hidden Generation of Dementia: A National Challenge, A Future Crisis	Provide evidence and increase awareness for younger onset.Recommendations (72p)	**Underdiagnosed**, still in workforce, but not recognized as 'disabled' to get appropriate **disability payments**
2007	The Healthy Brain Initiative: A National Public Health Road Map to Maintaining Cognitive Health	10 priority actins to increase awaeness over the next 3-5 years. How="continuing and expanding research; developing and channeling resources; working to develop or strengthen partnerships with likeminded organizations; designing collaborative operational plans of action; and establishing systems to track progress, facilitate communication, and exchange information."(70p)	**Syndicated** report between Centers for Disease Control and Prevention, AlzAss, ADI, NIA; initiative started in 2005. **From managing crisis to deveopl a road map for cognitive health**. No pictures of old pathetic, incapable people, but of **healthy, happy looking elderly** doing **sports, yoga, dancing** and other activities. Proposing **new model**: The Model: Moving Science into Public Health Practice. Proposed actions and recommnedations **by clusters not entire population**
2008	Voices of Alzheimer's Disease Report	Statements/voices from early onset patients. Public Perception and the Stigma of Alzheimer's disease; Dissatisfying Interactions with the Medical Community; Sources of Major Concern in Daily Life; Desire to Stay Involved and Make a Difference; Uncertainty about Availability of Support Services (36p)	Involvement of patients; first report with **patient participation**; **stigma** of AD; **challenging** medical community and diagnostic and treatment process;
2010	Changing the Trajectory of Alzheimer's	Examines the current projected costs of the **AD crisis**: prevalence data, costs of care, changing the trajectory: two hypothetical scenarios: impact of delay treatment, impact of slowing down progression. Medicaid costs for nursing home care (20p)	Both hypothetical treatments described would result in substantial positive outcomes for patients, and for the nation as a whole, **even if** the outcomes are well short of a cure. **Scenario planning** based on HIV, heart disease, cancers
2011	Generation Alzheimer's: The Defining Disease of the Baby Boomers	Outlines the human and financial cost Alzheimer's will have on the baby boom generation. "Baby boomers will spend their retirement years either with Alzheimer's or caring for someone who has it. Death rates for other major diseases — HIV, stroke, heart disease, prostate cancer, breast cancer — are declining. Alzheimer's is the only top 10 cause of death **without a way** to prevent, cure or even slow its progression."(16p)	Emphasis on numbers indivative of **threat and crisis**. To get the report you have to provide your name and email:"please download the report now to learn more about what can be done to **conquer this devastating disease**"
2012	World Alzheimer's Report 2012 with ADI	Overcoming the stigma (see ADI Table 5)	After 2011 no 'theme' report appears on the association's website apart from the yearly 'Facts and Figures' report
2013	Alzheimer's Disease Facts and Figures	The Association publishes every year a statistical report with prevelance, cost and other data of US AD population.	
2014	Alzheimer's Disease Facts and Figures , Women and AD		

Table C6: Alzheimer's Association Reports

Year	Reports	Purpose and main findings	Notes
2009	World Alzheimer Report 2009: The Global Prevalence of Dementia	Current prevalence and future projections in Asia, Europe, Americas and Africa. Mortality, disability, strain on carers and dependency. Cost estimation. Recommendations for action. (96p)	Increasing awareness of the severeness of disease by providing prevalence data. Reference to existing treatments (**the hope for a cure**), shorter reference to non-pharmacological treatments as psychological and psychosocial interventions. Reference to the **lack of cost-effectiveness proof of pharmacological treatments**. Call for **more reasearch** to prove effectiveness of **non-pharmacological treatments** as **reminiscence therapy**, **cognitive stimulation**, and "**low-cost strategies**, easily applied by carers at home; for example **massage** and **aroma therapy**" for treating psychological symptoms **instead of using high-risk antipsychotic drugs**.
2010	World Alzheimer Report 2010: The global economic impact of dementia	The report includes an estimate of the worldwide cost of dementia, including direct medical costs, direct non-medical costs and costs of informal (family) care. It makes policy recommendations and urges governments to take action now. (56p)	Cost estimates by region, income; comparative studies to **emphasize the magnitude of costs**. "Call on governments to **make dementia a health priority**". Call is fulfilled **2 years later.** "Call on governments to ensure that **people with dementia are eligible to receive and do receive disability benefits**". Inevitably, **creating a stigma** to increase support and raise funds.
2011	World Alzheimer Report 2011: The benefits of early diagnosis and intervention	Evidence and promotion of interventions more effective in the early stages of dementi; strong economic argument in favour of earlier diagnosis and timely intervention. Recommendations to improve the likelihood of earlier diagnosis and intervention. (72p)	**Treatment gap** due to late or no diagnosis. Evidence for efficacy of approved drug treatments and Gingko Biloba in early stages only; Evidence that **pharmacological treatments and cognitive stimulation activities** (i.e., non-pharmacologcial treatments such as reality orientation, activities, games and discussions) are both **effective**. "Economic models suggest that the **costs** associated with an **earlier dementia diagnosis** are **more than offset by the cost savings from the benefits of anti-dementia drugs** and caregiver interventions. These benefits include delayed institutionalisation and enhanced quality of life of people with dementia and their carers."
2012	Dementia: a public health priority (together with WHO)	An overview of the impact of dementia worldwide containing valuable best practices and practical case studies from around the world: prevalence data, costs, awareness efforts, need to includia dementia and AD in public health agenda as a priority, listen to and involve patients and caregivers in policymaking and research agenda, need to act now.(112p)	'Dementia is not a normal part of ageing". Emphasis on **care**, **prevention**, policy making (legal, social, ethical), stigma reduction and acceptance of disease. About treatment (health systems): highlighting **early diagnosis**, promoting systems of **care** (**integration** of multiple institutional orders such as communities, professions, state, families). Example of India: multidisciplinary model 'that has great acceptability, **providing care beyond cure**.' Need for balance between treatment, care and cure.Future trends example: 'Efforts to improve the **quality and availability of care**, and to **seek for cure**, should be coupled with **urgent investment in primary prevention** measures.' Discussion about drugs only focusing on risks in use of antipsychotic drugs and how to reduce their unnecessary use.
2012	World Alzheimer Report 2012: Overcoming the stigma of dementia	Information on stigma and dementia, best practices in the field of dementia, and recommendations for stigma reduction (survey with more than 2500 people in 54 countries).(80p)	Quotes: 'I am still a **person with feelings** and that [although] I have this diagnosis I am **still a human being** that just needs **a little more attention** but not to be condemned to a nursing home'. 'Treat us as **normal people**. We're still here, just a little slower and sometimes confused.' Lessons learned from patients and caregivers regarding stigma: include people with dementia in conversations; do **not avoid** the **person with dementia** and only talk to their carer; **proactive** involvement of patients in activities; programs to reduce stigma should include promoting **earlier diagnosis**, **art and physical activity.** Prescribe appropriate treatments that include **drug and non-drug treatments**.
2013	World Alzheimer Report 2013 - Journey of Caring: An analysis of long-term care for dementia	Define and explain long-term care (health and social) in demetia. Suggestions for care quality improvements and cost management. Recommndations for policy makers: Need for health and social care systems structured and funded to provide high-quality care and support to patients and carers.(92p)	**Care (health and social)**: single focus of report. Emphasis on implications for policy makers, improving quality & cost of care, **person-centred care** solutions. Recommendations for research: **primary prevention, reduce the incidence, limit the progression**, better undestand **values and preferences of patients** and caregivers depending on demgrafics, culture, etc. Fill the gap between efficacy and **effectivenes (in 'real world' circumstance)**.
2013	Global Impact of Dementia 2013	Update of the prevalence report in 2009: "The new data has shown that the current burden and future impact of the dementia epidemic has been underestimated"(8p)	The short report is a **briefing** for heads of **government**. Highlighting dementia and Alzheimer's as **epidemic disease**. Comparison with HIV epidemic, emphasis on lessons learned and best practices from HIV. Emphasis on setting a national health agenda, **healthy aging and brain**, long-tern **care**, early **diagnosis** and **intervention.**

Table C4: Alzheimer's Disease International Reports

6.4 List of conceptual and empirical studies on dynamic capabilities

Table D.1: Conceptual studies on dynamic capabilities

Year	*Author(s)*	*Journal*	*Title*	*Main findings*	*Open questions/ future research*
1992	Leonard-Barton	SMJ	Core capabilities and core rigidities - A paradox in managing new product development	Traditional core capabilities impede innovation, here called core rigidities. Managers have to deal with the paradox of utilizing core capabilities in new product and process development *without being hampered by their dysfunctional flip side*	
1997	Teece, Pisano, Shuen	SMJ	Dynamic Capabilities and Strategic Management	Sketching an outline for DC approach, discussing 4 different paradigms of strategy; DC framework to deal with competitive advantage in rapidly changing environments	Call for empirical studies to test and apply the DC framework
2000	Eisenhardt and Martin,	SMJ	Dynamic capabilities: what are they?	DCs: commonalities across firms, but idiosyncratic in their details; dependent on market dynamism; necessary but not sufficient conditions for competitive advantage	
2001	Makadok,	SMJ	Toward a synthesis of the resource-based and dynamic-capability views of rent creation	Two distinct mechanisms for economic rents: resource picking and capability building	'Extending the model by relaxing some of the model's stringent and unrealistic assumptions'
2002	Zollo and Winter	Org Science	Deliberate learning and the evolution of dynamic capabilities	DCs as higher-order capabilities, or meta-routines, that enable firms' operational decisions, as well as strategic, long-term ones	Empirical testing of the developed hypotheses
2003	Zott	SMJ	Dynamic capabilities and the emergence of intra-industry differential firm performance: Insights from a simulation study	Link between DCs and firm performance; similar DCs may lead to differential performance. Impact and importance of timing, cost and learning effects	Empirical testing. 'What additional performance-relevant attributes of DCs exist? Can we predict what it takes for firms competing on the basis of dynamic capabilities to outperform their industry peers? At which inflection points can, or should, managers intervene, and in what ways should they intervene? What roles do leadership and culture play in the context of dynamic capability?'
2003	Winter	SMJ	Understanding dynamic capabilities	'The firm is more than the sum of its resources, and more than the sum of the capabilities of its individual members and arguably more than the sum of its routines'	
2003	Byler and Coff	SMJ	Dynamic capabilities, social capital, and rent appropriation: Ties that split pies	Social capital necessary but not sufficient for the existence of DCs	Empirical testing of propositions; exploring other theories of rent generation to discover patterns of rent appropriation

2006	Zahra, Sapienza and Davidsson	J Mngt St	Entrepreneurship and dynamic capabilities: a review, model and research agenda	DCs and substantive capabilities; how organizational knowledge and skills moderate their relationship	'Are the routines of younger firms indeed relatively more malleable and why are they calcified in later stages? How may they be kept flexible? Do established companies have unique advantages in developing DCs? What is their source? Can they leverage their greater resources to an advantage? How do older firms renew different routines and develop capabilities?
2006	Lavie	AcMaRe	Capability reconfiguration: An analysis of incumbent responses to technological change	'Substitution, evolution, and transformation are three mechanisms of capability reconfiguration that enable incumbents to overcome cognitive and operational impediments and bridge capability gaps'	Call for qualitative case-based analysis of the impact of consecutive technological changes on the capabilities of a single firm by comparing the configurations of capabilities prior to and following the technological change
2007a	**Teece**	**SMJ**	**Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance**	**Specification of the nature and the microfoundations of DCs that lead to sustainable firm performance in an 'open economy with rapid innovation and globally dispersed sources of invention, innovation, and manufacturing capability'**	**How can a firm be the 'first to spot an opportunity' to generate economic profits, make the right decisions and 'institute the disciplines to execute on these opportunities, and then stay agile so as to continuously refresh the foundations of its early success, thereby generating economic surpluses over time…'?**
2007b	Teece	Blackwell: Oxford, pp 19-29	'Managers, markets, and dynamic capabilities' in Dynamic Capabilities: Understanding Strategic Change in Organizations	Teece proposes managerial DCs with respect to fundamental economic problems that trouble strategic managers: 'Critical DCs are asset orchestration encompassing co-specialized and complementary assets within the resource base of an organization. Managers not only must assemble these bundles of resources, but also they must design appropriate governance and incentive structures…'	
2007	Helfat et al.	Blackwell: Oxford	Dynamic Capabilities: Understanding Strategic Change in Organizations	Definition of DC: *DC is the capacity of an organization to purposefully create, extend, or modify its resource base.* '**To understand how organizations identify and respond to the need for change, we must examine the underlying organizational and managerial processes.'**	Call for further research on managers, alliances and acquisitions, innovation, knowledge management and organizational learning and many other topics concerning firms and organizations
2007	Augier and Teece	Mngt Internat. Rev	Dynamic capabilities and multinational enterprise: Penrosean insights and omissions	DCs become more critical for MNE's financial performance as business environments, esp. the hypercompetitive ones, change faster and diverse more. DCs allow MNEs to respond faster to and shape evolving technologies and marketplaces and therefore result in 'superior enterprise performance over multiple product cycles'.	Further reading of Penrose's theory and observations within the DC framework
2007	Wang and Ahmed	Internat. J of Mngt Rev	Dynamic capabilities: A review and research agenda.	There are various transformational mechanisms that link firms' internal resources and capabilities to their strategic choices in the product markets. **'Capability development is time-dependent and** does not necessarily produce immediate performance	Qualitative research to establish linkages between firm-specific processes and the commonalities of DCs across firms. Quantitative research to develop and validate a multi-dimensional construct of DCs that provides a better understanding of the conditions and processes that enable firms to

				effects… effective capability development requires that firms maintain a consistent long-term vision and have long-term performance at heart.'	utilize their resources and capabilities and achieve sustained competitive advantage
2007	Schreyögg and Kliesch-Eberl	SMJ	How dynamic can organizational capabilities be? Towards a dual-process model of capability dynamization.	Path dependency, structural inertia and psychological commitment (cognitive traps) can mainly cause the observed paradoxical persistence in changing environments.	
2007	Ng	J of Mngt Studies	A modern resource based approach to unrelated diversification	Three pillar model of increasingly unrelated diversification: Strength of dynamic capabilities, alertness to weak ties and absorptive capacity.	Call of empirical testing of propositions
2008	Dosi, Faillo and Marengo	Org Studies	Organizational capabilities, patterns of knowledge accumulation and governance structures in business firms: an introduction.	'Predictions concerning the vertical and horizontal boundaries of the firm, the relationships between learning processes and organizational structures and the determinants of firm performances.'	Call for empirical evidence on the relationships between capabilities and corporate growth
2008	Oliver and Holzinger	Ac of Mngt Rev	The effectiveness of strategic political management: A dynamic capabilities framework	'The effectiveness of political strategies is a function of firms' dynamic political management capabilities (flexible organizational architecture, scanning and predictive capabilities, political social capital deployment, institutional influence capabilities).'	How firms overcome inertial tendencies and core rigidities that disable them from new knowledge acquisition concerning political environment? How firms could better evaluate different political strategies on rival costs?
2009	**Teece**	**Oxford University Press: New York**	**Dynamic Capabilities and Strategic Management: Organizing for Innovation and Growth**	**'DCs are the skills, processes, routines, organizational structures, and disciplines that enable firms to build, employ, and orchestrate intangible assets relevant to satisfying customer needs, and which cannot be readily replicated by competitors. Enterprises with strong dynamic capabilities are intensely entrepreneurial. They not only adapt to business ecosystems; they also shape them through innovation, collaboration, learning, and involvement.'**	
2009	Pitelis and Teece	Europ Mngt Rev	The (new) nature and essence of the firm	DCs lead to sustainable competitive advantage, esp. in a 'knowledge-based, intangible assets-dominated and semi-globalized economy, characterized by intensified competition, uncertainty and change'	Further research on their findings, especially on proving that *it is DCs that are more important for the effectuation of sustainable competitive advantage* and that the processes of market creation and asset re-configuration by firms are *the very raison d'être of their existence*.
2009	Augier and	Org Science	Dynamic capabilities and the role	'DCs enable firms to achieve coordination and benefit from	Further research into entrepreneurship, organizational learning, and the

	Teece		of managers in business strategy and economic performance	complementarities. Developing decision-making skills and organizational processes to sense and seize opportunities is an essential managerial function embedded in the dynamic capabilities framework. The manager/entrepreneur plays a key role in achieving asset selection and the "coordination" of economic activity, particularly when complementary assets must be assembled. 3.Whether intrapreneur or entrepreneur, the function senses new opportunities and leads the organization forward to seize them. The entrepreneur/manager must lead. These are roles should be central to economic theory, too.'	role of managers and leaders in enterprise performance.
2009	Ambrosini and Bowman	Internat. J of Mngt Rev	What are dynamic capabilities and are they a useful construct in strategic management?	There are three levels of DCs: incremental, renewing and regenerative. DCs are also shaped by managers perceptions and motivations and do not automatically lead to performance improvements.	Empirical research on the proposed three levels. Study regenerative dynamic capabilities in younger versus more established firms.
2009	Easterby-Smith, Lyles and Peteraf	Brit J of Mngt	Dynamic capabilities: Current debates and future directions	DCs are multi-formal and –functional. They are 'higher-level capabilities, which provide opportunities for knowledge gathering and sharing, continual updating of the operational processes, interaction with the environment, and decision-making evaluations.'	Call for more longitudinal studies. How DCs are linked to functional capabilities like marketing, IT, R&D? How do DCs encompass the utilization of recourses and the implementation of new processes? Shift focus on more traditional industries, the public sector and other countries, where different constraints and conditions prevail, rather than the already studied dynamic industries. Call for further research on linkages of DCs and firms' macro-environment (managerial cognition and search processes). Study the distinction between operational and higher order capabilities, which 'rely on incremental learning processes and those that presuppose dramatic new knowledge trajectories'.
2009	Ambrosini, Bowman and Collier	Brit J of Mngt	Dynamic Capabilities: An exploration of how firms renew their resource base	Regenerative DCs may either be internal or external, stemming from changes in leadership or external change agents. DCs don't always have a positive impact on firm performance; the renewal of a firm's resource base might not be aligned with its environment.	
2009	Narayanan, Colwell and Douglas	Brit J of Mngt	Building organizational and scientific platforms in the pharmaceutical industry: A process perspective on the development of dynamic capabilities	Process of DC development in a large pharmaceutical firm in US: '…senior managers play a major role in the development of capabilities by imprinting the organization with their specific cognitive orientation and then orchestrating the multilevel organizational routines necessary for actualization of a capability.'	How do replicable managerial actions accumulate to generate an inimitable capability? Further studies to compare knowledge acquired from successful and unsuccessful cases to refine and better understand lessons for practicing managers.
2009	Pandza and Thorpe	Brit J of Mngt	Creative search and strategic sense-making: Missing	Understanding the cognitive aspects of DCs requires first distinguishing between selection-adaptation and path creation	How could managerial agency and highly patterned knowledge accumulations coexist? Longitudinal studies of cognitive processes of

			dimensions in the concept of dynamic capabilities	mechanisms of change. Duration, position and breadth are important dimensions of cognitive processes of DCs, necessary esp. when differentiating between firms from established industries and firms from novel industries.	DCs, while keeping them connected to their real strategic context.
2009	Arend and Bromiley	Str Org	Assessing the DCV: spare change, everyone?	Critique and questions that cause confusion and uncertainties regarding the DCV. Highlighting the need for a foundation (theory or model), otherwise drop the DC approach. Authors suggest replacing the efforts to develop a DC foundation with 'work on strategic change tied to fuller theories of strategic organization'.	*'If we can develop our own dynamic capabilities as researchers, we may improve the DCV and address its core research question. But, we suspect researchers will be well, perhaps even better, served by other approaches to strategic change.'*
2009	Helfat and Peteraf	Str Org	Understanding dynamic capabilities: progress along a developmental path	Answering one-by-one Arend and Bromiley's critiques and questions	*'Given the importance of this question for practice, as A&B admit, and strong signals in terms of scholarly interest regarding dynamic capabilities potential, why not give it a chance?'*
2009	**Lichtenthaler and Lichtenthaler**	**J of Mngt Studies**	**A capability-based framework for open Innovation: complementing absorptive capacity**	**There are six 'knowledge capacities' as a firm's critical capabilities of managing internal and external knowledge in open innovation processes: inventive, absorptive, transformative, connective, innovative, and desorptive capacity.**	**Reconfiguration of knowledge capacities beyond firm boundaries.**
2010	**Wall et al**	**Edward Elgar Pub**	**Strategic Reconfigurations: Building Dynamic Capabilities in Rapid Innovation-Based Industries**	**Authors combine the theory and practice of organizational resource configurations; they integrate DCs with organizational realities and adjacent theories of strategic innovation and entrepreneurship by providing various qualitative and quantitative studies**	**DCs relevance to managerial practice and applicability to other than rapid innovation-based environments**
2010	Di Stefano, Peteraf and Verona	ICC	Dynamic capabilities deconstructed: a bibliographic investigation into the origins, development, and future directions of the research	Extensive content analysis of 40 articles based on DCV led to the following categorization: 1.foundations and applications (90.6%), 2.interrelationships with other theoretical perspectives, 3.issues of governance structure, 4.transformation processes and entrepreneurship	Study further the conflict created by DCV researchers themselves, i.e. need to direct research to the individual manager (Teece 2007a) or to external environment (Helfat et al. 2007)
2010	Kay	ICC	Dynamic capabilities as context: the role of decision, system and structure	There is a mutual effect between the nature and content of strategic decisions and the DCs that support them. Hence, 'the nature of the hierarchical organization of strategic decisions and the role of resource links or linkages (in the form of shared or similar resource characteristics) will matter for the creation and deployment of DCs.'	Call for modeling or testing author's propositions

2010	Dunning and Lundan	ICC	The institutional origins of dynamic capabilities in multinational enterprises	Due to simultaneously increased geographical dispersion of markets and greater number of market-based transactions, MNEs tend to 'engage more in the development of new routines' and 'formalize them into transferable practices'. Hence, firm capabilities are easier identified and specialization is favored against internalization at the industry level.	Call for longitudinal and historical case studies of individual MNEs to answer questions such as: 'Where and how new routines are being developed, and what kinds of coordination problems are they intended to solve? Under what circumstances do local solutions receive sufficient support to be developed into transferable routines, and how successfully are such routines transferred within the firm? How far do new routines become diffused in the host countries, and is this the result of deliberate or incidental learning (spillovers)?'
2010	Dixon, Mayer and Day	JMS	Stages of organizational transformation in transition economies: A dynamic capabilities approach	Development of theoretical framework of organizational transformation that explains the processes by which organizations learn and develop dynamic capabilities in transition economies. The framework focuses on inter-relationships between, leadership, organizational learning, dynamic capabilities, and performance over three stages of transformation: break with the past (I), exploitation and deployment (II), exploration and innovation (III)	Empirical testing of the proposed framework
2010	Pitelis and Teece	ICC	Cross-border market co-creation, dynamic capabilities and the entrepreneurial theory of the multinational enterprise	Extension of the DCV to the theory of MNE and foreign direct investment. Highlighting the importance of concepts like 'cross-border asset co-specialization' and 'market and value co-creation' to study the 'new nature and essence of the MNE in the semi-globalized, knowledge-based economy.'	Study further the nature, behavior and impact of MNE activity
2010	Romme, Zollo and Berends	ICC	Dynamic capabilities, deliberate learning and environmental dynamism: a simulation model	'There is a non-linear and complex relation between deliberate learning and DCs, which arises from the differential impacts on DCs from operating routines, articulated knowledge and codified knowledge.' 'Tacit knowledge can be particularly sensitive to the prevailing environmental conditions.'	Further work on the limitations of the model
2010	Loasby	ICC	Capabilities and strategy: problems and prospects	Extensive review and discussion of the present and future of DCV based on the articles published in ICC's special issue (2010: vo 19; no 4). For instance, emphasizing the differences and linkages between operational and dynamic capabilities: 'a firm's relationships with its rivals, customers, and suppliers are differentiated potential sources of both operating and dynamic capabilities, which may inspire the imagination of new combinations; and other capabilities may reside in particular regional, national and international connections.'	What kinds of dynamic capabilities should be expected to emerge at regional, national and international level of a firm's environment? Studies of substantial decision processes in a variety of organizations and in particular with respect to government decision-making.

2010	Barreto	J of Mngt	Dynamic Capabilities: A review of past research and an agenda for the future	New conceptualization of dynamic capability as an aggregate multidimensional construct: 'A dynamic capability is the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to **make timely and market-oriented decisions**, and to change its resource base.'	Solve the **paradox of how to integrate the existence of commonalities in DCs across firms and simultaneously acknowledge the possibility of an impact of DCs on performance or competitive advantage**. Study the dimensions that form a dynamic capability by using **case studies**.
2011	Leiblein	J of Mngt	What do resource- and capability-based theories propose?	Core constructs and differences of all three theoretical streams (RBV, strategic factor market and DCV) and consequent propositions	How factors such as the form of competition, the nature of bargaining, or the distribution of information within an industry may lead to new insights regarding theories and their boundary conditions? Further exploration of the interactions between resource- and capability-based perspectives and elements of product market competition.
2011	**Helfat and Winter**	**SMJ**	**Untangling dynamic and operational capabilities: Strategy for the (n)ever-changing world**	**There is an unavoidably blurry line between dynamic and operational capabilities, like brand management or marketing capabilities due to their dual-purpose and multi-variant nature**	***Judiciously utilize categories of capabilities with regard to change. Include non-radical change, ongoing businesses and placid external environments in research of DCs. Be aware of one's own perspective and biases.***

Table D.1: Conceptual studies

Table D.2: Empirical studies on dynamic capabilities

Year	*Author(s)*	*Journal*	*Research design*	*Title*	*Main findings*	*Open questions/ future research*
1996	Camuffo and Volpato	ICC	Qualitative case study of Fiat Auto	Dynamic Capabilities and manufacturing automation: organizational learning in the Italian automobile industry	Fiat's automation strategy: non-linear learning progress based on the internal development, external acquisition, imitation, analogical replication, combination and selection of capabilities.	
1997	Helfat	SMJ	Empirical study on the 26 largest US energy firms (primarily petroleum)	Know-how and asset complementarity and dynamic capability accumulation: The case of R&D	'In response to rising oil prices, firms with larger amounts of complementary physical assets and technological knowledge also undertook larger amounts of R&D on coal conversion.'	How do firms spot and promote opportunities for knowledge and asset sharing across different activities, esp. in increasingly complex and dynamic competitive settings.
1997	Tripsas	ICC	Qualitative case history of Mergenthaler Linotype in the typesetter industry	Surviving radical technological change through dynamic capability: evidence from the typesetter industry	There are two key contributors to dynamic technical capability: external integrative capability, which enables firms to identify and integrate knowledge out of its boundaries, and geographically distributed research sites.	How can a firm manage the costs of multiple locations and how can it better locate a research site in a particular country? What are the trade-offs involved in the different levels of commitment used to access external knowledge?
1998	Petroni	Technovati -on	Qualitative case study of the Smith & Nephew Group in the healthcare industry	The analysis of dynamic capabilities in a competence-oriented organization	New product development, technical post-sale assistance, innovative processes interrelated with and affected by external and internal integration of knowledge.	Validation of the measures (e.g. nr of citations) the authors used, call for use of different measures.
1999	Deeds et al.	J of Bus Vent	Empirical study on 94 pharmaceutical and biotechnology firms	Dynamic capabilities and new product development in high technology ventures: an empirical analysis of new biotechnology firms	Geographical location as an important strategic decision: 'San Diego, Seattle, and Philadelphia rather than established locations as Silicon Valley and Boston'. Strong positive relationship between productivity of a firm's research team and its previous academic performance. Importance of highly experienced leadership, which stays distinct from the scientific team.	'Is a large number of sparsely cited papers a better indicator of a firm's scientific capabilities?' Study further firm performance and geographical concentration. Use advanced multiple measures of firm capabilities that manage their complexity.
1999	Forrant and Flynn	ICC	Qualitative case study of the Brimfield Precision, Inc. in the US metal-working sector	Skills, shop-floor participation and the transformation of Brimfield Precision: lessons from the revitalization of the metal-working sector	The instructive tale of the conditions and processes of the transformation of Brimfield Precision Inc from a machinist to a designer and producer of surgical instruments.	
1999	Delmas	ICC	Empirical study on 927 cases of technological acquisitions in the waste management industry in Europe and North America	Exposing strategic assets to create new competencies: the case of technological acquisition in the waste management industry in Europe and North America	Despite high transaction costs, technological acquisitions enable tacit competencies and at the same time abate the threat of competitive technological innovations and regulatory changes.	Study alliances with non-profit organizations. What are the exact mechanisms that link firms and society?

2000	Pisano	Oxford University Press	Longitudinal case studies of four biotech organizations	In search of dynamic capabilities: the origins of R&D competence in biopharmaceuticals	Process technology and technical knowledge are the two outcomes of every development process. Four different dimensions of organizational learning: 1. Basic scientific or more specific engineering problem solving. 2. Advanced analytical and experimental techniques. 3. Organizational structure (decentralized vs. centralized). 4. Manufacturing site (plant) integration or isolation.	Further study the impact of experiences on organizational learning (limits of path-dependence). Study development projects and routines as dynamic capabilities and the impact of integration on learning in novel environments.
2000	Majumdar	J of Bus Vent	Empirical study on 39 large US telecommunication firms	Sluggish giants, sticky cultures, and dynamic capability transformation	Size doesn't have a negative impact on firm performance, esp. in today's dynamic settings. 'With a larger variety and pool of resources available, larger firms can undergo transformation through a process of dynamic learning as effectively as smaller firms.'	Study micro-level learning processes of individual firms. Follow-up studies to test the author's findings.
2000	Madhok and Osegowitsch	J of Inter Bus Studies	Empirical study based on cross-border transactions of biotech companies between the US and Europe, involving at least one commercial party	The international biotechnology industry: a dynamic capabilities perspective	Organizational form and geographical flows in international diffusion of technology: Data proved that: 1. The early unilateral flows from leading to lagging nation are transformed to reciprocal flows from lagging to leading. 2. Significant nr of alliances with stable proportion over time.	Study the nature of tradeoffs (e.g. opportunism and leakage) in knowledge acquisition and deployment processes.
2000	Lehrer	ICC	Qualitative case studies: British Airway, Lufthansa and Air France in the European airport industry	The organizational choice between evolutionary and revolutionary capability regimes: theory and evidence from European air transport	Capability regimes and competitive advantage: *Revolutionary - discontinuous restructuring of the skills base according to commercial imperatives. Evolutionary - continuous accumulation of skills according to technical expertise.*	
2000	Rosenbloom	SMJ	Empirical study based on field data – NCR Corporation	Leadership, capabilities, and technological change: The transformation of NCR in the electronic era	Importance of manager's role and individual leadership in DC development. Firm's capacity to transform itself in order to adapt to strategic and environmental changes.	Transformation and leadership
2001	Griffith and Harvey	J of Inter Bus Stud	Empirical study on US manufacturers' overseas (SME) distributors: 250 Canadian, 250 Chilean, 100 Great Britain, and 100 Filipino	A resource perspective of global dynamic capabilities	By intergrading resource- and market-based view: *asset specificity, predictability and market knowledge gap influence a distributor's power.*	Expand the scope of studied relationships and study the effects of firms' global DCs
2001	Rindova and Kotha	Ac of Mngt J	Qualitative study on Yahoo! and Excite	Continuous "morphing": Competing through dynamic capabilities, form, and function	Continuous morphing as a mechanism for renewing competitive advantage, which is achieved through internal and external activities and ongoing renewal and not with 'a favorable position in an attractive industry or with a bundle of heterogeneous resources.'	Further development of the concept by testing it in large established or older firms and by mapping transformation facts to performance.

2001	Noda and Collins	Ac of Mngt J	Longitudinal study of seven regional holding companies of Bell in the US cellular telephone industry	The evolution of intra-industry firm heterogeneity: insights from a process study	Intra-industry firm heterogeneity as a path dependence process of market, competition and organization interactions. Initial experiences are positively enhanced through economic, sociopolitical and cognitive mechanisms.	Development of a complete process theory for the evolution of intra-industry firm heterogeneity.
2002	D'Este	ICC	Empirical study on 67 Spanish domestic pharmaceutical firms	The distinctive patterns of capabilities accumulation and inter-firm heterogeneity: the case of the Spanish pharmaceutical industry.	5 clusters of strategic configurations based on innovating/ non-innovating differentiators and the marketing differentiators.	Deep studying of firms' knowledge bases and learning patterns: How the firm's knowledge base changes over time? To which extend the strategic management of knowledge can be viewed as the distinctive axis along which intra-industry firm heterogeneity might be identified?
2002	Lee, Lee and Rho	SMJ	Simulation model/ computational data	An evolutionary perspective on strategic group emergence: A genetic algorithm-based model	When dynamic capabilities are absent or when rivalry is extended over firms with dissimilar strategies, strategic groups are less likely to exist. Mobility barriers and strategic interactions play an important role in sustaining intergroup performance difference.	Further empirical testing of the reasons strategic groups exist sometimes and do not at other times. Examine strategic group behavior by relaxing the author's assumptions.
2002	King and Tucci	Mngt Science	Empirical study based on archival data of 174 firms from the disk drive industry, 1976–1995	Incumbent entry into new market niches: The role of experience and managerial choice in the creation of dynamic capabilities	Experience in previous markets increased the probability that a firm would enter a new market. This experience had greater value if the firm entered the new market. Managers chose to enter these markets to obtain this increase in value.	
2003	Lampel and Shamsie	J of Mngt Studies	Empirical study based on 400 films from each of the two periods: studio era and post-studio era, in the Hollywood movie industry	Capabilities in motion: New organizational forms and the reshaping of the Hollywood movie industry	Two industry capabilities—mobilizing and transforming capabilities—play a crucial role in assembling and transforming resource bundles into feature films.	
2003	Alvarez and Merino	Org Studies	Empirical study on the Spanish savings and loans institutions	The history of organizational renewal: evolutionary models of Spanish savings and loans institutions.	The process of organizational renewal faced by Spanish savings and loans institutions led to different adaptation mechanisms, which were strongly influenced by organizational resources and capabilities.	
2003	Verona and Ravasi	ICC	An exploratory case study of Oticon A/S, a leading Danish producer of hearing aids	Unbundling dynamic capabilities: an exploratory study of continuous product innovation.	1. In order to sustain product innovation a firm must build DCs that allow the simultaneous and continuous creation, absorption and integration of knowledge. 2. Sustaining continuous innovation requires a further DC (a context that spurs creativity from all parts of the organization at any time). 3. Each DC leverages company resources, esp. human and physical capital, structures and systems, and company culture. 4. Building blocks of product innovation.	

2003	Meyer and Lieb-Doczy	J of Mngt Studies	18 longitudinal (qualitative) case studies in Hungary and East Germany	Post-acquisition restructuring as evolutionary process	'A defensive focus on short-term efficiency, i.e. downsizing, may fail to realize the long-term potential of the organization. Acquirers supporting an evolutionary development of their new subsidiary by providing autonomy and complementary resources might well have to tolerate some slack in the short run, but may realize more of the potential contributions of the acquired assets in the long run.'	Analyze acquisitions in different contexts and explore in further depth the key concepts of DCs, knowledge transfer, experimentation and variety of business practices: the analysis of evolutionary aspects of capability development and organizational learning → draw explicitly on analogies with biological theories of evolution to explain intra-organizational change, and the merger of organizations in particular.
2003	Salvato	J of Mngt Studies	Comparative case studies of two Italian companies: Alessi and Modafil	The role of micro-strategies in the engineering of firm evolution	Organizational leaders have a crucial role in purposefully guiding evolutionary processes. There are 3 aspects of intra-organizational evolution: '1.Adaptive evolutionary processes are often rooted in core micro-strategies. 2. Adaptive evolutionary processes of innovation and growth are pursued through recombination of existing micro-strategies according to a limited repertoire of recursive recombination patterns. 3. The organization leaders purposefully guide evolutionary processes.'	Empirical studies to cover more contextual settings.
2003	Figueiredo	ICC	Case studies of CSN and USIMINAS in the Brazil steel industry	Learning, capability accumulation and firm differences: evidence from latecomer steel.	The technological capability accumulation paths followed by the two firms diverged and have proceeded at different rates over time. Key features of the intra-firm learning processes have played a substantial part in influencing these differences.	
2004	Brady and Davies	Org Studies	Qualitative case studies of Cable & Wireless Group and Ericsson Telecommunications Limited	Building project capabilities: from exploratory to exploitative learning.	Organizational learning in both firms turned quickly into exploitation; learning was largely 'top-down' from the corporate organization to the projects; senior corporate management redirected the organization around the new projects. Both firms continued to engage in some degree of exploratory learning at a strategic level; Both firms' response to market environment influenced their turn from project to business learning.	
2004	Mota and de Castro	J of Mngt Studies	Two contrasting cases in the Portuguese molds industry: Tecmolde and Iberomoldes	A capabilities perspective on the evolution of firm boundaries: a comparative case example from the Portuguese molds industry.	The existence of distinct trajectories in terms of the evolution of firms' vertical boundaries is due less to the distribution of capabilities in an industry that can be universally accessed, and more to the structure of indirect capabilities that allows access to external capabilities.	Study the role of diversity for the generation of capabilities in a system of interconnected relationships.
2004	Sako	ICC	Comparative case studies between Honda, Nissan and Toyota	Supplier development at Honda, Nissan and Toyota: comparative case studies of organizational capability enhancement.	Replication difficulty is overcome by enabling companies to share the practice rather than the representation of tacit knowledge. Interdependence in the hierarchy of routines that constitute organizational capabilities has led companies to broaden the scope of supplier development	

					over time. This broadening challenges the suppliers to accept customer companies' intervention in interval investment decisions, requiring a certain mode of corporate governance.	
2004	Keil	J of Mngt Studies	Two longitudinal case studies in the information and communication technology sector in Europe	Building external corporate venturing capability	Two complementary groups of learning processes for capability building: 'acquisitive learning for knowledge acquisition to manage external corporate ventures and learning-by-doing, knowledge is adapted to the specific context and an in-depth capability is built'.	Test the findings of this study in other contexts. Extend this study by developing and testing quantitative models of the learning processes and factors affecting them. More fine-grained research of learning processes would help to inform the literature of capability building
2005	Athreye	ICC	Qualitative case study on the Indian software industry	The Indian software industry and its evolving service capability.	Export success as a comparative advantage in outsourcing, growth success and as the result of low wage costs and entrepreneurial experimentation stemming from inter-organizational learning. Successful lobbying by the industry's national association enabled necessary policy making.	
2005	Woiceshyn and Daellenbach	ICC	Qualitative study on Canadian oil and gas companies	Integrative capability and technology adoption: evidence from oil firm.	The efficacious adopters developed strong strategic commitment to the technology early, facilitating their more extensive external and internal integration activities. The more efficacious firms differed from the less efficacious ones also in their knowledge systems: employee skills, technical and managerial systems, and values and norms. The firms` integrative capability developed through a dynamic interplay of adoption processes and their knowledge systems, and affected efficacy of adoption.	Further explore relationships between external and internal integration. Identify other knowledge system elements and the contexts in which they support integration and commitment. Moving beyond the used proxy measures with respect to absorptive capacity. Longitudinal research concurrent with the time of adoption: How integrative capability evolves during critical time periods? How firms successfully negotiate competence destroying technological changes?
2005	Newbert	J of Small Bus Mngt	Empirical study of a random sample of 817 American nascent entrepreneurs, older than 18	New firm formation: a dynamic capability perspective.	Gestation activities for successful nascent entrepreneurs: preorganization events focused on the acquisition or reconfiguration of a valuable, rare, inimitable, non-substitutable physical, human, or organizational resource. Market dynamism affects the complexity and characteristics of the new firm formation process. Learning negatively impacts new firm formation success operating in highly dynamic markets.	Study the impact of past failures on new firm formation success rates.
2005	George	ICC	Empirical study based on patenting and licensing activities at the Wisconsin Alumni Research Foundation	Learning to be capable: patenting and licensing at the Wisconsin Alumni Research Foundation	Curvilinear relationship between experiential learning within a capability and the costs of developing the same capability. Learning in a primary capability has a beneficial spillover effect on the development of complementary capabilities. At high levels of accumulated experience the primary capability has the potential to impede the deployment of related capabilities.	Call for documenting the dynamics, pattern, pacing and substitution of capability development in organizations. Study the incentives for dialog on university science and its roles in creating efficient institutions for technology transfer.

2005	Lazonick and Prencipe	ICC	Qualitative study on Rolls-Royce Plc in the UK high-tech manufacturing	Dynamic capabilities and sustained innovation: strategic control and financial commitment at Rolls-Royce	Innovation depends on: who strategic managers are and how they control financial resources. 'Strategic control': the controllers of corporate resource allocation are able and willing to 'confront the technological, market and competitive uncertainties inherent in the innovation process'. 'Financial commitment': Strategic managers can 'mobilize the types of financial resources that will remain committed to sustaining the innovation process'.	Further concurrent analysis of organization and competition to fully understand how firms differ and how it matters.
2005	Ethiraj et al.	SMJ	Longitudinal, single-firm case study: Indian software services industry	Where do capabilities come from and how do they matter? A study in software services industry	The marginal returns to acquiring different capabilities may be different. Understanding and managing these differences can have a positive impact on firm decisions to improve and/or acquire such capabilities. Firm capabilities are often context-specific and studying them in their context improves their significance and value.	Repeat study in other industries
2005	Song t al.	SMJ	Empirical study based on a survey: 466 respondents from U.S. joint ventures formed between 1990 and 1997	Marketing and technology resource complementarity: An analysis of their interaction effect in two environmental contexts	The effect of the interaction between marketing and technological capabilities on performance is significant only in a highly turbulent environment. The marketing-related main effect is lower in the high-turbulence environment. The main effects of technology-related capabilities are the same in both environments.	Investigate whether other capabilities have similar performance impact profiles (characterized by synergistic interaction) and under what environmental conditions.
2005	Kor and Mahoney	SMJ	Empirical study on 60 technology-based entrepreneurial firms	How dynamics, management, and governance of resource deployments influence firm-level performance.	Firms with increased resource deployments in marketing will exhibit high firm-level economic performance than these without such deployments. Managers' experience has a positive relationship with R&D deployment intensity and economic returns. Institutional ownership boosts economic returns from marketing deployments by subjecting these deployments to increased scrutiny and by sending positive signals to the market about the firm.	Test the generalizability of authors' findings and investigate industry-specific relationships between resource deployments and firm-level economic performance.
2006	Gilbert	Org Science	Qualitative study with field analysis on one newspaper organization	Change in the presence of residual fit: can competing frames coexist?	Response paradox: 'Framing discontinuities as opportunities creates problems for models of strategic renewal that require a performance decline to trigger organizational response. Anticipating a threat can trigger an organizational response, but one that creates deep organizational rigidities.'	Extend findings beyond the single field site the authors researched. Analyze in more depth the organizational response mechanisms and their entanglement in DCs. What enables this entanglement without affecting negatively the differentiated unit? How does coordination across subunits occur?
2006	Slater et al.	SMJ	Empirical study based on a survey: 80 marketing executives from manufacturing and service businesses	The moderating influence of strategic orientation on the strategy formation capability-performance relationship	The strategy formation capability is a DC; the firms' strategic orientation moderates the relationship between strategy formation capability and performance.	

2006	Marcus and Anderson	J of Mngt Studies	Empirical study based on a survey: 108 grocery chains from U.S. retail food industry, 1997	A general dynamic capability: Does it propagate business and social competencies in the retail food industry?	A general dynamic capability affects firms' competence in supply chain management (a business competency), but not the competence in environmental management (a social competency).	Validation of the used measures, future longitudinal work and further study the evolution of these capabilities.
2006	Karim	SMJ	Empirical study on archival data of 250 firms from the U.S. medical industry, 1978–1997	Modularity in organizational structure: The reconfiguration of internally developed and acquired business units.	Internally developed units and acquired units serve different roles in the structural reconfiguration: Acquired units are reconfigured sooner than internally developed units and there is also a greater share of acquired units that are reconfigured than internally developed units.	Call for studies 'tracing the evolution of different reconfiguration paths and their consequences' could be insightful. When is it appropriate to 'create a new unit vs. dissolving one into another'? Further granularity, understanding of modular organizational systems and their changing processes by observing components at the resource level. 'How reconfiguration affects units' financial performance, innovativeness, or operating efficiencies?' Focus closely on a single firm as it reconfigures to observe what routines are used and created to carry out the reconfiguration process.
2006	Zúñiga-Vicente and Vicente-Lorente	J of Mngt Studies	Empirical study based on archival data of 134 Spanish banks, 1983-1997	Strategic moves and organizational survival in turbulent environments: the case of Spanish banks	Strategic moves under environmental shifts conditions have a positive effect on organizational survival (in a population of firms that has undergone radical transformations in its environment).	Call for new and more extensive empirical studies before generalizing results; products and services in banking sector easier to imitate than those in pharmaceutical industry. Include environmental factors (complexity and volatility) as additional parameters to explain organizational survival. Study the role of potential feedback effects between the level of strategic mobility and the stability of environmental conditions.
2007	Rothaermel and Hess	Org Science	Empirical study based on archival data of 81 pharmaceutical firms worldwide, 1980–2001	Building dynamic capabilities: Innovation driven by individual-, firm-, and network-level effects	Antecedents to innovation at the: individual, firm, and network levels. Individuals matter. Firm adaptation and innovation can be properly studied only when considering the firm's intellectual human capital.	Study more detailed alliance distinctions into the multilevel theoretical model presented by the authors, while controlling for alternative innovation mechanisms. Develop and implement a better measure of firm innovation than patent counts.
2007	Kale and Singh	SMJ	Empirical study based on survey data - 175 large U.S. firms from industries engaged in alliances	Building firm capabilities through learning: The role of the alliance learning process in alliance capability and firm-level alliance success.	An alliance learning process, involving articulation, codification, sharing, and internalization of alliance management know-how, is positively related to a firm's overall alliance success.	'Measure a firm's alliance management skills by case-based research or by collecting detailed data on these practices for a small subset of firms and their alliances. Examine whether the alliance learning process has any adverse or declining effects in firms. Conceptualize alliance success at the firm level in different ways, such as using measures based on financial or accounting data.'
2007	Pablo et al.	J of Mngt Studies	Qualitative study based on field data of one regional health authority in Canada	Identifying, enabling and managing dynamic capabilities in the public sector	There are three phases in developing a DC: identifying a DC, enabling a DC, and managing the ongoing tensions.	Develop and test the three-stage dynamic capabilities model. Determine whether there are unique attributes to learning through experimenting or the organizational setting (public sector health care) that may limit their generalizability. Study the same capability in the private sector.

2007	Moliterno and Wiersema	SMJ	Empirical study on 26 teams from professional baseball (MLB) during the period 1969–83.	Firm performance, rent appropriation, and the strategic resource divestment capability	There is a two-step organizational change capability: decisions about whether to engage in resource divestment and decisions about which resources to divest.	Simulation-based analysis to examine the proposed bilateral monopoly scenario. 'How, given an ongoing product market strategy, the firm makes decisions on the resources that it will require to replace those that are divested?' Study 'the effects of information asymmetries on the seller side of factor market transactions'.
2008	Danneels	SMJ	Survey - two wave panel data of 77 US public manufacturing frims, 2000, 2004	Organizational antecedents of second-order competences	Study the first form of dynamic capability: the competence to build new competences or the ability to explore new markets and new technologies—referred to as marketing and R&D second-order competences, respectively- Willingness to cannibalize, constructive conflict, tolerance for failure, environmental scanning, and resource slack are antecedents of marketing and R&D DCs.	'Use different time intervals between survey waves to empirically determine the length of causal lags. Obtain survey data from a second informant to gain more confidence in the reliability of the measures and to more conclusively assess common source bias.' Are the studied antecedents complementary or contradictory and how this impacts on the question whether organizations can be ambidextrous?
2008	Døving and Gooderham	SMJ	Survey-254 Norwegian small firm accountancy practices	Dynamic capabilities as antecedents of the scope of related diversification: The case of small firm accountancy practices	Heterogeneity of human capital, internal development routines, and alliances with complementary service providers influence the scope of related diversification	Develop more general measures or possibly develop measures tailored to other research settings. Future research might extend our approach to other professional service industries, and possibly to other sectors and larger firms as well.
2009	Salvato	Org Science	Inductive case-study; 90 product innovation processes that took place at Alessi over the 15-year period (1988–2002)	Capabilities unveiled: the role of ordinary activities in the evolution of product development processes	Adaptive renewal is based on daily ordinary activities, whereby 'mutations resulting from local search are first tested by internal or external selective forces, and then refined and reproduced by managerial intervention. Managing capabilities renewal means encouraging and motivating all units, sub- units, and even external collaborators to actively participate in experimenting novel solutions within the ongoing functioning of capabilities.'	What drives managerial decisions in 'retaining and institutionalizing the improvised "mutations" and not others'? What are 'the criteria and cognitive processes prompting managers to select and retain variations that initially show negative performance outcomes'? Future research may hence add depth to the cognitive dimension of processes through Which 'processes enable managers "learn" which alterations in capabilities bear the highest adaptive potential, and which intentional selection and reproduction activities can more effectively replicate this potential'? 'Under what conditions evolved capabilities directly improve organizational performance, rather than simply constituting reliable building blocks for innovative efforts'?
2009	Laamanen and Wallin	J of Mngt Studies	Longitudinal multiple case study analysis of 3 network security software firms (10–15-year life spans)	Cognitive dynamics of capability development paths	Capabilities are rarely context-independent, but strongly connected in setting where they co-evolve. Capability paths are by no means predetermined. Similar firms can follow quite different paths. Analogical reasoning (capability constellation), internal attention allocation dynamics (capability portfolio), and sensitivity to learning (individual capabilities) impact on managerial cognition.	Expand findings to other industries and periods. Further study the poser of 'continuous cycling between cognition and action, between the ostensive and performative aspects of routines.'

2009	Macher and Mowery	Brit J of Mngt	Empirical study based on data from a large sample of semiconductor manufacturing facilities	Measuring dynamic capabilities: practices and performance in semiconductor manufacturing	New process development and introduction represent a DC, which comprises a very important source of competitiveness in the semiconductor industry, given the short product lifecycles, rapid price declines, and rapid technological advances that define the industry. The studied and measured DC is the 'foundation for organizational learning via improved knowledge articulation and knowledge codification.'	
2009	Mc Kelvie and Davidsson	Brit J of Mngt	Longitudinal study of Swedish young firms (mail survey 1997-2000)	From resource base to dynamic capabilities: an investigation of new firms	Empirically measuring several DCs: founder human capital, access to employee human capital, access to technological expertise, access to other specific expertise, and access to two types of tangible resources. There are positive effects stemming from access to particular resources. However, for access to employee human capital and access to financial capital negative effects appear.	Call for a more theory-driven design leading to development of more precise hypotheses.
2009	Newey and Zahra	Brit J of Mngt	Longitudinal single case study of two collaborating firms, a biotech and a pharmaceutical	The evolving firm: how dynamic and operating capabilities interact to enable entrepreneurship	'At the operating capability level, firms build absorptive capacity in value networks during their product development experiences and this learning needs to be captured at the product portfolio planning level. When this learning is captured and transformed, product portfolio planning acts as a dynamic capability reconfiguring operating capabilities based on beliefs about follow-on entrepreneurial opportunities.'	'How the routinization of interactions between portfolio planning and product development enables/constrains the adaptive capacity of the organization in the face of exogenous shocks?' Better study value network absorptive capacity as a linking mechanism between dynamic and operating capabilities. How firms need to build their portfolio planning capabilities to better prepare for and/or limit the adverse impacts of exogenous shocks? Call for 'a longer longitudinal study that tracks the interaction between these capability sets over multiple product development experiences and the resultant revisions that occur to the product portfolio and examine the process of actually reconfiguring and/or building new operating capabilities.'
2009	Bruni and Verona	Brit J of Mngt	Qualitative study of a selected sample of high-performing pharmaceutical firms	Dynamic marketing capabilities in science-based firms: an exploratory investigation of the pharmaceutical industry	Dynamic marketing capabilities enable firms to develop new products and change their capability base over time. In this manner dynamic marketing capabilities provide 'a more granular understanding of the management practices and performance heterogeneity of firms operating in science-based industries.'	Call for quantitative test of the relationship between dynamic marketing capabilities and firm performance and further study of dynamic marketing capabilities in other science-based sectors. Does performance related to marketing DCs depend on 'the actual alignment of beliefs among Marketing, R&D and Business Development managers? Or does it depend on 'the prevailing policy adopted by one department over another'?
2009	Karim	Mngt Science	Empirical study on 250 medical firms studied over a 20-year period	Business unit reorganization and innovation in new product markets	U-shape relationship between reorganization and innovation. Only reorganization experiences within a recent period (and not past ones) influence future innovation.	Study more 'granular, incremental innovations within product markets' and compare findings with author's results. 'How much is the lack of market entry attributable to the lack of learning versus rational reasons for not wanting to invest in new markets?'

2010	Shang, Wu and Yao	Inter J of Techn Mngt	A qualitative comparative analysis on two major personal computer enterprises in Taiwan	A dynamic innovation model for managing capabilities of continuous innovation	'A dynamic entrepreneurship with both foresight of the market and insight into internal capabilities tightly linked with cyclical processes of resource integration, experience, learning, and transformation, may accelerate enterprise capabilities in building continuous innovation into the dynamic business environment.'	
2011	Martin	Organizati on Science	Comparative case study of six firms operating in the high-dynamic software industry (mixed approach)	Dynamic managerial capabilities and the multi-business team: The role of episodic teams in executive leadership groups	Effective dynamic managerial capabilities: 'improve information quality and currency, reduce economic and political barriers in conducting cross-unit activities, enable GMs to tap into innovations and resources in each others' BUs when formulating and deciding novel resource actions, improve the overall variation-selection-retention engine in multi-business organizations'. As a result: better evolutionary fitness at BU level and consequently higher firm performance. Episodic team: 'a stable group in which group member activities, although largely independent, are on occasion interdependent, collaborative, or both.'	Further empirical analysis on the results.
2011	Rothaermel and Hess	SMJ	Empirical study on 108 global pharmaceutical firms over 3 decades (1974-2003)	When are assets complementary? Star scientists, strategic alliances and innovation in the pharmaceutical industry	There are two mechanisms to combine resources for innovation in the pharmaceutical industry: recruitment and retention of star scientists, and engagement in strategic alliances.	Future research to amplify the validity of authors' findings. Pharmaceutical industry as an optimal setting study knowledge acquisition and assimilation within upstream and downstream activities.

Table D.2: Empirical studies

6.5 Curriculum Vitae

Fotini Pachidou

Born on August 27, 1981 in Athens, Greece

EDUCATION

2010 - 2014 PhD candidate, **ETH Zurich,** Department of Management, Technology, and Economics, Chair of Strategic Management and Innovation

2007 - 2010 MSc, **ETH Zurich,** Department of Management, Technology, and Economics

2005 - 2006 Mobility MSc student, **Denmark's Technical University**, Centre for Microbial Biotechnology

2000 - 2006 BSc and MSc, **National Technical University of Athens**, Faculty of Chemical Engineering, specialization in Biotechnology and Food Technology

EXPERIENCE

2010 - 2014 Research and teaching assistant, **ETH Zurich,** Department of Management, Technology, and Economics, Chair of Strategic Management and Innovation

2009 Intern, **ABB Switzerland Ltd,** Production & Development division at the BU of High Voltage Products/ Systems, Zurich

2007 Biochemical engineer, **Evonik Industries**, Marl Chemical Park, Germany

2006 - 2007 Research assistant, **ETH Zurich**, Institute for Microbiology

2004 Intern, **Oil refinery 'Hellenic Petroleum'**, Athens