RESPONSIVE INNOVATION:

WHY CENTRAL MANAGEMENT SHOULD RELY ON PERIPHERAL SENSING

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ABSTRACT

In dynamic environments, competitive advantage lies in developing useful knowledge from continuous streams of unstructured and ambiguous data. Frontline employees and certain groups of customers are often the first to sense emerging issues of strategic importance due to their experiential insights of the firm's daily operations. Yet, they are rarely asked to provide updated information about critical issues. The present paper seeks to conceptually develop the notion of responsive innovation, by drawing on literary streams concerning collective sensing, strategic issue diagnosis and integrative strategy within a micro foundations perspective. It is posited that companies should root their innovation processes in the collective sensing of frontline-employees and customers that operate around the organizational periphery. This frames the concept of responsive innovation, where individuals engaged in the firm's ongoing business activities collectively identify issues that central managers can resolve.

1. INTRODUCTION

In dynamic environments, strategic advantage lies in the ability of firms to be early in their industry to unravel evolving conditions (Ansoff, 1975, 1980; Dutton and Duncan, 1987; Eisenhardt, 1989; Stacey, 1995; Teece, Pisano and Shuen, 1997; Teece, 2007). Certain pockets in the strategy and innovation literatures have recognized that frontline employees and customers operating around the organizational periphery tend to be at the forefront of important developments and can often sense emerging events of strategic importance. Yet, specific approaches for continuously aggregating and incorporating peripheral sensing into decision making processes have remained elusive.

It has long been noted that detailed knowledge of specific operating conditions is typically held among lower-level employees (Burgelman & Grove, 1996; Dutton & Ashford, 1993; Mintzberg, 1990a). Burgelman and Grove (1996) argue that employee behavior may signal strategic inflection points. Teece (2007) echoes this line of argument and suggests that the firm is vulnerable if the only sensing is left to a few individuals at the top. Building on these rationales, it has been posited that frontline employees are able to anticipate changes in operational capabilities that are linked with financial firm performance (Andersen, 2013). In the field of innovation, von Hippel (1988, 1999, 2005) has similarly advocated that so-called lead users experience needs ahead of the bulk of the market, and Christensen et al. (2003, 2004) have suggested that certain customers and nonconsumers pursue developmental trajectories that end up disrupting markets. When combined, these studies underscore the competitive importance of peripheral sensing to the central strategic apex. However, a specific approach of utilizing peripheral sensing is needed, as well as knowledge on the relationship between these micro-level insights and subsequent macro-level phenomena (Felin & Foss, 2006).

As frontline employees and customers are in a position to sense and accumulate distinct knowledge about operational aspects of the business that will eventually influence its financial performance, they can be introduced as resources for responsive ap-

proaches to innovation and decision making (Andersen, 2013; Burgelman & Grove, 1996; Teece, 2007). The present paper conceptualizes this approach to innovation as 'responsive innovation'. Responsive innovation describes how the sensing of key stakeholders should be continuously aggregated to identify issues and opportunities which can inform managerial decisions. Hence, collective sensing of key stakeholders may fuel strategic issue diagnosis i.e. SID (Ansoff, 1980; Dutton, Fahey & Narayanan, 1983; Dutton & Duncan, 1987), which holds the potential to foster innovative responses. This responsive approach to innovation could help firms continuously adapt to markets in evolutionary states of motion.

In the present paper, the concept of responsive innovation is introduced. More specifically, the paper will examine why companies should aggregate insights from key constituents such as frontline employees and customers positioned around the organizational periphery, and how their ongoing collective sensing can help firms adapt to dynamic markets, by focusing innovative attention on strategic issues.

The purpose of this conceptual paper is threefold: First, to introduce the notion of responsive innovation. Secondly, to explicate why frontline employees and customers operating around the organizational periphery should be at the forefront of emerging events, and hence, should be able to collectively sense strategic issues. Third, to explicate why central management should continuously incorporate these dispersed insights into strategic decision making processes to foster organizational adaptation and innovative responses. The remainder of the paper will explicate the background of responsive innovation, and subsequently draw up the contours of the concept.

2. BACKGROUND

Drawing links between micro and macro levels has long been problematic within social sciences, and the literature in strategic management is no exception (Felin & Foss, 2006). Some of the most debated and troublesome issues in social sciences have been those concerning analytical levels and units of analysis. Consequently, an important

philosophical topic has been whether individuals ("micro") or social collectives ("macro") have explanatory primacy i.e. methodological individualism versus methodological collectivism (Burrell & Morgan, 1979). Clearly, these issues are of immense importance for theory-building within strategic management, organizational learning and innovation, and they should therefore be taken into account when establishing the concept of responsive innovation.

Albeit substantial attention has been put on "multiple level analysis" within strategic management, the field has seen few efforts to reconcile micro and macro levels, or more generally, efforts to build micro foundations (Felin & Foss, 2006). Hence, there is a need for research that investigates the linkage between micro and macro levels, where the *explanandum* (that which is to be explained) is on the collective level, but where the *explanans* (that with which explanation takes place) are at the individual level (Felin & Foss, 2006). Utilizing sensing from key stakeholders entails interesting elements related to the philosophical debate, as it focuses on micro foundations – but likewise investigates its implications on an aggregated level.

The notion of responding to emerging events has previously been emphasized within certain streams of the strategy literature (Andersen, 2013; Ansoff, 1980; Dutton, Fahey & Narayanan, 1983; Dutton & Duncan, 1987; Mintzberg, 1990; Teece, Pisano & Shuen, 1997). However, these literary developments have rarely (i) seen issues as innovation opportunities (ii) incorporated collective sensing into decision making processes (iii) been coupled to mechanisms that can aggregate the peripheral sensing.

Hence, responsive innovation contributes to the strategy literature by providing a systematic approach for aggregating and utilizing the collective sensing of key stakeholders, with the purpose of identifying strategic issues and opportunities that can foster innovation. Responsive innovation is defined as an organizational response capability where the collective sensing of key stakeholders and subsequent firm responses make it possible to modify business activities in ways that accommodate emerging internal

and external changes. As such, responsive innovation necessitates that peripheral sensing and central decision making are combined to form an organizational response capability that can foster organizational adaptation through innovative responses.
As it can be seen in figure 1, responsive innovation is a subset of the literary stream focusing on strategic responsiveness: Hence, responsive innovation focuses on the birth of innovative ideas and creative problem solving of emerging strategic issues and opportunities. Furthermore, responsive innovation entails interactive learning, as peripheral learning is utilized to sense emerging issues, and central decision making activities are utilized to asses, prioritize and act upon the collective sensing of key stakeholders.

Responsive innovation is different from the notion of dynamic capabilities in several ways: First, responsive innovation utilizes collective intelligence from both internal and external stakeholders to identify issues. Secondly, responsive innovation predominantly focuses on making continuous incremental adjustments to its *operational capabilities* (Wu et al., 2010). Hence, responsive innovation does not seek to radically change its operational capabilities – but instead to continuously adapt them to emerging issues. Hence, responsive innovation differs from dynamic capabilities, by focusing on continuous incremental adjustments of the firm's *operational capabilities.* Operational capabilities have been conceived as, "how you earn your living" (Zollo & Winter, 2002) and dynamic capabilities as "how you change your operational routines" (Helfat & Peteraf, 2003; Winter, 2003).

Unlike dynamic capabilities, responsive innovation does not seek to change the firm's existing resource base or radically change its operational routines. Instead, the focus of responsive innovation is on ongoing improvements of existing operational capabilities and resources. However, many small adaptive innovations accumulated over time may add up to a significant change, in line with a dynamic capability rationale. Innovation focused on continuous change furthermore resonates with process philosophy, where innovation is equated with being in a perpetual state of motion.

Similarly, responsive innovation differs from conventional approaches to strategic issue diagnosis (SID) by (i) focusing on the innovative potential of issues (ii) and by utiliz-

ing the collective sensing of key stakeholders for issue and opportunity identification. Hence, the utilization of aggregated experiental insights from around the organizational periphery should stimulate an underlying integrative strategy dynamic that can foster organizational adaptation and innovative responses.

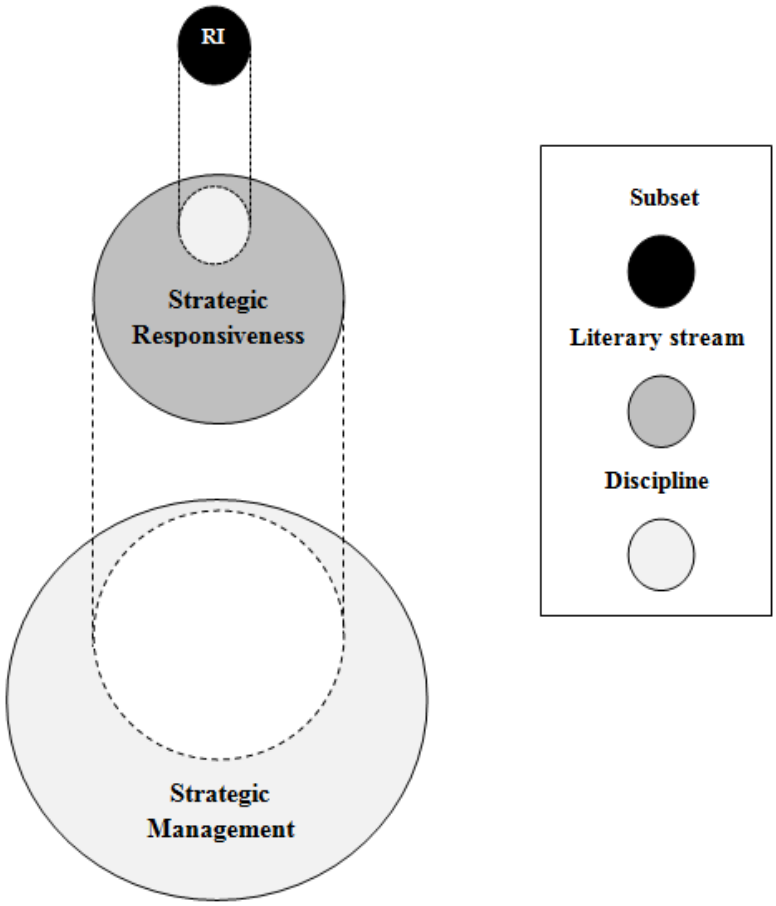

Figure 1: The position of responsive innovation

The background of responsive innovation consists of an amalgam of literary streams concerning strategic issue diagnosis (Ansoff, 1975, 1980; Dutton and Duncan, 1987), collective sensing (Andersen, 2013; Surowiecki, 2004; Teece, 2007) and integrative strategy (Andersen, 2004, 2009, 2013; Burgelman and Grove, 1996, 2007; Grant, 2003; Hill et al., 2000). Each literary stream provides a piece to the underlying background of

responsive innovation. It similarly explicates the importance of focusing on the linkage between micro and macro levels in organizational adaptation.

The key literary streams influencing the notion of responsive innovation are depicted below. The following will briefly explicate the essence of each of the three literary streams, and will furthermore highlight their relevance for the concept of responsive innovation.

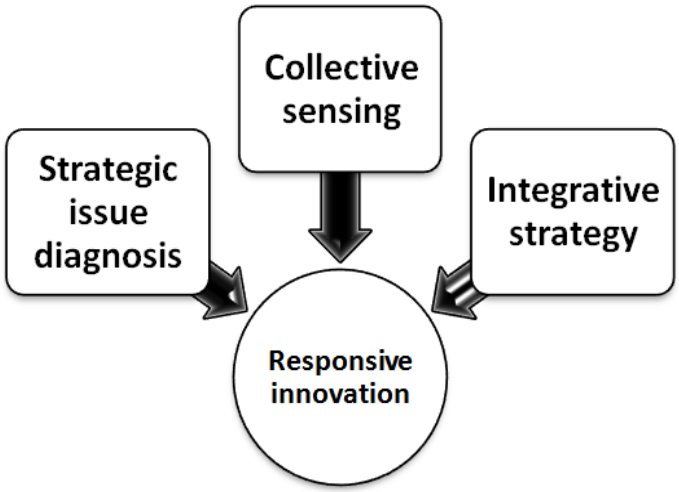

Figure 2: The Literary Streams underlying Responsive Innovation

Strategic Issue Diagnosis

Responsive innovation entails innovative responses to strategic issues that have been identified by the collective sensing of key stakeholders: According to Ansoff (1975, 1980), a strategic issue is an event that has a significant performance impact on the firm. The domain subsumed by an 'issue' is likely to be broad, diffuse and ill-defined – particularly in its early stages (Dutton, Fahey & Narayanan, 1983).

Hence, it is important to respond to weak signals in order to make a timely response (Ansoff, 1975, 1980). As noted by Ansoff (1975) "firms often fail to anticipate and suddenly discover that a fleeting opportunity has been missed or that survival of a product line is threatened. Typically, at the 'moment of truth' neither the causes nor the possible responses are clear; the firm confronts an unfamiliar and often threatening event"

(p. 22). Timely identification of issues constitutes an important strategic capability that should involve diverse points of view in the form of attentional triangulation.

Put differently, strategic issue management constitutes a systematic approach for early identification and fast responses to important issues. In order to make a timely response, it is necessary to act early on weak signals, as illustrated below (Ansoff, 1980, p. 144):

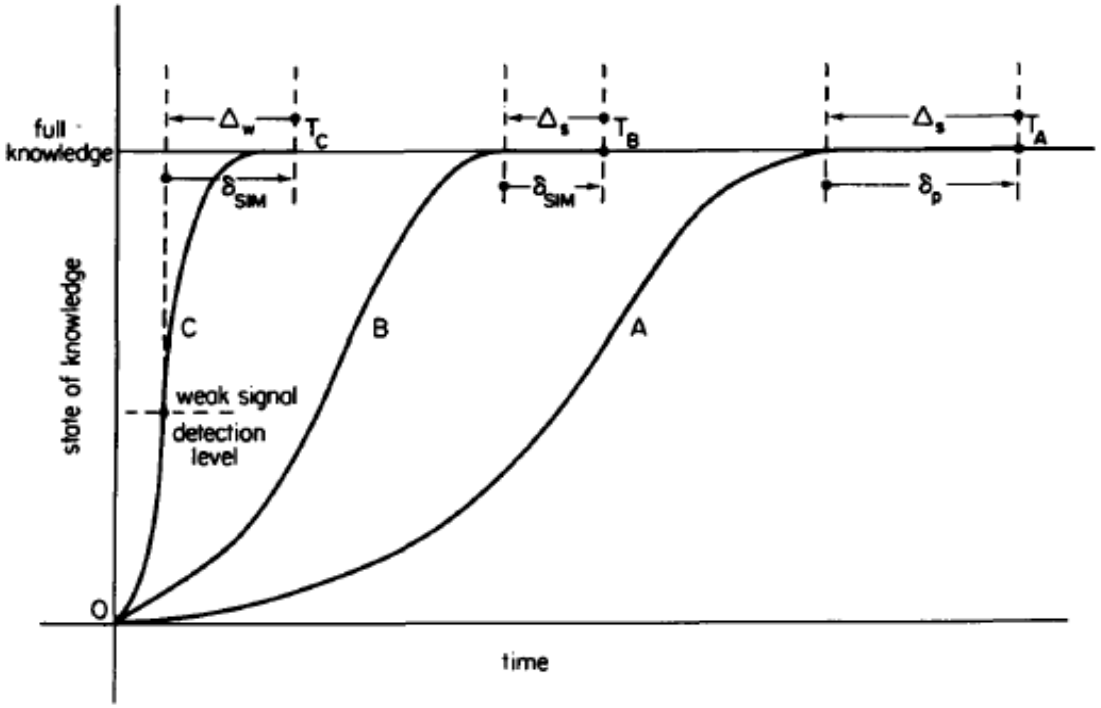

Figure 5. Interaction between forecasting horizon and response time. Δ_s = strong signal forecasting horizon, Δ_w = weak signal forecasting horizon; δ_p = periodic system response time, δ_{SIM} = SIM response time

Figure 3: Interaction between forecasting horizon and response time

The timeliness of firm responses is dependent on the interaction between the forecasting horizon and the time required by a firm to select and implement its response. The figure shows three different patterns, ranging from a slow event in curve A to a fast event in curve C. The vertical scale describes the state of knowledge about a change. The time of the event's impact is essential, as this represents the time after which it is too late to respond (Ansoff, 1980). In case C, the firm's response will be inef-

ficient if it chooses to base its response on strong signals – therefore, weak signal detection is necessary in hypercompetitive environments. Periodic planning is applicable for case A events, but in environments with many case C events, weak signal detection is necessary in order to make a timely response. However, the managerial processes surrounding the issue identification process may complicate managerial action (Dutton and Duncan, 1987).

In a similar vein, several high-reliability firms have started to pay attention to what Holland (2002) calls 'tiny initiating events' or what Andriani and McKelvey (2009) conceptualize as 'butterfly-events'. Hence, complexity science stresses the importance of events that initially seem insignificant, but which may have an extreme impact in the near future. As described by Andriani and McKelvey (2009), positive feedback processes among interactive data points cause extreme events, as illustrated in Pareto distributions. Thus, tiny initiating events create causal dynamics leading to non-linearity. The element of collective sensing constitutes a novel contribution to the strategic issue diagnosis literature: Responsive innovation utilizes collective intelligence (Malone et al., 2010) and the wisdom of crowds (Howe, 2008; Surowiecki, 2004) to identify emerging strategic issues.

Collective Sensing from around the Organizational Periphery

The strategies which have been developed by the central apex are enacted, effectuated and experienced by individuals around the organizational periphery. The enacted strategies come to life in the daily interactions among employees and between frontline employees and customers. This suggests that frontline employees (Andersen, 2013; Burgelman and Grove, 1996) and certain customers (Chesbrough, 2011; Christensen, Anthony & Roth, 2004; Christensen & Raynor, 2003; von Hippel, 1988, 1999, 2005) often have updated and specific knowledge of the effects and developments of the chosen strategic trajectory. Teece (2007) argues that an important part of the micro-foundations of dynamic capabilities lie in the sensing capabilities of lower-level employees.

As strategic planning has often separated thinking from doing (Mintzberg, 1994), experience-based learning has typically been ignored by the managerial top. This can force employees to create innovative initiatives that go against managerial orders i.e. creative deviance (Mainemelis, 2010). However, emergent strategies often happen in a more subtle manner, where action drives thinking. This is exemplified by Mintzberg (1987), who explain that, "Out in the field, a salesman visits a customer. The product isn't quite right, and together they work out some modifications […] after two or three more rounds, they finally get it right. A new product emerges, which eventually opens up a new market. The company has changed strategic course" (p. 68).

In a similar vein, Miller and Wedell-Wedellsborg (2013) make the case for stealth innovation, by arguing that it is often a better strategy for lower-level employees to innovate under the radar than going straight to the managerial top to obtain support for an innovation initiative: Going to the top can be a risky strategy for the employee, as the default answer is often 'no', and as the corporate spotlight can be a dangerous place for unproven ideas. According to Miller and Wedell-Wedellsborg (2013), a better alternative is to innovate under the radar, by appealing to managers one or two levels below the C-suite; securing resources and creating proof of concept that will eventually be presented to a jury of executives (Miller and Wedell-Wedellsborg, 2013). Hence, the notion of stealth innovation resonates with concepts such as autonomous initiatives (Burgelman and Grove, 1996; Mintzberg and Waters, 1985) and creative deviance (Mainemelis, 2010).

Teece (2007) refers to sensing as a unique firm capability that taps into changes in the firm's surroundings. Consequently, frontline employees and customers should be able to collectively sense emerging issues. Hence, their collective sensing capabilities should be appropriate to include in innovation processes, as they can collectively sense emerging events that central management should subsequently act upon.

The rationale of relying on peripheral crowds is similarly explicated in the extensive literature on 'the wisdom of crowds' or collective intelligence. The wisdom of crowds, or collective intelligence, denotes the surprisingly accurate estimates that crowds can provide. As Surowiecki (2004) states, "under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them" (Surowiecki, 2004, p. xiii). The underlying logic of the wisdom of crowds posits that the independent judgment of a crowd of individuals will be relatively accurate. The hypothesis is derived from mathematical principles which indicate that the crowd's judgment comprises signal-plus-noise, and that the subsequent averaging across judgments will cancel out the noise while extracting the signal (Page, 2007; Hong & Page, 2011; Suroweicki, 2004). Consequently, "Collective wisdom, as we shall define it here, exists when the crowd outperforms the individuals that comprise it at a predictive task" (Hong & Page, 2011, p. 2). Hence, the continuous aggregation of the sensing of peripheral crowds should provide accurate estimates of competitive conditions.

Figure 4 juxtaposes peripheral learning with central learning: Where central learning is characterized by long feedback cycles of planning followed by an outcome, peripheral learning is characterized by relatively short feedback cycles entailing peripheral actions followed by immediate results (Andersen, 2013). Consequently, the experiential insights learned around the organizational periphery should be more updated than those originating from the central apex. As noted by Andersen (2013), the two types of learning cycles should be combined within a system of interactive learning, which is in line with the underlying rationale of integrative strategy making.

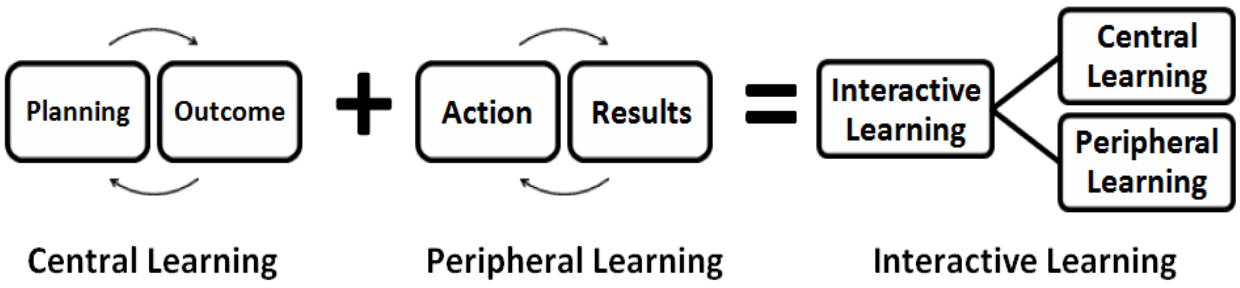

Figure 4: The rationale of interactive learning

Integrative Strategy

A seminal discussion within strategic management concerns the extent to which strategies evolve from lower-level 'autonomous' initiatives in the organization, as opposed to being initiated by the managerial top (Andersen, 2013; Bower & Gilbert, 2007; Burgelman & Grove, 1996, 2007; Mintzberg, 1987, 1990a, 1990b, 1994; Mintzberg & Waters, 1985). For example, some studies question whether strategy is a coherent plan conceived at the top, or if it is formed by a stream of individual commitments, not always in line with the plans of the top management team (Bower and Gilbert, 2007; Burgelman and Grove, 1996, 2007; Miller and Wedell-Wedellsborg, 2013; Mintzberg, 1987; Mintzberg and Waters, 1985).

However, there are strong arguments for both a designed top-down driven strategy and bottom-up approaches of an emergent character. However, reality is most likely comprised by a complex interrelationship between the two, resembling the time-bound swings of a pendulum that intricately interweave central and peripheral processes over time (Andersen, 2013; Bower and Gilbert, 2007; Burgelman and Grove, 1996; Grant, 2003; Mintzberg, 1994). Hence, a practical reality entailing both central top-down planning of intended strategies and peripheral bottom-up effectuation that may foster emergent strategies and innovative initiatives has long been propagated (Andersen & Minbaeva, 2013; Mainemelis, 2010; Mintzberg, 1987, 1990a, 1994; Mintzberg & Waters, 1985; Stacey, 1995). The combination is not only the most accurate, but it has been shown to provide superior performance outcomes (Andersen, 2013). Thus, complex strategy comprises longterm planning and everyday actions.

Central and peripheral processes may be complimentary within corporate strategy, organizational learning and innovation, as they together form an organizational response capability that can overcome the tension between exploitation and exploration: The necessity of combining central and peripheral processes has long been highlighted, but often in slightly different ways (Andersen & Fredens, 2011, 2013; Bower and Gilbert, 2007; Burgelman & Grove, 1996, 2007; Grant, 2003; Mintzberg & Waters, 1985).

For instance, Andersen and Fredens (2011, 2013) argue that corporate entrepreneurship and strategic renewal derive from complimentary central and peripheral processes. In a similar vein, Mintzberg and Waters (1985) have explicated how real-world strategies lie on a continuum between deliberate and emergent – and that a mutual interplay between the two poles is the most common. Similarly, Burgelman and Grove (2007) propose that corporate longevity depends on matching cycles of autonomous and induced strategy processes to different forms of strategic dynamics, and that the role of strategic leadership is to balance the induced and autonomous processes.

However, Grant (2003) sees planned emergence as a process in which strategic planning systems provide a mechanism for coordinating decentralized strategy formulation within a structure of demanding performance targets and clear corporate guidelines. Finally, Burgelman and Doz (2001) argue that long-term success in maximizing profitable growth requires developing new strategy-making capabilities, i.e. complex strategic integration (CSI), which make leaders able to identify the *maximum-strategic-opportunity set.* This refers to those opportunities that can let companies fully exploit both their capabilities and their potential to pursue new strategies (Burgelman and Doz, 2001).

3. THE CONTOURS OF RESPONSIVE INNOVATION

A synthesis of the main arguments from the preceding review can draw up the contours of responsive innovation. Responsive innovation represents an approach to innovation that centers around peripheral sensing of strategic issues and minor initiating events: If it is acknowledged (i) that central and decentralized processes should be aligned in order to foster interactive learning and develop an organizational response capability (Andersen, 2004, 2013; Andersen & Fredens, 2011, 2013; Andersen & Nielsen, 2004; Burgelman and Doz, 2001; Burgelman & Grove, 1996, 2007; Grant, 2003) (ii) that lower-level employees and customers have strategically important knowledge that is qualitatively different than that of central managers (Burgelman and Grove,

1996, 2007;; von Hippel, 1988, 1999, 2005) (iii) and that collective intelligence may lead to more accurate decisions (Howe, 2008; Surowiecki, 2004), then each of the arguments may be integrated. By incorporating collective sensing into the process of strategic issue diagnosis (Ansoff, 1975, 1980; Dutton, Fahey & Narayanan, 1983; Dutton & Duncan, 1987), the integrative strategy approach could foster innovation.

The figure below illustrates a framework describing the uses of crowds for innovation and decision making. The conventional uses of collective intelligence of customers and employees in innovation and decision making have typically revolved around: (i) Management identifying an issue and framing it as a task. (ii) The peripheral crowd solving the posed task. In contrast, responsive innovation reverses the conventional uses of crowds. Responsive innovation entails: (i) The peripheral crowd identifying issues, opportunities and tiny initiating events. (ii) Management responding to the identified issues, typically by exploring existing or novel ideas inside or outside the organization.

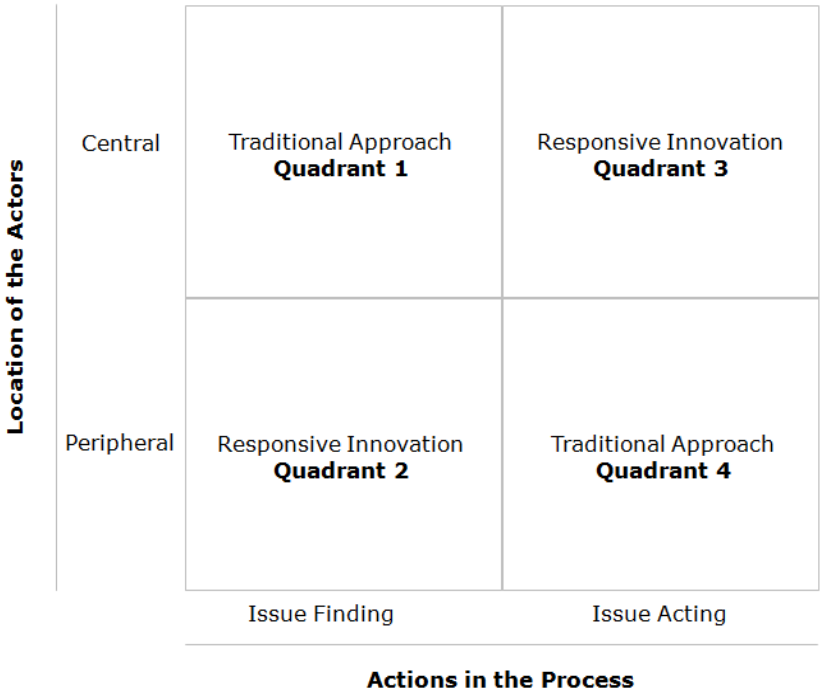

Figure 5: The model of Responsive Innovation

As it is apparent in the figure, the traditional use of collective wisdom in the innovation process is represented by quadrant 1 and 4: Typically, management identifies a specific issue and frames it as a task, and then they make use of the collective intelligence of an external or internal crowd to solve the posed task (Howe, 2008; King & Lakhani, 2013; Surowiecki, 2004). Examples of this practice are seen in Google's use of prediction markets for employees (Cowgil et al., 2009) and Threadless' business model for leveraging crowds (Chesbrough, 2011). Albeit this approach has proven its usefulness (Howe, 2008; Luckner et al., 2012; Suroweicki, 2004), it is argued that the approach only represents a very narrow use of the innovative potential of collective intelligence in peripheral crowds.

In contrast, quadrant 2 and 3 in figure 3 illustrates the basic elements of responsive innovation: Here, collective intelligence and aggregated sensing of the peripheral crowd is utilized to find emerging issues that central management will subsequently seek to resolve. As frontline employees (Andersen, 2013), certain users (von Hippel, 1988, 2005) and certain customers (Christensen, Anthony & Roth, 2004) have been characterized as being at the forefront of novel developments, it would be logical to rely on their collective sensing of internal and external changes.

However, it is essential to emphasize that managerial issue responses do not require that managers themselves imagine solutions to emerging problems: As it has previously been propagated by Burgelman and Grove (1996, 2007), top management typically struggles to come up with solutions when facing emerging crises.

Hence, the notion of managerial issue responses rather entails that management takes responsibility of the emerging issue, and seeks to discover an existing or novel solution inside or outside the walls of the organization (Burgelman & Grove, 1996), by engaging in interactive discussions (Simons, 1990, 1991, 1994, 1995) or initiating crowdsourcing initiatives (Howe, 2008).

4. CONCLUSION

In this paper, the concept of responsive innovation has been introduced as a strategic innovation model that incorporates the collective sensing of key stakeholders. The model provides the contours for an approach to innovation that emphasizes responsiveness to volatile settings. In particular, it has been proposed that key stakeholders operating around the organizational periphery can collectively sense internal and external issues, and that central management should continuously aggregate, diagnose and act upon their insights. Hence, the innovation model builds on integrative strategy, collective sensing and strategic issue diagnosis.

5. LIMITATIONS AND A RESEARCH AGENDA

While the concept and framework of responsive innovation make several theoretical contributions, it is evident that future research should explore the verisimilitude of the conceptualized model in empirical studies entailing both qualitative and quantitative data. This not only meets the need to empirically validate the developed framework, it can also provide in-depth explanations of the concepts entailed within responsive innovation. Here, it would be relevant to investigate the industries where responsive innovation holds the most promise. It is clear that responsive innovation should be appropriate for high-velocity environments, but is the approach mostly applicable to service industries, due to its emphasis on frontline employees and customers? Or does the recent servitization trend similarly make it valuable for manufacturing companies? These are questions that call for empirical answers.

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