Counteracting the success trap in publicly owned corporations

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Abstract

Top management teams frequently overemphasize efforts to exploit the current product portfolio, even in the face of the strong need to step up exploration activities. This mismanagement of the balance between explorative R&D activities and exploitation of the current product portfolio can result in the so-called 'success trap', the situation where explorative activities are fully suppressed. The success trap constitutes a serious threat to the long-term viability of a firm. Recent studies of publicly owned corporations suggest the suppression of exploration arises from the interplay between the executive team's myopic forces, the board of directors as gatekeeper of the capital market, and the exploitation-exploration investments and their outcomes. In this paper, system dynamics modeling serves to identify and test ways in which top management teams can counteract this suppression process. For instance, we find that when the executive board is getting stuck in the success trap, the board of directors can intervene by constraining exploration (in case of a rather stable environment) or by encouraging exploration (in case of a turbulent environment).

Keywords: exploitation-exploration, management-board interaction, success trap, suppression process, system dynamics, intervention.

1. Introduction

Exploitation and exploration activities are critical to organizational learning (Levinthal and March, 1993). Exploitation refers to learning processes that incrementally improve the firm's current knowledge base, often translating into product enhancements. In that sense, exploitation is about choice, execution, and variance reduction (Lavie et al., 2010). On the other hand, exploration is directed toward the generation of knowledge that is different from the current knowledge base (Greve, 2007; Lavie et al., 2010). Typically achieved through R&D investments (Harmancioglu et al., 2007), exploration enhances search, experimentation,

and variation – and is about developing radically new products (Roome, 2007; Tushman et al., 2010).

Firms directed toward the simultaneous pursuit of exploitative improvements and explorative R&D are able to adjust faster to environmental fluctuations and, therefore, tend to survive longer in the market place (McCarthy and Gordon, 2011; Helfat et al., 2007; De Visser et al., 2010). For instance, after IBM's struggle for survival during the beginning of the 1990s, IBM's management successfully launched its 'Emerging Business Areas' program around 2000 that led to the company's remarkable comeback (O'Reilly et al., 2009). Nevertheless, the top management teams of Rubbermaid, Caterpillar, Polaroid and many other firms at some point failed to direct their firms toward an exploitation-exploration portfolio sufficiently aligned with the environmental conditions and, therefore, underperformed on the long run (Helfat et al., 2007; Tripsas and Gavetti, 2000; Walrave et al., 2011).

A key reason underlying these failures is that a focus on exploitation tends to reinforce itself (Gupta et al., 2006; March, 1991; Walrave et al., 2011). As the organization develops greater skill in, and success with, exploitation, it tends to engage in that activity more and more, thereby further suppressing exploration (Shibata, 2012). This vicious loop is commonly referred to as the *success trap* (Levinthal and March, 1993; March, 1991; Lavie et al., 2010). The success trap substantially limits the firm's ability to develop a balanced portfolio of exploitation and exploration activities and, as such, undermines its potential to survive in the marketplace (Walrave et al., 2011).

Interestingly, the literature does not provide any evidence-based clues regarding how to counteract the success trap (cf. Vermeulen, 2010): some authors have argued that explorative investments (starting as early as possible) will counteract the suppression of exploration (e.g., Helfat et al., 2007; Tushman et al., 2004) and others have pointed out that drastic turnarounds, such as an exit from the stock market, are required to escape the success trap and avoid bankruptcy (e.g., Walrave et al., 2011; Wiersema, 2002). As such, in this paper we intend to create a deeper understanding of the mechanisms that serve to restore the alignment between exploitation-exploration activities and the firm's environment before the need for a major turnaround effort arises. The main contribution to the literature as well as managerial practice is the codification of courses of action, at the executive as well as supervisory board levels, that serve to counteract the suppression of exploration in publicly owned firms.

By means of causal loop diagram analysis and system dynamics modeling, we find that the success trap can be effectively counteracted, but only when top management adopts rather specific intervention strategies. For instance, our study suggests top managers need to avoid launching explorative R&D initiatives too early, which extends earlier work advocating to start with exploration as early as possible (Helfat et al., 2007; Tushman et al., 2004). Furthermore, a thoughtful collaboration between the executive and supervisory boards yields the best chances to successfully counteract the suppression of exploration – rather than sharply separating the executive and supervisory powers in public corporations suggested by others (Bednar et al., 2012; Lhuillery, 2011).

The next section presents the theoretical background. We then develop several propositions on how management teams and boards can counteract the suppression of exploration. Subsequently, we test these propositions through system dynamics simulation experiments. Finally, we conclude by discussing the implications of this work.

2. Theoretical background

Exploitation and exploration are defined as all activities that result in organizational learning (Levinthal and March, 1993). Exploitation typically involves a smaller amount of learning compared to exploration (Greve, 2007; Gupta et al., 2006; March, 1991).

Accordingly, the distinction between the two concepts can be considered more a matter of degree than of kind (cf. Greve, 2007; Lavie et al., 2010). Exploitation and exploration are, therefore, often considered as two ends of one continuum; and an increase in exploitation activities decreases the amount of resources available for exploration efforts, and vice versa (Gupta et al., 2006; Lavie et al., 2010; Uotila et al., 2009).

Firm performance is largely determined by the organizational ability to *explore* as well as *exploit* changes in the business environment (Helfat et al., 2007; Teece et al., 1997, De Visser et al., 2010). As such, for sustained organizational performance, executives need to create a particular operational exploitation-exploration distribution that aligns the available resources with (changes in) the market and competitive environment (Gibson and Birkinshaw, 2004; Harmancioglu et al., 2007; Walrave et al., 2011). Yet, executives often fail to sense environmental changes *or* fail to translate this information into a particular exploitation-exploration strategy (Smith and Tushman, 2005; Walrave et al., 2011).

Two traps are at the heart of such failure (Levinthal and March, 1993; Lavie et al., 2010; March, 1991). The first trap constitutes the situation where exploration drives out exploitation in a self-reinforcing fashion (Levinthal and March, 1993). More specifically, the (unavoidable) dead ends arising from explorative R&D can cause management to step up explorative search activities; and new ideas and technologies are substituted by other newly developed ideas and technologies. This situation, where exploitative investments are (fully) suppressed by explorative initiatives, is known as the 'failure trap' (March, 1991; Levinthal and March, 1993; Lavie et al., 2010).

The second trap is commonly referred to as the 'success trap' (Levinthal and March, 1993; Lavie et al., 2010; Gupta et al., 2006) and is characterized by exploitative activities driving out explorative activities – also in a self-reinforcing manner. Compared to the failure trap, the success trap is far more commonplace (Walrave et al., 2011) – which constitutes the raison d'être for our focus on the success trap in this paper. The success trap is likely to occur when past exploitation initiatives in a given area make future exploitation investments in that same domain (increasingly) more efficient (Gupta et al., 2006; Levinthal and March, 1993; March, 1991). As such, the short-term virtue of exploitative refinement causes the executive team to deny or underestimate environmental changes, as a result of managerial myopia, which motivates (further) suppression of explorative R&D investments (Bednar et al., 2012; Greve, 2007).

Yet, it is unlikely that the executive team is completely unaware of changes in the environmental context, no matter how swift or implicit these changes are (Tushman et al., 2004). Therefore, managerial myopia may delay exploration investments, but does *not* fully suppress explorative R&D activities per se. As such, managerial myopia appears to have limited explanatory power for the (often) observed consequences of the suppression of exploration. Walrave et al. (2011) therefore developed a more comprehensive process theory underlying the success trap. This so-called 'suppression process' describes the *interplay* between the executive team's myopic forces, the board of directors as gatekeeper of the capital market, and the (outcomes of) exploitation-exploration investments as the main cause of the suppression of exploration. Figure 1 depicts the causal loop diagram outlining how and why suppression process may occur.

More specifically, the *stick to exploitation* loop (Figure 1) captures the effect of managerial myopia (Hannan and Freeman, 1984; Tripsas and Gavetti, 2000). Investments in exploitation within a very stable environment tend to generate a positive operating result, and hence, increasingly limit the decision to shift the exploitation-exploration balance (Bednar et al., 2012; Tushman et al., 2010). This loop therefore, if left on its own, is self-reinforcing in nature (Shibata, 2012). However, changes in the environment may result in an increasing misalignment between the environmental context and the current exploitation-exploration

balance, which in turn—albeit delayed—may result in the executive team's decision to shift the exploitation-exploration balance (toward exploration), and so forth (Roome, 2007). As such, major environmental turbulence thus tends to counteract the self-reinforcing nature of the 'stick to exploitation' loop (Bednar et al., 2012).

This suppression theory assumes a specific role of the board of directors. That is, we assume boards become especially involved in strategy formulation when organizational performance is weak (Bednar et al., 2012; McNulty and Pettigrew, 1999; Wiersema, 2002) and they are exposed and susceptible to pressure from outside stakeholders (e.g., institutional investors) that demand more exploitative investments during dire times (Mayer, 2013; Tushman et al., 2004; Wiersema, 2002). These processes constitute the basis for the balancing *external pressure* loop (Figure 1). This feedback loop determines to what extent the executive team's decision to shift the exploitation-exploration balance toward exploration results in actual explorative R&D investments, given the perceived trend in the current operating results. More specifically, a positive trend in financial performance creates discretional space for the executive team to exploit *and* explore (i.e., the board is not expected to intervene) (Wiersema, 2002). A negative trend, however, gradually increases the board's pressure on the executive team to focus on exploitation in an attempt to restore shareholder value (Bednar et al., 2012).

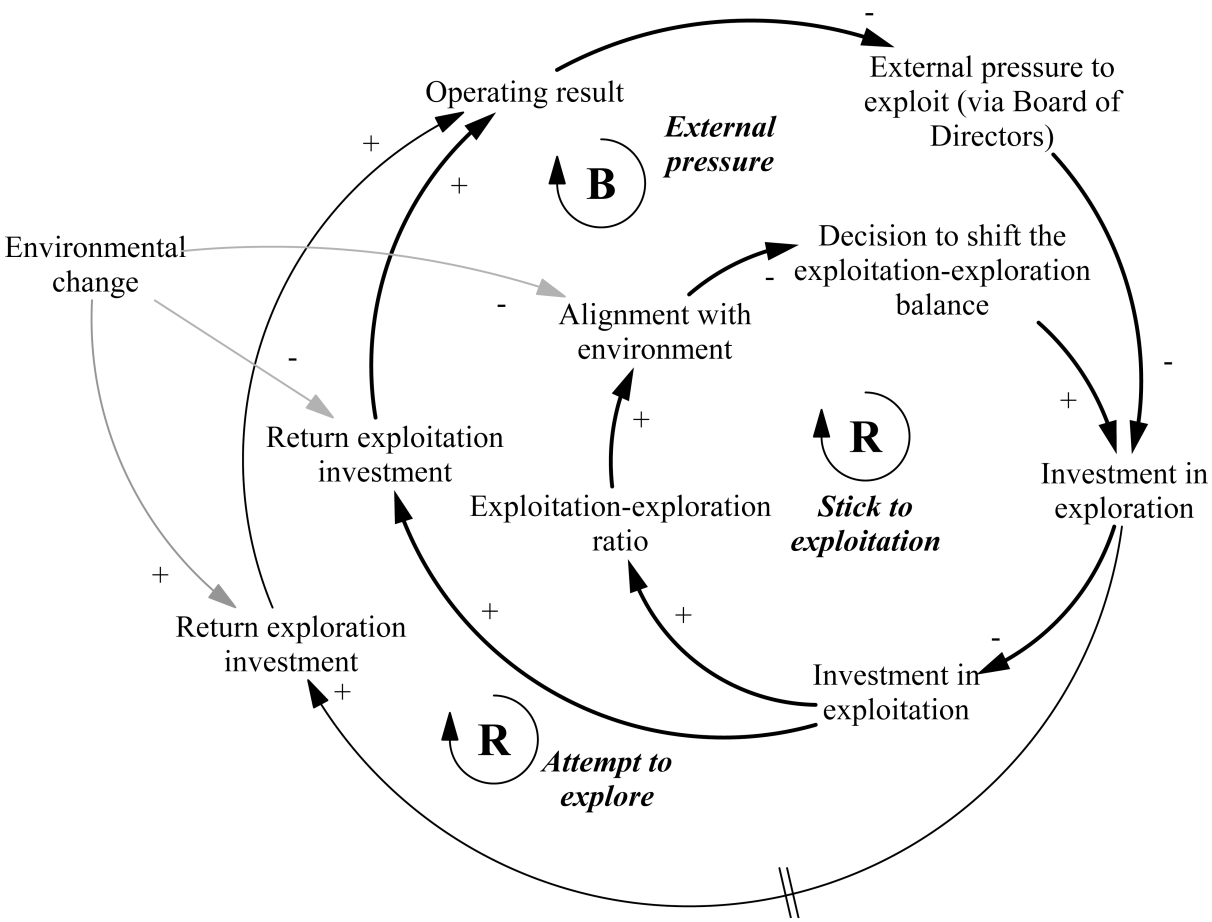


Figure 1: Causal Loop Diagram of managerial decision making with regard to investments in exploitation and exploration (based on Walrave et al., 2011).

Finally, the self-reinforcing *attempt to explore* feedback loop (Figure 1) captures the implications of actual resource investments in exploration. After a certain delay, explorative

R&D attempts, aligned with the environmental context, start paying off and thus increase the operating result (Harmancioglu et al., 2007). If the operating result improves, the pressure to exploit decreases, which allows for further investments in exploration. In essence, an actively working 'attempt to explore' loop is a vital signal that the firm, within the framework in Figure 1, is making an effort to counteract the suppression process.

The suppression process ultimately resulting in the success trap evolves over three major time periods (cf. Walrave et al., 2011). In the first *period of stability* (period A), the firm's initial focus on exploitative product improvements is well-aligned with the environment and results in good financial performance. This causes management to stick to its successful exploitation strategy and, as such, provides the foundation for the suppression of exploration (Tushman and O'Reilly, 1996). Subsequently, as a result of *upcoming change* (period B) the focus on exploitation grows increasingly suboptimal. Managerial awareness of the environmental change and increasing misalignment grows only slowly, due to myopic forces (Hannan and Freeman, 1984; Tripsas and Gavetti, 2000). In the subsequent period of *major change* (period C), financial performance declines, triggering the board to exert more pressure to exploit. Despite the fact that the executive team becomes increasingly aware of the need for more explorative R&D, the board's pressure to exploit is so substantial that explorative investments are (almost) completely abandoned. As such, the executive team is forced to respond to environmental changes with even more exploitative investments. The firm is now completely caught in the suppression of exploration, involving a structural decline in firm performance over time.

Despite the dramatic consequences of the suppression process (e.g., bankruptcy), not much is known about how it can be counteracted. Some have argued that a sufficient level of early explorative investments (i.e., before the environmental context changes) could prevent the process from unfolding (e.g., Helfat et al., 2007); yet, what exactly constitutes 'sufficient' remains unclear. Looking at numerous cases, Tushman et al. (2004) observe that successful managers *foresee* the need for major strategic change by recognizing external threats and opportunities. But there is a lack of knowledge on when or how to actually change the exploitation-exploration distribution. As such, in the remainder of this paper we identify and investigate how management teams and boards of directors should act in order to counteract the suppression process.

3. Propositions

As illustrated, a causal loop diagram (CLD) is a powerful tool for representing the feedback structure and dynamics within systems (Sterman, 2000). As such, the use of CLDs has a long tradition (e.g., Van Oorschot et al., 2013; Perlow et al., 2002; Romme et al., 2010). Here, we use the CLD described in the previous section to develop propositions on how top management teams can counteract the suppression process.

We will particularly investigate the 'stick to exploitation' and 'external pressure' loops in Figure 1. The former feedback loop involves the executive team perceiving environmental changes, resulting in the decision to initiate more explorative R&D, but only after a considerable delay (due to managerial myopia). Reduction of this delay implies a faster realization by the executive team that more explorative investments are required and, as such, may prevent firms from getting caught in the suppression of exploration (Levinthal and March, 1993; March, 1994; Tushman et al., 2004). In this respect, the executive board's decision to adjust the exploitation-exploration balance toward more explorative R&D investments constitutes the first general course of action toward counteracting the suppression process.

The 'external pressure' loop controls how the board transmits the pressure of the capital market into pressing the executive team toward enhancing its focus on exploitation. In this

respect, whereas the executive team is the primary orchestrator of adjustments to the exploitation-exploration balance, the board of directors plays a critical role in the actual execution of such proposed changes by reinforcing or tempering the 'stick to exploitation' loop via the 'external pressure' loop (McNulty and Pettigrew, 1999; Walrave et al., 2011). As such, the board can play a significant role in enhancing or undermining the effectiveness of the first course of action, by varying the external pressure to exploit. This varying of the external pressure to exploit – in combination with the first approach – constitutes the second general course of action toward counteracting the suppression process.

These two general principles can be 'executed' at different periods in time. As such, we analyze the effectiveness of executing the two courses of action during a period of stability, a period of upcoming change, and a period of change (after which, we assume, a period of stability sets in again). Following, in the remainder of this section we explore six propositions regarding (1) the effectiveness of attempts by the executive board to increase explorative R&D investments and (2) the role of the board of directors in making such attempts succeed.

3.1. Changing the exploitation-exploration balance during a period of stability (period A)

When the environmental context is stable, the CLD in Figure 1 implies the decision to shift the exploitation-exploration toward more exploration results in the following dynamics. First of all, firm performance continues to be rather good because the exploitation-exploration balance is still well-aligned with the environmental situation. This provides the executive team with the means to actually shift the exploitation-exploration balance toward more explorative R&D. That is, there is no external pressure from the board to invest (mainly) in exploitative ends, causing the 'attempt to explore' loop to prevail over the 'external pressure' loop at this moment in time. However, early explorative R&D investments in a relatively stable environment tend to raise significant opportunity costs (Jansen et al., 2006); that is, costs associated with investing in exploration at the expense of exploitative investments. This is likely to decrease the financial performance of the firm. As such, as firm performance decreases, the 'external pressure' loop becomes increasingly dominant. In this respect, if the opportunity costs are high enough, the 'too early' shift in the exploitation-exploration balance can cause the firm to get trapped in the suppression process.

Consider Philips. In 1988, about 750 million Philips television sets were globally in use and the quest for the high-definition (HD) standard was ongoing within Philips. In this respect, Philips made hefty investments into the HD television project and expected to sell its first sets early 1994 (Adner, 2012). Although Philips, from a technical point of view, was perfectly capable of developing HD television sets, its environmental context was not ready for this new technology because HD television cameras and transmission standards were not yet available. This resulted in significant opportunity costs, and in 1992 Philips was forced to sell assets in order to cut its debt and reduce its annual interest costs. This left Philips with a $2.5 billion write-down that seriously undermined the financial stability of the company (Adner, 2012). It was not until 2006 that flat-panel HDTVs became the mainstream standard (McBride et al., 2005). The introduction of the first MP3-players (there was no legal content at that moment in time), light and alcohol-free beer (initial cultural disagreement), the Newton (Apple's version of a PDA) all suffered from similar strategic failures: these new products were simply ahead of its time (Adner, 2012).

In this situation, where the executive team responds 'too early', the main goal of the board of directors is to limit opportunity costs by minimizing the influence of the 'attempt to explore' loop. This is achieved by increasing the pressure to exploit while firm performance is still adequate – which thus constitutes rather counterintuitive behavior by the board. This board intervention would limit the executive team's resources for shifting the exploitation-

exploration balance toward more explorative R&D. Consider the Philips case: the executive team invested too much and too early in HD technology (Adner, 2012). In this particular situation, Philips' board of directors could have pressed the executive team to follow a more moderate, slower path in adjusting the exploitation-exploration portfolio toward more exploration – for example, by putting a cap on the amount of explorative R&D investments per year. This would have constrained the 'attempt to explore' loop by enhancing the 'external pressure' loop, and would have likely reduced the opportunity costs – and subsequent problems – significantly. We therefore propose that in the context of the suppression process:

Proposition 1. In a relatively stable business environment:

(1a) The executive team's decision to shift the exploitation-exploration balance toward more exploration is likely to initiate the suppression process toward the success trap (i.e., 'too early' investment in exploration).

(1b) The board of directors can potentially reverse the negative outcome predicted by proposition 1a by convincing or pressing the executive team to invest more in exploitation.

3.2. Changing the exploitation-exploration balance during a period of upcoming change (period B)

The executive team's decision to increasing their firm's explorative R&D investments during a period of upcoming environmental change results in completely different dynamics. Initially, the exploitation-exploration balance is well aligned with the stable environmental context and results in good financial results: the 'stick to exploitation' loop is dominant. Nevertheless, as environmental change unfolds the growth in performance stagnates. An increase in the explorative R&D initiatives that takes place before the 'external pressure' loop becomes dominant, causes the 'attempt to explore' to grow increasingly strong. Explorative investments in this period are more likely to result, after a certain delay, in actual firm performance improvement (compared to similar investments in period A) due to the alignment between environmental context and these investments (Jansen et al., 2006; Walrave et al., 2011). As such, these more 'timely' adjustments to the exploitation-exploration balance can keep the external pressure from growing dominant, which enhances the likelihood that management successfully prevents the suppression process from unfolding.

In 1999 Lou Gerstner, IBM's CEO, noticed that IBM failed to create sufficient value from 29 separate technologies and businesses that the company had developed (O'Reilly et al., 2009). A detailed internal analysis of the situation resulted in a rapidly growing awareness of the misalignment between the exploitation-exploration portfolio and environmental context and, subsequently, in an increase in the managerial awareness to explore (cf. O'Reilly et al., 2009). IBM's executive team discovered that the existing management systems primarily rewarded execution targeting short-term results (i.e., stick to exploitation) and did not value and reward efforts to explore and build strategic awareness of environmental changes (i.e., attempt to explore). At that moment in time, IBM was driven by processes that emphasized the firm's ability to exploit the current product portfolio, which led to IBM's financial successes during a period of relative stability (Applegate et al., 2005; O'Reilly et al., 2009). The timely decision to shift the exploitation-exploration balance allowed IBM's top management team to introduce its Emerging Business Opportunities (EBO) program, focused at renewing its exploration efforts (O'Reilly et al., 2009). The EBO program served to adequately address environmental changes by activating the 'attempt to explore' loop. In this respect, several EBO projects grew to become highly profitable businesses (O'Reilly et al., 2009). Between 2000 and 2005, projects such as Business

Transformation Services and Linux generated $US 15.2 billion in sales (Applegate et al., 2005). As such, the executive decision to step up explorative R&D, in the face of upcoming change, prevented the firm from getting trapped in the suppression process.

Some other firms are also known for their ability to successfully transform themselves alongside changing environmental contexts. For example, the 250 years old *GKN* morphed from the iron ore to steel industry, to automotive parts, then to aerospace, and today is an industrial services company (Macdonald, 1995; O'Reilly et al., 2009). The Dutch company *DSM* has also repeatedly demonstrated such adaptive behavior in a timely fashion. DSM, founded in 1902 as a coal mining business, diversified into the fertilizers business, then became a petrochemical company, subsequently moved into chemicals, and is now active in the nutrition, pharmaceutical, performance materials, and polymer industries (Grant, 2004). This also implies that the role of the board of directors in this situation is to monitor and advise – rather than to actively intervene in the exploitation-exploration strategy. Therefore, we propose:

Proposition 2. In a business environment characterized by upcoming change:

(2a) The executive team's decision to shift the exploitation-exploration balance toward more exploration is likely to counteract the suppression process (i.e., 'timely investment' in exploration).

(2b) The board of directors does not need to intervene by increasing or decreasing the pressure to exploit (unless the executive team fails to act in line with proposition 2a).

3.3. Changing the exploitation-exploration balance during a period of change (period C)

Finally, another dynamic pattern arises from the executive's team decision to increase their firm's exploration activities during a period of major environmental change. At first, the 'stick to exploitation' loop is dominant in a stable environment, resulting in good financial results. The period of upcoming change ends and environmental change sets in, causing firm performance to start declining. This triggers management to decide to shift the exploitation-exploration balance toward more exploration, but also makes the 'external pressure' loop become increasingly dominant. Even if the executive team now starts investing in exploration, such R&D initiatives only start contributing to firm performance after a substantial delay. As such, it is very likely that the 'external pressure' loop is enhanced and becomes increasingly dominant, and any explorative initiatives are therefore prematurely abandoned. In the absence of (major) explorative investments, the firm then completely suppresses exploration. Any executive decision to make the firm explore more is therefore made 'too late'.

Consider the case of *Gamma Holding*, headquartered in the Netherlands, which achieved substantial growth in the technical textile industry until 2007. This was mainly done by pursuing an exploitation strategy for an extended period of time – a strategy largely in line with the relatively stable context (Walrave et al., 2011). Nevertheless, around 2000, competition intensified significantly (mainly from China) and, more importantly, customer preferences for technical textiles were drastically changing. However, the dominant 'stick to exploitation' loop caused a significant delay in the executive team's decision to shift the exploitation-exploration balance toward more exploration. In 2008, the executive team attempted to adjust the firm's strategy toward innovation and product development – about eight years after the market and competitive environment started changing (Walrave et al., 2011). At the same time, however, financial results were already deteriorating – a downward trend that was further reinforced by the global economic downturn. The subsequent external pressure for short-term performance improvements made Gamma Holding's executive team

abandon the new strategy. From this point onward, the value of Gamma Holding on the stock exchange continued to decline rapidly until it reached the lowest value ever (Walrave et al., 2011) and the board of directors decided to appoint a new CFO and CEO to enforce and facilitate a strategy with an enhanced focus on exploitation. Gamma Holding was now completely stuck in the suppression of exploration. As of January 2011, the company was bought out by a group of investors, taken of the stock exchange, and sold in separate parts.

In a similar vein, *Kmart Corporation*, once the largest retailer of the U.S., struggled for survival around 1994 (Wiersema, 2002). After years of significant growth in a relatively stable environment, in which Kmart grew rapidly, the competitive landscape changed significantly in the early 1990's, also as a result of the rise of Wal-Mart and Target (Hakim and Kaufman, 2002). The pressure from Kmart's shareholders to restore previous levels of performance was significant and a new CEO was assigned, who immediately focused on protecting shareholder value by means of exploitative efforts (Wiersema, 2002). The new strategy involved, for example, reducing advertisements in circulars and trying to beat the competition by lowering prices. Kmart Corporation thus got trapped in the suppression of exploration, with no means left to adapt to the changing environmental context. Less than two years later, Kmart filed for bankruptcy (Hakim and Kaufman, 2002; Wiersema, 2002).

In this situation, where the executive team decides 'too late' to adjust the exploitation-exploration balance, the main role of the board of directors is to keep the 'external pressure' loop from becoming dominant. Once more, this behavior is rather counterintuitive for most boards. Executives and directors now need to work together to prevent any further delays in explorative R&D investments (Hillman and Dalziel, 2003; Rosenblatt et al., 1993; Walrave et al., 2011). More specifically, through minimizing the external pressure, the 'attempt to explore' loop can (relatively) quickly become more dominant, which may mitigate the effects of the 'too late' response by the executive team and possibly save the company from getting fully trapped in the suppression process. Therefore:

Proposition 3. In a relatively unstable business environment:

(3a) The executive team's decision to shift the exploitation-exploration balance toward more exploration is likely to be ineffective in counteracting the suppression process toward the success trap (i.e., 'too late investment' in exploration).

(3b) The board of directors can possibly mitigate the negative outcome predicted by proposition 3a by convincing or pressing the executive team to invest in exploration.

4. Simulation method and results

4.1. Method

We will test the propositions presented in the previous section by performing simulation experiments. System dynamics (SD) simulation modeling, adopted in this study, is particularly useful when addressing a fundamental tension between competing metrics and intertwined processes (e.g., management-board interactions), characterized by multiple interacting processes, feedback loops, time delays, and other non-linear effects (e.g., Davis et al., 2007; Oliva and Sterman, 2001; Sterman, 2000). The SD simulation model developed by Walrave et al. (2011) will be used here. This model pertains to a top management team, historically favoring incremental improvements over exploring new horizons, that is then faced with a relatively swift change in the environmental context. Adopting this model allows for experimentation with the relevant variables by means of so-called *if-then* simulation experiments.

More specifically, the experiments are directed toward identifying the minimum shift in the exploitation-exploration balance (toward exploration) that the executive team needs to

realize in order to counteract the suppression process. Here, we assume that the executive team can adjust the firm's exploitation-exploration balance by a quarter percent per week more toward exploration (without considering the influence of the normal system's dynamics). Subsequently, the shift required, at any given *t*, can be calculated by counting the amount of weeks the executive team would need to keep pressing toward more explorative R&D, in order to successfully counter the suppression process. Although this represents a rather abstract measurement, it does allow for comparing different scenarios in terms of both magnitude and timing.

Furthermore, in order to consider the financial viability of the managerial decision to adjust the exploitation-exploration balance, the *opportunity costs* need to be considered. The opportunity costs capture the difference between *what is* (i.e., financial performance as a result of change in the exploitation-exploration balance), compared to *what could have been* when the development of the exploitation-exploration balance would have remained 'untouched'. We refer to the model appendix, available on http://www.bobwalrave.com, for detailed information about the model and simulation experiments.

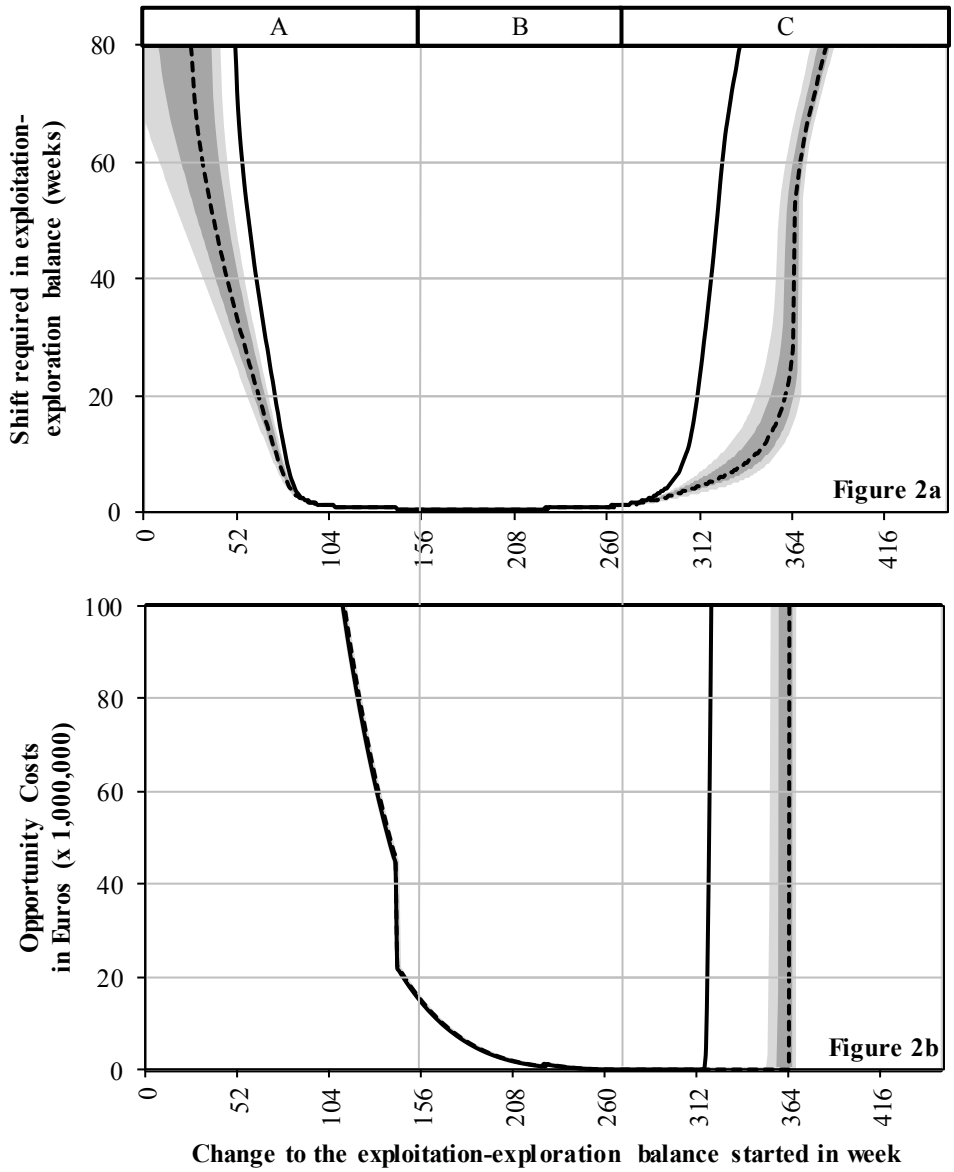
In the first experiment we investigate propositions 1a, 2a, and 3a. We do so by calculating the shift to the exploitation-exploration balance required, and the associated opportunity costs, to counteract the suppression process. Subsequently, in the second experiment, we investigate propositions 1b, 2b, and 3b by varying the 'external pressure to exploit' (with 10 percent) while conducting the first experiment again: any 'too early' adjustment to the exploitation-exploration balance (executed in period A) *increases* the pressure to exploit; while any 'too late' adjustment (executed in period C) *decreases* the external pressure to exploit. By comparing the results of the first experiment with those of the second experiment, we can isolate the action the board needs to take in order to counteract the suppression process.

4.2. Results

Figure 2 depicts the simulation results. The graphs in Figure 2a denotes the *tipping points* regarding the time the executive team started to adjust their firm's exploitation-exploration balance (t = 0 till t = 450; capturing period A, B, and C of the suppression process). That is, when the executive team directs a shift toward exploration for a smaller amount of weeks than the tipping point indicates, the firm gets caught in the suppression of exploration, and vice versa. The graph should therefore not be interpreted as a continuous line unfolding over time. For example, an increase in explorative R&D activities (Figure 2a – solid black line) starting around t = 70 requires the executive team to push for more explorative R&D for at least 20 weeks to prevent the success trap. Following that same logic, Figure 2b denotes the opportunity costs arising from the required shift to the exploitation-exploration balance as illustrated in Figure 2a – at the end of a model run. For the example previously mentioned, the opportunity costs are higher than 100 million Euros.

Propositions 1a, 2a, and 3a (experiment 1) can be evaluated by the results in Figure 2 – *solid* black lines. These results suggest a significant increase in the explorative R&D investments during period A is likely to result in very high opportunity costs (Figure 2b). Such a too early increase in exploration activities by the executive team easily triggers the process toward the success trap. As such, these simulation results support proposition 1a. However, an increase in explorative activities during period B is likely to counter the suppression process. Such timely adjustment of the exploitation-exploration balance is characterized by a small managerial effort to shift the exploitation-exploration balance required (Figure 2a) as well as low opportunity costs (Figure 2b). Therefore, these results illustrate and support proposition 2a. Finally, increasing exploration during period C is likely to suffer from a rather difficult to realize shift to the exploitation-exploration balance required

to counteract the suppression process (Figure 2a). As such, these interventions by the executive team are too late and no longer likely to counter the suppression process — in line with proposition 3a.



The solid black lines represent the results from the first experiment. The dotted black lines denote the findings from the second experiment. For the latter experiment, the external pressure was increased (for period A) or decreased (for period C) by 10 percent (■ +/- 3 percent; ■ +/- 5 percent).

Figure 2: results of the simulation experiments.

The results of the second experiment are shown in the *dotted* black lines (Figure 2). These results demonstrate that an increase in the external pressure, in the case of a too early change in the exploitation-exploration balance, lowers the executive team's effort required to realize sufficient change to the exploitation-exploration balance, thereby increasing the

success chances of counteracting the suppression process. Whereas the results indicate that the opportunity costs decrease significantly, they still remain very high (as such, this result is not clearly visible in Figure 2b). This is caused by the fact that the simulation setup suppresses, rather than delays, exploration initiatives. As such, it may be paramount that, in line with proposition 2a, in period A the board *delays* executive efforts to step up exploration until period B. As such, this supports proposition 1b, but only under the condition that the external pressure to exploit merely delays (rather than suppresses) attempts to explore. Moreover, in line with proposition 2b, the role of the board in period B is merely to monitor and advise. Finally, the simulation results indicate that, in the case of too late adjustments to the exploitation-exploration balance, decreasing the external pressure to exploit in the first half of period C is likely to lower the executive effort required (to realize sufficient explorative R&D) as well as the opportunity costs so that the suppression of exploration can be effectively countered — in line with proposition 3b.

5. Discussion and conclusion

The success trap, in which a firm fails to adapt to environmental changes due to an excessive focus on exploitative investments, is an important cause of organization decline and failure (Levinthal and March, 1993). In this paper, we explore whether and how the suppression of exploration can be successfully prevented or counteracted. Suppression process theory is employed to explain how a publicly owned firm can get trapped in suppressing exploration activities due to the dynamic interaction between top executives, board members, and exploitative versus explorative investments. By means of CLD analysis and system dynamics modeling we developed a deeper understanding of how the suppression process can be countered and, as such, prevent the success trap from bringing about organizational failure. The question of how to guard against the suppression of exploration remains an under-researched, yet important, topic within the exploitation-exploration literature (Vermeulen, 2010). In this respect, our study contributes to the literature by codifying courses of action by both executives and directors for counteracting the suppression of exploration in publicly owned firms.

Badly timed decisions and wrong expectations are a core source of innovation failure (Adner, 2012). Our findings underline the importance of *timing* (Hannan and Freeman, 1984). That is, resources need to be appropriately divided among explorative R&D initiatives and exploitative product enhancement at the right moment in time, in order to prevent the suppression process from unfolding. This study discussed three phases: 'too early', 'timely', and 'too late'. Each phase has different characteristics and, therefore, requires a particular approach – with a different likelihood of success – to counter the suppression process. In this respect, an increase in the explorative R&D activities conducted 'too early' (period A) can carry high opportunity costs due to the fact that many short-term opportunities remain unused. In this phase, 'successful companies stick to what works well' (Tushman et al., 2004, p. 586), while keeping a keen eye on new developments and upcoming changes. This implies the executive team should not aim, or be allowed by the board, to engage in major investments in exploration that are in clear misbalance with the firm's exploitative efforts, while the suppression process is still in its infancy. In a way, this finding partially contradicts the popular idea that early explorative investments will prevent firms from getting caught in the suppression of exploration (Levinthal and March, 1993; March, 1994; Tushman et al., 2004). This popular thesis is only valid under the condition that there is a thoughtful balance between such early investments in exploration and sustained investments in the current product portfolio.

The 'timely' phase implies relatively low or moderate amounts of investments in exploration are required to counteract the suppression process. That is, financial performance

is likely to remain adequate, as the correct timing of changing the exploitation-exploration balance brings along only limited opportunity costs and the 'external pressure' loop thus does not grow dominant. Timely executed shifts are best conducted at the moment in time when the environmental situation is starting to change (period B). As such, the likelihood of successfully countering the suppression process is highest during this period. This also implies that the role of the board is to monitor and advise, but not to actively intervene in the increasing levels of explorative R&D.

Finally, an increase in explorative R&D activities executed 'too late' has very little chance of being effective. Too late shifts in the exploitation-exploration balance are common but also dangerous (March, 1991; Walrave et al., 2011), as these need to be conducted in the context of substantial external pressure. In most cases, firm survival then depends on drastic turnarounds, such as a stock-market exit (Helfat et al., 2007; Tushman et al., 2004). More leeway created by the board to explore new knowledge (in spite of disappointing performance) is likely to provide more time to counteract the suppression process.

Interestingly, many executive teams postpone frame-breaking changes until severe financial underperformance forces them into drastic action (Tushman et al., 2004). That is, the executive team discovers the performance problem, diagnoses its cause(s), and subsequently implements solutions. Our findings underline that this 'traditional' procedure, implied by many theories of decision making (e.g., Levinthal and March, 1993), may not be effective against the self-reinforcing nature of the suppression process.

5.1. Role of the board of directors

Our findings also provide an interesting perspective on the role of boards of directors. A thoughtful collaboration between the executive team and the board appears to yield the best chances to successfully counteract the suppression process. In this respect, it appears that management-board independence might actually contribute to the self-reinforcing dynamics that can capture the firm in the suppression process (cf. Bednar et al., 2012; Mayer, 2013). This effectively counters the idea that the board of directors needs to work quite independently from the executive team (Hillman and Dalziel, 2003; Main et al., 1995; Walrave et al., 2011).

Furthermore, our findings illustrate that directors need to operate in a more anti-cyclical manner: during times of prosperity and stability, directors should strive to minimize opportunity costs (i.e., delaying explorative R&D investments by enhancing external pressure on the executive team), whereas during times of decline the focus should be on enabling executives in making explorative investments as soon as possible. These findings are critical because executives and directors often act in the opposite manner (Mayer, 2013; Vermeulen, 2010). Frequently, the main aim of the board of directors is to satisfy the firm's shareholders and, as such, it typically pays more attention to pleasing the investment community than to 'fixing' the company (Mayer, 2013). Such anti-cyclical behavior of the board thus requires an enhanced collaboration between executives and board members as well as a certain degree of independence of the board toward the shareholders (Mayer, 2013).

5.2. Managerial implications

The results of this study imply the board needs to take a proactive position between shareholders and top executives to both monitor results and provide resources (Hillman and Dalziel, 2003; McNulty and Pettigrew, 1999). One approach to accomplish this has been coined the 'trust firm', involving a board of directors that functions as a 'board of trustees'. This type of board does not interfere in the day-to-day running of the firm, yet guards the long-term values and principles the firm stands for. This strengthens existing governance arrangements by providing oversight that is distinct from, yet complementary to, the

executive team. In this respect, the 'trust firm' structure allows the board to commit credibly to the principles and values of stakeholders *and* shareholders, to which shareholders would otherwise fail to adhere (Mayer, 2013). The notion of a trust firm aligns with Hayward's (2007) recommendation that an executive should have a *foil*. A foil is somebody who helps to advance managerial decision making through complementary capabilities and perspectives, by providing important feedback about performance and the quality of decisions. In this respect, a *well-informed* board of directors can act as foil by questioning, underscoring, informing, enhancing and complementing the executive team and its agenda (Hayward, 2007).

Evidently, the success trap is best avoided early on, when change sets in. In this respect, the executive team must monitor how other (leading) firms distribute their exploitation and exploration activities. Furthermore, continuous data collection regarding changes in customer needs, emerging technologies and other changes within the external environment should take place. For instance, venturing with new businesses can help to establish insights and deduce potential consequences of decisions on exploitation-exploration ahead of time (Hayward, 2007; Schildt et al., 2005). This information can be combined with information gathered from customer and/or supplier involvement in the innovation process. The resulting dataset can be used to assess the characteristics of the current environment (e.g., its level of stability and turbulence) *and* predict possible changes in the environmental context, allowing for the development of a shared and long-term vision on exploitation-exploration investment levels.

A tell-tail sign with respect to a period of stability is the healthy returns made on exploitative investments. Product demand levels then are high due to stable customer needs (Walrave et al., 2011). Moreover, leading competitors have not significantly increased their R&D investments or not clearly started developing radically new products; furthermore, the broader environmental context indicates no upcoming changes that are likely to affect customer needs or preferences.

The period of upcoming change is characterized by (gradual) changes in customer preferences and gradually stalling growth in the return on exploitative investments. Other indications may involve new product ideas and prototypes developed and presented by competitors or other firms. These new solutions may breed the interest of again other firms, resulting in the acquisition and/or (further) development of such solutions. Note that many new products are likely to underperform compared to established product solutions at the time of introduction. Furthermore, macro-economic trends may or may not reinforce the appeal of the current offering.

Finally, a period of major change is characterized by rapidly decreasing demand levels of the 'old' offerings. Consumers adopt the new solution that, by now, offers a superior experience compared to the established product. Furthermore, the newer solution is likely to quickly gain in functionality and appeal, due to sustained investments in the technology, a growing number of users (network externalities), or even governmental support. As such, exploitative investments in the established solution are no longer likely to generate significant returns. In this respect, other firms are likely to have both the established and new products in their product portfolio.

Table 1 summarizes the key findings in terms of indicators of each period as well as loop dominance of the 'too early', 'timely' and 'too late' responses. The notion of loop dominance implies that the behavior of the system in the CLD in Figure 1 over time depends on the evolution of the dominance of feedback processes. That is, at any moment, some feedback loops are highly influential – the dominant loops – while others are inactive.

Table 1: Overview of key findings.

	Period			
	(A) Stability	(B) Upcoming change	(C) Change	(A) New cycle starts
Indicators for top management	Exploitative investments generate a healthy return on investment. No sign of changes in customer preferences or enhanced levels of explorative R&D investments at competing firms.	Growth in the return on exploitative product improvements gradually stalls. Signs of early adopters of new (emerging) products. Enhanced explorative investment levels at competing firms (e.g., R&D investments but also acquisitions).	Actual change in customer preferences; sales of established product decreases rapidly, while sales of the new offerings ramp up rapidly. Competitors offer established as well as new products. Investments in the new offering cause rapid performance increase.	Idem as A.
Loop dominance for corporations that get caught in 'success trap' (*too early* shifts)	Attempt to explore.	External pressure.	Stick to exploitation.	Stick to exploitation of existing product portfolio.
Loop dominance for corporations that get caught in 'success trap' (*too late* shifts)	Stick to exploitation.	Stick to exploitation.	External pressure.	Stick to exploitation of existing product portfolio.
Loop dominance for corporations that counteract the 'success trap' (*timely* shifts)	Stick to exploitation (made possible through increased external pressure).	Stick to exploitation & Attempt to explore.	Attempt to explore (made possible through decreased external pressure).	Stick to exploitation of new product portfolio.

5.3. Limitations and future research

The model and simulation experiments in this paper are, of course, highly stylized representations of the real dynamics in the executive and boardrooms of public companies. Thus, the kind of managerial actions analyzed in this paper would, if conducted in a real-world corporate context, interfere with many other dimensions and dynamics of the incumbent corporation. Any modeling approach entails a compromise between simplicity for communication and completeness for validity (Sterman, 2000; Wolstenholme, 2003). Therefore, the true added value of the conducted analyses does not arise from its comprehensiveness, but from producing theories that cannot be developed by other means (Perlow et al., 2002).

The dynamics captured in our model apply primarily to those publicly owned firms that have historically favored incremental improvements over exploring new horizons (Walrave et al., 2011). The separation between control and ownership is strongly present in public

companies following the Rhineland governance model, used mainly in continental Europe (Barca and Becht, 2001). The Anglo-American governance practice involves a single-tier governance approach (Lhuillery, 2011) that at first glance appears not to fit the dynamics discussed so far. Within the Anglo-American model, however, non-executive board members tend to represent the voice of the shareholders, which also frequently raises agency conflicts between executive and non-executive board members (Barca and Becht, 2001; Tribo et al., 2007). In this respect, institutional shareholders favoring short-term returns tend to dominate the stock markets in the UK/US system (Boyd, 1990).

Future research should more systematically translate the general courses of action, investigated in this paper, in specific interventions by the CEO and/or the board of directors. In this respect, there is only a limited amount of systematic knowledge about the different tools (and their effects) used by strategy consultants, planners and managers, which limits the opportunities to develop evidence-based strategies and interventions (Jarzabkowski, 2004; Whittington, 2006; Whittington, 1996). Therefore, there is a strong need to study and incorporate the lived experiences of executives and directors, in order to further uncover the dynamics underlying the suppression process, the success trap, and its potential remedies. In this respect, future work may involve describing, modeling and simulating detailed longitudinal cases in which particular interventions are conducted.

5.4. Conclusion

All firms will ultimately fail (Stubbart and Knight, 2006), but some firms appear to exist significantly longer than others (Geus, 1999). A common mode of failure arises from the suppression of exploration, which constitutes a serious threat to the long-term viability of firms. We studied several ways to counteract the suppression process. Our research approach and results provide an interesting perspective on the timing of shifts in the exploitation-exploration balance as well as (the interaction between) the actors involved. A key implication is that a strong separation between executives and directors in publicly owned corporations constitutes a major handicap in any effort to avoid the suppression of exploration.

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