How process improvement efforts can drive organisational innovativeness

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In this study, we draw upon literature in technology and innovation management to theorise about how process improvement efforts in organisations can drive the exploratory activity that is generally associated with more radical forms of innovation. We develop a set of propositions on how process improvement efforts might directly and indirectly drive exploration and more radical forms of organisational innovation. These propositions are organised into four categories: (1) ‘Direct’ – how exploratory forms of process improvement can directly drive innovativeness; (2) ‘Resource Capacity’ – how process improvement can increase the resource capacity that drives innovativeness; (3) ‘Knowledge’ – how process improvement efforts can strengthen knowledge resources that drive innovativeness; and (4) ‘Management Vision’ – how process improvement efforts can influence the managerial vision that moderates the effect of process improvement efforts on innovativeness.

Keywords: process improvement; process management; process innovation; exploration and exploitation; radical innovation; innovativeness; lean; Six Sigma; quality management

1. Introduction

Process management and innovation are both central concerns of modern managers, yet recent characterisations can put the two at odds with each other in both the academic literature (e.g. Benner and Tushman 2002) and in the popular press (e.g. Hindo 2007). Although process improvement efforts are certainly a form of innovation, these innovations are often considered to be more incremental in nature and may stifle more radical, exploratory forms of innovativeness. Radical, exploratory innovations generally involve knowledge that substantially deviates from firms’ extant knowledge stock (Phelps 2010) and established routines (Benner and Tushman 2003). Process improvement efforts, on the other hand, are traditionally geared towards increased efficiency and control (Sitkin, Sutcliffe, and Schroeder 1994). There has been very little attention to the ways in which process improvement efforts can, in fact, drive more radical, exploratory innovation.

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Organisations are increasingly becoming ‘process-centred’ (Hammer 1997), in that they are structured in terms of horizontal workflows that often cross-functional and organisational boundaries. Process improvement efforts are typically characterised in terms of increasing efficiency, standardising practices, and reducing variance. Such activities are more suited to the exploitation (March 1991) of existing knowledge sources and thus are more likely to lead to incremental forms of innovation (Benner and Tushman 2002).

More radical forms of innovation, on the other hand, require the exploration associated with diverse knowledge sources (March 1991). Since process improvement efforts tend to focus on streamlining existing activities, they are seen as drivers of incremental, adaptive organisational improvements, which, it is argued, will often crowd out exploratory activities that are necessary for more radical forms of innovation. This overarching tendency has been clearly, rigorously, and thoughtfully established elsewhere (Sitkin, Sutcliffe, and Schroeder 1994; Lamping 2000; Sutcliffe, Sitkin, and Browning 2000; Benner and Tushman 2002, 2003). It is not our intention to question or refute this theoretical relationship. However, we note that since Benner and Tushman (2002), for example, address a specific process management methodology (e.g. ISO/9000) and a singular measure of product innovation (e.g. patent data), this view may not give adequate consideration to the wide variety of process improvement efforts nor the diversity of potential organisational innovations. By focusing only on the broad, general relationships between process improvement and organisational innovations, researchers and managers run the risk of having an oversimplified (Starbuck 1983) or ‘impoverished’ (Weick 1990) view of organisational phenomena. As it stands, the prevailing rather simple view emphasises the tendency of process improvement efforts to support incremental activity. Although this is broadly supported both theoretically and empirically, managers and researchers might run the risk of interpreting this view to mean that they should avoid process improvement in highly innovative contexts.

To avoid relying too heavily on this potentially oversimplified view, it is important to equip researchers and managers with different ways to think about the relationship between process improvement efforts and innovations. In this effort, we look to identify how process improvement efforts may enable more radical forms of innovation. In doing so, we equip managers and researchers with additional theoretical arguments that they might draw upon to think about this relationship in their research and practice. Such arguments enable the requisite cognitive complexity for dealing with organisations as complex systems in situ (Beer 1984; Boland, Tenkasi, and Te’eni 1994). In this paper, we propose a number of propositions that essentially make the counterpoint to received theory and theorise about ways that process improvement might actually drive innovativeness. Thus, we do not necessarily contradict the prevailing view, but we add nuance and variety – contributing to a broader repertoire of theoretical insights.

This essay begins with a discussion of the prevailing argument that process improvement efforts can stifle more radical forms of innovation and we address issues that may moderate this tendency. We then describe four broad groups of propositions that focus in the following areas: (1) process innovation; (2) resource capacity; (3) knowledge; and (4) management vision. We conclude with a model representing these propositions and what they mean to the relationship between process improvements and innovation.

2. Theory

2.1. Process improvement and exploration in the literature

Modern process improvement efforts find their roots in the highly interrelated traditions of business process re-engineering (Hammer 1990; Hammer and Stanton 1999), the implementation
of enterprise information systems (Davenport 1998), and the quality movement (Cole and Scott 2000). In each of these cases, the purpose of the process improvement is generally to support goals relating to efficiency, control, integration, and standardisation.\(^1\) For example, common objectives of business process re-engineering efforts include increased productivity and compressed cycle times (Grover et al. 1995). Goals associated with enterprise information system implementations inevitably involve integration and standardisation (Davenport 1998; Ciborra 2000). The majority of quality management efforts involve teams that simplify and streamline existing processes (Hackman and Wageman 1995). In each of these examples, there is an optimisation logic that focuses on improving the performance efficiency of existing processes.

Process improvement efforts can be characterised as heuristically driven methodologies for process enhancement (Winter 1994) that generally involve three broad steps: (1) understanding the existing process; (2) designing the process improvement; and (3) implementing the improvement. These efforts have been conceived to help firms achieve incremental innovation by necessarily focusing on existing process issues and existing customer needs. Thus, the innovative ideas that stem from these efforts can then be expected to incrementally improve activities along existing trajectories exploiting established knowledge sources (Harry and Schroeder 2000; Benner and Tushman 2002).

In situations characterised by scarce resources, there is therefore a trade-off between exploration associated with new knowledge and exploitation of existing knowledge (Sutcliffe, Sitkin, and Browning 2000). Since successful organisations are rewarded for doing what they do best, there is often tremendous pressure for successful firms to focus on exploitative activity at the expense of exploration (March 1991). This principle where successful organisations get better at what they know at the expense of innovativeness has been a central concern for organisational theorists from Schumpeter’s notion of adaptive and creative response (Schumpeter 1947) to concepts such as the productivity paradox (Abernathy 1978), competency traps (Leonard-Barton 1995), and the innovator’s dilemma (Christensen 1997). Successful organisations must find a way to balance exploitative with exploratory activities in order to prosper beyond the short term (March 1991). Since process improvement efforts are thought to generally support exploitative activities at the expense of exploration, such efforts will generally stifle more exploratory or disruptive forms of innovation just as they spur incremental, sustaining, or adaptive innovations (Benner and Tushman 2002).

The logic behind the prevailing view of the impact of process improvement is sound and rooted in a rich tradition of organisational theory. Furthermore, it has been rigorously shown that in certain environments, using patent data and specific definitions of exploitative and exploratory technological innovations, process improvement efforts do appear to drive more exploitative technological innovations at the expense of exploratory innovations (Benner and Tushman 2002).

Recent literature has also proposed a number of contingent relationships between process improvement and technological innovation. For example, within ambidextrous organisations process improvement may have no effect on exploration, as the explorative subunits may be loosely coupled from the rest of the organisation (Benner and Tushman 2003; O’Reilly and Tushman 2004; Tushman et al. 2010). Certain product environments are characterised by such dynamic innovation, that exploration and exploitation necessarily coexist between modular subunits and may not compete for resources to the extent assumed by March (1991), and may in fact, be orthogonally related (Gupta, Smith, and Shalley 2006). Therefore, Figure 1 shows the prevailing view of the effect of process improvement efforts on exploitation and exploration, moderated for organisational ambidexterity (a simplified version of the model presented in Benner and Tushman 2003). In general, process improvement efforts will positively affect exploitation and negatively affect exploration. This negative effect on exploration is moderated by the ambidexterity of a
particular organisational form. Further, successful exploration will result in greater exploitation over time (March 1991).

To extend this prevailing view of the impact of process improvement efforts, it makes sense to question some of its assumptions. For example, the model explicitly assumes that process improvement efforts are focused on principles relating to efficiency and control. While this may typically be the case, it is important to note that there are a multitude of process improvement philosophies and methodologies that are not as harmoniously focused on notions of efficiency and control as some of the literature may suggest (Scott and Cole 2000). Total quality management, for example, simultaneously encourages continual learning and experimentation while embodying the potentially conflicting principles relating to control and efficiency (Sitkin, Sutcliffe, and Schroeder 1994). Different methodologies have different emphases and heuristics that can be interpreted differently (Winter 1994). For example, the overarching principle of Lean Manufacturing involves removing waste, whereas the key principle of Six Sigma is reduction of variance.

Another assumption that is implicit in much of the literature is that organisations are fairly uniform in their reaction to process improvement efforts (given a certain structure). That is, an organisation can be characterised as a monolithic entity whose various units are generally in sync. This is typically not the case, however. Organisations are in fact comprised of heterogeneous units and different units will relate to process improvement initiatives differently (Sitkin, Sutcliffe, and Schroeder 1994; Scott and Cole 2000; Benner and Veloso 2008). Further, a variety of process improvement strategies can be applied to different organisational domains and can be tailored to suit those domains (Sutcliffe, Sitkin, and Browning 2000). For example, on the one extreme, the Supply Chain Operations Reference Model (SCOR) is applicable at an organisational or interorganisational level and at the other extreme, Six Sigma is particularly well suited to specific processes with identifiable customers and metrics.

Finally, process improvement initiatives do not remain a stable, consistent set of methods inherited from the traditional quality movement, but instead are continually evolving and combining to form new heuristics and methods. For example, there is an emerging set of process improvement practices geared specifically to improve the processes that generate technological
innovations. Stage–gate methodologies (Cooper 1990) are geared specifically at fostering more successful exploratory innovations within companies. Product design and development can be standardised to improve product innovation outcomes consistently (Clark and Fujimoto 1991; Ulrich and Eppinger 1995). Design process improvement practices based on models such as the design structure matrix (Smith and Eppinger 1997) are targeted at shortening cycle times of experimentation to potentially enable greater iteration and may spur analysis that can lead to innovation relating to organisational and product architectures (Baldwin and Clark 2000). Enterprise information system vendors are actively promoting product lifecycle management systems that are distinct from traditional enterprise resource planning (ERP) functionality and instead are focused on managing iteration, virtual modelling and analysis, and interactive collaboration required for technological innovation (Grieves 2006). Other examples abound, including agile software development methodologies which can be adopted with the requisite level of ‘ceremony’ for a given development project (Cockburn 2002).

While the structure of a firm will undoubtedly moderate the effects of process improvement efforts on exploration and exploitation, there are other moderators that have been addressed in the literature, if not directly in this context, such as an organisation’s technological capabilities and the qualities of its management (Benner and Veloso 2008). Firms that have a wider variety of technological capabilities may benefit more from process improvement over the long term than those with fewer technologies, since those with more capabilities can potentially make firm-specific innovations through idiosyncratic technology combinations (Benner and Veloso 2008). The impact of process improvements within a given organisation may also be contingent upon the abilities of upper management. In the case of IT-enabled process improvements, organisational contexts where management has a high degree of entrepreneurial alertness, process improvements may act as ‘digital options’ and provide organisations with a platform for simultaneous exploration and exploitation (Sambamurthy, Bharadwaj, and Grover 2003).

From this review of the literature, we find support for the following two broad conclusions. First, process improvement initiatives will neither be uniform across firms nor homogenous within firms. Second, the impact of process improvement efforts are subject to a variety of contingencies, including the particular type of process improvement, the level of application for the process improvement, and the organisational and environmental context within which the process improvements take place.

Thus, while there may be an overall tendency for process improvement efforts to promote exploitative innovations at the expense of certain forms of exploration in particular contexts (Benner and Tushman 2002), there is certainly room for theorising about the potential ways that process improvement efforts can increase the likelihood of exploration. With this in mind, we intentionally reviewed the technology and innovation management literature looking for arguments and mechanisms through which process improvement efforts might drive more exploratory forms of innovation. We identified four broad categories for theorising in this regard: (1) process improvement as exploration; (2) capacity for exploration; (3) knowledge driving exploration; and (4) executive management and exploration. In the rest of the paper, we will address these four broad areas and develop sets of propositions in each.

### 2.2. Process improvement as exploration

Process improvement efforts themselves can be conceptualised in terms of exploratory activity and can often enable radical process innovations. Although technological innovations are invaluable, by somehow giving technological innovations primacy (as measured by patent data, for example),
researchers may neglect the ways that novel processes can enable radical and disruptive innovations. For example, many service innovations involve new ways of doing things and although service innovations may have technical components, they fundamentally involve customer-facing tasks and processes (i.e. a process improvement – e.g. Lyttinen and Rose 2003). Since service components are increasingly more vital to modern organisations (Zuboff and Maxmin 2002), this is an issue that cannot be so readily overlooked.

Proposition 1 Process improvement efforts positively affect process innovation.

There is a rich tradition in the management literature of how process innovations enabled radical outcomes. Perhaps one of the most well known is how Japanese car manufacturers completely disrupted the US car industry almost entirely with process innovations (Womack, Jones, and Roos 1990). Dell changed the landscape of the computer industry in the 1990s through process innovation (Magretta 1998) and IBM resurrected entire organisation through process innovations (Hamel 2000). Examples of such radical process innovation are endless – not only modern organisations such as Amazon, Wal-Mart, Southwest Airlines, and Nucor – but also traditional firms such as Ford Motor Company, McDonald’s, and Sears made their most dramatic impact more through process improvements rather than through technological innovation. Ford Motor Company, for example, revolutionised the manufacturing system by pioneering the mass production system, which enabled the production of large amount of standardised products on assembly lines (Hounshell 1984). Thus, certain forms of process improvement may be fundamentally more exploratory and targeted towards broader, more sweeping forms of process improvement:

Proposition 1.1 Exploratory process improvement efforts positively affect radical process innovation.

Process improvement efforts within established organisations, however, rarely involve such innovations that affect entire value chains. In practice, process improvement efforts tend to offer more humble, incremental results (Weick 2000; Benner and Tushman 2002). However, even in cases of incremental process improvement eventual outcomes could be radical. In fact, it has been argued that radically disruptive innovations such as the Internet are, in fact, the result of a series of incremental innovations along intersecting network trajectories (Tuomi 2002). Further, radical product innovations often require a process innovations to come to fruition (Utterback and Abernathy 1975), which in turn require innovative responses, thus setting off cascading innovations throughout networks of innovation in processes, technologies, and products (Boland, Lyttinen, and Yoo 2007). Thus incremental process improvements are necessary for both before and after breakthrough innovation (Weick 2000).

Proposition 1.2 Process improvement efforts enable radical product innovation.

Since management literature has a rich history of conceptualising organisations as complex systems (Ashby 1962; Beer 1984), one might look at processes as subsystems each with their own output. From a systems perspective, process improvements of segments of a process can enable flexibility through modular combination of the process segments (Parnas 1972). As work on modularity, product development, and process improvement indicates (e.g. Hargadon and Eisenhardt 2000), incremental change associated with strict standardisation on one level may enable radical forms of innovation on another level in the organisation. Standardised, rigorously managed processes within an organisation may be more readily recombined to enable that organisation the flexibility to adapt to change or drive broad innovation (Martin and Eisenhardt 2004; Farjoun
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2010) – often through the ‘meta routines’ which are processes that enable this recombination in organisations (Eisenhardt and Martin 2000). Therefore, taking a systems view of organisations and processes, there is a multilevel relationship whereby efficiency in one level of the system can enable change on another level (Farjoun 2010):

Proposition 1.3  Process improvement efforts on one level of organisational subsystems can enable radical forms of innovation on other levels of organisational subsystems.

In highlighting a way in which process improvement efforts can breed process innovations – both radical and incremental – we blur the line between process improvement, exploration, and exploitation. Process improvement can certainly drive incremental, exploitative improvements, which, in turn, can enable or effect radical innovations. Further, process improvement efforts can be characterised as a form of exploration in and of themselves. Thus, process improvements can directly drive exploratory forms of innovation. However, it is important to note that process improvement can also indirectly drive exploratory innovation. One way that process improvement efforts can indirectly drive exploration is by generating capacity for this exploration. Next we will discuss how process improvement efforts might drive this capacity.

2.3. Capacity for exploration

Improved efficiencies associated with process improvement in one portion of the firm enable innovativeness in another portion in way much more straightforward than those argued through a complex systems or modularity lens (Farjoun 2010). By making certain processes more efficient, organisations free resources that can potentially enable innovation.

Proposition 2  Process improvement efforts free resources that can be used for exploration.

The immediate way that this increased capacity manifests itself is through cost savings. If process improvements bring about cost savings, those financial resources could potentially be put to exploratory uses. Even in what one might refer to as the ‘zero-sum’ view of organisational resources, where resources must be divided between exploratory and exploitative activities (e.g. March 1991; Benner and Tushman 2002; Lin et al. 2013), successful process improvement can increase the resources for exploration while not sacrificing exploitation. Alternatively, in situations where resources are abundant and both activities flourish (Sutcliffe, Sitkin, and Browning 2000; Gupta, Smith, and Shalley 2006), additional resources might drive both exploration and exploitation.

Proposition 2.1  Process improvement efforts generate cost savings that can be used to fund exploration.

Similar to the way in which financial resources can be freed to be invested in innovative activities, human knowledge resources can also potentially be freed from administrative burdens through process improvement (Zigiaris 2000; Kim, Kumar, and Kumar 2012). The attention of knowledge workers is a scarce organisational resource (Ocasio 2011) and process improvements that free knowledge workers’ attention from repetitious or routine activities could allow knowledge workers to devote more time to exploration activities with less administrative burdens.

Proposition 2.2  Process improvement efforts reduce the administrative burden for knowledge workers, enabling them to devote more time to exploration.
This increased capacity for knowledge work does not only apply to individual humans, but also to horizontal organisational processes as well. More efficient operations in one area of a value chain may enable more exploration at another point (Hargadon and Eisenhardt 2000; Catmull 2008). For example, when there is a fixed window of opportunity, such as a required customer delivery date, shorter lead times in one portion of the process (e.g. production) due to process improvement may enable more time for creativity in another portion of the process (e.g. engineering). Krishnan, Eppinger, and Whitney (1997) refer to these segments of a process as ‘upstream’ (early) and ‘downstream’ (late) portions of the process.

**Proposition 2.3** Process improvement efforts that shorten lead times in an upstream (downstream) subsegment of the process allow more time for downstream (upstream) exploration within the same process.

Similarly, within a given subprocess, process improvement efforts associated with inherently iterative activities such as design may enable more and better experimentation through enhanced flexibility and adaptability (Smith and Eppinger 1997; Hammer and Stanton 1999; Farjoun 2010). For example, lean principles applied to product design and development may enable shorter cycle times and more iteration in product development (Karlsson and Ahlström 1996). Additional iterations allow for more experimentation that is associated with improved product innovation outcomes (Thomke 1998; Krishnan and Ulrich 2001). Thus, product design process improvement can drive the capacity of experimentation.

**Proposition 2.4** Process improvement efforts that improve the efficiency of experimentation positively affect increased exploration.

Although much thinking sets exploration and exploitation in contrast, in the context of process improvement, some have argued for how the two can be synergistic or mutually reinforcing – particularly in contexts where high reliability and resilience are required (Sutcliffe, Sitkin, and Browning 2000). Reliability implies that an organisation’s output remains consistent throughout ongoing exogenous and endogenous disruptions (Weick 1987; Roberts 1990). That this output is consistent does not mean that it does not change over the course of time and therefore does not preclude innovation. For example, Cisco can be said to reliably deliver both incremental and exploratory technological innovations (Gupta, Smith, and Shalley 2006). Rather, reliable organisations produce a consistent quality of output (Weick and Roberts 1993; Weick, Sutcliffe, and Obstfeld 1999). Weick (1987) and LaPorte and Consolini (1991) indicate that high reliability organisations often face a great deal of complexity and they deal with hazardous and/or expensive situations that do not tolerate failure. In such situations, redundancy (rather than streamlining), slack resources (rather than optimisation), knowledge overlaps (rather than specialisation), and loose coupling (rather than tight integration) may be the most efficient course of action. Further, process improvements that encourage experimentation and learning along with routinisation and standardisation may enable the adaptability necessary to deal with highly disruptive exogenous disturbances, and thus to radically innovate (Sutcliffe, Sitkin, and Browning 2000; Weick 2000). Therefore, as effected in the context of high reliability organisations, process improvements may involve freeing capacity for the same sort of practices that also foster innovation (i.e. slack, redundancy, etc. see Damanpour 1991).

**Proposition 2.5** Process improvement efforts drive exploration in situations of high reliability.
Such capacity-related arguments for the positive relationship between process improvement efforts and exploration can imply an immediate impact – such as the case with synergistic arguments where benefits are immediate (Daniela et al. 2004). Alternatively, this impact can be delayed somewhat, such as monetary cost example where the savings have to be monetised before they can be spent (Li et al. 2006). In other situations, this delay could be quite significant, such as impacts of process improvement on innovation through the knowledge acquisition associated with process improvement. Although longer term in its perspective, knowledge acquisition can be an important driver of innovativeness. Next we will address how process improvement efforts can foster the knowledge acquisition that might drive organisational innovativeness over a longer term.

2.4 Knowledge driving exploration

March (1991) initially formulated exploration in terms of a learning process where individuals within the organisation search outside of the established modes of problem solving in a given context. As such, organisations whose personnel have diverse, heterogeneous knowledge domains should exhibit more exploratory learning than those whose knowledge domains are homogenous (March 1991). Process improvement efforts are typically pursued through temporary, cross-functional teams (Hackman and Wageman 1995). It is a long-established tenet in organisational theory that individuals from different functional groups have differing orientations and capabilities (e.g. Lawrence and Lorsch 1967; Hansen and Nohria 2004), and such combinations of heterogeneous orientations and capabilities are explicitly a driver of exploratory activity, in March’s (1991) model.

Proposition 3 Process improvement efforts encourage the knowledge heterogeneity that drives exploration.

These cross-functional teams often include combinations of younger workers and more experienced workers. Six Sigma and ERP initiatives often require that organisational units contribute their ‘best people’ to such teams (Lengnick-Hall and Lengnick Hall 2006). Such a cross pollination of competencies enable individuals to learn from each other and from the application domain. This transferred knowledge and experience will broaden individual capabilities and improve the ability of individuals to innovate and respond to exogenous change in the future (Tambe, Hitt, and Brynjolfsson 2012). Process improvement efforts should not be considered the end of learning, but rather the beginning of a new learning process (MacDuffie 2000). In this sense, process improvement efforts that temporarily enlist a variety of individuals can support the absorptive capacity of organisations (Cohen and Levinthal 1990; Bingham and Davis 2012).

Proposition 3.1 Process improvement efforts positively affect the absorptive capacity of an organisation.

Beyond the learning enabled by the transfer of knowledge between individuals, the interaction across functional boundaries can result in the creation of forms of knowledge that are new to the organisation, as organisational groups engage in the difficult perspective making and taking activity (Boland and Tenkasi 1995). Such close interaction will enable the exchange of both explicit knowledge and ‘knowing in practice’ (Cook and Brown 1999) which allows for the generation of new knowledge, which can later enable more profound forms of innovation.

Proposition 3.2 Process improvement efforts positively affect knowledge creation.
Thus, to this point we have conceived of direct (process improvement as exploration) and indirect explanations (capacity and knowledge) for how process improvement might positively impact exploratory innovations. Of course, these impacts are stronger or weaker given different contingencies and the existing literature addresses some of these contingencies – particularly those associated with environmental dynamism and organisational structure (e.g. Benner and Tushman 2003). These moderators are largely conceived as exogenous to the process improvement activities. However, the impact of a process improvement on innovativeness may also be contingent on factors that are endogenous to the process improvement effort. Next we will address one such factor that is endogenous to process improvements: the potentially moderating influence of managers.

2.5. Executive management and exploration

As indicated above, within subunits or even across individuals, exploratory and exploitative activities may compete for resources (March 1991; Xue, Ray, and Sambamurthy 2012) and managers must make the decisions where to invest scarce funds. In big organisations with multiple loosely coupled subunits, each with their own distinct environments, exploration and exploitation activities can be orthogonal (Gupta, Smith, and Shalley 2006), but managers must still determine the goals of these subunits. Also, even in situations where exploitation and exploration are sufficiently balanced, managers must contend with the different mechanisms that maintain this balance, which could involve ambidextrous organisational forms (O’Reilly and Tushman 2004; Tushman et al. 2010; Lavie, Kang, and Rosenkopt 2011), varying environmental conditions (Uotila et al. 2009), simultaneous exploration and exploitation associated with resiliency (Sutcliffe, Sitkin, and Browning 2000), or punctuated equilibrium, which involves switching between periods of exploitation and exploration (Gupta, Smith, and Shalley 2006). In short, managers have agency and can intercede on behalf of exploratory activity in the organisation. Managers with greater vision, or entrepreneurial alertness (Sambamurthy, Bharadwaj, and Grover 2003), will set more exploratory process improvement metrics to enable radical innovation.

Proposition 4 Managerial vision will moderate the influence of process improvement efforts on organisational exploration.

As discussed earlier in the paper, there are many different forms of process improvement that have unique guiding principles (Sitkin, Sutcliffe, and Schroeder 1994; Sutcliffe, Sitkin, and Browning 2000). Process improvement efforts geared towards efficiency will have dramatically different results than process improvement targeted towards continuous learning, sensemaking, and resiliency (Weick 2000). There are a host of process improvement efforts that managers can draw from to implement change – such as Lean, Six Sigma, SCOR, and ERP – each with its own set of goals and assumptions. DiMaggio (1997) refers to an internally consistent set of goals and assumptions of cause and effect as the ‘logics of action’ associate with a particular course of action. Different process improvement techniques and strategies have different logics. As managers can set the goals and choose the approach for the process improvement efforts they will support, they implicitly draw upon logics that will have a direct impact on the outcomes of those efforts.

Proposition 4.1 The logic associated with the process improvement effort will moderate the influence of process improvement efforts on organisational exploration.
Process improvement efforts are expensive, particularly in the time associated with human resources. Even process improvement efforts that focus on efficiency will get managers accustomed to the idea of taking critical resources out of daily business activity in order to improve that activity. Even as the marginal returns of such efforts diminish over time (Winter 1994; Weick 2000), such efforts often sensitise managers to the power of such expensive, supporting activities that are outside of the value chain – activities similar to exploration. Over time such efforts can become part of the culture of an organisation. Thus, process improvement efforts may aid in helping managers to understand the value and more readily invest in exploratory activity (Walrave, Oorschot, and Romme 2011). As such, these sensitised managers will help their organisations to balance knowledge-creating activity with shorter term profit-driven activity (Scarbrough 1999), which is at the core of organisational ambidexterity (Benner and Tushman 2003; O’Reilly and Tushman 2004; Gupta, Smith, and Shalley 2006).

**Proposition 4.2** Process improvement efforts will positively affect the managerial vision for exploratory innovation.

### 3. Discussion

This paper is an exercise in theorising (Weick 1995). This theorising concerns the relationship between different forms of process improvement efforts and the exploratory organisational activity that breeds more radical forms of innovation. While we make no claim for an exhaustive, all-encompassing model, we do assert that many critical insights of the organisational discourse are not accounted for in what we describe as the prevailing model in both the academic and the practitioner literatures (see Figure 1).

The prevailing model takes a singular view of process improvement efforts. Through a blunt, direct, and positive relationship with exploitative activity, process improvement efforts are expected to drive more incremental forms of innovation at the expense of radical and disruptive innovations (e.g. Benner and Tushman 2002). In our theorising we are careful never to directly contradict this view, because it is a rigorously developed and supported view that makes a great deal of sense. However, in our effort to better appreciate the complexity of diverse organisational contexts, we explore powerful direct and indirect effects and contingencies that may also impact this relationship in a broader context.

Thus we look to a diverse body of literature to extend the prevailing model. From the literature on process innovation (Utterback and Abernathy 1975; Davenport 1993), we find that the processes themselves may embody disruptive innovation and they may enable radical product innovation (Proposition 1). Also in the spirit of systems theory (Ashby 1962; Beer 1984), we argue that that incremental process improvement together may account for disruptive innovation and that process improvement in one subsystem within a hierarchical system such as an organisation may enable more radical forms of architectural or generational innovation across other subsystems (Proposition 1.3). In taking a capacity view of organisational activities, we find that process improvements free up human, physical, and capital resources to pursue more exploratory activity (Proposition 2). Also, we argue that in certain circumstances, such as high reliability, it is precisely the exploratory activity that can be the object of process improvement efforts (Proposition 2.5).

Further, following the premise of the theory of exploration and exploitation, where heterogeneous knowledge sources encourage exploration (March 1991), we argue that diverse process improvement teams can directly contribute to highly innovative outcomes by virtue of
their heterogeneous knowledge sources or they can contribute to the innovative capacity of an organisation (Cohen and Levinthal 1990; Proposition 3).

A key insight in our analysis of the relationship between learning and process improvement is that completed process improvement efforts do not mean an end to learning. Instead, when such efforts are considered to be the beginning of a learning process that continues long after any particular project (MacDuffie 2000), one can better appreciate the long-term direct or indirect effects from process improvement efforts.

Finally, our analysis highlights the role of the manager, particularly with respect to large, global organisations. Such organisations have loosely coupled components and the resource allocation and goal setting is largely a function of managerial decision-making. Managers with greater vision can consciously fund exploratory activity and those with greater ‘entrepreneurial alertness’ can leverage process improvement efforts as platforms from which to engage in exploration (Sambamurthy, Bharadwaj, and Grover 2003; Proposition 4).

Figure 2 shows a model summarising these propositions taken together. This model is an extension of the prevailing view of the effect of process improvement on exploration and exploitation shown in Figure 1, with extensions for the proposals in the preceding pages.2

This model strives to present the complexity associated with direct and indirect effects of process improvement initiatives as they might drive exploratory activity and more radical forms of innovativeness. Rather than put this model forward as a formula for successful innovation, the model is a descriptive one, intended to remind practitioners and researchers alike about the complexity associated with what often appear to be small, insignificant changes. The impacts of process improvement efforts on innovativeness can be direct or indirect. They can be fairly immediate, such as the exploitative impact on the process itself, or can undergo a significant delay, such as the impact of process improvement on a firm’s absorptive capacity.

It is important for researchers to simplify reality with models such as the prevailing one (Figure 1) in order to make other researchers and practising managers aware of strong effects between common activities and critical organisational outcomes. Similarly, it is important to occasionally complicate the thinking of managers and academics alike (Weick 1990), as organisations, innovations and process improvement efforts are all complex phenomena. One cannot always deal
effectively with complexity using simple models (Ashby 1962). Rather, the thinking of managers and academics must have the requisite cognitive variety to deal with complex phenomena that are central to organisations. Our theorising is an initial effort to provide some of this requisite variety, the next step will be to empirically test some of the broad propositions developed in this essay.

4. Conclusion

Process improvement and innovation are two central topics for modern organisations and organisational theorists. In this work, we propose a number of mechanisms through which process improvement efforts can potentially drive more radical, exploratory forms of innovation. This theorising can have implications for practising managers, policy-makers, and management researchers. Practitioners can actively think through these propositions when designing process improvement efforts, and thus consciously make decisions not only regarding the direct outcomes of the efforts, but also indirect and long-term impacts of their process improvement approaches. Policy-makers may similarly think through these propositions when looking to regulate organisations through compliance-driven processes and the innovation-related outcomes that this might entail. Researchers may look to test these propositions and to extend them with more theorising.

Although there is some existing literature in this area, given the importance of both process improvement and innovation in contemporary organisations and across societies, we expect that this is just the beginning of a wave of upcoming research on the relationship between these two phenomena. Keeping in mind that there are different types of process improvements, multiple forms of innovations, and innumerable innovation outcomes, empirical research can help better to understand the relationships of specific forms of process improvements with specific innovations. Just as Benner and Tushman (2002) identified the strong relationship between a specific form of process improvement effort and a specific measure of innovativeness, future research should identify other relationships between particular aspects of these important phenomena.

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Notes

1. We acknowledge that BPR is different from other process improvement approaches such as TQM movement. Fundamentally, BPR focused on radical redesign of firm’s existing business processes and resources rather than iterative process improvements. Nevertheless, we argue that BPR and quality movements such as TQM share the common objective of achieving high efficiency, control, integration, and standardisation since the underlying aim of the BPR is to achieve improving critical performance measures such as cost, quality, service, and speed.

2. This model does not represent the entire nomological network that relates process improvement to exploration, exploitation, and more radical forms of innovation. Other relationships, such as shown in Figure 1, are omitted for the sake of simplicity. Also, the reader may wish to refer to other information on this topic – particularly those associated with organisational forms which have been hypothesised as important to this relationship (see Benner and Tushman 2003). For example, specific organisational forms such as ambidextrous or dual organisations are known to moderate the relationship between process management and technological innovations (O’Reilly and Tushman 2004; Tushman et al. 2010). Further, prior studies have shown that absorptive capacity and exploratory innovation facilitate radical forms of innovation (e.g. Dahlin and Behrens 2005; Zhou and Li 2012).
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