A theory of contingent business process management

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Abstract

Purpose – Many researchers and practitioners suggest a contingent instead of a "one size fits all" approach in business process management (BPM). The purpose of this paper is to offer a contingency theory of BPM, which proposes contingency factors relevant to the successful management of business processes and that explains how and why these contingencies impact the relationships between process management and performance.
Design/methodology/approach – The authors develop the theory by drawing on organizational information processing theory (OIPT) and applying an information processing (IP) perspective to the process level.
Findings – The premise of the model is that the process management mechanisms such as documentation, standardization or monitoring must compensate for the uncertainty and equivocality of the nature of the process that has to be managed. In turn, managing through successful adaptation is a prerequisite for process performance.
Research limitations/implications – The theory provides a set of testable propositions that specify the relationship between process management mechanisms and process performance. The authors also discuss implications of the new theory for further theorizing and outline empirical research strategies that can be followed to enact, evaluate and extend the theory.
Practical implications – The theory developed in this paper allows an alternative way to describe organizational processes and supports the derivation of context-sensitive management approaches for process documentation, standardization, monitoring, execution and coordination.
Originality/value – The theoretical model is novel in that it provides a contextualized view on BPM that acknowledges different types of processes and suggests different mechanisms for managing these. The authors hope the paper serves as inspiration both for further theory development as well as to empirical studies that test, refute, support or otherwise augment the arguments.

Keywords Contingency theory, Business process management

Paper type Conceptual paper

1. Introduction

Business processes describe the sequences of organizational activities that transform inputs into outputs (Garvin, 1998). Business process management (BPM) describes the attempts of organizations to manage these processes in such a way that positive effects accrue like increased quality, customer satisfaction, financial performance, decreased production time or costs (Kohlbacher, 2010; Ranganathan and Dhaliwal, 2001). Poor process management, conversely, can lead to decreased financial performance, organizational conflicts and decreased innovation (Benner and Tushman, 2003; Ittner and Larcker, 1997).

Much like organizations being different in terms of their markets, value propositions, customers, performance and so forth, so are the processes that are run in organizations. This is

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both intuitive and readily observable: in manufacturing processes, for example, processes differ alongside physical properties (such as machinery), dimensional tolerance (size and form) or defect rates (more or less). In healthcare, drug prescription is clearly different from surgery. In any organization, procurement is a different process in many ways from order fulfillment.

This variability has long been absorbed in the literature. Text and management handbooks for process management speak of primary vs secondary activities (Porter, 1985) or of core, management and support processes (Ould, 1995). Some also suggest principles for differentiating these (vom Brocke *et al.*, 2016). Likewise, researchers have reported studies of organizational processes ranging from mass customized and automated processes (Schmahl, 1996; Feitzinger and Lee, 1997) to more artistic or creative processes (Seidel *et al.*, 2015; Voigt *et al.*, 2013), to knowledge-intensive processes (Davenport, 2010), context-dependent processes (Rosemann *et al.*, 2008) and so forth. Clearly, a variety of "different" processes exist, and researchers and practitioners alike seem to be equipped with some intuition that different processes may need to be managed differently.

Yet, these "differences" that constitute the observable variability have not been conceptualized into BPM in a consistent way. Instead, BPM still strives for one best method (Pentland, 2003) – the one following the tradition of scientific management (Taylor, 2004) and its idealization of a perfect pin factory. To make informed decisions and to prevent wasted efforts, process management research needs to understand and conceptualize process differences, classify processes into meaningful categories and link them to appropriate process management approaches (Venkatesh, 2006).

The "one size fits all" approach to BPM is not a new problem. Scholars have discussed the need for BPM to move away from this assumption for at least a decade. Proposals ranged from the encompassment of context-awareness into process management (Wieland *et al.*, 2007; Rosemann *et al.*, 2008; van der Aalst and Dustdar, 2012), to new categorization schemes for processes based on process and organizational dimensions (vom Brocke *et al.*, 2016), to the inclusion of contingency theory (Skrinjar and Trkman, 2013) or more generally the development of a notion of "fit" of processes to their environment and management (Benner and Tushman, 2003; Johns, 2006; Trkman, 2010). Yet, none of these approaches has provided a coherent theory that: explains the logic that links process characteristics to different management mechanisms embodied in BPM and predicts how and why different management of processes may lead to differences in performance. We take this step. We report on our development of a new encompassing contingency theory of BPM that postulates how and why process management mechanisms should be adapted to different processes and offer predictions which of these adaptions lead to improved performance. Our theory is grounded in organizational information processing theory (OIPT) (Galbraith, 1973) as a theoretical lens to give our predictions anchoring in a more abstract, general theory whilst our own theory is more substantive and detailed – it offers answers to the following questions:

(1) Why do processes require different management mechanisms?

(2) When are process management mechanisms successful and when not?

Through our theory development, we provide two central contributions. To our knowledge, we are the first to provide a coherent theory that links process characteristics to process management mechanisms, and their joint relationship to performance. In contrast to existing process classification systems that classify processes into two or three high-level groups, we describe process differences based on underlying process dimensions. Thus, we intend to not only describe process differences but also explain why a specific process requires a certain management mechanism. Second, we provide operationalized predictions in form of propositions that demonstrate under which circumstances process management mechanisms such as process documentation, standardization or monitoring will improve the efficiency and effectiveness of processes. Our theory together with the set of propositions

provides a rich platform for future research in the BPM area. This is particularly important as there are many contradictory findings as to whether process management activities increase or decrease organizational performance (Benner and Tushman, 2003).

We proceed as follows. We first discuss research on process differences and process management. We then introduce OIPT and demonstrate how the theory has been applied in literature until today. Based on this, we derive a theory explaining management requirements of business processes including testable hypotheses. After an illustration of the theory, the paper ends with a discussion and implications for research and practice.

2. Background

2.1 Differences in organizational processes

Our starting point is the observation that business processes in organizations are diverse. There are processes that represent the core business of an organization, such as the production process in a manufacturing organization, and processes that support the core activities, such as human resources (HR) or finance processes. Processes can be machine-intensive and (partly) automated (Schmahl, 1996; Feitzinger and Lee, 1997), but other processes have also been labeled "artistic" (Hall and Johnson, 2009), "knowledge intensive" (Davenport, 2010) or "creative" (Seidel *et al.*, 2015). A number of process classification systems have been developed theoretically and empirically to be able to compare processes within organizations (Vilkas and Stancikas, 2005). Such classification systems are the basis for conceptualization and the progression of research, as they help to reduce complexity and to recognize fundamental structure and relationship (Bailey, 1994; Recker and Mendling, 2016).

Most of the available process classification systems differentiate processes into a few, high level categories based on the degree of process importance. A famous example for a process classification is the differentiation into core, management and support processes (Ould, 1995). Core processes contribute directly to the value creation of a company, while support processes enable core processes to work more effectively. On the other hand, management processes are strategic processes that focus on goals, monitoring and control. Similarly, Porter (1985) differentiates in his value chain model between primary activities that are the source of competitive advantage for organizations and secondary activities that support the primary activities. Such classification systems distinguish processes into high-level categories that differ in the degree of value contribution (i.e. importance). However, within one category, there is still a large variety of processes that need to be understood in detail to derive appropriate management approaches.

More detailed process classification systems, such as the one of the American Productivity and Quality Center (APQC, 2016) or the ISO 9000 typology of organizational processes (ISO, 2008), build on the differentiation into core, management and support processes. As an example, the process classification of APQC is closely aligned with traditional functional departments (Spanyi, 2015) and differentiates between multiple operating processes (such as strategy, product development, marketing and sales, product delivery, customer services) and management and support processes (such as HR, information technology, procurement, finance or stakeholder management). The functional view on which APQC is based does not consider similarities of processes stemming from different functions that might demand for the same management approach. As an example, there might be administrative processes in Finance as well as in HR which have a similar nature and require a similar management approach. In addition, also processes within one department can have different requirements, for example, an administrative HR process as compared to personnel development processes. These differences of processes are not taken into consideration when processes are classified based on the degree of process importance or organizational functions. Thus, more process dimensions are necessary to describe process differences.

In the literature, a variety of process dimensions are used to describe process differences. Exemplary dimensions are the degree of knowledge-intensity (Isik *et al.*, 2013), interdependence (Davenport, 2010), routinization (Lillrank, 2003) or complexity (Schäfermeyer *et al.*, 2012). In a systematic review of the literature, we identified 59 of such dimensions to describe processes (self-reference omitted for review). Consolidating and aggregating these process dimensions into five high-level dimensions based on an information-processing perspective (Galbraith, 1973) resulted in five process dimensions: process variability, analysability, interdependence, differentiation and importance (self-reference omitted for review). A definition of each dimension is displayed in Table I.

The advantage of describing processes based on these dimensions over using high-level process classification systems is that processes can be differentiated on a more granular level. The five dimensions also allow to differentiate between processes that belong to the same functional area (e.g. HR) but which have different management requirements (e.g. administration vs personnel development). Building on established theories to link these process dimensions to management mechanisms will help to manage processes more efficiently and effectively, overcoming the "one size fits all" problem of BPM.

Process dimension	Definition	Related dimensions	Exemplary sources
Process variability	The degree to which process inputs/steps/outputs are variable and difficult to predict in advance	Consistency, customization, flexibility/adaptability, predictability, repeatability, repetitiveness, rigidity, routinization, spontaneity, standardization, structuredness, variety of inputs, variety of outputs	Gebauer and Lee (2008), Harrison (1998), Mackelprang *et al.* (2012), Lillrank (2003), Johansson and Olhager (2006), Silvestro *et al.* (1992), Field *et al.* (2006), Slaughter *et al.* (2006) and Safizadeh *et al.* (1999)
Process analysability	The degree to which personal judgment (as opposed to computational procedures) is required for process execution	Automation, creativity, formalization, information intensity, knowledge-intensity, personal judgment/thinking	Papavassiliou and Mentzas (2003), Papavassiliou *et al.* (2003), Isik *et al.* (2013), Lillrank (2003) and Davenport (2010)
Process interdependence	The degree to which process participants unidirectionally or reciprocally exchange resources and information with others in accomplishing their process steps	Collaboration, interdependence between functional units/tasks, iterativeness, linearity	Setia *et al.* (2013), Fang (2011), Davenport (2010), Ma *et al.* (2012), Tenhiälä (2011) and Sprigg *et al.* (2000)
Process differentiation	The degree to which people whose organizational areas, backgrounds, experience, goals and priorities differ are involved in executing the process	Boundaries, customer involvement, number of process participants, labor intensity	Gibb *et al.* (2006), Segars and Grover (1998), Kellogg and Nie (1995), Safizadeh *et al.* (1999), Harrison (1998) and Groenroos (1998)
Process importance	The degree to which a process impacts an organization's competitiveness	Criticality, value contribution	Gibb *et al.* (2006), Rodríguez-Díaz and Espino-Rodríguez (2006), Harrison (1998), Vanhaverbeke and Torremans (1999), Mani *et al.* (2006) and Graupner, Melcher, Demers and Maedche (2015); Graupner, Schewer and Maedche (2015)

Table I.
Process dimensions (self-reference omitted for review)

2.2 Approaches to overcome the "one size fits all" problem of BPM

Despite the clearly documented differences in organizational processes, management mechanisms typically follow a static, "one size fits all" approach. Pentland (2003) likened the approach to BPM theory to be fitting the image of Taylor's perfect pin factory – which does not resemble the more muddled, differentiated – contextualized nature of the processes organizations actually run.

This situation is also visible in BPM education: most textbooks provide BPM lifecycles; most of which use somewhat different terms to essentially describe the same procedures ranging from identifying and documenting business processes, defining process performance indicators (PPIs) for measuring and monitoring the performance of processes, executing and coordinating business processes and implementing means for continuous improvement (van der Aalst, 2013; Elzinga *et al.*, 1995; Lee and Dale, 1998). It does not seem to matter what the process is, all should undergo the same "lifecyle."

In line with the basic argument of contingency theory (Elzinga *et al.*, 1995), some researchers responded to this situation and proposed that we need to understand which process management mechanisms are most useful in different contexts (Vanderhaeghen *et al.*, 2010; Romero *et al.*, 2015; Skrinjar and Trkman, 2013; Johns, 2006; Trkman, 2010). As an example, Benner and Tushman (2003) found that traditional process management approaches are successful only in stable environments but not in turbulent, rapidly changing environments. Similarly, Ittner and Larcker (1997) compared process management mechanisms in the automotive and computer industry and found that different mechanisms have different performance impacts depending on the industry.

Another class of attempts at solving the "one size fits all" dilemma was put forward under the notion of context-aware BPM. This line of argument suggests that processes are situated in a context (mainly external, environmental variables) and that they need to adapt to any changes in the context (Wieland *et al.*, 2007; Rosemann *et al.*, 2008; van der Aalst and Dustdar, 2012). Thus, contextual factors can influence the design of a process as well as its execution (Ploesser and Recker, 2011; Rosemann *et al.*, 2008). However, not only external, environmental factors seem to impact process management but also organizational factors as well as process goals and characteristics (vom Brocke *et al.*, 2016). The characteristics of processes seem to influence the success of a wide area of process management activities such as process standardization (Schäfermeyer *et al.*, 2012), process virtualization (Overby, 2008) or business process outsourcing (Mani *et al.*, 2010). Thus, process managers have to find efficient and effective management mechanisms that consider the specific nature of the process that has to be managed (vom Brocke *et al.*, 2014, 2016).

All these approaches make a similar argument in that BPM needs to overcome the one-size-fits-all approach. Yet, none of the existing studies have provided a coherent theoretical model that: explains logic that links attributes which constitute variability of processes to different management mechanisms embodied in BPM and predicts how and why different management of processes may lead to differences in performance. We address this research gap. Our approach to overcome the "one size fits all" problem in process management is to develop an encompassing contingency theory of BPM that describes how and why process management mechanisms should be adapted to the nature of a specific process. In contrast to research that examined the influence of organizational and environmental factors on process management (Trkman, 2010; Rosemann *et al.*, 2008), we focus on the influence of internal factors, which we call process characteristics. We conceptualize these process characteristics, their linkages to different process management mechanisms and their joint relationship to performance. In addition, we develop a set of propositions that demonstrate under which circumstances process management mechanisms will improve the efficiency and effectiveness of processes. As a theoretical lens, we use OIPT (Galbraith, 1973) which we apply to the level of organizational processes to develop a theory for contingent process management.

2.3 Organizational information processing (IP) theory

The theory we wish to develop is substantive and specific in nature: given a particular process in a particular setting, which process management mechanisms will be most effective in increasing performance and why? As such, our theory can be considered one which aims to explain and predict (Gregor, 2006; Weber, 2012). To provide a plausible basis for our theorizing, we first sought an underlying framework that operates, in general, in line with some key assumptions that underlie our research questions: first, our theory is one of contingencies (Sousa and Voss, 2008; Trkman, 2010). Second, we view processes as systems that interact with each other and with their environment (Melao and Pidd, 2000), so they are interconnected and require coordination. Third, our interest is not on the individual (micro) or organization (macro) but on the process (meso) level. Fourth, our theory must be able to make recommendations that link prescriptive advice (which management mechanisms should be used?) with descriptive explanations (which performance effects will accrue?).

We believe OIPT is in line with these assumptions. OIPT is an organizational-level theory first introduced by Galbraith (1973) to address the question of how organizational systems should be designed in order to increase performance. OIPT builds on contingency theories stating that the structure of the organization needs to fit variables inside and outside the organization (Tushman and Nadler, 1978; Haußmann *et al.*, 2012).

OIPT assumes that organizations are open social systems that deal with work-related uncertainty (Galbraith, 1973; Tushman and Nadler, 1978). Uncertainty is defined as the amount of information required to perform the basic task of an organization compared to the amount of information already possessed (Galbraith, 1973). Based on the mechanisms that organizations apply to deal with uncertainty, OIPT considers organizations as IP systems that collect, process and distribute information (e.g. about how different components of the organization are functioning, about the quality of outputs, or about conditions in external domains):

- The nature of the task and IP requirements: OIPT states that task characteristics determine the IP requirements of an organization (Daft and Lengel, 1986). Task characteristics can challenge the organization in predicting activities or potential problems which leads to increased task uncertainty and, thus, to higher IP requirements which mean that people need to process more information in order to deal with the uncertainty. While the original theory focused on the amount of information (the information quantity) only, some authors enhanced this view by suggesting that also information richness plays a critical role for IP (Daft and Lengel, 1986). Just enhancing the amount of information might help to reduce uncertainty but is not effective in situations of high equivocality. In these situations, it is important to help people with the interpretation of information (Cooper and Wolfe, 2005).
- Control and coordination mechanism: Organizations apply different coordination mechanisms in order to compensate for the uncertainty or equivocality (Galbraith, 1973; Daft and Lengel, 1986): Rules, programs or defined procedures are viewed as particularly helpful in routine and predictable situations with a low degree of uncertainty. Professionalization of the workforce with setting and cascading goals is another way of coordination where people can choose necessary actions in order to achieve predefined goals. Another coordination instrument is implementing a hierarchy where decisions are transferred to a higher level manager. If uncertainty is increasing, however, the IP capacity can be further increased through investments in information systems as well as the creation of lateral relations in which decision making is decentralized (Galbraith, 1973). The organization design strategies introduced by OIPT influence IP capacity in terms of the amount and richness of information that is being processed.
- The concept of fit and organizational performance: While many contingency theories have been criticized for not being able to specify the concept of fit, OIPT explains it as a

match between IP requirements and IP capacity (Tushman and Nadler, 1978). If the IP requirements are higher than the IP capacity, organizations have a high degree of uncertainty which needs to be reduced through organizational design and management in order to reach high levels of organizational performance. On the contrary, it would be inefficient and costly if the IP requirements are lower than the IP capacity.

In general, OIPT views fit as criterion-specific concept which is impacting organizational performance. Fit is viewed as a match between IP requirements and IP capacity which is impacting organizational performance. However, there are different ways of operationalizing the concept of fit (Venkatraman, 1989; Umanath, 2003). Some researchers have calculated difference or deviance scores (e.g. Graupner, Melcher, Demers and Maedche, 2015; Graupner, Schewer and Maedche, 2015; Mani *et al.*, 2010; Premkumar *et al.*, 2005), while others looked at configurations and patterns (Bensaou and Venkatraman, 1995) or moderation and interaction effects (e.g. Gattiker and Goodhue, 2005; Goodhue *et al.*, 1992). We will return to this issue in subsequent sections.

OIPT has been used to explain a variety of phenomena on multiple organizational levels. Different authors focused on different sources for uncertainty or equivocality explaining phenomena either within organizations, sub-units or processes (e.g. Tushman and Nadler, 1978; Goodhue *et al.*, 1992; Bensaou and Venkatraman, 1995; Mani *et al.*, 2006; Graupner, Schewer and Maedche, 2015). We apply OIPT on the process level with the aim to move toward contingent process management.

3. A new theory of contingent process management

Even if OIPT has been developed as a theory of organizational design which focuses on the organization as the unit of analysis, we believe that an IP view serves as a valuable lens to also examine business processes and process management mechanisms. We make four arguments in support of this assertion: First, much like OIPT belonging to the class of contingency theories, we also argue that there is no one best way to manage processes but the optimal way depends on the nature of processes. Second, processes have objective qualities that can be described and measured if information is available and collected. Third, processes (like organizations) can be conceived as open social systems that process information. Within processes, a variety of actors execute a variety of tasks in some logical and temporal dependency, often using a variety of tools and equipment. This situation involves a huge amount of information being processed, distributed and created. Everyone involved, therefore, must cope to some extent with uncertainty and equivocality. Fourth, processes (like organizations) involve tasks that span a variety of groups or departments. They therefore require certain coordination mechanisms to process information. IP is important to connect single tasks to an efficient and effective process.

Starting out with OIPT as an organization-level theory, we then proceeded to transfer and instantiate its notions and concepts into the context of organizational processes and process management. In other words, we derived a substantive theory of process management from the higher order, more abstract categories of OIPT. Our resultant theory of contingent BPM is shown in Figure 1. The central thesis of our theory goes as follows: Any positive effect of process management mechanisms on process performance is moderated by process management requirements, which are determined by the nature of a process. This is because process management mechanisms such as process documentation, standardization, monitoring, and so forth provide the management agency for control and coordination. The aim of these management mechanisms is usually to increase process performance (Kohlbacher, 2010). However, their application to process performance will not unequivocally be effective: the application of process management mechanism is contingent

on the context – the nature of the process being managed and the requirements to process management this nature yields.

The following concept definitions underlie our theory:

- the nature of process describes the characteristics of a process that differentiate one process from another;
- process management requirements result from the nature of process and describe the degree to which a process requires process participants to collect and interpret information;
- process management mechanisms describe the methods which process managers apply to define, coordinate and control processes (in short to manage them); and
- process performance is defined as the operational efficiency and effectiveness of a process in terms of costs, time, quality and customer satisfaction.

Next, we describe the components of our theory in detail, and then proceed to developing propositions from the theoretical model.

3.1 The nature of process

We propose that organizational processes should be described based on multiple process dimensions. Building on a structured literature review in which an information-processing perspective has been applied to the level of organizational processes (self-reference omitted for review), we suggest five process dimensions that determine process management requirements: process variability, analysability, interdependence, differentiation and importance.

3.1.1 Process variability. Processes can be very variable, as process inputs, steps and outputs might be variable and difficult to predict in advance. We can, for example, differentiate between craft work showing a low amount of variability and research or strategic planning showing a high amount of variability (Perrow, 1967). Similarly, administration processes or the process on an assembly line shows only a low degree of variability, while engineering processes are highly variable (Perrow, 1967).

3.1.2 Process analysability. Second, processes differ with respect to the personal judgment or knowledge that is required to execute a process as opposed to using computational procedures. On the one hand, organizations run processes such as administration, assembly line and engineering that can follow computational procedures and for which mostly one right answer can be derived (Perrow, 1967). On the other hand, there are processes such as craft work, research or strategic planning for which knowledge or personal judgment is quite important (Perrow, 1967). In process management research, these types of processes have been called knowledge-intensive business processes as they rely on personal judgment or knowledge (Bailey, 1994). Similarly, some processes require

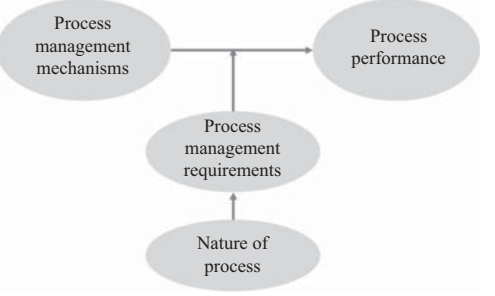

Figure 1.
Simplified theoretical model for contingent process management

creativity which calls for divergent thinking instead of applying objective, computational procedures (Seidel *et al.*, 2015; Voigt *et al.*, 2013).

3.1.3 Process interdependence. Third, some organizational processes require multiple individuals to cooperate to complete work while others do not have many interfaces and can be performed quite independently. As an example, we can identify processes in call centers, claim processing or administration as processes with a low degree of interdependence. On the contrary, software development processes, research or product design often involve many process participants with a high degree of interdependence. Thus, interdependence plays a key role in characterizing organizational processes as one frequently mentioned process characteristic in process management literature (e.g. Davenport, 2010; Tenhiälä, 2011).

3.1.4 Process differentiation. Fourth, business processes in organizations such as financial reporting, engineering or software development mostly include people from similar educational backgrounds that are likely to have a shared understanding. In research processes or strategic planning, the diversity of the involved people might be much higher leading to more different backgrounds, goals, and experiences. Therefore, some processes show much differentiation between the involved departments or roles, while others involve experts from only one or very similar areas.

3.1.5 Process importance. As mentioned in Section 2.1, one frequent categorization of processes differentiates between core, management, and support processes (Ould, 1995). These processes differ in the degree of value contribution with core processes contributing directly to the value creation of a company, while management and support processes enable core processes to run more effectively. Process importance is a critical process characteristic influencing business process outsourcing (Mani *et al.*, 2006) and process visibility (Graupner, Schewer and Maedche, 2015).

3.2 Process management requirements: process uncertainty and equivocality

Following OIPT, we propose that process characteristics determine process management requirements, which we conceptualize as the degree of process uncertainty and equivocality.

Uncertainty refers to the amount of information that is required to perform a process. Processes which are highly variable hinder process participants from predicting steps, outcomes or potential problems, which increases the uncertainty within the process. In addition, if process participants are highly dependent on each other to accomplish their work, uncertainty within the process is also increased. As a consequence, more information needs to be processed between process participants.

Equivocality is defined as ambiguity or the existence of multiple and (potentially) conflicting interpretations of a situation (Daft and Lengel, 1986). This concept was introduced to OIPT based on the assumption that the amount of information is not the only relevant factor, but also the quality of the information (Daft and Lengel, 1986; Cooper and Wolfe, 2005). Building on OIPT, we suggest that knowledge-intensive processes (processes with a low analyzability) require more personal judgment during process execution which increases equivocality. In addition, if the differentiation between process participants is high, their viewpoints or interpretations will differ. As a consequence thereof, equivocality increases which leads to the need to interpret and assign meaning to the information that is being processed.

3.3 Process management mechanisms

In line with literature that demonstrated that process management yields positive effects on performance (e.g, Kohlbacher, 2010; Ranganathan and Dhaliwal, 2001), we suggest that process management mechanisms, *ceteribus paribus,* positively impact process performance. However, this *prima facie* effect in line will be contingent (Benner and Tushman, 2003; vom Brocke *et al.*, 2016): our theory suggests that process characteristics

moderate the strength of the effect of process management on process performance. To detail this argument, on the basis of the existing literature, we will discuss several process management mechanisms that positively impact process performance but which are influenced by process uncertainty and equivocality.

Process management consists of many different mechanisms which are applied to improve process performance in terms of its efficiency and effectiveness (e.g. Kohlbacher, 2010). These mechanisms can be more or less appropriate depending on the type of process that has to be managed. While we cannot examine the contingent relationship of all potential mechanisms with the nature of processes in this paper, we focus on frequently applied ones: process documentation, process standardization, process monitoring and process execution through coordination mechanisms such as information systems or lateral relations between process participants (e.g. Elzinga *et al.*, 1995; Lee and Dale, 1998; Haußmann *et al.*, 2012).

3.3.1 Process documentation and standardization. According to OIPT, IP capacity can be increased through rules or defined procedures, control mechanisms, and coordination mechanisms (Galbraith, 1973; Daft and Lengel, 1986; Haußmann *et al.*, 2012). In situations of low uncertainty, for example, we often apply fixed standards, rules, and formal operating procedures (Galbraith, 1973; Tushman and Nadler, 1978). In case the uncertainty is increasing, however, the management needs to move away from this "mechanistic" structures to so-called "organismic" structures that are characterized through less formalization, less rules and regulations but highly connected networks, participation and joint planning (Galbraith, 1973; Tushman and Nadler, 1978).

Transferring this view to the process level, we propose that formalization (i.e. process documentation) and standardization initiatives are appropriate for processes with a low degree of uncertainty but not for processes with a high degree of uncertainty. Indeed, research on business process standardization has shown that not all processes can be easily standardized. Especially non-routine processes with high uncertainty are difficult to standardize compared to repetitive, routine processes (Schäfermeyer *et al.*, 2012).

3.3.2 Process monitoring. In addition to process documentation and standardization, we suggest that process monitoring and control differ depending on the type of process that has to be managed. Situations of low uncertainty are characterized by low levels of IP requirements where there is no need for continual monitoring, feedback or adjustments (Galbraith, 1973; Tushman and Nadler, 1978). Is the uncertainty increasing, however, the amount of information that needs to be processed increases and thus the need for continual monitoring and feedback (Galbraith, 1973; Tushman and Nadler, 1978).

Thus, processes with a low degree of uncertainty do not require much process monitoring or feedback. In contrast, the definition of PPIs will be more important the higher the degree of uncertainty. For these processes, continuous monitoring should be implemented in order to provide constant feedback to process participants.

3.3.3 Process execution through information systems or lateral relations. Last, coordination mechanisms such as information systems or lateral relations help to increase IP capacity (Galbraith, 1973; Tushman and Nadler, 1978). In situations of higher uncertainty, more information needs to be processed and information systems can help to do so. In situations of higher equivocality, information additionally needs interpretation, so we need direct personal interaction between different process participants which are called lateral relations.

Business processes are often supported through information systems such as ERP systems. These systems help to coordinate interdependent activities, which is more important for processes with a high interdependence (Goodhue *et al.*, 1992). When equivocality increases, however, information systems might not be appropriate as they lead

to higher compromise and design costs (Goodhue *et al.*, 1992). To support the interpretation of information in processes with a high equivocality, lateral relations could be established that facilitate coordination efforts (Daft and Lengel, 1986; Haußmann *et al.*, 2012).

3.4 Process performance and the moderating impact of the nature of processes

In OIPT, organizational performance results from the fit between IP requirements and IP capacity that result from control and coordination mechanisms of the organization (Galbraith, 1973). Viewing processes as IP systems, we expect high process performance in situations where process management requirements (determined by process characteristics) fit to process management mechanisms. A lack of fit can result from two situations: first, providing a high amount of information and information with high levels of specificity is inefficient and a waste of resources in situations where it is not required to process or interpret a lot of information (low process uncertainty and equivocality); and, second, providing too few information or information with low levels of specificity hinders participants to execute the process in situations where it is actually required to process and interpret a lot of information, thus leading to lower levels of quality and customer satisfaction.

Fit can be conceptualized in multiple ways, both criterion-free and criterion-specific (e.g. Umanath, 2003; Venkatraman, 1989). Criterion-free views of fit often assess the congruence between two or more variables in terms of deviation scores, simple correlations or multivariate co-variation among variables of different domains (Umanath, 2003; Venkatraman, 1989). On the contrary, criterion-specific views of fit assess the relationships between pairs of variables on a criterion, such as performance. Based on OIPT, we take the latter perspective viewing fit as a criterion-specific concept which is impacting process performance.

To analyze the impact of fit on performance, researchers can use different operationalization of fit such as moderation, mediation, or profile deviation (Venkatraman, 1989). Based on research in BPM, we suggest that process management generally has a positive effect on performance (e.g. Kohlbacher, 2010; Ranganathan and Dhaliwal, 2001) but that this effect is contingent on the characteristics of the process (Benner and Tushman, 2003; vom Brocke *et al.*, 2014, 2016). In other words, process characteristics moderate (strengthen or weaken) the positive effects of process management on process performance. This view has also been followed by researchers that applied an information-processing perspective to different contexts (e.g. Gattiker and Goodhue, 2005; Goodhue *et al.*, 1992; Kim and Umanath, 1992; Venkatraman, 1989).

The performance of a process relates to both its efficiency (low process time and low costs) and effectiveness (high quality and customer satisfaction) which are the intended positive effects of process management (Kohlbacher, 2010). One of the goals of process management refers to minimizing costs for the production of goods and services. Thus, the production time and related costs associated with process execution determine process performance. Another goal of process management is to generate value for a customer. Against this background, a process reaches high levels of process performance when the output is of high quality and meets customers' requirements. A lack of fit between process management requirements and capacity influences both aspects of process performance, the efficiency and effectiveness of a process.

4. Proposition development

Above we have formulated our general theory of continent BPM. We now detail our view of this theory, by examining the complexity of the suggested moderation relationship between process management mechanisms and process management requirements in more detail. Figure 2 shows our view of the relationship between the mechanisms and requirements we consider. We now proceed to detail the propositions visualized in this model.

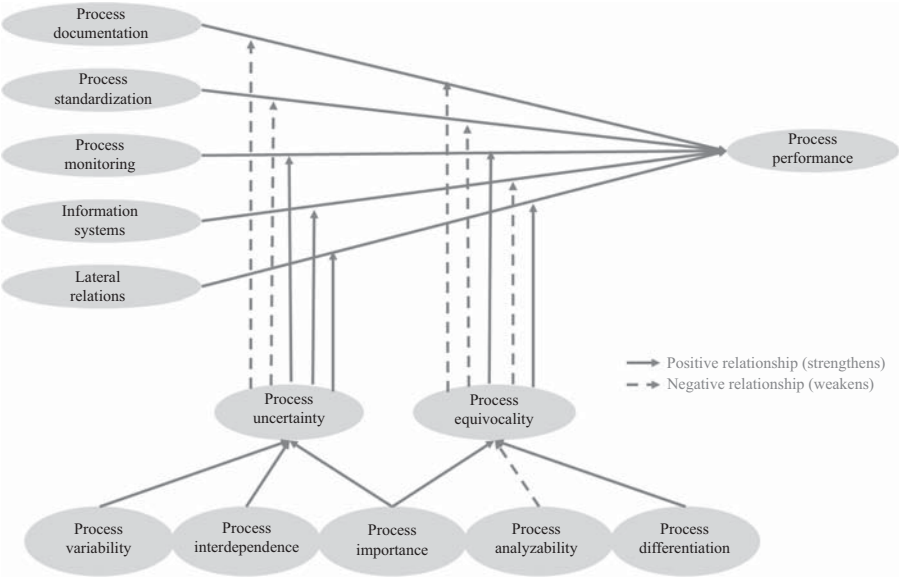

Figure 2.
Detailed theoretical model for contingent process management

We start by examining the mechanisms of documentation and standardization. OIPT proposes that formalization works well in organizations that show low levels of uncertainty. In much the same vein, we argue that process documentation and standardization initiatives will be effective mechanisms to manage processes with a low degree of uncertainty, but not processes with a high degree of uncertainty. Process documentation lays a formalized basis of understanding for what a process does and what it consists of, thus having a positive effect on process performance. However, documentation and standardization provides information only to a certain extent. If a process is variable and interdependent, we have lots of uncertainty what the process "is really about." The information provided through documentation and standardization might thus not be sufficient to effectively manage the process. Documenting "one way of working" and standardization of process steps will neglect the remaining variability and will inappropriately decrease the interdependencies. As research in BPM has shown that non-routine processes with high uncertainty are difficult to standardize compared to repetitive, routine processes (Schäfermeyer *et al.*, 2012), we propose that documentation and standardization is particularly helpful for processes with a low or medium level of uncertainty and less for processes with high uncertainty:

P1a. The lower (higher) the degree of process uncertainty, the higher (lower) the positive impact of process documentation on process performance.

P2a. The lower (higher) the degree of process uncertainty, the higher (lower) the positive impact of process standardization on process performance.

A similar argument applies for process equivocality. In case process equivocality is low, process participants do not need a lot of information that supports interpretation (Haußmann *et al.*, 2012). Few, objective information is sufficient to execute their tasks. Thus, if process equivocality is low, process documentation and standardization are highly effective means and will thus highly impact process performance. If process equivocality is increasing, however, documented information or standard procedures are not helping that

much anymore, as the interpretation of information through other process management mechanisms becomes more important. Thus, we propose:

P1b. The lower (higher) the degree of process equivocality, the higher (lower) the positive impact of process documentation on process performance.

P2b. The lower (higher) the degree of process equivocality, the higher (lower) the positive impact of process standardization on process performance.

Next, we consider the definition of PPIs and continuous process monitoring mechanisms. Process monitoring is an important mechanism to provide process participants with information about the process, thus positively impacting process performance. However, OIPT suggests that in case uncertainty is low, people do not need to process much information to execute a task (Galbraith, 1973). Thus, we suggest that for processes with a low degree of uncertainty, not much process monitoring or feedback is required. In contrast, the definition of PPIs becomes more and more important the higher the degree of uncertainty. The same logic applies to process equivocality: processes with a low degree of equivocality do not require much interpretation of information and only low levels of IP. Thus, monitoring efforts become more and more important if the degree of equivocality is higher. As continuous monitoring provides constant feedback to process participants, we thus expect that it will be more relevant in situation of high uncertainty and equivocality. Thus, we suggest the following moderation effect:

P3a. The lower (higher) the degree of process uncertainty, the lower (higher) the positive impact of process monitoring on process performance.

P3b. The lower (higher) the degree of process equivocality, the lower (higher) the positive impact of process monitoring on process performance.

For the execution of business processes and the coordination of process participants, information systems can be helpful to increase IP capacity (Goodhue *et al.*, 1992). Similar to the discussion above, information systems are viewed as appropriate in case of increased uncertainty but not in case of increased equivocality (Haußmann *et al.*, 2012). This is because information systems support the connection of interdependent process activities and help to process information (Galbraith, 1973). However, when equivocality increases in addition, IS should not be as helpful as in situations in which the equivocality is low. The reason is that more information does not necessarily mean rich information and information systems have been found to lead to higher compromise and design costs in situations of high equivocality (Goodhue *et al.*, 1992). Thus, we state:

P4a. The lower (higher) the degree of process uncertainty, the lower (higher) the positive impact of IS on process performance.

P4b. The lower (higher) the degree of process equivocality, the higher (lower) the positive impact of IS on process performance.

OIPT suggests that lateral relations help to connect interdependent tasks and supports IP (Galbraith, 1973; Tushman and Nadler, 1978). Lateral relations include various kinds of decentralized decision making such as task forces, liaison roles or integrator roles which solve problems on the levels where they occur (Haußmann *et al.*, 2012). These bilateral relationships connect process participants or departments with each other which helps to process information. In addition, it supports the interpretation of information through the direct, personal contact between people. Thus, lateral relations should increase process performance especially in situations of high uncertainty and high equivocality. We state:

P5a. The lower (higher) the degree of process uncertainty, the lower (higher) the positive impact of lateral relations on process performance.

P5b. The lower (higher) the degree of process equivocality, the lower (higher) the positive impact of lateral relations on process performance.

The propositions above are specific instantiations of the central thesis of our theory that any positive effect of process management mechanisms on process performance is moderated by process management requirements (i.e. process uncertainty and equivocality). As described earlier, process uncertainty and equivocality themselves are determined by the nature of a process which we conceptualized through five process dimensions: process variability hinders process participants from predicting steps, outcomes or potential problems, which particularly increases the uncertainty within the process. In situations of high process interdependence where process participants are highly dependent on each other to accomplish their work, uncertainty within the process is increased as well. Knowledge-intensity (low analysability) requires process participants to apply personal judgment during process execution which particularly increases equivocality. Processes with a high differentiation include process participants with differing viewpoints or interpretations, which also increases equivocality to a large extent. Process importance, on the other hand, determines how threatening uncertainty or equivocality is (Premkumar *et al.*, 2005). As such, it contributes to (or enhances) both the uncertainty and equivocality caused by the other process dimensions. We summarize these arguments in the following final propositions:

P6a. The lower (higher) the process variability, the lower (higher) the process uncertainty.

P6b. The lower (higher) the process interdependence, the lower (higher) the process uncertainty.

P6c. The higher (lower) the process analyzability, the lower (higher) the process equivocality.

P6d. The lower (higher) the process differentiation, the lower (higher) the process equivocality.

P6e. The lower (higher) the process importance, the lower (higher) the process uncertainty and equivocality.

5. An illustration of our theory

In this section, we demonstrate how our theory can be applied. We use it to contrast four business processes: personal data administration, international transfer management, continuous performance management, and rolling out a new HR strategy. As all of these processes belong to the HR department, existing process classification systems would thus unequivocally classify them as support processes (Ould, 1995) or HR processes (APQC, 2016; ISO, 2008). We will show how our theory provides a more appropriate and detailed view on what these processes are and how they should be managed.

Our illustration and analysis of these four processes draws on the personal observations of one of the co-authors who has been involved in consultancy projects targeted at the management of these four processes. Whilst these observations are neither case study nor action research, they serve well as a personal, informal source of experience for our theorizing (Fiske, 2004) and allow us both to generate and to reflect on theory: they allow us to build an explanation of management as experienced in the field and also to engage in thought experiments how practical management might be made more effective (Byron and Thatcher, 2016). We selected the four processes based on two key dimensions of the model shown in Figure 2: low or high levels of uncertainty and low or high levels of equivocality. A process model as well as a short description of each process is provided in Table II.

Overall, the four processes differ in their degree of uncertainty and equivocality. While the personal data administration process has both low levels of uncertainty and

Personal Data Administration Process description: This process describes the activities required to change an employees personal data. Changes can refer, for example, to the name, address, marital status, bank account, or telephone number. Usually, the employee requests the data change. In some cases, they need to provide a proof document (e.g. marital status or name change), in other cases, the change can be administrated without a proof document (e.g. telephone or bank account number). Employees in the human resources department administrate the data accordingly and store the information in the personnel file of the employee: 	Process nature: The process is commonly well-defined, involving routine, repetitive steps (low process variability). From the request until the updated data, there are not many steps and people involved (low process interdependence). Objective, computational procedures such as checklists can be used during process execution (high process analyzability). Process participants do not differ a lot in terms of their goals or experiences (low process differentiation). This process is a supporting process of an organization (low process importance): → low process uncertainty → low process equivocality
International Transfer Management Process description: This process describes the activities required to transfer employees from one country to another. Usually, the employee discusses the change with the manager and the manager requests the tranfer of the employee. A mobility consultant supports the manager and employee in estimating the costs and in defining the mobility package (e.g. move alone or with family, tax implications, travel costs, housing allowance, etc.). After both parties agree on the package, the information is transferred to an external vendor who initiates all mobility services (e.g. visa) and supports the transfer. Employees in the human resources department administrate the changes and store the information in the personnel file of the employee: 	Process nature: This process is dependent on the agreement between manager and employee as well as on the country combination (home and host country of the transferring employee) (high process variability). Many parties are involved and interact with each other (e.g. employees, manager, mobility consultant, external vendors) (high process interdependence). However, the procedures and activities are determined by legal regulations and company policies (high process analyzability). Many parties are involved but the interests, knowledge, or background are somewhat similar (medium process differentiation). While the process is a core process of human resources, it is still a supporting process from an organizational perspective (medium process importance): → high process uncertainty → medium process equivocality
Continous Performance Management Process description: This process describes the activities performed by a manager together with their employees to continously manage employees performance. At the beginning of the year, both managers and employees agree on a set of goals which are leading an employees activities. They document the results and meet in regular cycles to discuss the employees performance. They both define actions or development opportunities which they also document and regularly follow up. The goal of this process is to continously provide feedback to the employee and support their development: 	Process nature: The process is always conducted in the same way but every employee and their goals are different (medium process variability; high process differentiation). Only two people are involved and interact with each other (low process interdependence). The process requires a lot of discussions, personal judgment, and expertise (low process analyzability). This process is an important process both for human resources and the overall organization (high process importance): → medium process uncertainty → high process equivocality
HR Strategy Development Process description: This process describes the activities performed to develop and roll-out a new or refined HR strategy. Based on guidance from the managing board, data is collected and a strategic analysis is performed. Building on the results of the analysis, a strategy and organizational priorities are defined. An approval from the managing board is required before the strategy and priorities can be rolled-out and communicated to employees and managers: 	Process nature: This process is not predictable as the goals of the managing board, the market situation, and stakeholder's interests impact the process (high process variability). Many factors need to be considered and aligned with all relevant stakeholders (high process interdependence; high process differentiation). The process cannot follow objective, computational procedures and requires knowledge-intensity instead (low process analyzability). The strategic process has direct implications for the competitiveness of the organization (high process importance): → high process uncertainty → high process equivocality

Table II.
Example processes

equivocality, the HR strategy development process has both high levels of uncertainty and equivocality. The other two processes show a mixed pattern. The international transfer management process has relatively high levels of uncertainty while having low to medium levels of equivocality. For the continuous performance management process, this pattern is reversed. The characteristics of the four process examples are summarized in a simplified way in Figure 3.

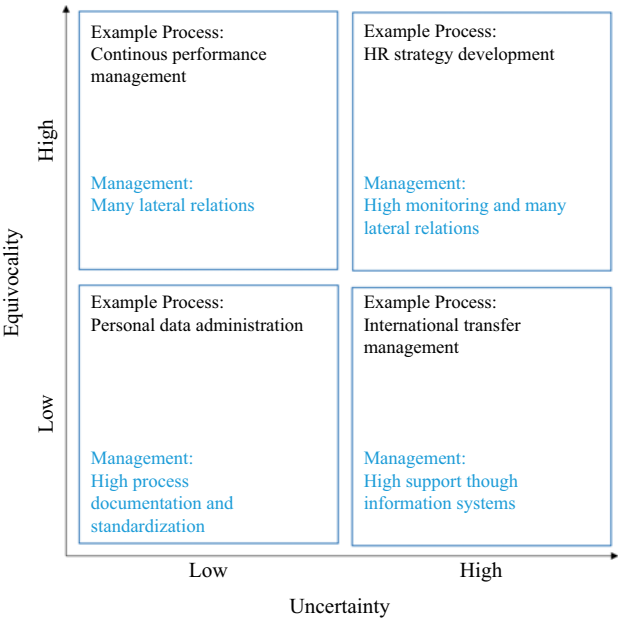

Figure 3.
Degree of uncertainty and equivocality of example processes together with management recommendations based on our theory

Having shown how our theory affords a deep characterization of the four processes, we now proceed to predict management recommendations based on the propositions developed in Section 4.

Processes with both low levels of uncertainty and equivocality (e.g. personal data administration) require low IP and low interpretation support. If the uncertainty of the process increases (e.g. international transfer management), more information needs to be processed. Thus, the management approach needs to be designed in a way to provide more information and support IP. If the equivocality increases (e.g. continuous performance management), the interpretation of information is more critical which requires interpretation support. In a situation in which both uncertainty and equivocality is high (e.g. HR strategy development), IP has to be supported through providing more information and through interpreting this information. In line with the propositions of our theoretical model, we can therefore offer the following recommendations, which we summarize per process in Table III.

Some of the recommendations derived from our propositions are in line with reported process management literature. However, some may appear contrary to common practice. For example, process standardization is indeed difficult for processes that show high levels of uncertainty (Schäfermeyer *et al.*, 2012), which is in alignment with our theory. Regarding the monitoring of processes, we would suggest that processes with a high degree of uncertainty should be monitored to a higher extent (more PPIs, more frequent measurements) than processes with a low degree of uncertainty. In practice, however, these processes are more difficult to monitor (Panian, 2011) and often remain a manual effort (Mundbrod and Reichert, 2014).

The four examples provided also demonstrate that existing process classification systems fall short in suggesting distinct management approaches – as we state above, our four processes would all seemingly belong to the same "class." Thus, the understanding of process differences based on underlying process dimensions that our theory provides can be helpful in differentiating processes and in understanding management requirements.

Table III. Example processes evaluated on process dimensions (low, medium and high), resulting process management requirements and recommended management mechanisms

	Process characteristics					Process management requirements		
Process	Variability	Interdependence	Analysability	Differentiation	Importance	Uncertainty	Equivocality	Recommendations for process management mechanisms to increase process performance
Personal data administration	Low	Low	High	Low	Low	Low	Low	High process documentation High process standardization Low process monitoring effort Medium support through IS Few lateral relations
International transfer	High	High	High	Medium	Medium	High	Medium	Medium process documentation Medium process standardization Medium process monitoring effort High support through IS Some lateral relations
Continuous performance management	Medium	Low	Low	High	High	Medium	High	Medium process documentation Medium process standardization Medium process monitoring effort Low support through IS Many lateral relations
HR strategy development	High	High	Low	High	High	High	High	Low process documentation Low process standardization High process monitoring effort Low support through IS Many lateral relations

6. Discussion

The theory discussed in this paper enhances perspectives on process management success factors through the focus on process-internal context factors, namely, process characteristics. Our intention was to understand: how business processes differ; why processes require different management mechanisms; and when process management mechanisms are successful and when not. In order to answer our research questions, we:

(1) conceptualized process differences in terms of process variability, process interdependence, process analyzability, process differentiation and process importance;

(2) developed a theory based on an IP perspective which suggests that the process nature determines process management requirements (process uncertainty and process equivocality) which moderate the positive effect of process management mechanisms on process performance; and

(3) derived a set of testable propositions that specify the relationship between process management mechanisms (e.g. process documentation, standardization, monitoring), process management requirements and process performance.

6.1 Implications

Contrary to existing process classification systems, we propose a new understanding of process differences based on underlying process dimensions. With this, we can address the diversity of organizational processes more accurately than existing process classification systems which differentiated between few high-level clusters only. Our proposed process dimensions inform all areas of process management research as they allow for more differentiated examinations of process-related phenomena. Researchers and practitioners can use these dimensions to describe organizational processes and examine context-sensitive management approaches. In that sense, the derived process dimensions could also serve as moderating factors to explain conflicting results in process management.

In addition, our theory links process dimensions to process management requirements in order to derive appropriate process management mechanisms. The management mechanisms we discussed refer to typical aspects of process management, namely process documentation, standardization, monitoring, execution and coordination (Elzinga *et al.*, 1995; Lee and Dale, 1998). Another interesting implication of our theory concerns the use of information technology in process management. Depending on process management requirements, we can derive the amount and type of investments in information technology. While some of the recommendations derived in the illustrative example are easy to understand and implement, such as the degree of formalization or standardization for administrative processes, others are difficult to realize and contrary to common practice. We propose, for example, more monitoring efforts for processes with higher uncertainty (e.g. strategic planning) as monitoring increases the amount of information provided to process participants. For these processes, however, monitoring is much more difficult, especially when work is being passed to other departments (Panian, 2011). As the monitoring is often performed manually (Mundbrod and Reichert, 2014), a valuable area for future research could be to examine ways of how to support monitoring of processes with a high uncertainty and equivocality, such as knowledge-intensive processes.

Our theory has implications for both process management theory and OIPT. On the one hand, the theoretical model explains why a specific process requires a particular management approach based on an IP perspective contributing to a deeper theoretical understanding of process management. On the other hand side, it provides a new application field for OIPT, thereby enhancing the theory. The theoretical model also provides a possible explanation for some of the findings in process management research.

As an example, we mentioned the findings that process complexity influences process standardization (Schäfermeyer *et al.*, 2012). These observations are in alignment with our theory and we additionally provide an explanation for these findings as complexity (caused through e.g. process variability and interdependence) increases process uncertainty and equivocality and, with that, lowers the appropriateness of process standardization. Our theory is therefore helpful to explain some of the findings in process management research and could be the start of an interesting research agenda looking into various process management mechanisms and their IP capabilities.

Overall, our paper emphasizes the need to support process managers and organizations in decision making through providing sound, context-situated theoretical frameworks. Our theory is developed through combining insights from different disciplines and demonstrates the importance of interdisciplinary methods and study designs to deal with the complexity of organizations. As such, our research may also have some value for similar disciplines coined by multiple reference fields and an inherent demand for interdisciplinary methods, including organizational design, enterprise architecture or systems engineering. Of course, how and why our propositions translate to these fields is ultimately an empirical question.

6.2 Empirical research strategies

Our theory is a first step toward understanding process management requirements as a basis for contingent process management. There are various opportunities for empirical research to apply our theoretical model and we now introduce ways to enact the model, evaluate the model and extend the model.

First, enacting the model can enable description and analysis of processes and process management. The constructs on which the theoretical model is based can serve as a valuable framework to describe a phenomenon in the field of process management. In case study research, as an example, researchers can describe more specifically the processes that are in scope of their investigations increasing the description of context as one requirement for case study research (Yin, 2013). This requires, as a first step, the operationalization of the constructs and the creation of measurement instruments. The development of validated instruments could also enable a broad research community to use the assessment for benchmarking purposes (similar to the APQC framework). In survey research, the constructs could be included as additional variables to test moderation or mediation effects, for example, why a process management initiative has been successful in one situation but not the other, depending on the process nature.

Second, research can evaluate the model by testing its propositions. To test the propositions of our theoretical model, research needs to develop measurement instruments for the process dimensions, management requirements, management mechanisms and performance effects. Performance is multidimensional and can be operationalized through a variety of different measures, such as customer satisfaction, product quality, production time and costs (Reinking, 2012; Zeithaml *et al.*, 1988). As the selection of performance measures impacts the results of empirical tests (Reinking, 2012; Zeithaml *et al.*, 1988), researchers need to carefully operationalize process performance for which, so far, no adequate measures have been developed (Reinking, 2012). To then test the propositions which build on contingency theories, Reinking (2012) suggests to use either case studies or cross-sectional surveys. In both cases, researchers need to ensure that there is a range of values on the contingency variables (Reinking, 2012), so they should include processes with differing process characteristics. In case studies, only a small number of case organizations is involved (Yin, 2013), which also allows to control for other influencing variables (Otley, 1980). As an example, interviews with process experts or observation of process execution could provide valuable insights into how processes are perceived and to what extent process management initiatives are successful or not depending on the nature of the process. As an

alternative to case study research, larger samples of processes can be examined through cross-sectional surveys.

Third, our model can be extended by using empirical research to change the model. By examining a diversity of processes, further process dimensions might be identified and added to the model. In a second step, it can be examined how these new dimensions fit into the model. They could be additional dimensions, they could influence the proposed dimensions, or they could be their consequence. It might also be that they influence the other constructs through mechanisms other than IP. The same logic also applies for the other construct dimensions such as management requirements and mechanisms. Another interesting area for research is to examine to what extent management mechanisms can also influence the way a process is structured (its characteristics). While we view process management requirements as a contextual factor to which the process management needs to be adapted, we do believe that the characteristics of processes (and with that their management requirements) can also change over time. Reasons for that can be process improvement or innovation for which process management mechanisms will be applied.

Fourth, and more generally, we believe our theoretical model yields two methodological implications: first, much of the logic in our theorizing builds on the notions of uncertainty and equivocality, and their role in teasing out the contextual contingencies. Notions such as these are best examined "in the field" where they emanate and manifest. Therefore, we believe research on BPM "in the field" should be conducted with a view of designing inductive, interpretive and qualitative studies. These are methods particularly well-suited to understand the richness of a context and to explore contingency factors that may previously be unknown. Research in this tradition can draw on several established methodologies and famous example – such as the ethnographic fieldwork by Martha Feldman (1995) – but it is as yet notably scarce in BPM research, as noted by Recker and Mendling (2016).

A second methodological implication flows from the basic observation that processes are different. To accommodate this variability, the process should be studied in different disciplines and also from the views of different disciplines. Together, interdisciplinary work will be better placed to identify and understand the true root causes for observable variety than any one discipline alone. As just one example, computer-assisted surgery processes describe fascinating and relevant scenarios in which health, technology, business process as well as individual psychology form a complex entanglement – all have a different view on the same procedure.

6.3 Limitations

Our theory development is bounded by several limitations. First, our new theory is grounded in contingency theory, more specifically in OIPT. Obviously other theoretical frames exist that would yield a different lens on process management mechanisms. We believe our selection is justified by the wealth of research supporting the basic premises of OIPT, including its previous applications to process topics and we also believe OIPT fits our core assumptions of phenomenon and theory best. Still, the notions of management, "fit" and performance also feature in several other theories. For example, Trkman (2010) discussed BPM-relevant factors drawn from dynamic capabilities or task-technology-fit. However, most other theories are less specific in their conceptualization of "fit" than OIPT and as processes can be viewed as open social systems (Melao and Pidd, 2000), we believe an information-processing perspective makes sense in this context. A test of competing theoretical viewpoints is out of the scope for this paper; however, we acknowledge that such a pursuit would be beneficial for theoretical advance (Groenroos, 1998), and several examples exist how such tests could be carried out (e.g. Allen and March, 2012; Wand *et al.*, 1995).

Second, the process management mechanisms available are not limited to the ones provided in this paper. For example, we did not consider process mining (van der Aalst,

2011) an explicit and distinct mechanism. As we mention above, it may be possible to extend our theory in several ways by identifying further process dimensions and management mechanisms.

Third, as we have no indications that the process dimensions are correlated, we assume that the dimensions are orthogonal and all possible combinations of process characteristics could in fact exist. However, it is also possible that the dimensions are correlated (e.g. the degree of differentiation and interdependence) and only a limited number of process types exist. This potential limitation is best addressed using empirical, perhaps quantitative research strategies that could delineate the factors of the model statistically.

Fourth, our empirical illustration was an account of personal observations, not a case study. We focused on processes within one organization and ignored external or environmental factors as well as inter-organizational processes. External factors are, however, also impacting process management (Rosemann *et al.*, 2008). While we held these factors constant for the sake of examining the specific influence that internal factors (i.e. process characteristics) have on process management requirements, future research should also examine external factors and integrate them into the framework. A possible approach for that could be to derive dimensions of organizations or environmental factors and examine their influence on process management requirements, similar to the approach, we followed for process characteristics. As an example, factors related to contractors or subcontractors could be a source of uncertainty for inter-organizational processes because many activities happen outside of the organizations boundaries.

7. Conclusion

Overall, our research builds on existing contextualized process management research but goes beyond these works by providing a coherent theory. Similarly to other researchers (e.g. Trkman, 2010), we build on contingency theory but provide novel and substantiated propositions for which management practices are adequate in which situations. In addition, we provide a clear guidance for how to evaluate, refute and advance the theory. Similar to other context-sensitive approaches (e.g. Rosemann *et al.*, 2008; vom Brocke *et al.*, 2014, 2016), we consider contextual factors as critical for process management but systematically derive them based on existing literature and link them to existing theory. By doing so, we do not only describe but also explain and predict context-sensitive process management which can serve as a basis for more context-sensitive process management research and practice. We hope this theoretical paper, therefore, serves as inspiration both for further theory development as well as to empirical studies that test, refute, support or otherwise augment our arguments.

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