The productivity dilemma revisited: how process improvement can lead to product innovation

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Abstract

This paper explores how process improvement (PI) approaches affect companies' capacity to incrementally and radically innovate their products. Using a qualitative multiple-case study method, three different PI strategies were found - "strategic and holistic", "facilitating and empowering", and "operational" - and their associated mechanisms for enhancing the impact of PI on product innovation were identified. Moreover, PI approaches were considered as enablers for product innovation when used strategically; however, when following either a "facilitating and empowering" or an "operational" approach, PI was regarded as an indirect facilitator or as an irrelevant factor in relation to product innovation.

Keywords: process improvement, product innovation, productivity dilemma.

Introduction

Organizations face a great pressure to pursue contradictory and conflicting goals (Benner and Tushman, 2003). Managing tensions and contradictory goals is a fundamental challenge (Andriopoulos and Lewis, 2009), as "the strengths of thriving firms can become weaknesses" (Adler et al., 2009: 107) and hinder their capacity to survive. In 1978 Abernathy introduced the notion of the "productivity dilemma", highlighting the importance, but at the same time the downsides of gaining efficiency through productivity improvement activities, as these can "hinder learning and innovation, leaving organizations rigid and inflexible" (Adler et al., 2009: 99). More recently, innovation management and strategy scholars have questioned the benefits of PI approaches such as lean, six sigma, theory of constraints (TOC), and total quality management (TQM), as they may enable incremental product innovation, but hinder radical innovation (Benner and Tushman, 2003, 2015).

On the other hand, a considerable amount of research has been undertaken on different PI approaches in the operations management literature (Modig and Ahlstrom, 2012, Sousa and Voss, 2002). This research highlights the benefits these bring to organizations, not only in term of greater efficiency and flow, improving product quality, improving productivity, but also in creating customer value, increasing customer satisfaction and innovating products and

services (Kim et al., 2012). Moreover, several operations management scholars have suggested that PI approaches consists of two contradicting dimensions; for example, Schroeder et al. (2008) argued that "Six Sigma can be viewed from two different structural dimensions: structural control and structural exploration" (p. 544). Also, Sitkin et al. (1994) identified two distinct approaches for TQM such as total quality control and total quality learning.

While some researchers adopted a primarily control-oriented view of PI approaches and argued that PI approaches hinders product innovation, other scholars adopted a learning-oriented view, arguing that PI approaches create a learning environment that fosters innovation (Pekovic and Galia, 2009, Prajogo and Sohal, 2001). The control-oriented perspective is linked to the more mechanistic (hard / tool-based) side of PI (Abrunhosa and Sa, 2008, Bourke and Roper, 2015) such as process management, waste minimization, statistical process control, and structured method (Benner and Tushman, 2003, Perdomo-Ortiz et al., 2006); instead, those adopting a learning-oriented view focus on the softer (behavioural) side such as employees' involvement, team work, human resource practices, leadership, training or/and people management etc. (Martinez-Costa and Martinez-Lorente, 2008, Abrunhosa and Sa, 2008) in addition to the hard practices. Nonetheless, empirical research shows mixed results regarding the relationship between different PI approaches and incremental and radical product innovation (see, e.g., Benner and Tushman, 2002, Kim et al., 2012).

In-addition to the heterogeneity of the theoretical and empirical arguments that exist in the literature, little is known about the mechanisms that companies can use to manage the interplay between PI and incremental and radical product innovation. Therefore, this research examines *how PI approaches affect companies' capacity to incrementally and radically innovate their products.*

Methodology

This research adopted a qualitative multiple-case study method to explore "how and "why" PI can play different roles in organizations and "how" it can act as an enabler or barrier for innovation (Yin, 2009). Following the methodology of comparative case study (Eisenhardt, 1989, Voss et al., 2002), the selected cases were purposefully sampled with the aim to achieve maximum variation (Denzin and Lincoln, 2011). Therefore, three companies that are based in the United Kingdom were selected. All of the three companies are large international manufacturing companies, industry leader in term of product innovation. However, they operate in three different industries - automotive, aerospace and pharmaceutical - and vary in their implementation of PI approaches. Consequently, multiple sources of evidence- semi-structured interviews, documents and research diary and reflections- was collected (Voss et al., 2002). Over a 15-months period a total of 37-semi-structured interviews with informants from different functional specialisms were conducted and a total of 55- online and internal-relevant documents were collected. Data were analyzed within and between cases through a multi-stage iterative process which includes several rounds of coding, categorization, and refinement by using NVivo software[1]. Table 1 describes the characteristics of the research context. Pseudonyms are used in this paper to maintain the confidentiality of the studied companies. These are: *Automotive, Aerospace, Pharm*a.

[1] More details on the analysis process are available from the author

Table 1- Research context

	Automotive	**Aerospace**	**Pharma**
Main Business	To design, innovate, engineer, manufacture, market and service premium vehicles, parts and accessories, sustainably, in a global market place	A pre-eminent engineering company focuses on world-class power and propulsion systems	To create, discover, develop, manufacture and market of pharmaceutical products, including vaccines, health-related consumer products
Sector/ Industry	Manufacturing/ Automotive	Manufacturing/ Aerospace	Manufacturing/ pharmaceutical
Company status in the industry	The largest automotive company in the UK	It is the largest aero engine company in the UK and in Europe and the second largest in the world	Having three world-leading businesses: pharmaceutical, vaccine, and consumer healthcare.
Size	Large (38,000 employees)	Large (49500 employees)	Large (99,500 employees)
PI usage	- Using PI across the organization where appropriate - Using different types of PI approaches and practices- such as lean, six sigma, TQM, etc. - There is a clear awareness of PI across the company even in R&D area	- Using different PI approaches- such as lean, six sigma, TQM- across the organization - Having a formal process for PI - Having dedicated teams for facilitating PI implementation	- Using PI only in manufacturing - Using different PI approaches - There is no formal program for PI - There is no awareness of PI across the company except in manufacturing
Product innovativeness	Industry leader, have different types of product innovation both incremental, and radical	Industry leader, mostly focused on improving current product (incremental product innovation)	Industry leader, have a different types of product innovation both incremental and radical
Time-to Market	Relatively long (5-7 years)	Long (7 - 12 years)	Long (12- 15 years or more)
Degree of regulations	Relatively high	High	High
Main Similarities	-All the research companies are large, manufacturing that based in the UK and industry leader in term of product innovation -Using PI approaches for more than 15 years ago.		
Main differences	The research companies vary in the degree of PI usage, product innovativeness and product type		

Findings

The cross-case analysis showed that the three studied companies differ in their approach for PI. Therefore, three strategies for PI were identified; these are *strategic and holistic approach* in *Aerospace*, *facilitating and empowering approach* in *Automotive* and *operational approach* in *Pharma*. Under the strategic and holistic approach, PI is implemented as a company-wide strategy in which everyone should be involved in doing improvement, on the other hand under the *facilitating and empowering approach* for PI, PI usage is left to people decision and employees are empowered to use the method they found appropriate. However, under the *operational approach* for PI, PI approaches are used only in manufacturing area

and not imposed on people in the organization. This section will compare the three identified PI approaches in three of the studied companies (*Aerospace, Automotive, Pharma*) in term of the main characteristics, scope of PI usage, responsibility and accountability toward PI, the consequences of these three strategies for PI on product innovation and the tactics that are used to enhance the impact of PI approaches on innovation (see table 2).

Main characteristics

The difference in the companies' strategies toward PI is evident through the following: first, the PI training strategy in the company, second, the management system in the company, third, PI aspects (tools and/ or behaviors).

Whereas under the *strategic and holistic approach* for PI, people's involvement in improvement activity is expected, under the *facilitating and empowering approach*, it is up to people to get involved or not. For example, the head of the production system in *Aerospace*, which uses the *strategic and holistic approach* for PI, elaborated about this:

"So you know, you can't rely on 6% of your organization to do all your process improvement. So we've got to move away from that mind-set and more of get everybody involved. And we were… and we measure that, so we do something called Lean Improvement for Everybody. So our target is 100%. We want every single person to do an improvement"

Whereas, the head of business excellence in *Automotive*, which uses the *facilitating and empowering approach* for PI, said:

"Everyone uses process improvement to improve their processes. What tools they use are all different. So, we have not kind of mandated, like General Electric said, everything has to Sigmatised. Everyone uses Six Sigma, this is the standard. Over here we have said, use Six Sigma, use 8D, use Lean, use Kaizen, use whatever you want to…There is no embargo on that".

Regarding *Pharma*, the use of PI is *operational*, which means that PI is used only in manufacturing, for instance, the Director of finance, strategy and operations in rare disease, in R&D unit in *Pharma* said:

"The lean sigma type thing tends to be much more in the manufacturing space"

Another distinguishing factor between the studied companies approach toward PI is the practices and PI aspects that are considered in each company. For example, while in *Aerospace* PI approaches are regarded as both tools and behaviors, in the other two companies PI approaches are regarded as set of tools. However, there is awareness of PI in *Automotive* across the company even in the R&D and product creation areas but there is no use and awareness of PI in *Pharma* in the innovative areas. The importance of the behavioral element of PI in *Aerospace* was evident through the cultural transformation programs, PI initiatives and improvement governance in the organization which aim to change the thinking, the behaviors of people in the organization and to sustain improvement benefits across the organization.

Scope of process improvement

The studied companies' approaches PI differ also in the scope of PI implementation. Under the *strategic and holistic approach* for PI in *Aerospace*, PI is used everywhere in the company, for instance the head of the production system described the spread of PI in *Aerospace:*

"I do know that all parts of our organization are using process improvement. And we're all getting the results that we want to. I think the biggest difference with process improvement between the three areas [R&D, engineering, Manufacturing], is the pace"

Although, *Aerospace* PI approach is holistic one, the degree in which different areas in the business use PI is different and this means that they have a different level of maturity of PI across the company. This variation is a result of adapting PI to the purpose of the function in which PI is operating in. For example, the head of the product development system described the interpretation of lean to the product development environment:

"We train certainly the people that contribute to the product development system process where we look for agile approaches. So back to this interpretation of Lean in a product development environment, a product development business environment, so we do train people in approaches that define Lean in a way that is appropriate for development. We don't define Lean in terms of the way that you would define it for a factory for instance. We do take on board Lean concepts"

Another way of adapting PI to different areas in *Aerospace* is through having different variants and elements of the production system which is cross functionally owned. For example, there is operations variant, supply variant and office variant and each is used in different environment according to the suitability of the variant in the function. For instance, the head of continuous improvement in engineering elaborated:

"We've got something called the production system which been developed in [Aerospace] which is sort of framework for improvement we've got three variance of that we use across we've got manufacturing variant, purchasing, supply chain variant and office variant at the office variant is applicable to all of engineering and we just start to kind of deploy that in engineering. Again, it takes all the principles of good process improvement theories, got activities to do just make them relevant to office environment."

On the other hand, under the *facilitating and empowering approach*, the scope of PI implementation in *Automotive* is different, so PI can be used everywhere in the company if needed. The skills are there and people are free to use it or not. For instance, the head of business excellence explained:

"It's across the business. Everyone uses process improvement to improve their processes. What tools they use are all different".

In *Pharma*, under the operational approach, PI approaches have only been used in manufacturing area. Moreover, there is minimum communication between R&D and manufacturing as they seem to be separate organizations. The product introduction lead described the differences between the R&D and manufacturing areas:

"I think the focus from R&D and from [manufacturing] is very different. It's probably not as well aligned – and this is my personal view – at what it can be. Where R&D's focus is to have innovative products and better products that are, you know, first in class, they are new, they are different….Whereas, [manufacturing], obviously, is focused on efficiency, you know, driving costs down, compliance to the regulators' requirements, so that's quite key for [manufacturing]. [Manufacturing], yes, I mean, obviously the focus would be slightly different".

Despite that the use of PI approaches are only in manufacturing areas, currently there is a tendency to spread PI approaches- such as lean- outside the manufacturing, For example, the manufacturing unit manager in *Pharma* explained:

"I would say most of the Lean Six Sigma-type ways of working and principles are in manufacturing. In the last three years, [Pharma] has been actively trying to spread, I would say, not as much Six Sigma but more lean principles into some of the functional processes and business processes: reduce waste, implement performance management and problem-solving, and standards outside of the factory. It's very high level, but it is something the company's actively been doing, which I think is good"

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Responsibility and accountability of PI

In *Aerospace* everyone is responsible for doing improvement activity, for instance the Technology lead in the innovation team in *Aerospace* said:

"we do encourage people to get involved. So unless you've got a role that is directly involved in innovation or continuous improvement or Six Sigma."

Also, employees' involvement in improvement activities is measured by their performance measurement system. For example, the head of the production system in *Aerospace* described this*:*

"We've got an IT system called My Learning, which everyone… if there's anything mandated that people need to do…when you've done your improvement project, you fill in like a confirmation. It's very quick to do. And you manager affiliates it. So what we say is, it's not up to the improvement function now. We don't govern all the improvements in the organization, because we don't have the capacity to do that. The manager says, yes, you have done an improvement. And then they'll tick it off on the system to say that they've done"

In *Automotive*, the accountability is for the process owners, for instance in a joint interview with the Product creation and development system process and project manager and the Process planner, in *Automotive* they said:

"So I guess, when a process improvement occurs, whoever operates or owns the process will be involved in the improvement of that process. We don't, you know, we don't have big process improvement teams who go out and improve processes of other people's behalf."

For the responsibility people are empowered to decide and see what is appropriate for example the Product creation and development system process and project manager and the Process planner, in *Automotive* said:

"People are empowered to own their own processes and improve their own processes within the boundaries of what they can operate within. So, if they do want to improve their process but it has a knock-on effect into the next process, well, you've got to get the person who owns the next process to buy into your changes".

In *Pharma*, there is no clear responsibility for PI, but the manufacturing area is the one that is responsible for PI for example the Director, Inhaled Drug Product Design and Development in *Pharma* said:

"*We don't have a centralised team. We talked about the standardised ways of working the process improvement approaches in a manufacturing environment, and there we do have an organisation whose function is to operate at manufacturing sides and drive these approaches, this culture into iterate thinking. Again, in R&D that's far less of a way of thinking".*

Impact of PI on Innovation

The three different approaches for PI in the three companies differ in their impact on product innovation. For example, under the strategic approach in *Aerospace*, PI is seen as enabler for product innovation. For instance, the head of continuous improvement in engineering described the benefit of using lean in the design and engineering areas:

"*I would like to talk about it within engineering it is really… we can make the processes as easy and as simple and you can take out as much waste you can from that… you can take away the time that spend on rework or waiting time all the wasteful time and focused that on the interesting innovation so you can spend more time designing… more time thinking about what could new concepts be and what new radical ideas… and have less time on the stuff that is annoying and wasteful so you don't actually do as many rework loop, so you don't have to spend time on non-value activities and you can really focus on training and the expertise of engineers on engineering. So, I think that's quite well linked."*

Also, the head of the production system in *Aerospace* argued that improvement and innovation activities go hand in hand:

"I don't see how you can be innovative if you don't have that improvement mind-set. I think they go hand-in-hand, because you're kind of doing exactly the same thing. You're looking for a better way. You know, innovation is we're looking for a better way to do it, or a different way of working. And an improvement mind-set, again, you're looking for exactly that same thing. Is there a better way of us doing it? Is there a different way of us doing it? Can we do it with less waste? Can we do it cheaper? Can we do it to a higher quality level? You know, can we do it faster?"

Under the *facilitating and empowering approach*, PI approaches are seen as indirect facilitator or as irrelevant this depends on the conceptualization of PI in the company. For

example, defining PI as set of tools only will hinder or regarded as irrelevant to innovation whereas defining it as behaviors, PI is considered as enabler for innovation. For instance, Product creation and development system process and project manager in *Automotive* said:

"the question as to what you believe Lean is, because if you believe Lean is a toolset, I think that's where we fail. If you believe Lean thinking is a mind-set, I believe there is a lot of potential there, because, again, one of the principles Daily Kaizen, continuous improvement, I think that's something in [Automotive], and potentially traditional Western companies, we miss. ...So I think if we can get Lean behaviours embedded so that people are thinking about the Lean principles, I think that's tremendously powerful. I think if we just assume we can lift Lean tools from the manufacturing environment and deploy them in product creation, we are wasting our time. Because it's a different environment. The tools need adaption, but the behaviours, I think, are very good…even for innovation"

Aligning to this view point, the Head of research in *Automotive* conceptualizes PI as set of tools that are irrelevant to innovation:

"I think just a tool to use and when appropriate. I don't think we innovate any more for them and I don't think we innovate any less for them. I just see them as a tool."

Under the operational approach for PI, PI is regarded as irrelevant for product innovation because the two are separate structurally and in location. For example, the director, Inhaled Drug Product Design and Development in *Pharma* described the differences between manufacturing and the R&D areas as:

"So, I would say our approach is night and day in terms of similarities. I think [manufacturing], our manufacturing environment, particularly in a highly regulated manufacturing environment, everything has to be standardised. In fact, that's really our goal that through development is to create a process, instructions, a way of working that is entirely standardised. And the [manufacturing] is our manufacturing organisation, the [manufacturing] approach would be to use those standardised processes and aim to continually improve those processes. In [manufacturing] it's all about standardisation, in R&D, I think we're much more likely to try and avoid standardisation as much as possible. So, I would say they are used much more purposefully in the [manufacturing] environment. So, the business will be aware of these tools and the approaches that can be used. But in a manufacturing environment they are found… essential in the culture."

Tactics to enhance the impact of PI on product innovation

Different mechanisms are used by the studied companies to manage the interplay between PI approaches and innovation. Some of these mechanisms are at the company level and others at individual level. For example, under the *strategic and holistic approach* for PI, *Aerospace* uses three main mechanisms to enhance the impact of PI on product innovation. First, conducting balanced training programs. For instance, there are trainings for PI and others for innovation. These training programs are conducted at the company level. For instance, the technology lead described this:

"*So, what's desirable, whether it was continuous improvement or innovation… so there will be something, and everyone has something around training, as well, because we're always trying to continuously improve the staff across the board, so there's always a training line item on there for everyone"*

Second, having balanced performance objectives at the company level. For instance, under the *strategic and holistic approach*, *Aerospace* seeking the balance between improvement and innovation through having performance objectives for PI and others for innovation at the company level. These objectives are managed in *Aerospace* through a formal review process to encourage people to get involved either in improvement or in innovation activities. For instance, the Technology lead said:

"And actually, employees in general have an objective. So, everyone has objectives as part of your role around innovation, be it continuous improvement or true innovation, a large innovation type thing. So everyone is encouraged at some level to get involved, every employee."

Third, varying the level of PI maturity within the organization through adapting PI to the area requirement. For instance, the head of continuous improvement in engineering emphasized the importance of adapting PI to the engineering and design area:

"we got much careful in how we translate. So it is relevant for engineers equal the waste, we use value stream mapping ….. I think all the tools are absolutely relevant just having practitioners are able to translate the messages and make those connection for engineers from the manufacturing into things around data or around knowledge creation around training and skills …the talent of process improvement and lean are universal"

Under the *facilitating and empowering approach* for PI in *Automotive*, two main mechanisms are used to manage the interplay between PI and product innovation. First, balanced performance objectives. Similar to *Aerospace, Automotive* uses performance objectives to support both improvement and innovation. However, in *Automotive* the performance objectives are balanced at the individual level. Thus, employees have performance objectives that are future-oriented and current business oriented. For instance, the marketing communication director described his performance objectives:

"so we try and get the balance, so because you always want enough of your objectives to be the forward thinking ones. Because the thing is, the reality is the business is hugely complex, everybody's always very busy. You can very easily just spend all day very easily with dealing with all the stuff of today. But of course you've got to give yourself enough bandwidth to kind of make sure you're heading in the right direction longer term **….***Then in terms of how can the business become more excellent in the future? I think then you are into the more future-type objectives. So we're always trying to get a mix in objectives of what should we be doing to do the basics well, and then where next is the business trying to head?"*

The second mechanism that *Automotive* uses is the flexibility between empowering approach for PI and the process-orientation in the company. For example, *Automotive* has moved from an organizational structure that is based on functions to a structure that is based on processes. Therefore, there are processes for leadership and strategy, finance, HR, research, product development and manufacturing etc. However, despite the tendency toward using processes in different parts of the organization, *Automotive* follows PI empowering approach for people in the company and this allow maintaining the rigor from processes and the flexibility through people empowerment.

However, under the *operational approach* for PI in *Pharma*, improvement and innovation goals get balanced through using PI and innovation in two structurally separate areas. For example, innovation is mainly located in R&D area and PI is more dominant in manufacturing area. For instance, the Director, Inhaled Drug Product Design and Development, in *Pharma*, described the differences between the manufacturing and R&D areas in term of their main focus:

"I think that having come back from the [manufacturing] environment, like I say, the [manufacturing] environment and R&D are chalk and cheese, and that's partly, cultural, it's a mind-set difference, rather than being a necessary difference"

Table 2- Identified PI strategies

	Strategic and holistic approach	**Facilitating and empowering approach**	**Operational approach**
Main characteristics	• PI is part of the overall company's strategy • Draws on both tools and behavioural aspects of PI approaches	• PI approaches are not imposed and employees are free to use PI when they regard it applicable and useful. • PI is regarded as a set of tools. However, there is	• PI approaches are used only in manufacturing and mainly as tools to increase efficiency

		a clear awareness of PI in the company	
Scope of PI implementation	• Everywhere in the company, but with varying degrees of maturity	• It can be applied everywhere in the company, when needed	• Only in manufacturing
Responsibility and accountability for PI	• Accountability: There are different specialized teams that facilitate, develop and ensure the use of PI in the organization • Responsibility: all employees in the company are responsible for PI	• Accountability and responsibility: the process owners are in charge of improvement, however no specific PI approach (lean, six sigma etc.) is utilized	• There is no clear accountability and responsibility for PI across the firm; however, the manufacturing function is responsible for PI in its operations
Links between PI and product innovation	• Generally speaking, PI is regarded as an enabler for product innovation	• PI as indirect facilitator of product innovation by maintaining efficiency	• PI regarded as irrelevant to product innovation
Tactics to enhance the impact of PI on product innovation	• Varying the level of maturity between functions and adapting it to the purpose of the functional area. • Balanced performance objectives (for both PI and innovation)	• Not imposing PI on people in the organization and at the same time having a process-oriented structure • Balanced performance objectives (for both PI and innovation)	• PI tends to be disconnected from innovation, as innovation is mainly located in R&D and PI in manufacturing

Discussion and conclusion

This research explored how PI approaches affect a company's capacity to incrementally and radically innovate its products. The findings show that there are three different PI strategies that are used by the studied companies. Specifically, PI approaches were considered as enablers for both incremental and radical product innovation when used strategically; however, when following either a facilitating and empowering or an operational approach, PI was regarded as an indirect facilitator or as an irrelevant factor in relation to product innovation.

This study makes four main contributions. First**,** this research contributes to the longstanding debate on the productivity dilemma (Abernathy, 1978; Adler et al. 2009; Benner and Tushman, 2015). Previous research in strategy and innovation management literature have criticized productivity-enhancing activities such as PI approaches for driving rigidity, standardization and variation-reduction which hinder organizational adaptability and innovativeness (Benner and Tushman, 2003). However, the findings of this research show that PI approaches are not necessarily barriers for product innovation; in fact, PI approaches were considered as enablers and essential to facilitate incremental and radical product innovation. This is because PI approaches provide clarity for the innovation process and allow people the time and mental capacity to innovate. This argument reinforces and extends what found by Kim et al. (2012) and Jansen et al. (2006) who stressed the importance of process management and formalization for different types of innovation. Second, this study

extends the body of literature on the relationship between different PI approaches- such as lean, six sigma, TQM- and product innovation (Bourke and Roper, 2017; Kim et al. 2012). A considerable amount of research has been conducted on the impact of different PI approaches on product innovation. However, the findings of this research move beyond the direction of the relationship between PI and product innovation and identified three PI strategies - "strategic and holistic", "facilitating and empowering", and "operational"- and their associated mechanisms which enhance the impact of PI approaches on product innovation. Third, research in operations management literature has discriminated between hard (tools / techniques) and soft (behavioural) aspects of PI (Bortolotti et al., 2015, Choo et al., 2007, Zeng et al., 2015). The findings of this research extend this by identifying four dimensions for PI: strategy, formality, scope and responsibility. Finally, by identifying the mechanisms in which the studied companies manage the trade-off between radical and incremental innovation, this research contributes to the debate on how to generate incremental and radical product innovation (Raisch and Birkinshaw, 2008). Previous research stresses the importance and the challenges in pursuing incremental and radical innovation as different types of innovation require different mindsets (Lin and McDonough, 2014). For example, radical innovation is about developing new products that meet emerging or latent customers' needs, while incremental innovation mainly relates to improving existing products to meet current customers' needs (Benner and Tushman, 2003). While other research identified the role of structural separation (Tushman and Oreilly, 1996), culture (Gibson and Birkinshaw, 2004), routines (Adler et al., 1999), and senior management cognitive frame (Smith and Tushman, 2005) to manage the tension between incremental and radical innovation, this research highlights the importance of process-orientation, people empowerment and performance objectives in managing conflicting goals.

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