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Suggestions for the Next Wave of BPM Research: Strengthening the Theoretical Core and Exploring the Protective Belt

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Abstract:

In this paper, I present a reflective and generative analysis of business process management research, in which I analyze process management and the surrounding research program from the viewpoint of a theoretical paradigm that embraces analytical, empirical, explanatory, and design elements. I argue that this view not only reconciles different perceptions of BPM and different research streams, but that it also informs ways in which the BPM research program could develop into a much richer, more-inclusive, and overall more-significant body of work than it has to date. I define three elements of a BPM research agenda, give several examples of exciting existing research, and offer key opportunities for further research that can (a) strengthen the core of BPM, (b) generate novel theory from BPM in relevant and topical big issue domains, and (c) explore more rigorously and comprehensively the protective belt of BPM assumptions that much of the present research abides by. The paper ends with some recommendations for continuing the debate about what constitutes BPM and some suggestions for how future research in this area might be carried out.

Keywords: Business Process Management, Research Agenda, Theory Development, Research Program, Recommendations.

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INTRODUCTION

Many research fields have an interest in business process management (BPM) because it combines knowledge from information technology, management, behavioural psychology, institutional economics, and other sciences for analyzing, designing, and improving operational business processes. For instance, research on organizational and management science has long examined how work processes and routines can be analyzed and designed (Pentland, 2003), how process innovation can be managed (Reijers & Mansar, 2005; Khazanchi, Lewis, & Boyer, 2007), and how processes can be standardized (Davenport, 2005). Research in psychology, by contrast, has looked at the reasons for why people sometimes choose not to follow and instead to deviate from work processes prescribed to them (Galperin, 2012). Technology research has developed tools to model, enact, analyze, or simulate processes (Dumas, van der Aalst, & ter Hofstede, 2005).

In the information systems field, a considerable deal of research on BPM has been undertaken that focuses on process-aware information systems that draw information systems engineers', managers', and users' attention from data and objects to the processes of the organizational environment. This shift in attention has spawned many streams of research on process topics, such as:

- Using process models for analysis and design (Curtis, Kellner, & Over, 1992; Recker, Rosemann, Indulska, & Green, 2009),
- Examining processes in information systems analysis and design initiatives (Kautz, 2001; Müller, Mathiassen, & Balshøj, 2010),
- Developing process mining software that evaluates processes instead of data (van der Aalst, 2011), or
- Developing information systems built on process rather than data schemas (e.g., Reichert & Dadam, 1998).

What is common to all these developments and studies on BPM is that at the heart of each are the notions of processes, process awareness or, more broadly, process orientation (Dumas, van der Aalst, & ter Hofstede, 2005; van der Aalst, ter Hofstede, & Weske, 2003; Dumas, Recker, & Weske, 2012). So, we could argue that designing, maintaining, and growing process orientation as a guiding principle in designing and analyzing information systems and work systems is the cornerstone of the BPM paradigm. We can understand a paradigm as a school of thought in which researchers share a set of assumptions and, in turn, jointly engage in a research program based on these assumptions. This does not imply that the research in a paradigm is programmatic (in fact, most is emergent rather than designed) or that there can't be multiple theories in a paradigm provided that, at the most general (i.e., paradigmatic) level, a set of shared assumptions is followed. Examples of such paradigms are evident in most mature fields. In psychology, large schools of thought follow the paradigm of the human as a symbol processor, and, in economics, much research has been founded on the paradigm that humans are rational decision makers (Burton-Jones & Grange, 2013).

I deliberately draw the analogy between BPM and theoretical paradigms (Kilduff, Tsai, & Hanke 2006) so that I can critically reflect on BPM research to date and suggest research questions that I believe should follow. For this purpose, a paradigm perspective is useful because paradigms (a) have well-defined attributes such as goals, characteristics, and problems (Kilduff, Tsai, & Hanke, 2006; Lakatos; 1970), and (b) provide a vocabulary to inspect the theory fundamental to a paradigm from the view of both the established research program and potential program shifts that can lead to the paradigm's progression (Lakatos, 1970).

In this paper, therefore, I use the paradigm lens to reflect on what I believe are important research problems and opportunities in BPM that we as a community should address. This reflection is not meant to suggest the development of a BPM theory, nor that the BPM research area is precisely bounded and meant to be kept separate or isolated from related research streams. Instead, I hope that the reflection will generate a more open and inclusive perspective on what constitutes BPM research, and that it will open pathways in which BPM research can benefit from and be married with research in related fields and streams. As a preamble to this generative reflection, I first elaborate on my understanding on BPM research from a theory viewpoint. This is important because I will then examine current and future BPM research with this understanding in mind.

IS THERE THEORY IN BUSINESS PROCESS MANAGEMENT?

I realize that many colleagues would define BPM differently, but, for the purpose of this paper, I adopt an established and longstanding definition proposed by van der Aalst, ter Hofstede, and Weske (2003, p. 4), which suggests that BPM is about:

> *supporting business processes using methods, techniques, and software to design, enact, control, and analyse operational processes involving humans, organizations, applications, documents and other sources of information.*

This definition is useful for a reflection on BPM research because it draws attention to BPM's multifaceted nature that makes up its allure to so many research fields. It mentions elements such as information, different tools and techniques (computer based or not), and the involvement of different actors and different levels of organizational reality. Therefore, I contend that this view on BPM can be shared among researchers from various fields including management, computer science, information systems, operations management, and others because scholars in these fields can select their phenomena of interest (e.g., the information required to make BPM work, or the technology that provides this information), their focus of analysis (e.g., the people or the organization), and even the type of process (e.g., a business process, a service delivery process or a software process) and the means of management applied to it (e.g., standardizing, redesigning, executing or outsourcing). This view of BPM is thus deliberately broad and inclusive, and suggests at the outset that there are more areas and fields to BPM research then what is commonly denoted as such. For instance, research in supply chain management also concerns the management of (inter-organizational) processes, even though most of this research is not normally described as BPM research.

So does this view of BPM imply the existence of a theoretical paradigm? To answer this question, it is purposeful to first delineate what I mean by theory. In the most general sense, I view theory as a socially constructed conceptual model that represents an account for some subset of phenomena in the real world to achieve some purpose (Weber, 2012, pp. 4-5). This means that theories are developed to represent a particular class of phenomena—such as the things an organization does to create value: its processes—with the view to achieving a causa finalis (Gregor, 2006). Often, the causa finalis is explanation or understanding (Weber, 2012; Hovorka & Lee, 2010), but I share the view that theory is not constrained to only explanation but can be means to different, sometimes perhaps even opposing, ends, such as with theories for action or theories for design and development (Gregor & Hevner, 2013). Using this view allows us to integrate a large share of the variety of research on BPM that we have seen over the years as manifestations or examinations of different types of theory under Gregor's (2006, p. 620) classification (see Table 1).

In constructing Table 1, I included examples from what many consider to be "core" BPM research and I also included examples from "other" research streams that examine processes of various kinds and how they can be managed and/or improved. I constructed the overview in this manner mainly because I wanted to highlight that processes as a phenomena have always been, and will continue to be, of interest to many research communities in a variety of fields, even if this work is not explicitly carrying the BPM banner. This is important, I believe, because an open and inclusive understanding of BPM will allow all fields to be bettered by developing a shared understanding of how others groups examine similar, if not identical, phenomena and problems, and how much all fields may learn from each other by integrating these largely disjoint research streams more in the future.

Table 1: Different Theoretical Views on BPM Found in the Literature		
Type of theory	**Definition**	**Selected examples from BPM research and from research on processes in general**
Analytical theory	Describes and analyzes what essential BPM phenomena are and how they are related.	Sets of workflow patterns that describe and analyze how well different workflow engines support processes (van der Aalst, ter Hofstede, Kiepuszewski, & Barros, 2003). Analysis and validation of constructs that describe the TQM philosophy (Ahire, Golhar, & Waller, 1996).
Explanatory theory	Provides an explanation of how, why, and when certain BPM phenomena occurred.	The study of which process redesign heuristics are effective (Reijers & Mansar, 2005). How organizational change is effected through software process improvement (Müller, Mathiassen, & Balshøj, 2010).
Predictive theory	States what changes to BPM phenomena will occur under certain conditions.	The use of process mining technologies to predict process completion times (van der Aalst, Schonenberg, & Song, 2011). Predicting stability and change in process routines by modelling them as networks of action (Pentland, Hærem, & Hillison, 2011).
Explanatory and predictive theory	Provides both an explanation and a prediction about how, why, and when in the future BPM phenomena will occur.	Theories that explain and predict continued use of process modelling grammars (Recker, 2010). Explaining and predicting the role of ERP software in business process reengineering (Soliman & Youssef, 1998).
Design theory	Gives explicit prescriptions (e.g., methods, techniques, principles of form and function) for constructing BPM artefacts.	Requirements for information systems to support a sense of collective responsibility about processes (Majchrzak & Wang, 1996). Development of advanced process model repositories (La Rosa et al., 2011).

Several points are worth highlighting. First, Table 1 provide evidence that, indeed, we can see much research on BPM as being concerned with the development and application of theory—the construction of accounts of particular phenomena (in our case, mostly processes, their models, their enactment in systems, etc.), which have been developed for certain goals: to analyze, explain, develop, enact, design, and so on.

Second, Table 1 also shows that different strands of BPM research (say, the managerial versus the technological streams) and their fundamental views on what BPM is can actually be reconciled. Many of the prominent software artefacts in BPM such as ProM (van der Aalst, 2011), ADEPTflex/ARISTAflow (Dadam & Reichert, 2009), or the more-recent Apromore (La Rosa et al., 2011) can all be seen as instantiations of BPM design theories, and are based on some fundamental assumptions and propositions of how such systems should work. In other words, the BPM universe is not as fragmented as some debates and commentaries may suggest. Third, Table 1 suggests that BPM indeed can be seen as a theoretical paradigm: a research program concerned with (re-) developing, extending, and testing the BPM worldview across research approaches, context, methods, time, and subjects. We have seen different research approaches, from development and engineering (Dustdar & Hoffman, 2007) to experiments (Reijers & Mendling, 2011) and surveys (Recker, 2010), in contexts as diverse as healthcare (Rebuge & Ferreira, 2012), accounting (Sonnenberg & vom Brocke, 2014) or the film industry (Ouyang, la Rosa, ter Hofstedeter Hofstede, Dumas, & Shortland, 2008), and we have seen studies involving students (Figl, Mendling, & Strembeck 2013), practitioners (Patig, Casanova-Brito, & Vögeli, 2010), and BPM experts (Indulska, Green, Recker, & Rosemann, 2009; Indulska, Recker, Rosemann, & Green, 2009).

Third, while the chosen theoretical angles may be different (from a view of design to one of analysis or explanation), it would seem that, in a more general sense, all BPM research follows some shared assumptions (e.g., what a process is and that processes should be explicated and managed). Table 1 also gives clear evidence that, under the umbrella of such paradigmatic assumptions, various theories from various reference fields can be applied to process phenomena. This may indicate that there is no single theory that could adequately explain all that is embraced under the process lens (e.g., Burgess, Singh, & Koroglu, 2006), or, at least, that there is merit in exploring multiple theoretical perspectives on process phenomena.

THE BPM RESEARCH PROGRAM

Above I suggest that we can see a research program as being concerned with (re-) developing, extending, and testing theory (here: BPM) across research approaches, context, methods, time, and subjects. So how do we evaluate whether the BPM program has made progress and how it will do so in the future? Lakatos (1970) suggests that progress must involve nurturing and articulating the leading ideas that give a research program its impetus and originality. In our case, we thus need to ask what the leading ideas of BPM as a theory, independent from the specific causa finalis and form of theory, are. In my interpretation of Lakatos (1970), the "leading ideas" describe the assumptions that compose a theory. For instance, most economic theories assume that humans are rational, and, most psychology research assumes that humans are signal processors (Burton-Jones & Grange, 2013).

In theoretical paradigms, assumptions are of two kinds. First, any theoretical program is founded on some fundamental claims that provide the "hardcore assumptions" of the theory. These are typically not empirically verifiable but are instead definitional. Hardcore assumptions can be differentiated from other sets of ideas held by a theory, which Kilduff et al. (2006), in reference to Lakatos (1970), label a theory's "protective-belt assumptions". Proponents often share and accept these assumptions; however, the assumptions can—and should—also be subjected to evaluation and revision in light of gathered evidence, application, and experimentation.

So what are the hardcore and protective belt assumptions of BPM in the most general sense? Instead of offering my own view of what the assumptions of BPM as a general-level theory are, I draw on Hammer (2010, pp. 11-2), who postulates seven key assumptions—in his words axiomatic principles—that underlie BPM. Table 2 lists these assumptions and classifies them as hardcore or protective-belt assumptions. It also provides some illustrative examples of BPM research that has examined these assumptions. For example, assumption 1 describes BPM's fundamental claim that we can view and analyze an organization as a collection of processes. This assumption has given rise to the wealth of research on process modelling (Curtis, Kellner, & Over, 1992) as ways in which processes can be described and formalized as sets of process models, and how we can improve on process modelling to provide better descriptions (e.g., Reijers & Mendling, 2011; Bandara, Gable, & Rosemann, 2005). Assumptions 2 and 3 suggest that, using this process-oriented view, we can examine the effectiveness of organizations and suggest improvements to the ways of working, which has led to different theories of process reengineering (Hammer, 1990) and process improvement (Davenport, 1993). Assumption 3 has led a great deal of computer science researchers to examine how information systems can be developed that support the effective execution of processes (e.g., Dadam & Reichert, 2009).

Assumptions 4-7 in Table 2 describe typical BPM beliefs that are allied to BPM's hardcore assumptions but that can be tinkered with. Over time, much of the work in the BPM research program can be seen as examining these protective-belt beliefs and learning from the results about how the view on BPM as a theory must evolve given the accumulation of work and evidence that surrounds these assumptions (and thus form a belt that protects the hardcore assumptions). For instance, assumption 4 has led researchers to ask when and how process change actually leads to performance improvement (e.g., Sarker & Lee, 2001). Assumption 5 is presently the basis for much research on collections of process models as representations of processes and how they can be merged and combined into standardized versions (e.g., Weber, Reichert, Mendling, & Reijers, 2011); in much the same way, assumption 6 has provided the impetus for the development of process mining technology (e.g., van der Aalst, 2011) and research on its application (e.g., Rebuge & Ferreira, 2012).

Note that Hammer's principles only describe one possible view of what BPM assumptions might look like. Other researchers might formulate these assumptions differently. For example, Markus and Grover (2008) delineate a range of "learning points" that one could also view as assumptions of a BPM research program. And, indeed, in their volume, they also outline a research agenda (Table 1.1 on page 12) and collate a great deal of research that addresses each of these assumptions. I do not argue that Hammer's views are exhaustive, nor that they are necessarily correct. Instead, I merely offer them as a starting set of assumptions in the hope to inspire a constructive dialogue about what BPM's assumptions are. This dialogue could also challenge the way I classify the assumptions into hardcore and protective-belt assumptions. My aim is modest in that I wish to ignite debate rather than provide a conclusive codification. Still, describing and classifying these assumptions is purposeful because it allows for re-

interpretation and, consequently, hopefully the design of studies to examine whether indeed the assumptions are correct, whether they can be supported by evidence, and/or whether they need to be falsified or modified. That is, in essence, the core of my argument is that we require more of such research to better understand what "processes" and their "management" is actually about.

Table 2: Assumptions of BPM and the BPM Research Program

No	Type of assumption	Description of assumption	Example of BPM research addressing the assumption
1	Hardcore assumptions	All work is process work.	How can we describe organizations using process models (e.g., Mendling, Reijers, & Cardoso, 2007)?
2		Any process is better than no process.	How can processes be (re-) designed (e.g., Hammer, 1990; Davenport, 1993)?
3		Even a good process must be performed effectively.	How can systems be designed to execute processes automatically (e.g., Dadam & Reichert, 2009)?
4	Protective-belt assumptions	A good process is better than a bad process.	Which heuristics for redesign make a process better (e.g., Reijers & Mansar, 2005)?
5		One process version is better than many.	How can we support and execute process standardization (e.g., Schäfermeyer, Rosenkranz, & Holten, 2012)?
6		Even a good process can be made better.	How can we mine process data to learn about and from running process instances (e.g., Conforti et al., 2013)?
7		Every good process eventually becomes a bad process.	How do BPM capabilities evolve over time (e.g., Niehaves et al., 2014)?

A CALL FOR RESEARCH

The view I explain above shows that we can view BPM as a theoretical paradigm with an existing and growing research program that builds on, and explores, its assumptions. This is, on the one hand, a good thing. Benefits of a paradigm are that it supports cumulative research because we can build on our own past work. It also accelerates the research processes because it provides us with a shared language and a shared set of tools. BPMN (OMG, 2011) or ProM (http://www.processmining.org/prom/start) are just two examples of these shared resources in BPM research.

Yet, on the other hand, paradigms also have associated costs or problems (Kilduff, Tsai, & Hanke, 2006), which, I believe, are evident in the BPM research community:

1) Paradigmatic research is often pre-determined, which means that many research problems targeted by BPM researchers tend to be things that end up showing that the BPM paradigm provides the solution (i.e., we are doing research on problems prone to BPM solutions). Similar points about surprisingly reductionist BPM research have been made by others, too (van der Aalst, 2013).

2) Paradigmatic research often deteriorates to puzzle-solving, which means that we increasingly focus on smaller and smaller puzzles inherent in some element of our research program rather than focusing on current big picture issues. One may argue, for example, that the current stream on understanding process models is augmented with this challenge: much of the research investigates in more and more detail various small elements of process model design, instead of focusing on broader issues such as where increased understanding assists users in making better decisions or how it helps build better workflows.

3) Paradigmatic research often becomes fairly stable in its choice of concepts and methods, which leaves little room or appreciation for alternative views and approaches. Again, some would argue that BPM research is prone to this challenge, as evidenced by a multitude of publications following a particular approach, say, process mining at current or process configuration in the past.

This is not to say that all these problems are hazardous to BPM's progression, or, indeed, that the research I exemplarily associate with the problems should dissipate at once. I only claim that a balanced view on positive and negative aspects of BPM's progression as a paradigm in the field can allow us to advance the field by extending and complementing rather than substituting our research emphasis. In the following sections, I outline three strategies that we can use to extend the BPM research program such that work on and around the core ideas of BPM will

improve and that BPM can increasingly be connected to important topics and issues and deliver value to an increasing number of stakeholders in academia and practice.

Strenghtening the Core

A first program of research should be focused on BPM's hardcore assumptions. Even while BPM researchers may readily accept some of these assumptions, there is much work yet to be done on clearly defining, formulating or specifying what BPM's essential concepts actually are. What is a process, and, importantly, what is not? Some researchers (van der Aalst, ter Hofstede, & Weske, 2003, p. 5) suggest that BPM is about business processes; they state that "processes at the strategic level or processes that cannot be made explicit are excluded". Yet, some scholars suggest that some processes may be different, which may make some management strategies such as standardization less desirable (Hall & Johnson, 2009). Others have formulated different views, from processes as ostentative and generative routines (Pentland, 2003) to an inclusion of "live events" (Rosemann, 2014), or processes in specific scenarios such as software development (Turk & Vaishanvi, 1998). Much is needed to formally describe an analytical theory of what the types of processes really are that are BPM's heart, or else to analyze existing process formalizations in how far they are able to express all desired or potential processes. One promising line of inquiry would be to develop an open and integrative typology that conceptualizes business processes (van der Aalst, ter Hofstede, & Weske, 2003, p. 5), software processes (Müller et al., 2010), and other types of processes in such a way that the BPM research field can embrace and merge with other "process-related" fields such as quality management (Powell, 1995), operations research (Stuart, McCutcheon, Handfield, Ron, & Samson, 2002), scientific workflows (Deelman et al., 2005), supply chain management (Hewitt, 1994), software development (Kautz, 2001), and many more.

A similar view can be taken on assumptions 2 and 3 from Table 2: what is process improvement? Is it the same as re-engineering from the 1990s, is it the same as the current trend of process innovation, and are there actually fundamental differences between approaches such as Six Sigma and Lean? Do changes in methodology adoption in companies (e.g., from traditional BPM to Six Sigma or Lean) reflect a fundamental difference in approach or a mere "naming game" (Dreiling, 2006)? And how is it that, after decades of research, we know much more about describing and analyzing our current processes than we have tools and use cases available demonstrating how process performance can indeed be improved or at least process redesign suggestions be made (van der Aalst, 2013, p. 29), which supposedly is at BPM's core?

Third, broader examples relate to the assumptions (not made by Hammer, but by others) about the wider capabilities required to do BPM (e.g., de Bruin & Rosemann, 2007; van Looy, de Backer, & Poels, 2014), such as strategic alignment, governance, methods, people, and culture. Many of these capabilities have received disproportionally little attention by the community. Just to cite one example: the question of what a BPM culture might be has only recently been addressed (Schmiedel, vom Brocke, & Recker, 2014; Škerlavaj, Stemberger, Skrinjar, & Dimovski, 2007).

Thus, I posit that we still require research that nurtures and articulates BPM's core ideas and its relevant facets to continue to give the research program as a whole impetus and originality (Kilduff, Tsai, & Hanke, 2006, p. 1032). A key component of such a line of inquiry is developing conceptualizations and translating them rigorously into operationalized constructs and measurements. I do not wish to say that such construct development work is not done in BPM fields (Ahire, Golhar, & Waller, 1996; Schmiedel, vom Brocke, & Recker, 2014; Recker & Rosemann, 2010; Chen & Paulray, 2004), but, overall, I feel that this important part of research is not done as often and as rigorously as it should be. In turn, many opportunities still remain to develop, compare, discriminate, and merge various operationalizations and conceptualizations of "processes" and other key concepts in our universe of discourse.

A final research question about BPM's core is whether the present assumptions (such as those listed in Table 2) are actually exhaustive. Progress to BPM as a theory can also be made by identifying currently tacit assumptions (Gray & Cooper, 2010) because this helps to identify some of the mechanical and theoretical procedures and auxiliary hypotheses on which a theory depends. Such research could yield insights, for instance, into the preconditions under which BPM (as set out by its assumptions) can actually work, and, importantly, also where BPM will fail. The abovementioned work on BPM capability areas, for example, can be seen as research that identified and specified previously tacit assumptions about organizational contingencies for BPM, but it may be that they did not cover all conditions or contingencies (Niehaves, Pöppelbuß, Plattfault, & Becker, 2014; van Looy, de Backer, Poels, & Snoeck, 2013). In much the same way, there is increasing interest in processes that deviate (e.g., Recker 2014; Setiawan & Sadiz, 2013), which, in turn, delineate boundaries where process standardization goes "too far". Another way of inquiry could examine sets of hardcore assumptions that are different to those in Table 2—for instance, those offered as learning points by Markus and Grover (2008)—or even formulate hardcore assumptions that are relevant and necessary for a particular subset of BPM phenomena, such as BPM culture or process improvement.

Generating New Theory from the Core

A second, perhaps even more-significant research opportunity derives from leveraging BPM's hardcore assumptions to "generate new theories and hypotheses, potentially increasing [BPM's] empirical scope" (Kilduff, Tsai, & Hanke, 2006, p. 1032). This opportunity relates to extending BPM's theoretical and empirical scope to issues currently external to the field. For instance, applying BPM to scientific workflows (e.g., Tolosana-Calasanz et al., 2010) or the promise of using BPM to organize private events and processes instead of focusing only on the corporate world (e.g., Rosemann, 2014) are excellent examples for how BPM can inform knowledge and solutions external to the core field but still of high relevance to industry and society in general.

There are several merits to such research. First, it empirically progresses the BPM paradigm: it demonstrates validity and applicability across an increasing number of contexts, subjects, and time periods. Second, it provides a positive heuristic: an opportunity to revisit protective-belt assumptions based on a gathered understanding of how well these beliefs hold up in new contexts and how robust they are to new applications and new evidence. Third, it ensures that BPM stays relevant by continuously evaluating and demonstrating the solution potential of theory, artefacts, and tools to relevant trends and current issues.

As I state above, the starting point for future research may well be the assumptions described in Table 2 accompanied by the question: where else could these assumptions inform a program of novel work? For instance, if all work is process work—and, thus, models of such processes can help us to better understand work (Mendling, Reijers, & Cardoso, 2007)—does that mean that process models will be useful to private tasks such as household duties, education, or even gaming? Or, if we can mine business process data to learn about current instances of work, can we use this knowledge in proactive patient care or evidence-based traffic flow management? And, in reverse, what can we learn about the management of business processes from the way software processes change an organization (Müller, Mathiassen, & Balshøj, 2010)?

Exploring the Protective Belt

A third research direction flows from the protective belt (including but not limited to assumptions 4-7 in Table 2). Lakatos (1970) argues that, in the progression of a research program, much research is typically done in falsificationist fashion: we test elements of theory with a view to refute it. However, even if refuting evidence is found about protective-belt assumptions, this does not mean to refute the paradigm per se. Rather, it is a call to alter the protective-belt assumptions such that the hardcore assumptions remain unscathed. Lakatos goes on to argue that, as long as these alterations allow scientists to move forward with the hardcore assumptions (i.e., if it allows for new or altered theoretical predictions that then, at some stage, find some empirical confirmation), the program remains progressive and it remains rational to continue to pursue it.

What does this mean for BPM? I believe it suggests that we should progress BPM research in at least three different ways. First, we need to continue exploring our protective-belt assumptions with as rigorous, dispassionate, and objective research as possible—not with the view of "proving" our paradigm but rather with a lens of curiosity that appreciates and embraces conflicting and refuting evidence. In other words, we need to see more BPM research that shows failure (Gray & Cooper, 2010), that explores counterexamples, and that draws BPM's boundaries and its effectiveness more stringently than we have done to date. There are more ways to demonstrate the relevance and utility of BPM or process orientation than by forcefully trying to demonstrate that it is important or that it improves organizational performance. The abovementioned emerging research on positive deviance and deviance mining is a good example of studies that deliberately focus on outliers for learning (Lewin, 1992), and thus show where the over-management of processes may indeed be counterproductive. We may also consider launching dedicated forums for conflicting and refuting evidence in similar ways in which other fields embrace negative results (e.g., the *Journal of Negative Results in BioMedicine*).

Second, we require more research that deliberately evaluates BPM theories, artefacts and methods *in comparison* to competing theories and approaches. Examples for such work remain far and far between, aside from few excellent outliers (e.g., Sarker & Lee, 2001). In culmination, this research on key assumptions needs to feed into critical and continuous feedback loops that allow us to explore, revisit, and potentially reshape the assumptions that compose our view on BPM.

Third, we require more research that examines BPM's tacit and underexplored assumptions. Many of the abovementioned BPM capability areas (Rosemann & vom Brocke, 2010) have too readily been accepted and taken for granted, and many of these areas have not received much, if any, research attention. Similar points can be made about other frameworks such as maturity models (van Looy, de Backer, Poels, & Snoeck, 2013) critical success factor models (vom Brocke et al., 2014; Trkman, 2010), and process patterns (van der Aalst, ter Hofstede, Kiepuszewski, & Barros, 2003; Barros, Dumas, & ter Hofstede, 2005). Opportunities are ripe, therefore, to spend

more research emphasis on BPM and its assumptions itself with the view to explore, revisit. and thereby strengthen the protective-belt assumptions that provide our identity.

A NOTE ON RESEARCH METHODOLOGY

Before concluding this paper, I briefly comment on matters of methodology. In this paper, I focus much on what we should research rather than how we should engage in it. Yet, ontology and methodology (and epistemology) are intertwined in research (Godfrey-Smith, 2003), and views on the ontology of BPM research requires some deliberation of methodological and epistemological aspects, too. Although I do not cover these elements in the same manner, I offer a view on methodology that can be subsumed under two imperatives: let's become more pluralistic, and let's become more rigorous.

With the call for pluralism, I envisage a broader adoption and recognition of different approaches to BPM research. If one pursues BPM research over many years, inevitably a routinization of research approaches and methods creeps in, both in our own work and in our expectation of the work of others. True pluralism relates to our own aptitude to experimenting with different methods, those that are established in other fields and also those that we as a community may invent ourselves. It also relates to our willingness and boldness to look favourably onto different and new approaches in papers that we get to review or consume. A particular trait of pluralism that should increase its relevant and presence is that of multi-method research: the rigorous study and development of BPM knowledge and artefacts from a variety of angles, with different lenses and methods. Such attempts have increased in recent years (Dumas et al., 2012), but there is certainly a long way to go. Of course, this is not a problem unique to researchers studying BPM but common to most if not all research fields. Still, this means that we need to uphold these calls in the hope that answers to these calls will be made in the future. And, if BPM should be one of the first research communities to broadly adhere to these calls, it will only be to its benefit.

One particularly promising pluralistic approach to research could be through the innovative combination of research methods. While case study and survey research are accepted multi-method inquiries in BPM and elsewhere (e.g., Bandara, Gable, & Rosemann, 2006), I find that a particularly intriguing approach could be to combine qualitative case research with quantitative experimentation because it would allow for full-cycle research travelling back and forth between observation and manipulation-based research settings and, in turn, show strong internal, external and ecological validity. There is guidance available for how to do such research (Chatman & Flynn, 2005), and, indeed, in my own work with colleagues, we have started to pursue such inquiry on a process topic (Bernhard, Recker, & Burton-Jones, 2013), which will hopefully serve as a simple example that will aid others in pursuing similar pluralistic research.

With the call for rigor, I hope that the pursuit of pluralistic research on BPM will go hand-in-hand with an increased appetite and capability for rigorously designing and executing research. This issue is important not only to me personally but also to the progression and reputation of the community as a whole: as we explore new methods, new theories and new approaches, we need to be mindful of the sound and faithful application of these attempts, even if such knowledge may not yet be available in our own community. At present, some of the development of rigorous research may be seen as endangered. For example, while experimentation has gained prominence as a research method in BPM over the last decade (e.g., Reijers & Mendling, 2011, Mendling, Reijers, & Cardoso, 2007), we have also witnessed criticism and debate about how such methods could or should be applied (e.g., Laue & Gadatsch, 2011). In my view, some of the concerns about this method (and by extension, other research approaches) is indeed appropriate and required. It may well be that, at present, there is much for us to learn from reference fields and their application of programming, algorithm engineering, design science, or different empirical methods. Yet, we need to adhere to the same standards of rigor that apply and are available elsewhere (e.g., Straub, Boudreau, & Gefen, 2004; Jedlitschka, Ciolkowski, & Pfahl, 2008; Runeson & Höst, 2009; Klein & Myers, 1999), and, over time, we can hopefully become standard setters rather than adopters in the conduct of good research.

CONCLUSIONS

To conclude, I stress that, as with any commentary, this paper conveys a viewpoint rather than facts generated through rigorous study. Viewpoints are inherently ambiguous and speculative, and are meant to allow for different interpretations. For instance, while revising this paper, a reviewer pointed out that the view offered could be construed as promoting a precisely defined and scoped area of research under the label of BPM, which would, in turn, be discriminant from research on processes that, on face value, appears related. I would like to point out that one pathway that is dear to me personally and also hopefully expressed in this paper is a research agenda that is coined by openness, pluralism, and integration. In fact, while many research fields exist for institutional, political, or other reasons, the nature of the phenomena we engage in are not bounded by such borders. Process phenomena are no different, and our and other fields would do well by overcoming methodological, ontological, or institutional

boundaries in pursuing research. The "process" community, too, can only benefit from acknowledging, considering, learning, and ultimately merging with other established fields that examine processes, even if their ways of inquiry may yet be alien to some of us.

Another, particularly welcoming, aspect of a viewpoint is that it can be challenged. And, indeed, one of the many ways in which further work on BPM as a research field could progress from here on would be to develop a view different to mine such that a constructive and progressive debate can ensue. Multiple such opportunities exist. For instance, I draw liberally from Lakatos (1970) as a framework. While I hope that my analogies have been faithful, I am confident that others would reach different interpretations, and I welcome the opportunity to contrast these interpretations to my own. It may also well be that instead of a Lakatosian approach, a Kuhnian strategy to paradigm building will serve the BPM field better. Given that I am not a philosopher of science, I will leave this judgment to better qualified scholars and merely state that, in my view, the truth is probably somewhere in the middle. As a field, we will be well served to pursue BPM research in the way I have outlined and also in other, contrasting ways. Time will tell whether the views offered in this paper, or views that will hopefully be formulated in response, have merit depending on how well they contribute to the understanding that our colleagues and students will develop. Indeed, I wish for a future paper that constructs a different view such that a meaningful debate can ensue to provide a synthesis between my view and those of others.

Finally, one interpretation of this paper may be that, by drawing on Lakatos (1970), it abides by his view on what science is and what is not. Such an interpretation would then question whether all research efforts on BPM and "processes" in general constitutes science or not. In my view, such a debate is neither healthy nor purposeful to progress the field. The merit of research should be determined by whether the arbiters of the work find it useful for bettering their own understanding or solving some of their problems. The nature and attributes of scientific work, in principle, is a quarrel for philosophers more so than for us.

In wrapping up, I do hope that the *JITTA* special section on business process management will become a high-quality forum that provides thought-provoking, inter-disciplinary and/or path-breaking papers that propose bold new ideas and offer fresh insights on traditional as well as emerging BPM topics. This hope, of course, rests on the authors, reviewers, and editors' willingness and continued commitment to crafting, reviewing, and ultimately publishing such work.

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