Incumbent Capability Enhancement in Response to Radical Innovations

Abstract

Schumpeterian market disequilibrium marked by entrepreneurial entry and incumbent exit has long held an important place in management literature. The extant literature has overwhelmingly championed the newcomer, despite incumbents' obvious advantages in resources, experience and market knowledge. The current research provides evidence for the effectiveness of the incumbent's strategy of capability enhancement (along an established technological trajectory) while responding to radical technological innovation. We develop a cognitive process model that integrates managerial cognition with capability development and deployment views, depicting the dynamics of the incumbent's capability enhancement process. We analyze the cognitive drivers of organizational actions in all stages (rigidity, triggering event, and capability renewal) and elucidate the role of top management cognition in the processes of detecting and correcting errors in a strategic course of action. We ground our model in the case of a cork-stopper industry veteran's decline: in the wine industry, corks ceded ground to screw tops and other stoppers. How a major company in the industry fought back in response to the emergence of these, in the industry context, radical technological innovations, provides the basis for our narrative. The proposed theoretical model contributes to literature on technology management (with regard to incumbent strategies in response to radical innovation threats) as well as the role of cognition in strategy (providing an explanation of the cognitive underpinnings of capability development).

Keywords: capability enhancement; radical change; managerial cognition; turnaround; sensemaking

INTRODUCTION

Hill and Rothaermel (2003) observe a persistent theme in the literature on technological innovation – the great struggle incumbents have when 'crossing the abyss created by a radical technological innovation.' Usually, the struggle leads to the incumbents' decline, 'while new entrants rise to market dominance by exploiting the new technology' (p.257). The demise brought about by radical technological innovations has long been seen as integral for industrial rejuvenation, the very essence of entrepreneurial dynamics and wealth creation (Kirchhoff, 1991; Schumpeter, 1941). Here, the term 'radical' technological innovation refers to a new technology that simultaneously is (a), a preferred substitute for that already existing from the customer perspective (Arrow, 1962; Reinganum, 1983), (b) competence-destroying from the perspective of an incumbent's technical capabilities (Tushman & Anderson, 1986, and (c), able to cannibalize the incumbent's existing products (see, e.g., Wu, Wan, & Levinthal, 2014). The shock of the new does not always overwhelm the tradition of incumbency, however. Some incumbents can and do respond successfully to radical innovation in their industry (Ansari & Krop, 2012): in Weick's (1993) terms, tools are not always dropped. In line with this reasoning, in the current paper we build an inductive theory from a critical case study of an established industry leader successfully adapting to radical technological innovation in its industry.

The focal industry is that of viniculture production, in particular the contribution of natural cork stoppers, which have been used by wine producers for sealing bottles for over two centuries. Starting in the 1990s, the role of the natural cork stoppers declined noticeably in the wine industry, in favour of alternative screw caps, made of plastic and aluminum. Within this context, we investigate how the cork industry veteran (the single largest cork stopper manufacturer in the world, *Corticeira Amorim* (COR), with over 30% global market share and

annual production of 13 billion cork stoppers) fought back in response to the emergence of radical technological innovation.

Our study analyzes the cognitive influences behind the dynamic strategic responses of this company. The resulting inductively developed cognitive process model integrates managerial cognition with capability development and deployment views and depicts the dynamics of an incumbent's capability enhancement process at all stages (rigidity, triggering event, and capability renewal). Taking a cognitive view of capability enhancement drivers puts a particular emphasis on the role of top management cognition in the processes of detection and correction of errors in the course of action (Catino & Patriotta, 2013) with respect to the incumbent's technological strategy.

The study makes two distinct contributions. First, the model of emerging process contributes to the technological innovation management literature addressing incumbent challenges to radical technological innovation through enhancing established capabilities associated with existing technology by a "racing" strategy (Adner & Snow, 2010). Such a strategy is intended to extend performance to the appropriate level. Second, to the seasoned observer of the strategy literature, it might appear as if it is only resources, competitive forces, or abstracted capabilities that drive strategy but as Powell (2014) argues, this is a result of the 'creeping impersonalism' that has characterized the strategy field since its inception. We follow his advocacy of the need for a personalist rebalancing of strategy; thus, our research adds to the small but important body of work on the role of managerial cognition. We address the processual dynamics of incumbent domain negligence prior to further capability development and deployment. While cognition, as "information processing, knowledge structure mapping and

concept attainment" (Rialp-Criado et al., 2010), is finding an increasingly important place in strategy, we know little about how incumbents avert potential disruption. The focus on managerial cognition is framed by engaging with the CEO of a family business as a key respondent. We integrate managerial cognition with the processual dynamics of incumbent capability enhancement, analyzing the cognitive drivers of organizational actions. The study reinforces the importance of personal managerial cognition in processes of external threat detection, analysis, and course correction.

The paper starts with a brief review of prior literature linking managerial cognition to incumbent firms' strategies when faced with radical innovation. Then, we discuss the focal context of a traditional industry (cork stoppers) exposed to a rising radical innovation (alternative stoppers). Next, we introduce the research method of a critical case study and qualitative analysis. The emerging findings in chronological themes are linked back to the prior literature (on managerial cognition and capability renewal), culminating in the process model of capability enhancement at the focal firm (Figure 1). In the discussion we provide generalize the findings theoretically, while in the conclusion we summarize contributions and limitations of the study.

LITERATURE REVIEW: MANAGERIAL COGNITION AND INCUMBENTS' RESPONSE TO RADICAL INNOVATION

Scholars have studied managerial cognition to explain incumbents' inadequate responses to new entrants (Henderson & Clark, 1990; Rosenbloom & Christensen, 1994). From an organizational perspective a number of reasons for inadequate responses to competitors' radical innovation have been suggested. Amongst these are the inhibitive roles of organizational inertia (Gilbert, 2005; Hannan & Freeman, 1984), structured routines (Nelson & Winter, 1982), and the

existing competencies trap (Leonard-Barton, 1992) on the part of incumbents faced with challenges. Not being weighed down by liabilities of oldness, new entrants are more usually seen as radical innovators (Abernathy & Utterback, 1978; Henderson & Clark, 1990; Tripsas & Gavetti, 2000; Tushman & Anderson, 1986; Utterback, 1994; Christensen & Bower, 1996). By possessing an "attacker's advantage" (Christensen & Rosenbloom, 1995; Foster, 1986) based on the shock of the new, newcomers triumph over incumbents (Henderson & Clark, 1990).

Incumbents that respond creatively to challenges sense changing events as a threat demanding action: a threat not constituted as such is a poor basis for a strategic response (Trahms et al., 2013; Danneels, 2011; Eggers & Kaplan, 2013). Emerging research incorporates managerial cognition or sensemaking – how top management perceives and interprets the environment – to understand organizational responses to challenges. Working out "what´s going on?" (Weick *et al*., 2005) requires the construction of reality in terms 'defined through social processes wherein interpretations are offered and affirmed, modified, or abandoned according to their congruence with others' interpretations' (Ford & Baucus, 1987, p. 367). Of course, agreeing what is going on might signify unanimity based only on ignorance, hubris, misdiagnosis or an incorrect analysis of the evidence. Beyond appropriate sensemaking there has to be action that subsequent processes affirm as appropriate and effective.

Appropriate and effective incumbent responses to radical innovation involve either creating new capabilities or reconfiguring existing ones, where a capability implies having a "specific and intended purpose" (Helfat & Winter, 2011). Sensemaking of that which is enacted as the external environment, as events and understandings of them change, produces managerial cognitions that determine whether existing organizational routines (or competencies) are

appropriate for managing changing circumstances. They represent filters for understanding present capability and potential incapability in the face of the new challenges grasped.

In a comprehensive longitudinal case study of Smith Corona, Danneels (2011) suggests that, "managerial cognition about firm resources" is crucial in explaining the change in established routines, "as the identification of resources and the understanding of their fungibility affect which directions of renewal are pursued"(p. 3). In line with this cognitive view, the earlier in-depth case study on Polaroid by Tripsas and Gavetti (2000) revealed how the cognitive inertia of Polaroid's corporate executives created difficulties in adapting to digital imaging. Most notably, when analyzing the role of rigidities and cognitive frames, Gilbert (2005) identified two reasons for inadequate responses: resource rigidity arising from embeddedness in existing routines, leading to failure to change processes. Yet, whereas the aforementioned studies exemplify the role of cognition in making what, with the benefit of hindsight, were obviously the wrong choices in response to radical innovations, in the current study we address the question of how the cognitive processes within an incumbent can facilitate the emergence of an appropriate and effective response strategy.

Extant literature has shown that 'preserving established product, service, or process architectures in the face of troubled organizational performance' (McKinley *et al.,* 2014: 94) can lead to a vicious circle of decline as the old ideas are adhered to and new ones fail to emerge. Inertia sets in, a situation in which 'organizations often resist change even when their environments threaten them with extinction' (Miller & Friesen, 1980, p. 591). Osiyevskyy & Dewald (2015) argue that in contrary cases where incumbents' enthusiastically adopt radical approaches the consequences can be equally as disastrous as either refusal to adopt or a rigid

response in doing so. The European airline industry (Vlaar, De Vries, & Willenborg, 2005) presents a case of the "incumbent's curse" in adapting to technological changes. Technological changes introduced by new entrants can serve as a trigger for the initiation of internal innovation processes in incumbents (Mone *et al*., 1998; Staw *et al*., 1981; McKinley *et al*., 2014), a scenario invariably characterized as being one in which *necessity is the mother of innovation*. The role of cognition is vital in changing capabilities. Organizational capabilities (Aaltonen & Lanzara, 2015), underlain by routines, are expressed in coordinated patterns of repetitive sets of activities constituting organizational skills (Eggers & Kaplan, 2013; Miner, Gong, Baker & O'Toole, 2011; Winter, 1990). Managerial cognition plays a key role in sensing, interpreting, encoding, and retaining prior experiences in the construction of organizational routines and responses to competitive threats (Gavetti, 2005; Gilbert, 2005; Tripsas & Gavetti, 2000; Osiyevskyy & Dewald, 2015).

Organizational routines are key characteristics in organization identity (Albert & Whetten, 1985). Identity reflects members' sensemaking of "who we are as an organization" and "what we do as a collective" (Nag, Corley & Gioia, 2007). Too sense of strong organizational identity can restrict ability in adapting organizational capability to changing environments (Kogut & Zander, 1996), especially when a benign or munificent environment not only delays recognition of the need for change but also slows or prevents the development of alternative models (Barr *et al*. 1992; Hedberg & Jonsson, 1977). Inertia becomes so habitual that the changing nature of the reality being faced is not acknowledged, even when 'extinction' is threatened (Miller & Friesen, 1980, p. 591). When strategy is increasingly out of kilter with the environment, the sensemaking of the top management team, which interprets the organization's environment, makes strategic choices, and monitors the results of those choices, is crucial

(Bluedorn *et al*., 1994, p. 203). Strategic leadership becomes particularly important during turnaround periods (Trahms et al., 2013) when top executives, whose sensemaking now seems to have been erroneous, will need to be strategically changed (Bluedorn *et al*., 1994). Such cases can easily be found in declining industries: for instance, new leadership at NCR changed the organization's capabilities (Rosenbloom, 2000). As argued by Barr *et al*. (1992), top managers' need to keep pace with changing environments and translate their sensemaking into the creation of innovative and appropriate capabilities. Capability acquisition can occur through redeploying prior managerial experience consciously or unconsciously to create new routines to bear upon a problem (Miner, Gong, Baker & O'Toole, 2011) or, as Lavie (2006) suggests, by learning from other firms via mergers, acquisitions, joint ventures or inter-firm alliances, or bringing new sets of knowledge and skills into the organization through new hires. Reconfiguration of existing knowledge bases supports incumbency while creating new routines and capabilities often puts incumbents at a disadvantage (Methé *et al*., 1997).

We turn now to a case of renewal in one of the most traditional of industries, in order to explore strategies for success in the face of an organization that nearly became extinct.

THE INDUSTRY CONTEXT AND RADICAL INNOVATIONS: STOPPER WARS

Records of the myriad uses of cork exist over at least two millennia. Cork is produced from the outer bark of an evergreen type of oak tree called the cork oak (species *Quercus suber*), native to the Mediterranean region. Cork consists of the irregularly shaped, thin-walled, wax-coated cells that make up the bark of the cork oak. Cork is obtained from the new outer sheath of bark formed by the inner bark after the original rough outer bark is removed. The outer sheath may then be stripped and will form again; hence, it is referred to as regenerative cork. Repeated stripping of

cork is possible because the inner bark of the cork oak develops an especially uniform and continuous regenerative tissue. Unlike the inner bark, the outer bark of cork is not vital to the tree's survival; it is a protective aid against heat and dry winds. Stripping this regenerated layer yields commercial cork slabs of air-filled cells, each of which consists of a watertight, flexible compartment. En masse, these cells constitute a medium impervious to liquids. Ancient Greeks and Egyptians used cork stoppers to seal their amphorae, which subsequently became the major commercial use of the plant. In terms of present day global cork production, Portugal and Spain account for more than 50% and 25%, respectively.

The development of the modern cork industry can be traced to the French Benedictine monk Dom Pierre Pérignon, who developed the production of champagne around 1680. Wooden stoppers wrapped in hemp and soaked with olive oil that often popped out had been used to seal sparkling wine containers. Pérignon obtained much better results when he tested cork as an alternative. Soon cork became an essential stopper and by the turn of the twentieth century, almost all wine and champagne bottles had cork closures, an overwhelming dominance that would remain till the early 1990s. *Capsulated cork*, which is a natural cork stopper with a range of different caps in plastic, wood and other materials, designed for bottling fortified wines and spirits, has also been developed to provide an efficient seal and easy manual extraction, used for wines meant for repeated subsequent re-use, such as Port, one of the bases of Portugal's substantial wine trade.

Having been the stopper of choice over the last few centuries, cork's dominance had been taken for granted, both by the wine and the cork stopper industries. An unpleasant awakening for the cork industry came in the 1980s, with the discovery of the reason behind a condition known

as *cork taint*. Recognized under various names, cork taint provoked a chemical reaction with the cork stopper, leading to wine contamination with the chemical compound, 2,4,6-Trichloroanisole (TCA). TCA was a particular problem for wine, causing it to become insipid and change flavor, leading the wine to become *corked*. The costs of poor quality cork closures can be very high: besides damaging expensive wine, contaminated cork also can ruin the reputation of the wine label.

The problem of cork taint had been known for a very long time; however, the cork industry denied cork was the cause, censuring the wine industry instead in a blame culture hampering the ability to detect and correct errors (Catino & Patriotta, 2013). After Hans Tanner, in 1981, first identified the TCA compound as causing 'an unpleasant, musty off-flavour [that] can render an otherwise excellent wine completely useless' (Buser, Zenier & Tanner, 1982, p. 359), the industry could no longer deny responsibility. Cork's days seemed numbered: a mock funeral for cork was held in New York City on October 2, 2002, led by some members of the California wine community. The end of the cork stopper seemed imminent.

Radical Innovation: the rise of alternative stoppers

Failure of the cork industry to respond effectively to TCA provided a boost to industry alternatives. Although the scientific linkage of wine spoilage with cork via TCA had been made a decade earlier, the first real challenge to natural cork stoppers came from emerging radical technological innovations – synthetic closures – only in the early 1990s. These were alternative stoppers molded from synthetics of either medical or food grade plastics, designed much like cork stoppers. Given their production process, synthetics are naturally TCA free, uniform in terms of quality, and neutral in terms of affecting the taste of wine. Synthetic stoppers quickly

gained a following among wineries alarmed by the discovery of TCA in natural cork stoppers. However, plastic stoppers are not infallible, as they tend to get stuck in the neck of the bottle after a few months or years of storage (Patterson, 2010). Another problem is permeability, when wines kept for some time are exposed to the influence of oxygen infiltrating through the synthetic stopper, a problem confirmed in a study conducted in 1999 by the Australian Wine Research Institute (AWRI). Synthetics producers have been trying to resolve both these problems by reformulating their materials to reduce permeability.

Aluminum screw caps have emerged in recent years as the most significant threat to cork closures. Following the acceptance of their screw cap closure for spirits, liqueurs and aperitifs, in 1959 the French manufacturer Le Bouchage Mecanique (L.B.M.) developed a quality table wine closure to replace the cork stopper. The company named it "Stelvin," claiming it to be at least comparable, and in many respects superior, to the traditional cork product. The screw caps were made of aluminum, were corrosion resistant, and had a treated, chemically inert wad facing the wine (Mortensen & Marks, 2003). The alternative stoppers were cheaper than natural cork: a natural cork stopper costs between $0.30 and $2.4, whereas synthetic rivals are priced between $0.18 and $0.50 (Hatton, 2011). Wine bottles with alternative closures are also simpler to open, as they do not require a corkscrew. From a customer perspective, this could be seen as a "no-faff" advantage.

No single global source collates data on bottle stoppers but estimates reveal that up to the beginning of 1990, cork had close to a 97% market share (information from an industry insider interviewed in the course of the study). That share dropped to 70% a decade later. Therefore, the alternative stoppers served as a substitute to cork, representing radical technological innovation

from the point of view of cork producers. For a growing number of existing wine makers they were a preferred substitute. As such they cannibalized existing products, destroying existing cork-based competencies as technical capabilities (Hill & Rothaermel, 2003; Ansari & Krop, 2012). Near the end of the twentieth century, the cork industry leader, COR, seemed well on its way toward organizational extinction, as 'a substantial, absolute decrease in [the] resource base occurs over a specified period of time' (Cameron *et al.* 1987: 224). COR fought back – and it is this retaliation that forms the basis for our research case. The case provides a relatively thick description of how an industry veteran confronted existential threat of extinction from radical innovation (Siggelkow, 2007). Next, we discuss how we conducted the research before moving to a discussion of the findings.

METHOD

Case justification

The uniqueness of COR justifies its choice as an exemplar case (Flyvbjerg, 2006). COR is the single largest cork stopper manufacturer in the world, accounting for 4 billion units of the global production of around 13 billion cork stoppers. COR is also leading the industry fight-back against alternative closures; hence it is easy to defend the choice of the firm precisely because it's centrality and size make it special, allowing one to gain certain insights that other organizations would not be able to provide. The second largest cork stopper player – Oeneo – enjoys less than half of COR's global market share. in researching this exemplar case we follow the lead of some influential single case studies that explore incumbent response to new technologies (Burgelman, 1991, 1994; Danneels, 2011; Rosenbloom, 2000; Sull, 1999; Tripsas & Gavetti, 2000). We use a longitudinal single-case study, highly appropriate for theory

generation that exploits 'opportunities to explore a significant phenomenon under rare or extreme circumstances' (Eisenhardt & Graebner, 2007, p.27). The case study method has the added "advantage of enabling the researcher to study a phenomenon in a real-life setting where often it would be otherwise difficult to grasp its dimensions" (Runfola et al., 2016; p. 2).

Data Collection

Data collection followed the principle of triangulation along the lines proposed by Flick (2004), who argued that multiple sources of information would lead to more robust findings, supporting construct validity. The first step was to collect information and data from publicly available sources, such as company websites, newspaper articles, industry journals, annual company reports, and trade statistics. Information was also gathered during an industry conference held in Portugal in April of 2011, which saw a gathering of experts, entrepreneurs, trade body representatives, as well as senior personnel from different Portuguese cork manufacturers. The documentary data collection process started in March of 2011, three months before our first interviews, which prepared us for the field visits.

The primary data source consisted of interviews carried out with key personnel involved in the fightback strategy of the firm, as well as industry representatives. We used multiple highly knowledgeable informants, enabling us to view the focal phenomena from diverse perspectives. Using this approach limited the probability of convergent retrospective sensemaking and impression management (Eisenhardt & Graebner, 2007, p. 28). First, we had a half hour telephone interview with a member of the administrative board of COR (June 3rd, 2011). The objective was to glean preliminary information on organizational strategy and to prepare for site interviews. Additionally, this interview helped COR to understand our research goals and needs,

a necessary legitimation process.

Second, exploratory and semi-structured interviews were conducted with ten key employees at company installations. All of those interviewed held senior positions either in the cork company (COR) or in the cork stopper business unit, with direct knowledge and involvement in COR's market recovery strategy. On average the interviews lasted 50 minutes (a total of close to 22 hours of personal interviews), with extensive written notes taken. The two interviews with the CEO of COR were tape-recorded on digital audio files; other interviews were not recorded. Interviews were held at least twice, and included four separate meetings with António Reis Amorim (ArA), the CEO of COR, who spearheaded and actively coordinated the response and growth strategies (the last interview was performed on 03/17/2015). To gain an industry ("outside firm") perspective, we interviewed Joaquím Lima, head of APCOR, the Portuguese cork trade association, which counts among its members more than half of all the cork stopper manufacturers, including all the large firms. All interviews were conducted separately, each lasting between a half hour to two hours.

Supplementing the research-generated data gathered through interviews, we collected substantial amounts of naturally occurring data (Silverman, 2011). During three afternoons at COR's R&D laboratory (June/2011, July/2011 and December/2014), where various tests for TCA detection were demonstrated, we generated substantial field notes. In addition, over the course of the study we were given extensive access to the company's secondary data regarding the firm itself s well as the cork-stopper industry, including internal reports, meeting notes and business memos. The company-provided secondary data was supplemented with additional information from public sources. Overall, approximately half of the archival evidence was in the

form of annual reports of COR and other documents from COR, while the rest consisted of books (including two on COR's history), newspaper and journal articles. Finally a draft of this paper was e-mailed to COR for internal circulation among those who participated in the study, in order to verify the accuracy of data and findings (Danneels 2011; Hirschman, 1986; Lincoln and Guba, 1985).

During the four years of data collection and analysis, more than seven thousand pages of text were collected, read and analyzed. Around two-thirds of these documents, including company reports, were in English, with the remainder in Portuguese. In data analysis priority has been given to themes emerging from the primary data sources (interviews and field notes). Secondary data served a different purpose, namely corroborating the evidence gathered from the primary data. In particular, the secondary data was used to provide evidence regarding: (a) an historical perspective on COR; (b) the state and dynamics of the industry, technology and the threat from alternative stoppers and (c), COR's product range expansion and sales evolution. Besides providing both a historical and contemporary perspective, the archival data helped strengthen construct validity and minimize the risk of overly subjective judgments being made from the primary data. The entire data collection process followed the principle of construct validation, seeking different angles from which to look at the same phenomenon, by using different data collection strategies and different data sources (Gibbert *et al*., 2008).

Data Analysis

Similar to the approach taken by other scholars analyzing organizational responses in the face of external threats from new technologies (Danneels, 2011; Rosenbloom, 2000), we used the extended case method (Burawoy, 1991) to guide the data analysis. Extended case study is not

intended to build new theory but rather refine and extend extant theory. While pure grounded theory method seeks to build new theory, the extended case method treats 'phenomena not as instances of some potential new theory but as counter instances of some old theory' (Burawoy, 1991, p. 9). The case of COR is aptly suited for extended case analysis "where instead of an exemplar the social situation is viewed as an anomaly" (Burawoy, 1991, p. 9), in that the firm was successful in combating decline induced by radical innovations, by initiating strategic alliances, appropriating new technology (either buying or developing its own), absorbing and integrating new technology with that already existing.

Using the extended case method enabled us to integrate concepts and theories to explain how COR responded to the alternate stoppers challenge. We began by creating an event history database (Van de Ven & Poole, 1990), chronologically ordering descriptions of events. A narrative, derived from interview and field notes, newspaper and journal accounts, books, and company reports, was developed. The data analysis followed an iterative process, coherent with Edmendson and McManus' (2007, p. 1155) suggestion of methodological fit in management field research as "created through an iterative learning process that requires a mindset in which feedback, rethinking, and revising are embraced as valued activities, and to discuss the implications of this for educating new field researchers." In keeping with Burawoy´s (1991) suggestion of theory reconstruction, we conducted two running exchanges between field notes and the consequent analysis. The first running exchange involved uncovering anomalies between extant theories of how incumbents succeed when confronted by radical innovations and the data that emerged from document analysis and field studies. In conjunction, the second running exchange was between data collection and existing theory.

The themes that emerged were based on commonly used statements, for instance multiple data segments referring to ‘we became complacent’ ‘we have grown for so long, and we would continue to do so’, ‘monopoly’, ‘wake up call’, ‘house in order’, suggesting domain neglect. This process was highly iterative (Locke, 2001), necessitating cycling between the data and extant theory, with the data suggesting relevant concepts and theories in the literature, while the literature provided conceptual frameworks to aid in the interpretation of the data (Danneels, 2011). Theoretically we drew from literature on capabilities, resource allocations and managerial cognition. As we gradually discovered pathways through the data, subsequent meetings specifically probed questions related to these, such as top management’s mental models. After four years of extensive reading of interview transcripts, articles and company reports, data saturation was reached when little headway was being made with respect to additional themes or new explanations (Morse, 1995). In what follows, juxtaposing data against theory (Orton, 1997), we describe how and why COR is managing, with increasing success, to maintain its leadership position in the stopper market while remaining faithful to its 150-year-old history and tradition with cork, thriving in the face of what had seemed likely extinction.

THE FIRM: *CORTICEIRA AMORIM* (COR)

The genesis of COR lies in the establishment of a small cork workshop in Vila Nova de Gaia, by António Alves Amorim in 1880. Amorim’s intention was to take advantage of the port wine trade that plied along the river Douro in this northern coastal part of Portugal. Following a fallout with his financial partner, in 1908 Amorim moved with his family to Santa Maria de Lamas, his wife’s birthplace, around fifteen miles south of Vila Nova. With the continuous growth of the family business, a purpose-built factory was constructed in 1922 and the cork firm was officially

incorporated. Over the next six decades the company continued to grow, especially under the leadership of a third generation family member, Américo Amorim. Over the years, the profits generated by the cork stopper business permitted the firm to evolve into a diversified conglomerate called *Amorim Investimentos e Participações* (AIP), with six sub-holdings. The non-cork sub-holdings involved diversified businesses including tourism, real estate, insurance, textiles and banking as well as financial interests ranging from oil to casinos. However, the cork sub-holding, *Corticeira Amorim* (COR), remains the largest revenue producer and the crown jewel of the group.

COR is organized in five business units, each developing its own products and brands, employing over three thousand workers. The raw materials unit is in charge of the management of all aspects of purchasing, storage and preparation of the common denominator of the firm, cork. The heart and soul of the firm, however, is *Amorim & Irmãos* (AI), the cork stopper business unit, with a share of almost 60% of group sales. Dwarfing the other four business units, A&I has eight industrial units, while the overall cork business, COR, has 28 industrial units (of which 17 are in Portugal). The total revenues of COR were around $714 million in 2014 (up from $650 million in 2013).

FINDINGS

COR was unable to stem the rise of alternative stoppers, or effectively counter cork's negative image from the TCA fallout in the 1990s: why was this? Despite possessing slack resources, there existed little deliberate and systematic effort at process innovations to reduce contamination at this time. Intriguingly, COR's response did not involve absorbing or adopting alternative stopper technology. In what follows, we trace, through a series of stages, how top

management's cognition was variously implicated in the development of capabilities and their deployment in shaping strategy and, consequently, organizational performance, which are summarized in the inductively developed a process model (Langley, 1999) of capability enhancement, presented in Figure 1.

Insert Figure 1 about here

Stage 1: Rigidity caused by denial (1990s)

The capabilities and resources of COR evolved over a century and a half, based on extensive experience in sourcing, manufacturing and connecting with global clients. Incrementally constructed routines, knowledge and assets steadily and predictably delivered favorable organizational outcome over decades for the market leader in a monopoly industry. Profits from cork stoppers enabled COR to expand into a host of areas ranging from hotels to oil, making its third generation family owner and CEO, Américo Amorim, among the richest men in the world (Forbes, 2015).

Prior to the establishment of a scientific connection between cork and wine spoilage in the 1980s, the cork and the wine industry (the latter reluctantly) implicitly assumed that a small percentage of wine would be "naturally" spoiled. The detection of TCA in cork, most of whose presence was derived from the then existing practices of extracting, transporting, and manufacturing cork, unambiguously established causality. TCA detection created the opening for competition, with a Seattle based company, Supremecorq, offering the first credible alternative to the market in 1994.

Increasingly negative coverage from the wine industry media, along with clientele increasingly reluctant to go along with cork industry excuses, provided clear pointers that the competitive environment was changing. However, it is the "ability to translate … insights into changes in the organization" that determines effective strategic action. The failure to act effectively and resolve contamination undermined the cork stopper's fundamental capability—the specific and intended "purpose" (Helfat & Winter, 2011) – to provide a quality closure that did not spoil wine. Some established clients of COR began to abandon cork for alternative products emerging by the mid-1990s as alternatives, leading to a steady erosion of the firm's market share, first due to plastic stoppers, increasingly from screw caps.

Encoding experience

At COR, routines were reinforced by three dynamics — the continuous success of COR, familiarity with processes ranging from procurement to distribution, and regularity of experiences. These three behavioral mechanisms enabled encoding of experiences into routines over the decades. Routines are based on interpretations of the past (Levitt & March, 1988), of which COR had a rich history. For more than a century, the firm had built up a trusted and established network of raw material and a large distribution system with local presence in all the important markets. These routines generated capabilities effectively deployed to generate profits over the years in every aspect of the organization.

Problem sensing

The process of transforming and assimilating information into knowledge and understanding determines management's chosen strategic options in given environments. In the face of a

changing environment, any effective strategic action toward organizational renewal could happen only when salient negative changes in performance were detected, recognized and interpreted as permanent downturns (Eggers & Kaplan, 2013). Initially slow to react because

> *"Everyone was conscious of the problem, with the exception of the monopoly cork industry. It's easy for everyone in a business to ignore an issue if there is no competition. At the end of the 1980s, cork was still the only available closure for quality wines or wines that had aspirations of quality. Low-tier wines might not be in a bottle with a cork, but that was the commodity market where only price mattered" (Taber, 2007, p. 59).*

In essence, there was a deficit in *problem sensing*, 'the cognitive processes of noticing and constructing meaning about environmental change so that organizations can take action' (Kiesler & Sproull, 1982, p. 548). The problem of market decline was not initially made sense of as something that could be permanent, calling for additional resource allocation; existing capabilities were largely maintained and while some measures to reduce contamination were put in place they did not represent clear and comprehensive innovation.

Matching capabilities to threats

The CEO's interpretive schema at the time the threat emerged shaped scarce resource allocation and capability deployment. Three important factors slowed COR's inability to adapt or reconfigure organizational capabilities to the changing environmental conditions. First, COR had grown into a conglomerate from its base in the cork industry. While cork stoppers were, and remained, the jewel in the crown, they had enabled investments into multiple and varied areas, creating a problem of attention deficit (Ocasio, 1997, p.188): "What decision makers do depends

on what issues and answers they focus their attention on." Attention was not focused unequivocally on the changes and threats to the cork-stopper industry.

Second, an increasing market preference for wine, with a steady rise in wine consumption since 1990, masked cork's decline. While the market share of cork was declining COR was selling over three times more in 2000 than it had in 1990, due in large part to the increase in wine sales in Australia and the USA. Growth in sales hid "a multitude of sins" (Barr *et al*, 1992) and the strong demand for cork in the mid-1990s reduced the sense of urgency to create or reconfigure capabilities to counter the threat developing from alternative wine-closers.

COR's organizational identity was a third factor inhibiting sensemaking in an increasingly negative environment marked by bad press and a rise in market share of alternative stoppers. Over thirteen decades of experience and knowledge had created a very strong sense of organizational identity at COR, an identity forged by cork. COR and cork were a unity. The sense of "who we are" as an organization was based on working with this single material, and this shaped management's interpretation of external (negative) information. COR could not change the organization without changing its identity.

COR's belief and faith in cork was so strong that, in the past, the possibility of the natural material being contaminated was not seriously considered. After the 1981 discovery of TCA, the company believed that, even if the problem really existed, it would eventually be resolved, a belief that was so embedded in the organization's culture that it inhibited a more objective and critical analysis of the TCA problem, corroborating the identity-based inertial processes pointed out by Tripsas (2009). Identity-challenging radical innovations are usually not embraced for two reasons: first, organizational identity functions as cognitive filters through which organizational

members notice and interpret information; second, identity and organizational routines are so intertwined that non-cognition occurs. These factors characterized COR's initial reactions in the 1990s.

Denial as the mother of rigidity

The consequence of COR's inability to adapt organizational capabilities to the threat from alternative stoppers led to a scenario in which "denial was the mother of rigidity," leading to an outcome similar to the "necessity as the mother of rigidity" perspective (Mone *et al*., 1998; Staw *et al*., 1981; McKinley *et al*., 2014). The existence of a real long-term problem was denied. In the face of the external threat posed by alternative stoppers, COR restricted information processing and continued to rely on well-embedded routines without investing in innovation. Limited innovation experience restricted the organizational memory of top management. Having been in a monopoly industry, with no substitute competitors for so long, few new capabilities were developed, with the accumulated history playing a significant inertial role with respect to routines (Cohen & Bacdayan, 1994). Tradition trumped innovation. Moreover, in the perception of the top management team of the COR (as an industry leader) the 'TCA' and 'radical innovations' problems were insufficiently salient to recognize errors in established courses of action from which they could learn (Catino & Patriotta, 2013).

Refusing to acknowledge the problem, a bunker mentality characterized the organization. Taber (2007) argues that denial of TCA contamination by the cork industry played a central part in the rise of alternative stoppers. Influential wine journalists long lamented the industry's refusal to admit that cork could be the cause of wine spoilage. Journalist Tom Cannavan (2008), observed:

> *There was almost a denial that the problem existed, with cork producers seemingly putting more money into PR than research, claiming other faults were being wrongly attributed to cork, criticizing other closures, claiming the statistics were all wrong and generally sticking their collective heads in the sand.*

Domain neglect

COR's top management pursued a strategy which could be termed as "domain negligence": they criticized the qualities of alternative stoppers, blaming TCA on wine producers' bad storage, while engaging in public relations. Management reinforced rigidity through perpetuation of already established routines (e.g., McKinley et al., 2014). COR's efforts at tackling contamination were perfunctory rather than a deliberate medium-term strategy. Looking back (in an indirect criticism of his uncle), the former CEO told us:

> *You cannot criticize your competition without first having your house in order. We didn't have our house in order.*[1]

On COR's domain neglect, Taber (2007) states:

> *For a long time…especially when plastic first came on, they tried to dismiss it and say "This is a crazy thing … no one is going to ever change to it and…" — but as they started to lose market share, they definitely started to react. They are very fortunate that a new generation of leadership came into the largest company.*

Triggering Event: Leadership Change

[1] When we quote respondents, the source is our written notes made during the interviews.

During the course of the 1990s, the principal shareholders of the family-owned company gradually realized that unless the TCA problem was dealt with effectively, disruption from alternative closures was imminent. As Daryl Eklund, the former general manager for Amorim Cork America wryly noted (cited from Patterson, 2010):

> *For people in the industry, it took a big mindset change. Nothing changes a mindset like losing a third of your market, which happened with the rise of synthetic corks in the 1990s.*

The board´s position at the end of the twentieth century reflected Ford and Baucus' (1987, p. 366) suggestion, that 'only after prolonged decline precipitated changes in top management was "weathering the storm" abandoned and "unlearning yesterday" and "inventing tomorrow" embraced.'

In 2001, the group's patriarch, Américo Amorim, decided formally to hand over the reins of the cork company to his thirty-three year old nephew, Antonio Rios Amorim (ArA). After taking over the cork stopper division as its managing director in 1997 he had already initiated some anti-contamination measures and introduced a new stopper type called Twin Tops, which was a technical cork stopper, made of agglomerated cork with a disc of natural cork at either end.

Stage 2: Capability Renewal (necessity as the mother of invention: since 2001)

Thirty-four year old ArA's cognition was quite different from that of his octogenarian uncle. With a very international outlook and education, he was well aware of the Schumpeterian forces of creative destruction. Educated in commerce from the University of Birmingham, with executive management programs from Columbia University, INSEAD (in France) and Stanford

University, his business sophistication combined with in-depth knowledge of the firm and industry played an important role in his sensemaking.

Interpreting purpose

Asked about the generational management transition, ArA summarized his thoughts on that period:

> *When I took over, we could have done nothing and milked the stopper cash cow, but then we would have been out of business in fifteen years. I knew that we had to do something.*

The new CEO had interpreted the future very clearly—if cork couldn't get rid of, or substantially reduce the presence of TCA, then there would be no future for the organization, at least as it existed. Existing routines had been constructed over decades of success but a changing environment required a "mindful" creation of new routines (Salvato, 2009). ArA was very attentive to cues from the recent past:

> *For some years I worked as my uncle's translator whenever there were English-speaking clients. I would also travel with him, and this gave me direct exposure to the unhappiness and problems of our clients.*

In such early experience the wine industry's distress was forcefully conveyed to ArA, providing compelling cues to shape new routines:

> *I had the worst meeting in my life sometime in early 2000, when Cabral and I (the newly appointed R&D head) had a meeting in Adelaide with Australian wine producing companies. For almost six hours we were under constant attack from them over the*

contamination issue. After it was over, I told Cabral that I don't want a repeat of this experience. I don't care what it costs: just fix this problem.

To handle the emerging crisis, ArA chose to enhance existing technology:

I knew that we had to first do our own homework, rather than criticize the alternatives, because each of these alternatives has its defects… I realized that the change has to come through technology, during a visit from an Australian, whom I took to Alentejo from where we source most of our cork. There, in front of the visitor, two people gave two contradictory views on the impact of sun on cork. I realized then that there has to be serious research behind our approach.

An essential component in the construction of routines to create capabilities is to identify the purpose (Eggers & Kaplan, 2013). ArA's sense of impending crisis provided him with that purpose. COR, essentially, was a one-trick pony whose success had rendered the firm billions of dollars over the years. It was evident that this pony was about to die, unless new capabilities that could eliminate the contamination problem were innovated.

COR was seeking incremental exploitative change, derived from a "problemistic search" which, in a case of bounded rationality, was local and close to existing practices (Osiyevskyy & Dewald, 2015). A change of this order implied the enhancement of existing capabilities along established paths. Facing the threat posed by reducing market share and loss of important clients, ArA sought to build new capabilities aimed at reducing contamination instead of reinforcing existing routines. Faced with a "loss context" (Wiseman & Gomez-Mejia, 1998), innovation was stimulated. As ArA mentioned:

The contamination issue was the best thing that happened to us in the long term. It was a good kick up the bottom -- no doubt about it. In the last 10 years, the cork industry understood that it was being challenged. I believe it [realization and action] was bound to happe, but what accelerated it were these plastics and synthetics and alternative closures. We in the cork industry had to speed things up and I think we did that. We must not become complacent.

Understanding COR's capabilities

Assembly of new routines into capabilities requires explicit cognizance of organizational skills (Eggers & Kaplan, 2013). ArA's direct supervision of the stopper business from 1997 and prior to that his experience within the group's hotel division and real estate, meant that he was well aware of the organization's resources and capabilities. Being an insider, he was well versed in the routines, skills, and capabilities of the cork organization and industry.

Assembling new routines for new competencies

Being a market leader with the best technological practices in the industry reduced the options open to COR in the form of acquisitions or joint ventures for learning new technology from within the industry. Outsiders have been found instrumental in helping the incumbents' top management to interpret the new knowledge appropriately (Kammerlander, 2013). COR's chose to hire outside expertise, Miguel Cabral, a Professor of Microbiology from Porto University, to head the R&D division of COR. Cabral´s mandate was clear from the beginning— resolve the TCA problem.

The series of process innovations to reduce the incidence and increase detection of TCA (outlined with technical details in the Appendix) were based on new routines derived from the work of Cabral and his team of researchers. One new routine involved sourcing the raw material. Many raw cork suppliers were vertically integrated to afford much greater quality control over the raw material for cork stoppers. When ArA took control of the company COR produced only 25 percent of the raw cork it used. After suppliers were purchased selectively, that figure rose to 95 percent by 2014. COR provided extensive technical training to employees involving the cutting of the cork bark from the oak (to reduce the possibility of contamination), as well as offering financial incentives to compensate for any eventual loss to the farmers derived from these new methods.

Domain defense

First sensemaking then strategic action, following the interpretation of a situation. ArA's strategy from the start was to recover lost market share and reputation. After assuming the helm of COR, he launched a careful and deliberate decontamination strategy. An integral part of domain defense strategy is creating awareness and ArA and other senior management, including the R&D chief Cabral, regularly make presentations at wine industry events, clients' offices, and international scientific conferences, both as evangelists of cork and with the purpose of learning new trends and consumer preferences.

COR's strategy, pursued after 2001, aimed at securing market position. Typical of domain defense, efforts were geared at preserving and restoring legitimacy and at preventing further encroachment on market share (Zammuto & Cameron, 1985; Ford & Baucus, 1987; McKinley et al., 2014). The innovations discussed earlier (and in the Appendix), including

changing of sourcing practices, were integral to domain defense as was creating new cork stopper types. ArA argued:

> *We can do more from the viewpoint of process than had been done so far, and improve. From the technological viewpoint, we can extract the raw material in a more efficient manner and use ever more sophisticated methods to produce cork stoppers, relying less on labor. We can develop new products and thereby become more competitive.*
>
> *In the first phase we did our homework. Before, in the early 2000s we only had promises. Once we showed improvements in performance (meaning TCA reduction), we were more comfortable with thinking of new products.*

An integral part of the sensemaking process involved active and continuous listening to customers. Illustrative of the new domain defense strategy was the launching in 2015 of a twist-off, re-sealable wine cork that doesn't need a corkscrew, called the Helix. Developed in partnership with the largest bottle manufacturer in the world, Owens-Illinois, the Helix combines an ergonomically designed cork stopper and a glass bottle with an internal thread in the neck. ArA explained the origins of the Helix, launched after four years of development:

> *A US client of ours did a market survey of the consumer experience with opening a bottle of wine. They found that clients preferred cork stoppers, and with regards to screw caps they felt frustrated because they believed they were being ripped off. Clients found screw caps cheaper, yet "convenient." We believe that especially for the countries that are beginning to have a greater tradition and culture of wine drinking, "convenience" would be very important. We asked ourselves: How can we give more convenience than we can*

give today? How can we give the same convenience as screw caps? That was how Helix started.

The introduction of the Helix was an implicit attempt at 'disrupting the disruptor' (Markides & Oyon, 2010), by coming out with a solution tailored to COR's competencies, yet matching a rival technology's strength in an important dimension. Helix follows earlier new cork stoppers introduced by COR, such as the Neutrocork, which, Miguel Cabral notes, has a zero incidence of TCA, and Twin Top (introduced when ArA ran the cork stopper division in 1997), both being individually moulded cork, made of fine cork granules and intended for wines bottled within two years of production. A more recent strategy has been to target high-end segment cork stoppers and regions with higher growth prospects, namely the US and China.

Performance Outcome: Arresting Decline

The domain defense seems to be bearing fruit: even though the alternative technologies have not been thwarted, important indicators point to slowing momentum in alternative stoppers, especially plastics. The series of process innovations undertaken since the beginning of the century (see the Appendix) have had the effect of reducing the incidence of TCA for corks by a factor of ten. Miguel Cabral is confident that the new detection machines that individually identify TCA incidence will bring TCA rates down to 0.5% for natural cork stoppers, a rate which already exists for COR's technical stoppers such as Neutrocork. COR also played an important role in selectively revealing some of their technology to uplift industry standards (Sarkar, 2016).

Recent years have seen COR registering strong growth, with revenues from cork stoppers close to €393 million in 2015, an increase of almost 45% over five years. In the first semester of 2016, there was a rise in the volume of sales by 9%. In 2015, COR increased its annual investment in R&D from annually around five million euros to seven million (Sarkar, 2016). Meanwhile, some of the largest competitors in the alternative closure industry are under pressure. One of the largest synthetic stopper makers, NuKorc of Australia, founded in 1996, has filed for bankruptcy; another huge synthetic stopper manufacturer, the American Supremecorq founded in 1992, also filed for bankruptcy in 2011. For the very important US retail market, studies of restaurant sales by *Wine & Spirits* magazine point to the decline of synthetic and screw cap wine closures, with a corresponding increase in the growth of cork stoppers. Cork closures accounted for 90% of wine bottles, an increase of 21%over the past decade, while screw caps and synthetics decreased at the rates of 39% and 70%, respectively. Carlos de Jesus (the head of Marketing at COR) emphasizing the importance of these results, noted:

> *The U.S. is now the world's biggest wine market. These figures are even more relevant if we consider that the USA has a great potential for growth in the per capita consumption of wine.*

The overall COR group ended the 2014 fiscal year with a net profit of € 35.8 million, a near 20% increase over the previous year. Cork stoppers recorded a new sales increase of around 7% in value and nearly 5% in quantity, selling over 4 billion cork stoppers. The Helix cork is now available in wine bottles in France, Italy, Spain and Portugal, with a very good reception from the wine industry. Cautious optimism is evident in the organization, even compared to 2011, when the research started.

DISCUSSION

Capability Enhancement in Response to Radical Innovation: An Emerging Process Model

Three distinct factors favored COR in its battle against alternative stoppers: (1) correctly interpreting the (unfavorable) environment after two decades of denial; (2) new leadership with concentration of powers that permitted the necessary change, and (3) engagement in an effective domain defense strategy.

The first research question related to the possibility of successful responses by an incumbent in arresting the momentum of radical innovations in their industries. The struggle of incumbents responding to radical technological innovation (Hill & Rothaermel, 2003) does not imply incumbent *inevitable* decline. Our analysis demonstrated the effectiveness of one of the possible response strategies, implying capability enhancement to extend the performance of existing technology along an established trajectory. The analysis also provides particular details regarding the actions taken by the established company to enhance its existing capabilities: (a) emphasizing R&D to resolve the initial problem, (b) initiating process innovations, (c) integrating vertically, and, finally, (d) developing new products stemming from the existing technology.

The second research question related to the cognitive processes within an incumbent company that facilitate the emergence of a successful response strategy. Analyzing the COR case through the lens of managerial cognition as sensemaking, we inductively developed a process model of capability enhancement, presented in Figure 1. The chart illustrates the interconnections between capabilities and managerial cognition along the three stages of rigidity,

triggering events, and capability renewal. The research uncovered how dynamics of cognition were variously implicated in the development of capabilities and their deployment in shaping strategy.

The initial pre-crisis period covered the company's thirteen decades of successful experience and market leadership with existing technology whose longevity is found in very few industries; not surprisingly, the technology of dealing with natural cork was deeply engrained in the company's identity and routines. As a result of this tradition, COR was insensitive to changes in the industry in the late 1980s, comprising customers' growing concerns about cork taint, nor was it cognizant of threats from rival technologies, some with performance parameters superior to cork. Consequently, in the first stage in Figure 1's process model – Rigidity – the organizational decision makers did not sense an emerging problem. In particular, the gradual loss of market share was interpreted as temporary, not leading to either creation of new routines or reconfiguration of existing capabilities to tackle the TCA threat. Alternatives were not perceived as a long-term threat, leading to a domain negligence that allowed alternatives to gain market share. In this "denial as the mother of rigidity" stage, the firm restricted information processing, relying on well-embedded routines, with little in the way of resources invested in innovation.

The leap from Stage 1 (Rigidity) to Stage 2 (Capability Renewal) was mediated by a triggering event: leadership change. A crumbling industry image, rising momentum of alternative stoppers, declining market share and direct exposure to an unhappy wine industry were potent cues to ArA, as early as 1997, that changes were needed. Assuming company leadership in 2001 gave him the leeway to enact new routines aimed at process innovations to reduce contamination, leveraging new innovative capabilities to face the threat of environmental

decline. The salience of this triggering event in our analysis emphasizes the fact that the top management, as the primary agent determining the fit between strategy and environment, scanned and interpreted the organization's environment, made strategic choices, monitoring their results. In order to achieve strategic change, the replacement of top management is sometimes required in order to be effective (Bluedorn *et al.,* 1994, p. 203).

The Capability Renewal stage started with re-thinking the industry situation and the future of the organization if the internal status quo were preserved; TCA-induced cork taint now was seen as an existential threat requiring immediate managerial attention. Coupled with rethinking organizational skills and capabilities, this sensemaking process led to tangible organizational actions creating new capabilities, assembling new underlying routines and acquiring necessary resources, ultimately resulting in an effective domain defense strategy.

Whereas most prior studies emphasize the incumbent's struggle to adapt or the imperative to embrace the radical innovation by either abandoning the existing technology or integrating existing and rival technologies (e.g., Osiyevskyy & Dewald, 2015; Adner & Snow, 2010; Hill & Rothaermel, 2003), committing to an established approach can also be a rational and radically innovative strategy that builds on tradition rather than usurping it.[2] Of course, a single success case study cannot be generalized to all situations (one need only beware of the counter-example of Kodak, where sticking to the existing technology led to disaster); additional studies will be needed to establish a fuller range of contextual factors determining optimal

[2] Adner & Snow (2010) term this the "race" generic strategy. Notably, whereas "a firm's *ability* to race against the new technology — improving the old technology's performance — depends largely on firm and technology attributes" (Adner & Snow, 2010, p.12, *italics added*), the actual trigger for this path lies with cognitive mechanisms.

strategy.

In line with the conceptual integrative framework of Eggers and Kaplan (2013), we contribute to the limited literature interconnecting cognition and capabilities by showing how managerial cognition plays an essential role in sensing, interpreting, encoding, and retrieving prior experiences in the construction of organizational routines. In particular, the process model (summarized in Figure 1) unpacks the cognitive dynamics behind capability development and deployment within an organization facing existential threat from emerging radical innovation. On the basis of a longitudinal case study, the current paper demonstrates the effectiveness of the incumbent's strategy of capability enhancement (along the established trajectory). In addition, we integrated managerial cognition and capability development and deployment views, depicting the dynamics of an incumbent's capability enhancement process as comprising two key stages (rigidity and capability renewal) with a triggering event between them, providing a detailed analysis of the cognitive drivers of organizational actions in all stages.

CONCLUSION

The primary theoretical contribution of the current study is the development of an inductively developed cognitive process model incorporating and synthesizing two distinct streams of literature – (1) managerial cognition and (2) capability development and deployment views – with which to explain the capability enhancement process that incumbents enact amid radical innovation causing turmoil in its industry. In particular, we scrutinize the cognitive drivers of organizational actions in all stages of the model (rigidity, triggering event, and capability renewal) and elucidate the role of top management cognition in the processes of detection and correction of errors in strategic courses of action. The two-stage dynamic model of capability

enhancement ('rigidity' – 'triggering event' – 'capability renewal') that the paper presents further develops the more general capability lifecycle process of Helfat and Peteraf (2003).

In particular, we contribute to the literature on radical innovation dynamics by providing a case clearly demonstrating the viability of an incumbent strategy of fighting back against an emerging radical innovation. Incumbent fightback is best done through capability enhancement aligned with an established technological trajectory and resource base in which its existing strengths reside. As such, our paper is a caution against an excessive emphasis on disruption as the most vital form of innovation (Christensen & Bower, 1996).

All theoretical and empirical contributions have contextual limitations imposed by the bounded rationality of both empirics and theory. An initial limitation is that much of the behavior of COR, especially its organizational identity, is doubtless due to it being family-owned – as are many enterprises in traditional industrial areas in Europe. While learning myopia can provoke incumbents to ignore the long run and discount the impact of new entrants and technologies or business models (Vlaar, De Vries, & Willenborg, 2005), being a family owned firm mitigates such short sightedness. It was for this reason that the family member CEO was a key informant. During the course of the empirical analysis, it became clear that the organizational identity of COR was shaped and determined by it being a family business, and in turn, the family strongly associated itself with cork. It would therefore be interesting to study the extent to which being a family owned organization helped COR in its fight against synthetic stoppers and refusal to adopt rival technologies, as well as the extent to which the embeddedness of the family enterprise in a local community created patterns of worker deference (Mann, 1995) to organizational strategy, rather than creative resistance to change (Courpasson, Dany & Clegg,

2012). Tradition was both a liability and an asset.

Two other essential limitations of this study are worth particular notice. First, COR's effective domain defense strategy based on incumbent technology may not be generalizable to other industries, where alliances or adopting rival, radical new technology may indeed be the best strategy. Therefore, further studies – moving beyond a single case analysis – are needed to test the external validity of the reported findings regarding the optimal generic incumbent responses, which will obviously be context-dependent. Second, the current research's theoretical lens is grounded in an internal managerial cognition view of environmental change; as such, it does not focus on essential contextual factors outside organizational boundaries, including the dynamics of shifting consumer perspectives on the emerging radical technology. In the case of the focal wine stopper industry, it is plausible that – despite the wine taint problem – many consumers still preferred cork for the traditional and valued ritual of extracting the cork with a corkscrew and that this demand characteristic shaped the optimal and behavioral responses of the company. Hence, we encourage further studies taking into account demand-side perspective on radical technological innovations.

In terms of future research directions, in addition to domain defense, the company also engaged in 'domain creation' strategy, testing out new markets to deploy the existing technology; that is, leveraging existing resources to renew itself outside the cork stopper industry. In doing so, the firm appears to have enacted "dynamic capabilities" to focus on the reconfiguration of its internal resources. Dynamic capabilities allow organizations to recombine and reconfigure assets as well as organizational structures, as markets and technologies change (Teece, 2006). The importance of applying a cognitive lens to reconfiguration of organizational

resources in line with dynamic capabilities was noted by Danneels (2011) as revealing "a gap in current dynamic capability theory, namely that it is necessary to consider managerial resource cognition in order to understand the actual or potential exercise of dynamic capability" and that "it is not only resources that affect dynamic capability but also cognition about those resources"(p.26). Hence, by hooking up dynamic capabilities with managerial cognition we bring together two influential streams in current strategy research.

REFERENCES

Aaltonen, A., & Lanzara, G. F. (2015). Building Governance Capability in Online Social Production: Insights from Wikipedia. *Organization Studies*, *36*(12), 1649-1673.

Abernathy, W. J., & Utterback, J. M. (1978). Patterns of industrial innovation. *Technology review*, *64*, 254-228.

Adner, R., & Snow, D. (2010). Old technology responses to new technology threats: demand heterogeneity and technology retreats. *Industrial and Corporate Change*, *19*(5), 1655-1675.

Albert, S., & Whetten, D. A. (1985). Organizational identity. *Research in organizational behavior*.

Ansari, S. S., & Krop, P. (2012). Incumbent performance in the face of a radical innovation: Towards a framework for incumbent challenger dynamics. *Research Policy*, *41*(8), 1357-1374.

Arrow, K. (1962). Economic welfare and the allocation of resources for invention. In *The Rate and Direction of Inventive Activity*, Nelson, R. (ed). Princeton University Press: Princeton, NJ; 609–625.

Barr, P. S., Stimpert, J. L., & Huff, A. S. (1992). Cognitive change, strategic action, and organizational renewal. *Strategic management journal*, *13*(S1), 15-36.

Bluedorn, A. C., Johnson, R. A., Cartwright, D. K., & Barringer, B. R. (1994). The interface and convergence of the strategic management and organizational environment domains. *Journal of Management*, *20*(2), 201-262.

Burawoy M (ed). 1991. *Ethnography Unbound: Power and Resistance in the Modern Metropolis*, University of California Press: Berkeley, CA

Burgelman, R. A. (1991). Intraorganizational ecology of strategy making and organizational adaptation: Theory and field research. *Organization science*, *2*(3), 239-262.

Burgelman, R. A. (1994). Fading memories: A process theory of strategic business exit in dynamic environments. *Administrative Science Quarterly*, 24-56.

Buser, H. R., Zanier, C. and Tanner, H. (1982) Identification of 2,4,6-Trichloroanisole as a Potent Compound Causing Cork Taint in Wine. J. Agric. Food Chem. 30, 359−362.

Cameron, Kim S., Myung U. Kim, and David A. Whetten. 1987. Organizational effects of decline and turbulence. *Administrative Science Quarterly*: 222-240.

Cannavan, Tom, Cork fights back, September 2008. Accessed online from http://www.aboutmyarea.co.uk/Essex/Maldon/CM9/Food-and-Drink/Wine/107118-Cork-Fights-Back

Catino, M., & Patriotta, G. (2013). Learning from errors: Cognition, emotions and safety culture in the Italian Air Force. *Organization studies*, *34*(4), 437-467.

Christensen, C. M., & Bower, J. L. (1996). Customer power, strategic investment, and the failure of leading firms. *Strategic management journal*, *17*(3), 197-218.

Christensen, C. M., & Rosenbloom, R. S. (1995). Explaining the attacker's advantage: Technological paradigms, organizational dynamics, and the value network. *Research Policy*, *24*(2), 233-257.

Cohen, M. D., & Bacdayan, P. (1994). Organizational routines are stored as procedural memory: Evidence from a laboratory study. *Organization science*, *5*(4), 554-568.

Courpasson, D., Dany, F., Clegg, S., (2012). Resisters at Work: Generating Productive Resistance in the Workplace, *Organization Science*, 23(3): 801–819.

Danneels, E. (2011). Trying to become a different type of company: Dynamic capability at Smith Corona. *Strategic Management Journal*, *32*(1), 1-31.

Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of management review*, *32*(4), 1246-1264.

Eggers, J. P., & Kaplan, S. (2013). Cognition and capabilities: A multi-level perspective. *The Academy of Management Annals*, *7*(1), 295-340.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: opportunities and challenges. *Academy of management journal*, *50*(1), 25-32.

Flick, U. (2004). Triangulation in qualitative research. In U. Flick, E. Kardorff and I. Steinke, *A Companion to Qualitative Research*. London: SAGE.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*(2), 219-245.

Forbes (2015). #369 Americo Amorim. Available from: http://www.forbes.com/profile/americo-amorim/ [Accessed Jul/20/2015].

Ford, J. D., & Baucus, D. A. (1987). Organizational adaptation to performance downturns: An interpretation-based perspective. *Academy of Management Review*, *12*(2), 366-380.

Foster, R. (1986). *Innovation: The Attacker's Advantage*. Summit Books, New York (1986).

Gavetti, G. (2005). Cognition and hierarchy: Rethinking the microfoundations of capabilities' development. *Organization Science*, *16*(6), 599-617.

Gibbert, M, Ruigrok, W., and Wicki, B. (2008). What passes as a rigorous case study? *Strategic Management Journal* **29**.13: 1465-1474.

Gilbert, C. G. (2005). Unbundling the structure of inertia: Resource versus routine rigidity. *Academy of Management Journal*, *48*(5), 741-763.

Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American sociological review*, 149-164.

Hatton B. (July 31, 2011) Cork fights back in the War of the Stoppers- available in http://www.forbes.com/feeds/ap/2011/07/31/general-eu-portugal-cork-apos-s-comeback_8593469.html

Hedberg, B., & Jöhsson, S. (1977). Strategy formulation as a discontinuous process. *International Studies of Management & Organization*, 88-109.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: capability lifecycles. *Strategic management journal*, *24*(10), 997-1010.

Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (N) ever-changing world. *Strategic Management Journal*, *32*(11), 1243-1250.

Henderson, R. M., & Clark, K. B. (1990). Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative science quarterly*, 9-30.

Hill, C. W., & Rothaermel, F. T. (2003). The performance of incumbent firms in the face of radical technological innovation. *Academy of Management Review*, *28*(2), 257-274.

Hirschman, E. C. (1986). Humanistic inquiry in marketing research: philosophy, method, and criteria. *Journal of marketing Research*, 237-249.

Kammerlander, N. (2013). *Organizational adaptation to discontinuous technological change: the effects of family influence and organizational identity*. Springer Science & Business Media.

Kiesler, S., & Sproull, L. (1982). Managerial Response to Changing Environments: Perspectives on Problem Sensing from Social Cognition. *Administrative Science Quarterly*, *27*(4), 548-70.

Kirchhoff, B. A. (1991). Entrepreneurship's contribution to economics. *Entrepreneurship theory and practice*, *16*(2), 93-112.

Kogut, B., & Zander, U. (1996). What firms do? Coordination, identity, and learning. *Organization science*, *7*(5), 502-518.

Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, 24(4), 691-710.

Lavie, D. (2006). The competitive advantage of interconnected firms: An extension of the resource-based view. *Academy of management review*, *31*(3), 638-658.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic management journal*, 13(2), 111-125.

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual review of sociology*, 319-340.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). Sage.

Mann, M. (1995) Sources of Variation in Working-Class Movements in Twentieth-Century Europe, *New Left Review*, 212: 14-54.

Markides, C., & Oyon, D. (2010). What to do against disruptive business models (when and how to play two games at once). *MIT Sloan Management Review*, *51*(4), 25.

McKinley, W., Latham, S., & Braun, M. (2014). Organizational decline and innovation: Turnarounds and downward spirals. *Academy of Management Review*, *39*(1), 88-110.

Methé, D., Swaminathan, A., Mitchell, W., Toyama, R., 1997. The underemphasized role of diversifying entrants and industry incumbents as the sources of major innovations, In *Strategic Discovery: Competing in New Arenas*, Thomas H, O'Neal D (eds). Wiley: New York; 99–116.

Miles, R.H. (1982) *Coffin Nails and Corporate Strategies*. Englewood Cliffs, N.J.: Prentice-Hall.

Miner, A. S., Gong, Y., Baker, T., & O'Toole, J. (2011). How does TMT prior experience shape strategy? A routine-based framework based on evidence from founding teams. *The handbook of research on top management teams.* Edward Elgar, Cheltenham, 189-213.

Miller, D., & Friesen, P. H. (1980). Momentum and revolution in organizational adaptation. *Academy of management journal*, *23*(4), 591-614.

Mortensen, W. and Marks, B. (2003). An innovation in the wine closure industry: Screwcaps threaten the dominance of cork. *Victoria University School of Management Working Paper Series*. Victoria University, Wellington, New Zealand.

Nag, R., Corley, K. G., & Gioia, D. A. (2007). The intersection of organizational identity, knowledge, and practice: Attempting strategic change via knowledge grafting. *Academy of Management Journal*, *50*(4), 821-847.

Nelson, R. & Winter, S. (1982). *An evolutionary theory of economic change*. Harvard University Press, Cambridge, MA.

Ocasio, W. (1997). Towards an attention-based view of the firm. *Strategic management journal*, *18*(6), 187-206.

Osiyevskyy, O., & Dewald, J. (2015). Explorative Versus Exploitative Business Model Change: The Cognitive Antecedents of Firm-Level Responses to Disruptive Innovation. *Strategic Entrepreneurship Journal*, *9*(1), 58-78.

Orton, J.D. (1997). From inductive to iterative grounded theory: zipping the gap between process theory and process data. *Scandinavian Journal of Management,* 13(4), 419–438.

Patterson T. (2010) *Wine Enthusiast Magazine*, March 2010.

Powell, T. C. (2014) Strategic management and the personal, *Strategic Organization,* 12(3): 200-207.

Rialp-Criado, A., Galván-Sánchez, I., & Suárez-Ortega, S. M. (2010). A configuration-holistic approach to born-global firms' strategy formation process. *European Management Journal*, *28*(2), 108-123.

Reinganum, J. F. (1983). Uncertain innovation and the persistence of monopoly. *The American Economic Review*, 741-748.

Rosenbloom, R. S. (2000). Leadership, capabilities, and technological change: The transformation of NCR in the electronic era. *Strategic Management Journal*, *21*(10-11), 1083-1103.

Rosenbloom, R. S., & Christensen, C. M. (1994). Technological discontinuties, organizational capabilities, and strategic commitments. *Industrial and corporate change*, *3*(3), 655-685.

Runfola, A., Perna, A., Baraldi, E., & Gregori, G. L. (2016). The use of qualitative case studies in top business and management journals: A quantitative analysis of recent patterns. *European Management Journal*.

Salvato, C. (2009). Capabilities unveiled: The role of ordinary activities in the evolution of product development processes. *Organization Science*, *20*(2), 384-409.

Sarkar, S. (2016). Uncorking knowledge-purposeful spillovers as a strategic tool for capability enhancement in the cork industry. International Entrepreneurship and Management Journal, 1-25.

Schumpeter, J. A. (1941), *Capitalism, Socialism and Democracy,* London, Taylor and Francis.

Siggelkow, N. (2007). Persuasion with case studies. *Academy of Management Journal*, *50*(1), 20-24.

Silverman, D. (2011). *Interpreting Qualitative Data: A Guide to the Principles of Qualitative Research* (4th Ed), London, SAGE

Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat Rigidity Effects in Organizational Behavior: A Multilevel Analysis. *Administrative Science Quarterly*, *26*(4), 501-524.

Sull DN. 1999. The dynamics of standing still: Firestone Tire and Rubber and the radial revolution. *Business History Review* 73.3: 430–464.

Taber, G. M. (2007). *To cork or not to cork: Tradition, romance, science, and the battle for the wine bottle*. Simon and Schuster.

Teece, D. J. (2006). Reflections on "profiting from innovation". *Research Policy*, *35*(8), 1131-1146.

Thomas, J. B., Clark, S. M., & Gioia, D. A. (1993). Strategic sensemaking and organizational performance: Linkages among scanning, interpretation, action, and outcomes. *Academy of Management journal*, *36*(2), 239-270.

Trahms, C. A., Ndofor, H. A., & Sirmon, D. G. (2013). Organizational decline and turnaround a review and agenda for future research. *Journal of Management*, *39*(5), 1277-1307.

Tripsas, M. (2009). Technology, identity, and inertia through the lens of "The Digital Photography Company". *Organization Science*, *20*(2), 441-460.

Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic management journal*, *21*(10-11), 1147-1161.

Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly*, *31*(3), 439-465.

Utterback, J. M. (1994). Radical innovation and corporate regeneration. *Research-Technology Management*, *37*(4), 10.

Van de Ven, A. H., & Poole, M. S. (1990). Methods for studying innovation development in the Minnesota Innovation Research Program. *Organization science*, *1*(3), 313-335.

Vlaar, P., De Vries, P., & Willenborg, M. (2005). Why Incumbents Struggle to Extract Value from New Strategic Options:: Case of the European Airline Industry. *European Management Journal*, *23*(2), 154-169.

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative science quarterly*, 628-652.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2005). Organizing and the process of sensemaking. *Organization science*, *16*(4), 409-421.

Winter, S. G. (1990), 'Survival, selection, and inheritance in evolutionary theories of organisation,' in J. V. Singh (ed.), *Organisational Evolution—New Directions*, pp. 269–297. Sage: Newbury Park, CA.

Wiseman, R. M., & Gomez-Mejia, L. R. (1998). A behavioral agency model of managerial risk taking. *Academy of management Review*, *23*(1), 133-153.

Wu, B., Wan, Z., & Levinthal, D. A. (2014). Complementary assets as pipes and prisms: Innovation incentives and trajectory choices. *Strategic Management Journal*, *35*(9), 1257-1278.

Zammuto, R. F., & Cameron, K. S. (1985). Environmental Decline and Organizational Response. *Research in Organizational Behavior*, *7*, 223-262.

APPENDIX

Technical details: Process innovations to counter the TCA menace

The very survival of not just the stopper business unit but of the financial health and continued existence of the whole cork firm rode on the success of eliminating the TCA menace. COR's contamination reduction strategy was built on what R&D head Miguel Cabral termed as the '3 pillars': *prevention*, *cure* and *control*. While the factory managers were responsible for the implementation of these measures, Cabral had a direct responsibility in making sure that norms were followed, besides being responsible for implementing new methods to detect TCA. During the factory visit, Cabral reviewed each of the stages in the decontamination process with us. We summarize below our findings on the process innovations undertaken by COR to decontaminate cork.

Preventive measures

While in the past, the pallets with the bales of bark arriving at the factories were left on the ground, rendering them vulnerable to fungus attacks, now they are placed on an inclined concrete floor that allows for rainwater drainage. The six-month seasoning of the cork bark that follows is now undertaken at COR's factories, not at the suppliers' warehouse, as was previously the case. Any cork coming into contact with the ground during the seasoning period is used for non-stopper products. All the cork bark earmarked for wine stoppers is placed and stored in stainless steel pallets in the factories. The airing that occurs during the seasoning process also helps reduce TCA formation. Before the boiling stage, the barks undergo a cutting process, with Cabral emphasizing that, currently, these cuts were being made about 10 cm above the floor height, which is understood to have the minimum risk of contaminating different samples in an experiment.

The boiling process has undergone many significant changes. It previously involved boiling five pallets of bark simultaneously, using the same water until it was completely evaporated. Since the pallets were compressed each on top of the other, when decompressed, they had a high water content, with approximately 40% humidity. In a marked departure from this practice, a new

system involves boiling two pallets at a time, which does not compress them. The water is removed after boiling forty tons of cork bales and during the boiling process the water passes through a system where any volatile elements present are extracted. This important innovation involving continuous volatile extraction (or CONVEX, as the new system is known) leads to a lower humidity content of the cork due to non-compression of the two pallets.

Curative extraction process

The vaporization and steaming processes implemented at COR has, over the last decade, perhaps contributed most toward reducing TCA contamination. The curative extraction process essentially involves two stages— vaporization of the contaminants in raw cork and steaming of cork stoppers. COR now employs a second generation cleaning process (called INOS II), a system patented in 2001 and used for Amorim's technical corks. INOS II utilizes a hydrodynamic extraction process to wash deep within the cork structure to flush out contaminants. After the final wash, the disks are dried in ovens and with sterilized air to a level of 6-8% relative humidity to retain flexibility.

The main objective of the *vaporization* process is the decontamination of raw materials, more specifically of the TCA present in the cork. After boiling, not only do TCA and other volatile compounds get extracted from the bales of cork, but also homogenization of moisture makes the cork barks easier to work with when punched to create cork stoppers.

Patented in 2004, *Rate of Optimal Steam Application* (ROSA) is applied to the cork granules used to produce Amorim´s technical stoppers and the new generation (Advantec® and Neutrocork) cork stoppers. The process is based on steam distillation to force out volatile trace compounds within the cork cells, with the decontamination treatment lasting approximately thirty minutes, which has been found to reduce incidence of TCA by 80%. While ROSA is effective for agglomerated stoppers, the high temperatures of this process would render it futile for natural cork stoppers due to resulting deformation. The solution for natural cork stoppers came in the form of ROSA Evolution, a process patented in 2007, whereby the natural corks were subjected to a constantly renewed system of high humidity and temperature but well below the temperature of the ROSA. The treatment time, however, was eight times greater compared to

ROSA, requiring a total of 4 hours.

Control measures

Most wine drinkers can detect TCA at a concentration level of above 5 ng/liter (five parts per trillion), with TCA easier to spot in tainted whites than heavy reds. COR has adopted a chemical analysis technology developed at ETS laboratories in California, which involves gas chromatography with mass detection or capture electron (GC-MS and GC-ECD), similar to that used for forensic evidence in the television series CSI. While the analyses are done mostly for the wine stoppers, periodically samples of cork from the cork pallets are also subjected to chromatography analysis.

The control measures continue after the curative process, where besides gas chromatography, a sensorial analysis is undertaken, whereby samples of premium natural cork stoppers are analyzed based on the ISO 22308-2005 methodology. The sensorial process involves soaking 5 cork stoppers from a lot in 100 ml distilled water during 24h at 30ºC with 20 soaks per lot. The rejection criterion is 10% of faulty samples detected by 50% of the testers. An important ongoing project (2013-2015), now in its trial phase, is a new way to analyze TCA. A British firm, under contract with COR (the name of the firm was not disclosed to the researchers for proprietary reasons), is developing this GC-TCA detector, capable of analyzing individual corks for TCA. The machine individually tests TCA presence in corks. Currently the gas chromatograph technology requires over twenty-four hour incubation periods. The new GC-ECD machines require the corks to be in a chamber for a much shorter incubation period; after this short period the air inside the chamber is injected directly into the chromatograph.

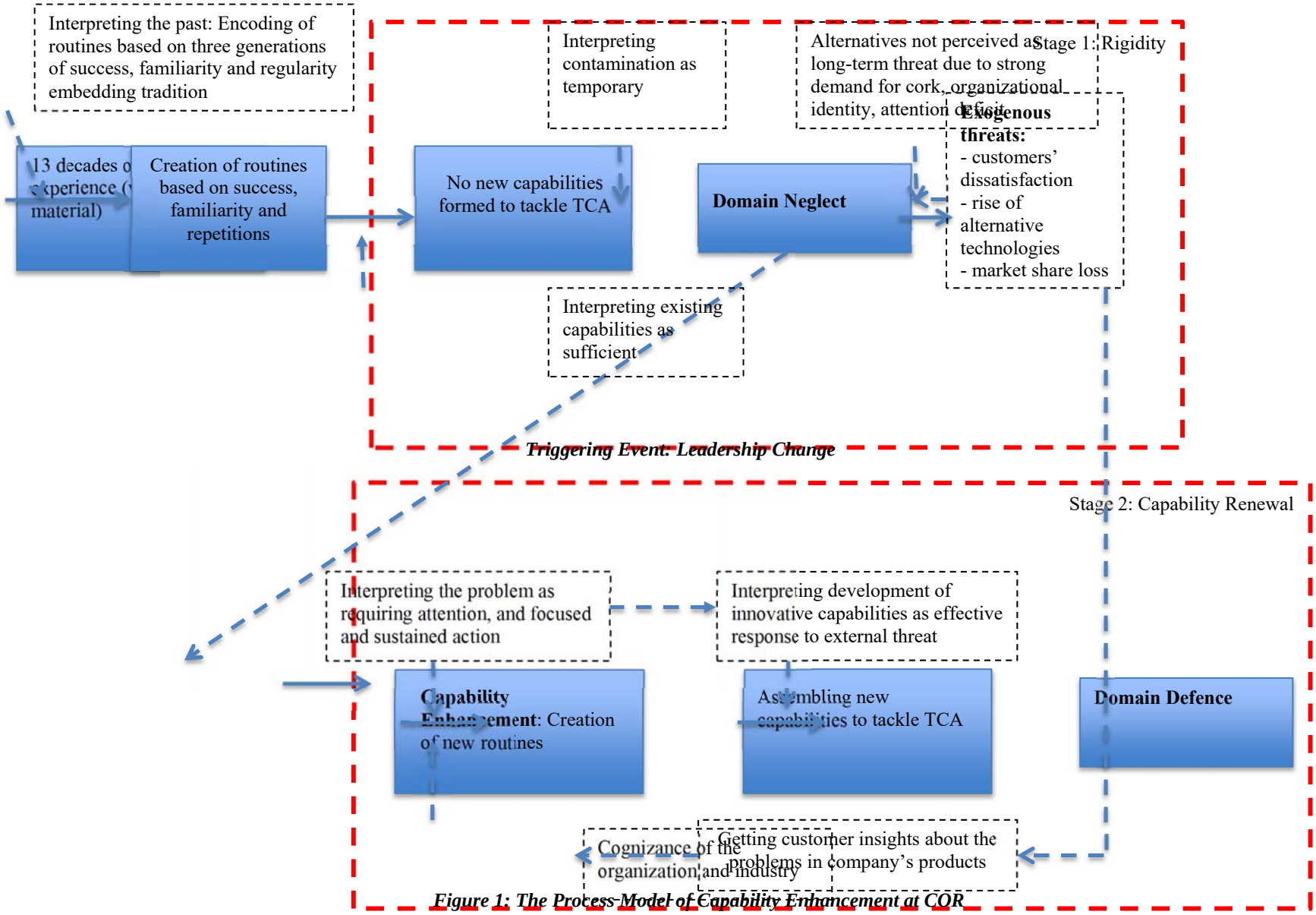

Figure 1: The Process Model of Capability Enhancement at COR