Gathering Knowledge from Decision Making

Research-in-Progress

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Abstract

Companies are forced to make decisions, either based on existing data or intuition. Documenting decisions would enrich the data base for future decisions and enable learning from experience. This learning is directly related to knowledge management, another important topic for companies. Both areas – decision making and knowledge management – are supported by information systems. However, currently, decision support systems seem to have fulfilled their duty when the decision has been made and knowledge management systems are not seen as a valid instrument for documenting decisions. This research projects aims at developing an artifact, able to document decisions made and converting it into explicit knowledge. The artifact is developed based on an iterative Design Science Research approach for integrating decision making and the documentation thereof into knowledge management.

Keywords: Decision Making, Knowledge Management, Decision Documentation, Learning, Design Science Research

Introduction

Decisions have to be made all the time, in particular in business situations. Decision support systems (DSS) have been in place since the 1960s (Buchanan and O'Connell 2006) to provide facts and figures and prepare for a rational decision (Alavi and Leidner 2001). However, non-rational decisions – based on 'gut feeling' – play also an important role and lack this support to date. Examining DSS lead to the conclusion, that the systems are designed to support the decision, but rarely offer ways to document what lead to the final decision, i.e., how the decision has been made (Watson 2018). Documented decisions, however, can be a basis for recurring or similar decisions. Preserving this knowledge about the decisions made may reduce decision time and improve decision quality. Preservation of knowledge is among the common goals of knowledge management and widely discussed in this field (Vladova et al. 2018). However, in this intersect between decision and knowledge management to the best of our knowledge, research is scarce. In this research project, we in detail investigate how decisions are made and can be documented. We include both types – rational and intuitive – of decision making and elaborate on differences and similarities. Based on a Design Science Research approach, we develop an according artifact based on various data sources leading to iterations and evaluation. The long-term goal of this research is to develop an artifact (model, tool or instrument) for decision documentation integrated into knowledge management, which is accepted and used by executives. Therefore, we ask: How can decision making and the documentation thereof be implemented into knowledge management?

The paper follows suggestions for design science research studies (Gregor and Hevner 2013). Accordingly, the paper is organized as follows: we show the current state of the field on knowledge management, decision-making theory and its support by information systems. Next, methodology is outlined, followed by a description of the preliminary results and further steps.

State of the Field

Although terms like data, information or knowledge are commonly used, a clear differentiation is often missing (Beynon-Davis and Wang 2019). To make our research project's focus clear, we initially differentiate between data, information and knowledge. Differences between data (symbols representing "properties of objects and events"), information ("processed data … increasing its usefulness"), information (answering to questions, descriptions) and wisdom, which "deals with values" (Ackoff 1989) has been discussed widely, yet without a final solution. Information has been described as the characteristics of the output of a process, informing about the process and the input (Losee 1997). According to the OECD, information exists in form of structured and formatted data that remain passive and inert until used by those with the knowledge needed to interpret and process them (OECD 2004). Knowledge empowers its possessors with the capacity for intellectual or physical action, it is information in action and a matter of cognitive capability (OECD 2004). Knowledge has also been described as "justified true belief" (Losee 1997). As knowledge is embedded in believes and behaviors, a large part of it is tacit (North et al. 2018), which means the collection of person's beliefs, perspectives, and mental modes that are often taken for granted (Alyoubi 2015; Nonaka 1994). Tacit knowledge is difficult to articulate and to put into words, text, or drawings. Explicit knowledge, by contrast, represents content that has been captured such as words, audio recordings, or images (Dalkir 2013; Davis et al. 2005). It is formal knowledge that can be expressed through language, symbols or rules (Alyoubi 2015; Nonaka 1994). Innovations evolve when organizational members share tacit knowledge, convert this into explicit knowledge in the form of a concept for e.g. service (von Krogh 1998). Therefore, knowledge is associated with firms' capabilities to achieve a competitive advantage and among the most important strategic factors in corporate operations (Spender 1996). It relates to what employees know about customers, one another, products, processes, mistakes, and successes, whether that knowledge is tacit or explicit (O'Dell et al. 2016; Razmerita et al. 2016). Consequently, individuals are the critical unit of analysis in working with knowledge – the more productive the individual is the more knowledge is being used (Grant 1996; O'Dell et al. 2016). In addition to individual knowledge, group knowledge (Nonaka 1994) is also important for companies. From an academic point of view, theoretical considerations like the knowledge-based theory of the firm (Alavi and Leidner 2001; Grant 1996; Massey and Montoya-Weiss 2006; Tanriverdi 2005) as well as organizational knowledge creation (Cook and Brown 1999; Nonaka 1994), to name just two important theories, reflect the importance of knowledge. The latter is directly related to the dynamic theory of organization knowledge creation (Nonaka 1994), stating that the basis of knowledge creation is a vivid and constant dialogue relying on socialization, combination, internalization and externalization as patterns of interaction (Nonaka 1994). The knowledge based theory of the firm, by contrast, values knowledge as a significant and strategic resource of companies due to the fact that these resources are hard to imitate (Grant 1996). Compared to the resource-based view of the firm (Wernerfelt 1984), knowledge is the most important resource a company owns.

Since the 1990s Knowledge Management (KM) as a research field has been constantly gaining importance with cross-disciplinary contributions from various disciplines (e.g., organizational behavior, strategic technology management, organizational learning, computer science, artificial intelligence) (Burstein and Carlsson 2008; Gaviria-Marin et al. 2018; Razmerita et al. 2016). Definitions regarding KM exist from various perspectives (Dalkir 2013); however, a universally accepted definition of KM does not yet exist (Shin et al. 2001). In general, KM addresses the process of converting tacit knowledge into explicit knowledge (Alyoubi 2015) to create value from an organization's intangible assets (Liebowitz 2001) as well as supporting and enabling better decision making (Burstein and Carlsson 2008). It has been emphasized, that KM is a collaborative and integrated approach to creation, capturing, organization, access, and use of companies' intellectual assets (Grey 1996 Newmann 1996). In the core it relates to identifying and leveraging the collective knowledge in an organization to help the

organization compete (von Krogh 1998) aiming at increasing innovativeness and responsiveness (Hackbarth 1998). Converting tacit into explicit knowledge includes socialisation, articulation, integration, and understanding respectively internalisation (Alyoubi 2015; Li et al. 2009; Nemati et al. 2002). Expected organizational outcomes of KM cover organizational learning, innovation, product quality, besides creative, financial, economic and organizational performance (Adams and Graham 2017; Brix 2017; Esterhuizen et al. 2012; Li et al. 2009; Vila et al. 2014). Quite often, five knowledge management processes are defined: construction (adding new material), organization (relating bodies of knowledge to each other), storage, distribution ("to places where it is needed") and application (Pentland 1995). However, on a more fine-grained level seven processes (i.e. knowledge acquisition, creation, refinement, storage, transfer, sharing, and utilization) have been identified (King 2009).

The important role of decision-making for managers has been emphasized for many decades (Tannenbaum 1950), as decisions are a significant activity of management and essential to the wellbeing of the entire organization. (Pelletier and Harrison 2000). Making solid, yet fast decisions (Patton 2003) in a complex economic environment, challenged by competitiveness on the market requires not only according cognitive abilities and intuition (Lank and Lank 1995) but also data (McKenna and Martin-Smith 2005). Asking on how to make decisions right (Dane and Pratt 2007) lead to different approaches. Yet, all of them share the idea that decision making means selecting between alternatives in more or less complex situations. From a rational point of view, decisions can be made in an analytical way based on existing data considering utility (Day 1971; Shapiro and Krishnan 2001). Since full information and perfect knowledge (Tarka 2017) for making well-informed decisions is never given, intuitive decision making seems to be a common human behavior, in particular in fast changing environments (Vershinina et al. 2017). Intuition depends on prior experience (Styhre 2011), associations (Dane and Pratt 2007), preferences and thoughts (Kahneman 2012) and allows fast decision making. It is not hindering rational decisions making but exists in parallel, yet showing different attributes regarding speed and applicability (Simon 1987). Some studies differentiate between System 1 thinking (more intuitive) and System 2 thinking (mainly rational based on analytical approaches) (Beresford and Sloper 2008; Hogarth 2003; Kahneman 2012). However, the systems are not independent and in complex situations, both are required and used to make decisions (Beresford and Sloper 2008; Kalantari 2010; Styhre 2011).

Information systems are used to support both, KM and decision making. First, Decision Support Systems (DSS) (Alyoubi 2015) aim at improving managerial decision making (Arnott and Pervan 2014). As information systems supporting decision making have a long history starting from the 1960, terms and associated methods and technologies changed over time (e.g. "executive information system", "decision support system", "business intelligence") (Power 2008). From small scale Personal Decision Support Systems (PDSS) (Arnott and Pervan 2014) up to Group Decision Support Systems (Alyoubi 2015), all DSS use data, provided in an appropriate (i.e., condensed) way to decision makers (Arnott and Pervan 2014). Due to the exploding amount of data from various sources (e.g., social media, cloud computing, Internet of Things, mobile devices, RFID) 'big data' as the basis for decision making (Arnott and Pervan 2014; Bontis 2001; Pauleen and Wang 2017) found a lot of attention. Second, Knowledge Management Systems (KMS) (Alavi and Leidner 2001), support knowledge management processes mainly in three different ways: "coding and sharing of best practices", "creation of corporate knowledge directories", and "creation of knowledge networks" (Alavi and Leidner 2001).

The relationship between rational decision making, based on data for making decisions and knowledge management evolves from the aim of knowledge management, i.e., the preservation of knowledge for enabling organization learning (Vladova et al. 2018) and supporting decision making (Burstein and Carlsson 2008). However, current research on the intersect regarding integration of decisions and their documentation seems to be scarce. Some studies address the problem and ask for applying KM principles to DSS for supporting semi- and ill-structured problems (Alyoubi 2015).

Methodological Approach

The aim of this study is identifying how decisions and documentation of decisions can be integrated into knowledge management as basis for improving companies' performance. We aim at developing an artifact, supporting decision documentation of both intuitive and rational decisions, which is integrated

into knowledge management to learn from previous decisions. We therefore rely on a design science research (DSR) approach (Hevner et al. 2004; Peffers et al. 2007). Based on the guidelines for the rigorous application of DSR, we identified problem relevance, focus on research rigor, adopt design as a search process and as an artifact, foster design evaluation but also include, research contributions and communication of research (Hevner 2007). The goal of our research – the artifact (prototype) – will be tested regarding utility, reliability and validity. In the actual development (see figure 1) we use a well-established 6-step research process for DSR (Peffers et al. 2007), but also open the research process to iterations in various steps as described in current DSR studies (Arnott and Pervan 2011; Bodenbenner et al. 2013). The prototype is based on different phases of development, supported by constructs, models and rigorous methods. The final artifact combines characteristics of a model and a process to document decisions and their attributes. Figure 1 shows the different data sources used to inform the DSR process.

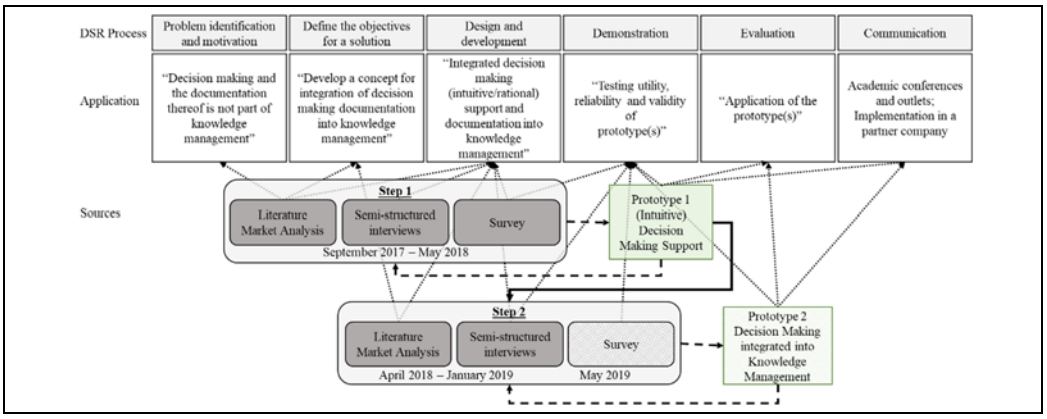

Figure 1. Sources Used for DSR, Iterations and Prototypes

Preliminary Results

This section will display the research process as well as the current state of the research project. First (Phase 1), the authors focused on the current state of research concerning intuitive decision making and its delimitation towards rational decision making. This included current research on information systems supporting intuitive decisions, too. Furthermore, as market analysis uncovered a lack of IS support concerning intuitive decisions, a prototype was developed incrementally implying three versions (built on one another). The aim of the prototype was to support decision makers in documenting their managerial decision and in learning from their prior decisions with focus on intuitive decision making. In phase 2, authors examined the current state of information systems' support of rational decisions. For details regarding data used in phase 1, please see Rueckel, Krumay and Wicke (2018).

Phase 1 - Intuitive and Rational Decision Making

The research started in 2017 with a structured literature review and market analysis, we conducted semi-structured interviews followed by a survey. The qualitative interviews covered three major questions: (1) current situation concerning intuitive decisions, (2) relationship/dependencies between intuitive and rational decisions (3) known/applied decision heuristics or patterns. Ten managers (C-level) agreed on participating, most of them were CEOs. Companies' sizes varied from 20 to 220000 employees and were segmented in different industries (machinery, education, IT, real estate, finance, consulting, manufacturing, culture). Decisive factors influencing the choice of decision type were derived as key findings based on coding techniques used in Grounded Theory (Strauss and Corbin 1990). The identified factors were: experience, mood, recommendations from others, exiting data, time and cost. Furthermore, decisions concerning 'soft' business tasks such as marketing were determined to be rather made intuitively that 'hard' tasks such as finance or legal concerns. Decision makers somehow classified their managerial decisions concerning risk and importance. Summarizing, participants were aware of importance and acceptance of intuitive decisions, did not apply any (formalized, explicit) decision heuristics and indicated the relation between learning and experience as evidence for the advantage of IS support. In order to evaluate these findings, a survey based on findings from the

qualitative phase and further literature research was conducted. 200 people (C-level) were identified as target group and invited to participate, relating in 91 questionnaires (response rate approx. 46 %) used for data analysis. Most of them were male (app. 85 %), between 31 and 60 years of age (app. 96 %) and had more than five years of experience in management (app. 80 %). More than 90 % were aware of making intuitive decisions, considered identification of decision type as possible (approx. 85 %) and even preferred intuitive decisions over rational decisions (approx. 75 %). Almost 65 % considered documentation of prior decisions as important, whereas importance rises with company size. These findings were the basis for developing a prototype to document decisions, learn from prior decisions and thereby gather experience. The prototype was designed and developed following structured design science methodology. Authors started the project with two simple proof-of-principle prototypes that offered rudimental functions for documenting decisions in the shape of a structured questionnaire. Even at early stage the prototypes offered a simple method to evaluate decisions ex-post using weighted average rating. Due to suggestions resulting from multiple evaluation iterations, the realization using .NET framework (later ASP.NET), C# (later HTML 5 and Bootstrap) and associated limitation to certain operating systems the actual prototype is based on platform independent technologies. The scope was widened to enhance usability (e.g. visualization, learnability, operability), design (e.g. user handling, user interface, layout) and security (e.g. confidentiality, integrity, accountability). The functionality focusses on five steps: (1) show questions on decisions (derived from literature and behavioral research); (2) analyze and structure data (derived from literature and behavioral research); (3) match data with historical data; (4) show results; (5) save decision with related data from analysis.

Phase 2 – Documentation of Decision Making

The most recent phase focused on (rational) decision processes and tool usage for documentation of decision-making processes. A market analysis was conducted to identify appropriate software tools, resulting in at least four applications (Riskturn, Board, Datapine, Actico) fulfilling the requirements from the previous phase. Using a qualitative approach (i.e., semi-structured interviews), we aimed at identifying (1) about companies' requirements towards documentation of decisions, (2) what information associated to decision to document and (3) how documented information on prior decisions could/does benefit companies. In addition, interviewees (five managers on C-level) were exposed to the tools found. Based on qualitative content analysis, the following requirements were identified: (a) tools have to be flexible as decision situations vary along business lines, (b) gathered information has to be shared and (c) transparency of the process leading to certain suggestions. Concerning decision associated information, it is necessary to document initiator of the decision, reason for decision situation, decision maker, information used to make decision and final decision. Finally, the following information on use of documented data is necessary: justification on prior decision, learning from prior decision, distribution of information and performance evaluation. Managers appreciated the idea of specialized tools, however, still tend to use standard software (e.g. spreadsheets) to document decisions.

Next Steps

As next steps in this research, we plan another survey among C-level managers for collecting more data, to further enrich knowledge regarding decision making and knowledge management. Besides developing a final prototype, the focus is on the integration of decision documentation in knowledge management processes as well as the expected impacts of organizational learning from decisions.

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