PERSPECTIVES ON COLLABORATION PROCEDURES AND POLITICS DURING THE SUPPORT OF DECISION PROCESSES WITH BUSINESS INTELLIGENCE & ANALYTICS

Complete Research

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Abstract

Improving decision quality in managerial decision processes through business intelligence and analytics (BI&A) is a crucial and challenging task. BI&A equips analytics experts with the technological capabilities for supporting decision makers and supplying them with high quality information. Results from related management research on decision processes suggest that, due to varying levels of political behavior and procedural rationality among decision stakeholders, the positive impact of high information quality on decision outcomes cannot be taken for granted. This research addresses the theoretically neglected interplay between information quality and characteristics of collaboration procedures among decision makers and analytics experts in shaping the outcomes of decision processes. We build on an ambidextrous conception of collaboration procedures, which considers process rigor and agility as two main characteristics. By using a multiple case study approach, we investigate eleven BI&A-supported decision processes, and our paper makes three contributions. First, we investigate political behavior, procedural rationality, and their impact on decision quality. Second, we examine ambidexterity of collaboration procedures in BI&A-supported decision processes. Third, we provide evidence on the complementary relationship between ambidexterity and information quality and its effects on decision processes and their outcomes. Finally, we discuss our study's implications for theory and practice.

Keywords: Business Intelligence and Analytics, Decision Processes, Ambidexterity, Case Study.

1 Introduction

Raising the level of decision quality in managerial decision processes by utilizing business intelligence and analytics (BI&A) is a crucial task, but the realization of the expected benefits is often challenging (Clark et al., 2007; Davenport, 2010; Polites, 2006; Watson et al., 2002). BI&A comprises a set of data collection, integration, and analytics technologies, which aim at improving data processing and analysis procedures along the information value chain (Chaudhuri et al., 2011; Chen et al., 2012; Dinter, 2013; Koutsoukis and Mitra, 2003; Watson, 2010). These technologies equip BI&A-experts (i.e., analysts or data scientists) with the technological capabilities for supplying decision makers with high quality information (Davenport and Harris, 2007; Viaene, 2013). Recent research findings suggest that the extent of benefits and improved decision quality, from supplying decision processes with high quality information, does not only depend on the BI&A technology within an organization, but also on

organizational factors and characteristics of decision processes (Davenport, 2010; Işık et al., 2013; Popovič et al., 2012, 2014; Sharma et al., 2014).

Reviews of prior research on data-centric decision support, and BI&A in particular, identify a major focus on the technological perspective and find that organizational aspects related to decision processes have only been considered narrowly (Arnott and Pervan, 2008, 2014; Sharma et al., 2014; Shollo and Kautz, 2010). In this regard, our research addresses two main research gaps concerning organizational aspects of BI&A-supported decision processes. The first gap pertains to the effects of decision makers' political behavior and procedural rationality on the use of information and the quality of decision outcomes. Concerning this, insights from management research on decision processes indicate that political behavior and procedural rationality affect decision outcomes (Dean and Sharfman, 1993a, 1996; Eisenhardt and Zbaracki, 1992; Elbanna and Child, 2007). Accordingly, research on data-centric decision support has explicitly called for further investigating the effects of these characteristics in the context of BI&A support (Shollo and Galliers, 2013).

The second gap concerns the collaboration between analysts and decision makers in BI&A-supported decision processes and focuses on its effects on decision processes and their outcomes. Despite being a relevant topic in practice, the effects of collaboration procedures among analysts and decision makers have been marginally considered in prior research (Viaene, 2013). Therefore, more research in the context of BI&A-supported decision processes has been explicitly called for (Sharma et al., 2014). For examining collaboration procedures between analysts and decision makers we build on an ambidextrous conception, which considers process rigor and agility as two main procedural characteristics (Gibson and Birkinshaw, 2004; Lee et al., 2010). Thus, ambidexterity characterizes the capacity to combine both procedural characteristics within the collaboration between analysts and decision makers, in the context of BI&A-supported decision processes.

The combined examination of both gaps allows this research to address the theoretically neglected interplay between the supply of high quality information and characteristics of collaboration procedures between analysts and decision makers, as well as implications for decision outcomes. Thus, our research is guided by the following research question: How do characteristics of collaboration procedures affect BI&A-supported decision processes and the quality of their outcomes? In order to address this question we investigate ambidexterity of collaboration procedures and its complementing effects with information quality. Furthermore, we examine its influence on political behavior and procedural rationality, as well as the quality of decision outcomes in BI&A-supported decision processes. Because decision process ambidexterity and information quality haven't been studied together, their interaction in shaping political behavior, procedural rationality and resulting decision quality remains theoretically underdeveloped. These gaps also have substantial practical relevance, because they pertain to how analysts can improve collaboration procedures with decision makers and thus augment the impact of their analytic work for improving decision outcomes.

In order to address the identified gaps, in-depth research on BI&A-supported decision processes is required. Using a multiple case study approach, we investigate eleven managerial decision processes that were supported by BI&A. With this paper we strive to make three main contributions. We contribute to the first research gap by (i) investigating how different extents of political behavior and procedural rationality in BI&A-supported decision processes result in varying levels of decision quality, despite the availability of high quality information. We contribute to the second research gap by (ii) examining process rigor and agility as characteristics of ambidextrous collaboration procedures, as well as investigating their effects on BI&A-supported decision processes. Furthermore (iii) we provide evidence on the complementing relationship between ambidexterity and information quality in shaping political behavior, procedural rationality and resulting decision outcomes.

This paper is structured as follows. In the next section we discuss the theoretical background of BI&A, decision processes and ambidexterity. Then, we describe details of our multiple case study design and data analysis. Subsequently, we present results from the multiple case study. The article closes with a discussion of theoretical and practical contributions, limitations, and future directions.

2 Theoretical Background

This section focuses on BI&A support of decision processes and further elaborates on relevant aspects from related management research for characterizing the organizational context of decision processes.

2.1   Business Intelligence and Analytics (BI&A) and Information Quality

From a technological point of view, business intelligence and analytics (BI&A) originates from data-centric approaches like database management and data warehousing and it combines different data collection, integration, and analytics technologies (Arnott and Pervan, 2014; Chaudhuri et al., 2011; Chen et al., 2012; Watson, 2010). BI&A encompasses technological support for data collection and integration (ETL), which is the basis for achieving and maintaining high data quality. Additionally, BI&A provides capabilities for basic analytics (e.g., ad-hoc queries and descriptive statistics) and advanced analytics (e.g., data mining and predictive modelling) (Chaudhuri et al., 2011; Watson, 2010).

The underlying decision making paradigm of BI&A is strongly focused on a technological perspective in which improving the procedures of data processing and analysis plays a central role. BI&A systems aim at providing support for the complete data processing and analysis value chain with the purpose of ultimately improving the quality of information that is available for decision making (Dinter, 2013; Koutsoukis and Mitra, 2003; Popovič et al., 2012). This technological perspective has been found to not sufficiently consider the organizational decision process context of BI&A (Arnott and Pervan, 2008, 2014; Davenport, 2010; Sharma et al., 2014; Shollo and Kautz, 2010). Understanding the organizational context of decision processes is crucial as it affects the realization of the benefits from improved information quality that is delivered by BI&A systems (Popovič et al., 2012; Sharma et al., 2014). In this regard, research on BI&A started investigating organizational aspects related to decision processes, like organizational information processing (Kowalczyk and Buxmann, 2014; Shollo and Galliers, 2013), analytical culture, information-sharing values and information use (Popovič et al., 2012, 2014) and factors related to the decision environment (Işık et al., 2013).

This research contributes to the field by investigating ambidexterity of collaboration procedures between analysts and decision makers in BI&A-supported decision processes and by linking it to the established concepts of political behavior and procedural rationality from management research.

2.2   Political Behavior and Procedural Rationality in Decision Processes

In management research, decision processes have been often studied on the basis of a three phase conception or derivatives of it, which includes the (i) identification of an issue, the (ii) development of solution alternatives and the (iii) selection of one solution (Mintzberg et al., 1976; Simon, 1960). Management research on decision processes distinguishes between political behavior and rationality of procedures as two main characteristics that affect the effectiveness of information usage in decision processes (Dean and Sharfman, 1993a; Eisenhardt and Zbaracki, 1992; Papadakis and Barwise, 1998). Both characteristics are considered as important, and a major focus has been on studying the outcomes of decisions that vary in terms of political behavior and rationality of procedures (Elbanna, 2006; Papadakis and Barwise, 1998).

The rationality of decision processes is a central topic in decision making theory and practice (Papadakis and Barwise, 1998). For characterizing rationality in the context of decision processes, previous research has developed a series of more specific constructs of rationality, which are derived from the rational model of decision making (Simon, 1978). Different notions of rationality in decision processes include comprehensiveness (Fredrickson, 1984; Papadakis et al., 1998), decisional rationality (Schwenk, 1995), and procedural rationality (Dean and Sharfman, 1996). The conception of procedural rationality in decision processes is defined as the extent to which decision maker behavior involves gathering information that is relevant to the decision and relying upon analysis in making the decision (Dean and Sharfman, 1993a, 1996). Hence, procedural rationality characterizes the extent of infor-

mation use throughout the phases of decision processes, which includes validating an issue, developing solution alternatives and forming expectations about them, and making the final decision (Dean and Sharfman, 1993a). The emphasis on the use of information in this 'procedural' conception of rationality renders it suitable for our research, as information use is considered to be crucial for profiting from high quality information supplied by BI&A (Popovič et al., 2014; Shollo and Galliers, 2013).

The perspective of political behavior in decision processes assumes that decisions are the result of a process in which decision makers have different goals and try to influence the decision process outcome, so that their own goals will be pursued (Pfeffer, 1992). This interaction of interests, conflict and power characterizes the political nature of decision processes and describes the way in which managers often make decisions (Eisenhardt and Zbaracki, 1992). The conception of political behavior can be defined as activities that use power and other resources to pursue own interests and preferred outcomes in situations with uncertainty about choices (Dean and Sharfman, 1996). According to this conception, control over information can be a possible source of power. From this point of view, problem definition, data collection, alternatives development and evaluation can be regarded as weapons that are used to distort effective information usage and to manipulate decision outcomes, rather than instruments that deliver facts for decision making (Dean and Sharfman, 1993a). Therefore, in this research we consider political behavior as the use of power by decision makers to pursue own interests or goals, which might affect the use of information supplied by BI&A (Shollo and Galliers, 2013).

Dean and Sharfman (1993a) investigated the relation between procedural rationality and political behavior in decision processes. They argue that the extent, to which information is used systematically, is conceptually different from political behavior and found both characteristics to be uncorrelated. This means that procedural rationality and political behavior are two distinct, complementary dimensions of decision processes. Thus, decision processes can be both – procedurally rational and political – or neither (Dean and Sharfman, 1993a). The empirical results on the impact of procedural rationality on decision outcomes provide evidence for a positive relationship (Elbanna and Child, 2007; Nutt, 2005, 2008; Papadakis et al., 2010). In contrast, the empirical evidence on political behavior mainly supports a negative relationship (Elbanna, 2006; Elbanna and Child, 2007). Reasons that account for this negative relationship include a lack of open discussions and information sharing among decision makers or even distortion of information (Pfeffer, 1992). This may result in dependence on incomplete information and incomplete understanding of environmental constraints (Dean and Sharfman, 1996). Furthermore, political behavior is considered to be time-consuming and may delay decisions, which can result in loss of opportunities and profit (Pfeffer, 1992). In summary, findings from literature suggest that positive decision outcomes depend on a favorable ratio between procedural rationality and political behavior, which means that the former exceeds the latter (Dean and Sharfman, 1993a).

2.3 Collaboration Procedures and Ambidexterity in Decision Processes

The success of BI&A-supported decision processes depends on the collaboration between analysts and decision makers (Sharma et al., 2014; Viaene, 2013). Analysts are experts who utilize the technological capabilities of BI&A in order to address the information needs of decision makers by supplying them with high quality information and insights (Harris et al., 2010; Viaene, 2013).

Prior research has found that managerial decision processes are often semi-structured or unstructured and characterized by nonroutineness. This means that adaptations of the procedures are typically needed and process steps within and between the process phases are often performed iteratively (Eisenhardt and Zbaracki, 1992; Gorry and Scott Morton, 1971; Mintzberg et al., 1976; Nutt, 2008). This implies that information needs, as well as data processing and analytics requirements can change frequently throughout managerial decision processes, which makes these decision contexts particularly challenging. In their work analysts do not only have to cope with these changing information needs, but as discussed in the previous section, also with varying levels of political behavior and procedural rationality.

In summary, the dynamics of decision processes demand adaptability for providing high quality information and effective analytical support as the basis for being able to improve procedural rationality.

Potentially conflicting goals and interests among decision stakeholders demand alignment for being able to establish effective collaboration and to attenuate effects of political behavior. This means that in the context of BI&A-supported decision processes requirements regarding adaptability and alignment are induced.

Simultaneously fulfilling both kinds of requirements has been often considered as difficult and organizational ambidexterity provides a useful theoretical lens on coping with such conflicting demands (Gibson and Birkinshaw, 2004; Raisch and Birkinshaw, 2008). Based on a general conception of alignment and adaptability (Gibson and Birkinshaw, 2004), a process-oriented conception, which considers agility and rigor in development processes was derived (Lee et al., 2010). The general notion of alignment describes the coherence among all the patterns of activities and their working together towards the same goals (Gibson and Birkinshaw, 2004). The derived conception of rigor is defined as the adherence to pre-defined, formal, and structured processes, as well as explicit definitions of roles, activities, work products and methods (Lee et al., 2010). In general terms, adaptability defines the capacity to reconfigure activities quickly to meet changing demands in the task environment (Gibson and Birkinshaw, 2004). Consistently, agility defines the process capability to effectively sense and respond to changing requirements (Lee et al., 2010; Lee and Xia, 2010). Ambidexterity describes the capability to combine capacities from both dimensions and the ideal state has been characterized as balance and excellence in both dimensions (Cao et al., 2009; Gibson and Birkinshaw, 2004).

In this research we rely on the process-oriented dimensions of ambidexterity (i.e., rigor and agility) for characterizing collaboration procedures between analysts and decision makers in the context of BI&A-supported decision processes. We furthermore investigate their effects on political behavior and procedural rationality, as well as decision outcomes in BI&A-supported decision processes.

3   Research Method

Researching BI&A-supported decision processes requires in-depth analysis of a complex phenomenon. Therefore, we considered the case study approach to be suitable for our research (Benbasat et al., 1987; Dubé and Paré, 2003; Seaman, 1999; Yin, 2003). The units of analysis of our study are decision processes that were supported by BI&A. We utilize a multiple case study approach and our design applies replication logic. This setup allowed us to attain a deep empirical grounding and immersion into multiple organizational decision processes. This helped establishing more valid and general results than it would be possible from a single case study (Miles and Huberman, 1994; Yin, 2003). The following sections provide further details on research design, data collection and analysis procedures.

3.1   Research Design

In this research we investigate eleven decision processes and these cases were selected following a theoretical and literal replication logic (Dubé and Paré, 2003; Yin, 2003). For achieving literal replication, we selected decisions that were characterized as being non-routine and we ensured that the basic corporate and technological context of the investigated decision processes were similar. This means that all case study companies were large firms and that in the investigated decisions, decision makers relied on BI&A support, which was provided by analysts. Furthermore, the decision processes had to be completed, because we were interested in gaining insights on the distinct phases and their characteristics, as well as on decision quality. We address potential sector-specific influences by selecting a broad set of firms from different industry sectors. For theoretical replication, we primarily aimed at investigating decision processes with varying levels of process agility and rigor, as well as distinguishing different levels of achieved decision quality. This allowed us comparing the obtained insights across the cases. Our research design relies on the perspective of BI&A-experts (i.e. BI&A unit leads, data scientists or analysts). These experts typically support all phases of a decision process and have deep insights into aspects related to data, analysis and the actual decision making. Hence, focusing data collection on their perspective helped us maximizing the visibility on the decision processes.

3.2   Data Collection

In order to support data collection and assure reliability we created a case study protocol and database. There we defined the objectives and data collection procedures for our study. During data collection we utilized multiple sources of evidence for data triangulation, which helped us to enhance the validity of our findings (Yin, 2003). This means that we conducted in-depth expert interviews, collected additional documents where possible, and gathered complementary data by using a follow-up questionnaire in order to increase the reliability and validity of our findings (Eisenhardt, 1989; Yin, 2003).

We identified participants by searching for suitable expert profiles on social networks for professionals. For the expert interviews we developed a semi-structured interview guide with open-ended questions. The guidelines were tested and refined in the context of two pilot interviews. The final version encompasses three parts. The first part inquires the educational background, professional experience and current organizational role of the expert. The second part deals with general information about the BI&A technology and the investigated decision process. Finally, the third and major part of the interview deals with one specific decision process, which was supported by the interviewed expert. For capturing the expert knowledge regarding the investigated decision processes we followed a key-informant approach (Bagozzi et al., 1991). During the interviews we explored the three phases of the decision processes in detail, by encouraging the experts to speak openly (Ericsson and Simon, 1993) and by applying the laddering technique for asking successive questions (Reynolds and Olson, 2001).

As a complementing means of data collection, the interviewed experts completed a follow-up questionnaire, with the purpose of collecting data for cross-validation and quantification. All characteristics were measured using multi-item, seven-point Likert scales and we mainly used existing scales or adapted them to our research context. Scales of agility and rigor use four items each (Lee et al., 2010) and were adapted to the research context under study. Information quality was measured using eleven items according to Popovič et al. (2012). Relying on established management literature we assessed political behavior and procedural rationality with four items each (Dean and Sharfman, 1993a, 1996; Elbanna and Child, 2007) and decision quality with three items (i.e., goal achievement, realized decision value, overall quality of decision) (Dean and Sharfman, 1993a, 1996; Nutt, 2008).

The case study interviews were conducted during a time period of four month in the second half of 2013. The majority of the interviews was performed as face-to-face meetings and few also on the telephone. On average one case meeting lasted two hours. The average interview time accounts for approximately 75 minutes and the remainder of the time was used for presentations or demonstrations by the participants and in most cases for filling out the questionnaire. In all cases the interviews were audio recorded. In summary, this research approach yielded a rich combination of qualitative and quantitative data that provides substantial depth and breadth for data analysis.

3.3   Case Overview

Table 1 provides an overview of the investigated cases and presents details on the industry of case firms, the interviewed experts and the decisions that were investigated in the case study. The average professional BI&A-experience of the interviewed experts amounts to more than ten years. Characterization of the investigated cases as comparable managerial decisions is based on discussions of the decision content and the ratings of the nonroutineness of the decisions. All investigated decisions exhibit increased ratings of nonroutineness, which vary between five and seven. Decision contents include issues like reacting on new competitors (Case 01, Case 11), major segmentation and product portfolio related decisions (Case 02, Cases 04-06, Cases 09-10), introduction of new risk models (Case 03, Case 08) and substantial changes to the constitution of a fleet (Case 07). Decision quality ratings were provided by interviewees and these ratings, as well as the assignment into three groups was corroborated with qualitative descriptions from the interviews. In all cases the organizations relied on BI&A systems from major BI&A vendors. The average ratings of information quality for the three phases of the investigated decision processes are rather high and vary between five and six for all cases.

Case ID	Industry	Interviewee Role	Experience (Years)	Decision Content	Avg. Info-Quality	Non-routine.	Dec. Quality
1	Telco	BA unit head	>10	Reaction to new competitor	5.7	7.0	High (7.0)
2	Media	Analyst	18	Product portfolio (pricing)	5.1	7.0	High (6.0)
3	Finance	Analyst	>10	Introduction of new risk models	5.9	5.0	High (6.0)
4	Consumer	BA unit head	6	Product portfolio (product mix)	6.0	5.0	High (6.7)
5	Tourism	BI unit head	14	New product development	5.9	5.0	High (6.3)
6	Finance	Analyst	>15	Product portfolio segmentation	5.3	7.0	High (6.0)
7	Logistics	Analyst	5	Fleet constitution	5.6	6.0	Med. (5.3)
8	Finance	Analyst	>10	Introduction of new risk models	5.0	5.0	Med. (4.7)
9	Logistics	Analyst	>12	Product portfolio (pricing)	5.4	6.0	Med. (5.0)
10	Telco	BA unit head	6	Product portfolio (constitution)	5.0	6.0	Low (1.5)
11	Telco	Analyst	> 15	Reaction to new competitor	5.3	7.0	Low (1.0)

Note: Scales for Avg. Info. Quality, Decision Nonroutineness and Decision Quality: 1-7; Dec. Quality: 7.0 ≥ High ≥ 6.0 > Medium > 3.0 ≥ Low ≥ 1.0

Table 1.   Case Overview

3.4   Data Analysis

Before starting data analysis, the audio files were transcribed. The case transcripts represent the main raw data that we used during analysis. The subsequent data analysis procedure followed established recommendations for qualitative data analysis (Corbin and Strauss, 2008; Miles and Huberman, 1994). First, transcripts were coded, by using a list of codes that has been defined based on existing literature on decision processes (Corbin and Strauss, 2008; Ericsson and Simon, 1993; Miles and Huberman, 1994). We utilized first-level coding for assigning codes to all statements that reflected statements on agility, rigor, procedural rationality, political behavior and their effects. The coding process was performed iteratively (Miles and Huberman, 1994). Next, we focused on conceptual links and interrelations between the identified and coded segments. Here we relied on an inductive procedure that allowed relationships to emerge from the data (Corbin and Strauss, 2008). Then we conducted case comparisons by utilizing techniques for cross-case analysis (Miles and Huberman, 1994). In this step we compared cases with regard to similar concepts and relationships. Moreover, qualitative data from the interviews and quantitative data from the questionnaires were analyzed jointly and checked for consistency. At all intermediate steps during analysis the results were discussed among the authors with the purpose to create a common understanding, as well as convergence on joint interpretations.

4   Results

The presented results are based on a comparative analysis of the investigated decisions. Subsequently, we examine case-specific compositions of political behavior and procedural rationality and discuss their impact on decision quality. Next, we focus on ambidexterity and elucidate the effects of rigor and agility on BI&A-supported decision processes. Finally, we integrate these perspectives and present evidence on how ambidexterity complements information quality for achieving decision quality.

4.1   Impact of Political Behavior and Procedural Rationality

The major value that BI&A systems deliver, in an organizational context, is related to an improvement in data processing and analysis capacities, which creates the basis for usage of high quality information in decision processes. Based on the results from the comparative analysis of cases, we find that achieving high levels of information quality is a necessary, but not sufficient condition for achieving high decision quality in decision processes. More specifically, we found that despite having relatively high information quality in all cases, the actual decision quality varies (see Table 1). Cross-case analy-

sis yielded two main categories of factors that influence the extent of political behavior and procedural rationality, which in turn can derogate the positive impact of information quality on decision quality.

The first category of factors originates from the organizational level and deals with the locus of analytics support. Analysts can be organized in a centralized or decentralized manner. This induces a trade-off between effectiveness of decision support, which requires analysts to have domain-specific knowledge, and transparency, which requires analysts to act independently. This tension turns out to increase the potential for an unfavorably unbalanced ratio between political behavior and procedural rationality, as highlighted in the following experts statements:

"I know many companies that have decentralized BI&A units, […]. Of course every local BI&A unit generates insights that let their unit shine. Even if analytics are used for optimization or improvement, this typically only happens in the local unit and hence there is mainly local optimization." (Case 1)

"[…] 'one version of truth', there are endless stories. If you don't have it, every business unit creates its own numbers and then you can challenge the numbers of others if you don't like them." (Case 11)

The second category of factors addresses the individual level and deals with conflicting goals and personal motivations. These were found to be a hindrance, even if decision stakeholders utilize the same high quality information basis, as highlighted by the following expert statements:

"In situations in which analysts or several decision makers utilize the same information, but pursue different goals, this does not help […] as soon as we are coping with interpreting analytics results […] this is where most political games happen." (Case 8)

"Political behavior, such as withholding information, represents a risk from the decision maker perspective, as complete and valid facts and background information are needed […] this is particularly dangerous if personal goals are not aligned with organizational goals." (Case 4)

Furthermore, participants noted that often information availability and quality is not the actual problem, but that instead rational or objective procedures for working with the information are lacking:

"I don't think that with today's amounts of data there is a problem with information availability, it's rather that these things are often seen subjectively, which can lead to wrong decisions." (Case 6)

In summary these factors affect the extents and ratio of political behavior and procedural rationality in decision processes and hence should impact decision quality. Next, we therefore take a closer look at political behavior and procedural rationality in the investigated decision processes. Figure 1 gives an overview of the phase-specific ratings for both characteristics. We aggregate the ratings from the seven point scales to three levels ($7.0 \geq$ high $\geq 5.0 >$ medium $> 3.0 \geq$ low ≥ 1.0) in order to enhance ease of interpretation. Additionally, we group decision processes that achieved high (left) and low/medium (right) decision quality. Decision process phases that are mainly characterized by procedural rationality are located below the quadrants of the diagonal and those that are mainly political are located above the diagonal. Based on previous findings (Dean and Sharfman, 1993a; Papadakis et al., 2010), cases located in quadrants below the diagonal should mainly exhibit high decision quality and those above the diagonal low decision quality. For cases in quadrants along the diagonal, medium levels of decision quality are feasible, as these process phases are exposed to both characteristics.

For cases with high decision quality we mainly find high extents of procedural rationality and these are maintained or even improved throughout the course of these decision processes. In particular, procedural rationality exceeds the extent of political behavior in most of the investigated decision process phases and we thus find favorable ratios of both characteristics. For cases with low/medium decision quality, we mainly find more balanced ratings of procedural rationality and political behavior. Here, higher extents of procedural rationality can be only found sporadically during some of the investigated development phases. In contrast to cases with high decision quality, particularly the selection phases are characterized by higher levels of political behavior. Overall, in these cases we find less favorable ratios of procedural rationality and political behavior. To summarize, the investigated cases exhibit patterns that confirm predictions that can be made based on literature. Interestingly, the results imply that already moderate levels of political behavior can impede the quality of decision results.
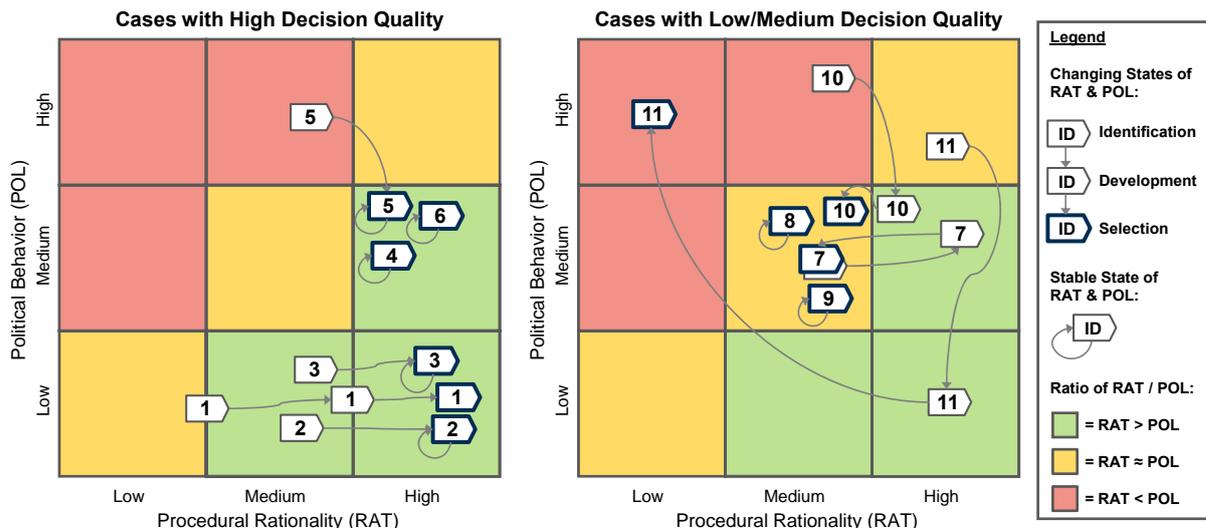
Figure 1.   Procedural Rationality and Political Behavior in Cases with High Decision Quality (Left) and Low/Medium Decision Quality (Right)

We describe case 11 in more detail, as it exhibits the highest extent of political behavior and the ratio with procedural rationality changes throughout the decision process phases. Case 11 deals with reacting to new competition and the decision process was triggered by brand management. The analyst was issued to develop a market model in order to make predictions about customer retention and for evaluating different strategies on how brand management should act with regard to the newly entered competition. A further goal that was perused was to highlight the value contribution of brand management, in order to strengthen its position within the company. The analyst collected information requirements for the analysis and withdrew for developing the analytic model and recommendations. During the development phase the interaction with brand management was limited, which seems to have allowed for raising the extent of procedural rationality of the decision process. In the selection phase the model and the derived analytic advice were presented to brand management. Although the analytic results were perceived to have high quality, the suggestions for coping with the new competition were rejected. The main reasons of brand management for neglecting the analytic advice were concerns regarding worsening its internal position, as the advice contradicted to its current strategy. Additionally it implied a rather low value contribution of brand management. Thus brand management decided to continue following its current strategy and forbid communicating the results and implications from this analysis. In the long run, dealing with the newly entered competition ended up on the top-management agenda and their changes to the company strategy proved the rejected analytic advice to be right.

In summary, we find that despite high quality information and analytic results the outcomes of BI&A-supported decision processes can be severely affected by political behavior and procedural rationality. Solely focusing on the supply of information seems not to be sufficient, as noted in the next quote:

"Generally speaking, you could state that availability of better information leads to better decisions, but this is rather very simplistic. I think it's more like a saturation curve, until a certain degree information gains increasing utility, but then this reduces […] then it's crucial how you make the decision, based on the information and the procedures." (Case 11)

This statement accentuates the relevance of procedural aspects in complementing the supply of information in decision processes. Next, we therefore focus on characteristics of collaboration procedures.

4.2   Decision Process Rigor and Agility as Dimensions of Ambidexterity

This section presents insights on rigor and agility as the two main characteristics of ambidextrous collaboration procedures between decision makers and analysts in BI&A-supported decision processes.

We examine the effects of rigor and agility in the context of the investigated decision processes. Based on the comparative case analysis, five properties of BI&A-supported decision process emerged, which are positively or negatively affected by rigor and agility. Table 2 gives an overview of the identified properties and effects by providing representative quotes from the expert interviews. Whereas the first two properties (rights and roles clarity, transparency) mainly cover the need for alignment in decision processes in order to control the extent of political behavior, the latter three (adaptability, efficiency and effectiveness) primarily deal with improving procedural rationality in decision processes.

Dec. Process Properties	Effects of Rigor	Effects of Agility
Rights and Roles Clarity	*(+) "In the area of analytics and insights generation, we have explicit publishing rights. [..] we can independently publish our insights and all decision makers have access. Hence, we are neutral, independent and transparent and we can make insights available to everyone." (Case 1)* *(+) "[...] formality allows that analysis does not remain one sided [...] that all relevant stakeholders are involved into the process in a timely manner." (Case 8)*	*(-) "In agile collaboration this is rather difficult, personally I would consider a well-defined selection of decision stakeholders, with clearly defined roles, as necessary. Agile collaboration contributes rather little in this direction." (Case 3)*
Transparency	*(+) "[...] the clear advantage is that a lot is documented. It's always clear how you get to the results and with whom they have been discussed, this helps [dealing with politics]." (Case 1)*	*(-) "The more flexible you are, the more opportunities exist for making the process less transparent. There you can introduce large political influences." (Case 9)* *(+) "[With agility] you have significantly increased speed of information flowing into the decision process [...] this also allows for earlier intervention in such processes [...]." (Case 8)*
Adaptability	*(-) "If adaptability is needed in a problem context, then rigor could be a hindrance, because I won't have the flexibility to adapt the process as required." (Case 7)*	*(+) "[...] during model development, if data are changed or for example facets of the analysis change, then agility is fundamental in such a context." (Case 11)*
Efficiency	*(+) "[...] positive effects, particularly on decision speed and also on the avoidance of friction losses between stakeholders, because the procedures are clearly defined. I think that there is also more precision in interpretation." (Case 7)*	*(-) "But agility has to be used in a structured and rigorous manner, otherwise you lose track of what you are actually doing.", "[...]halfway through the process you realize that this needs major changes, then it was badly defined from the beginning [..]." (Case 2)*
Effectiveness	*(+) "If a decision is traceable and measurable, then this raises decision quality." (Case 2)* *(-) "This is a very structured process, which is important for us, but for decision makers this is really very formal and is partially seen as a barrier for working with us." (Case 1)*	*(+) "From my point of view, agility has a positive effect, because adaptability is important for the results, so that the results provide relevant evidence." (Case 7)* *(-) "I often experienced that in cases where different perceptions prevail, the analytic insights are often neglected in decision making and instead discussions about aspects like governance model and responsibilities emerge." (Case 6)*

Table 2.   Effects of Rigor and Agility on Decision Processes

Rigor was associated with the clarity of rights and roles, which was described as positive in the context of decision processes, because responsibilities can be defined explicitly and independence of analysts in the organizational context can be ensured. This helps providing balanced perspectives on analysis and interpretation of results. Additionally, the creation of transparency concerning decision and analytic procedures through rigor was described as the major mechanism for being able to reduce the extent of political behavior. In this regard, process rigor was also associated with positive influence on efficiency of BI&A-supported decision processes. In contrast, rigor was found to have drawbacks re-

garding the required adaptability of analytic procedures in decision processes. Concerning the effectives of decision process support we received mixed results. Rigor was found to contribute to effectiveness. But at the same time, very high levels of rigor were associated with negative effects, particularly when high formality was impeding collaboration between analysts and decision makers.

For agility, the major benefit that was identified was the flexibility to adapt procedures to changing information requirements. Achieving an adequate level of adaptability was regarded as the basis for realizing effective analytic decision support. Overall, agility was found to be lacking with regard to rights and roles clarity. Statements concerning transparency were mixed. On the one hand, high levels of adaptability were considered as dangerous due to missing definition of procedures, diminishing reproducibility and consequently increased opportunities for political behavior. On the other hand, increasing the speed of information infusion and close collaboration with decision makers were seen as possibilities to gain consensus and more control over the decision process. Although agility was associated with speed in analytic procedures, high extents of agility were also linked to negative influences on decision process efficiency, when process structure was missing. Concerning effectiveness, agility was mainly attributed positive influence and was seen as the basis for achieving relevant analytic insights for supporting the decision processes. But also negative influences were mentioned, particularly for situations where absence of process structure can derogate the usage of relevant analytic results.

In summary, findings from the investigated cases suggest that rigor and agility seem to have advantages and drawbacks concerning their effects on decision processes. Consequently, a notion of balance between both characteristics was described as being most beneficial. But it was also considered as challenging to achieve, as explained in this quotation:

"This is somehow a paradox between both capabilities. On the one hand I can stay flexible, but then I lose formality and on the other hand I can make this so formal that I won't be flexible." (Case 9)

The importance of this balance between rigor and agility for BI&A support of decision processes is summarized and highlighted in the following expert statement:

"I believe that you need the right balance. [...] you need the defined process for transparency, structure and also efficiency. And you need agility for achieving result quality and effectiveness." (Case 1)

This notion of balance between rigor and agility has been previously conceptualized as ambidexterity (Lee et al., 2010). We use this conceptualization of ambidexterity in order to investigate the procedural dimension of the collaboration between analysts and decision makers jointly with information quality.

4.3 Complementarity of Information Quality and Ambidexterity

In this section we integrate the previously developed perspectives. We present evidence on how ambidexterity in BI&A-supported decision processes complements information quality in shaping favorable ratios of procedural rationality and political behavior, for achieving decision quality. Figure 2 integrates the phase-specific ratings of process ambidexterity and information quality for the investigated decision processes. We operationalized ambidexterity as product of the ratings of rigor and agility (Cao et al., 2009; Gibson and Birkinshaw, 2004). All ratings of ambidexterity and information quality are phase-specific and we again reduced the scales to three levels. Additionally, for each phase of the decision process, the phase-specific ratios of procedural rationality and political behavior are depicted.

For information quality we find that it was relatively high in all cases and decision process phases. The lowest values can be found mainly in the first phases (identification) of the investigated decision processes. Information quality improves or is maintained at a high level throughout the second phases (development). In the final phases (selection) we find high ratings in all cases. Hence, in most cases high quality information was available, but nevertheless decision quality varies strongly.

Comparing both groups of cases yields further interesting insights. We find that cases with high decision quality exhibit mostly high ratings of ambidexterity. The ratings of information quality and process ambidexterity are fairly balanced and this balance tends to be maintained or improved throughout the process phases. In the final decision process phases (selection) all cases can be found relatively

close to the diagonal and the upper right corner. In the set of the cases with high decision quality, only two phases (identification phases of cases 1 and 5) are characterized by increased levels of political behavior, although information quality and ambidexterity are relatively high. An explanation for this might be that in the initial phases, the mode of collaboration between decision makers and analysts has not yet been established and hence increased levels of political behavior can occur. In both cases this changes in subsequent phases and these are to a higher extent characterized by procedural rationality.
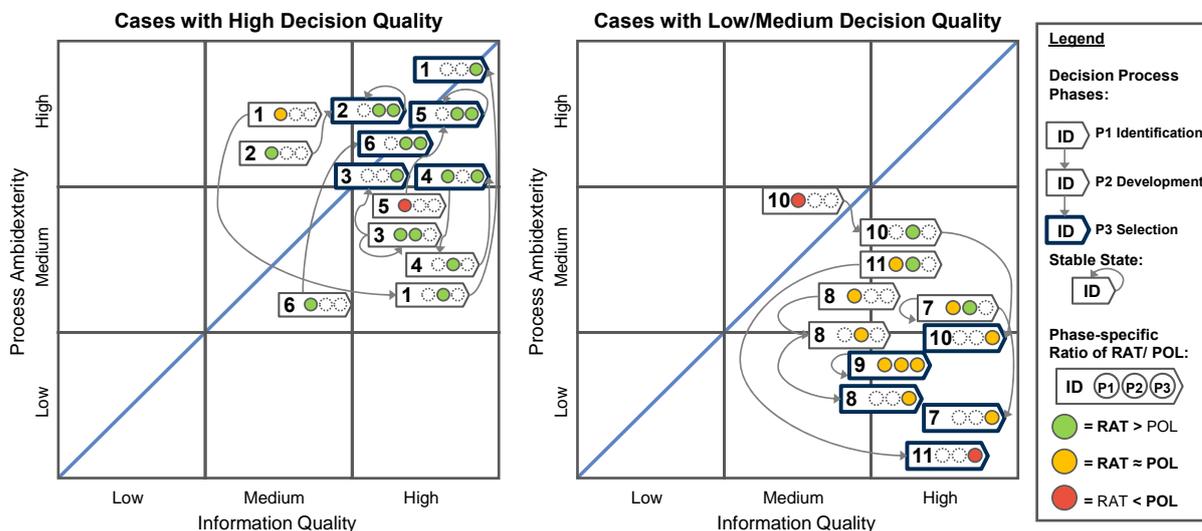

Figure 2.   *Effects of Information Quality and Ambidexterity in Cases with High Decision Quality (Left) and Low/Medium Decision Quality (Right)*

In contrast, the set of cases with low/medium decision quality exhibits an unbalanced pattern between information quality and process ambidexterity. Most phases are located below the diagonal and we can observe a tendency for decreasing balance throughout the decision process phases. Particularly, in the selection phases we find the most unbalanced combinations between ambidexterity and information quality, with a focus on the latter. The majority of process phases is characterized by increased levels of political behavior. Prevalence of procedural rationality can be only found in the development phases of three cases (cases 7, 10 and 11). This interesting pattern can be explained by a reduced extent of interaction between decision makers and analysts during the development phase. After identifying and specifying the problem, analysts withdrew from the interaction with decision makers and focused on data analysis, which allowed them to raise the extent of perceived procedural rationality. Unfortunately, due to a lack of process ambidexterity, this effect seems not to be sustainable. The level of political behavior rose again during the selection phase and influenced decision quality negatively.

5 Discussion and Conclusion

This research investigated the organizational context of BI&A-supported decision processes. In the following, we discuss theoretical and practical implications, as well as directions for future research.

5.1 Discussion of Key Findings

With this study we strived to contribute to existing research by going beyond the prevailing technological perspective and by explicitly addressing decision processes and the organizational perspective of BI&A decision support (Arnott and Pervan, 2008; Sharma et al., 2014; Shollo and Kautz, 2010). Our multiple case study of BI&A-supported decision processes offers the following contributions.

This research integrates established conceptions of political behavior and procedural rationality from decision process research into the context of BI&A support. Investigating compositions of political

behavior and procedural rationality in BI&A-supported decision processes provided further evidence that achieving high levels of information quality is a necessary, but not sufficient condition for achieving high decision quality (Popovič et al., 2014; Shollo and Galliers, 2013). In the investigated cases we mainly observed medium and low levels of political behavior. Considering the research context, which deals with BI&A, this might not be surprising and is consistent with previous research on decision processes (Dean and Sharfman, 1993b; Eisenhardt and Zbaracki, 1992). The interesting implication is that despite having high quality information, already moderate levels of political behavior can impair decision process outcomes, particularly if politics prevail through multiple decision process phases.

Furthermore, we focused on the characteristics of collaboration procedures between analysts and decision makers in the investigated decision processes. The more distinctive theoretical contribution of this research refers to the complementing relation between ambidexterity and information quality in BI&A-supported decision process. In this regard, our study provides insights on the need for both, process rigor and agility during the collaboration between analysts and decision makers in BI&A-supported decision processes. Through cross-case analysis of qualitative and quantitative data we provide initial empirical support for the complementing relation between information quality and ambidexterity, as well as for its implications on political behavior, procedural rationality and the outcomes of decision processes. We find that ambidexterity and information quality are essential for realizing the benefits of BI&A and achieving decision quality. Identifying the complementing effect of ambidexterity does not only allow for extending the reference theory foundation of decision support systems research, but also represents a novel contribution to management research by combining both streams of research (Papadakis et al., 2010). The results of this research provide valuable insights on how to design collaboration procedures in order to cope with varying extents of procedural rationality and political behavior in BI&A-supported decision processes.

These insights are also of considerable practical significance, because they highlight the factors that are relevant for improving decision processes and their outcomes. In particular, the results suggest that delivering technological and analytics support for achieving high quality information and analytic recommendations is not sufficient. Instead ambidexterity of collaboration procedures between analysts and decision makers has to be actively pursued and managed throughout decision processes, in order to assure that analytic insights generate the intended impact and benefits. This suggests that establishing collaboration between analysts and decision makers should be guided by principles for achieving rigor and agility in decision processes. Our findings imply that maintaining rigor and agility throughout the collaboration can help achieving favorable ratios of procedural rationality and political behavior, which positively affects the outcomes of decision processes. Thus our results provide guidance on how to design procedures in order to improve BI&A-supported decision processes and their outcomes.

5.2   Limitations and Future Research

We presented results on BI&A support in decision processes from firms located across different industries. Using a multiple case study approach we strived for more general results than those that can be achieved with a single case study. Nevertheless, there is still further need for discussion and validation of the research findings. Limitations arise from reliance on the key-informant method and ex post data collection and potential associated biases. Although taking the perspective of analysts was beneficial with respect to visibility on the investigated decision processes, this research would benefit from investigations of complementing perspectives (i.e. decision makers), in order to validate findings.

We found that ambidexterity of collaboration procedures affects decision processes. This relationship should be investigated further, as it seems to be viable for the usage of information and the effectiveness of decision support in an organizational context. Another interesting aspect that would require further research is the saturation effect for supplying information quality, which could be investigated under different conditions and decision process contexts. In this regard, a larger empirical basis of BI&A-supported decision processes would be of great value. We hope that by adding a perspective that goes beyond the technological view we can actuate further related research in this direction.

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