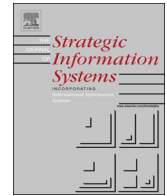




Contents lists available at ScienceDirect

Journal of Strategic Information Systems

journal homepage: www.elsevier.com/locate/jsis

When decision support systems fail: Insights for strategic information systems from Formula 1

Paolo Aversa, Laure Cabantous, Stefan Haefliger*

Cass Business School, City, University of London, United Kingdom

ARTICLE INFO

Keywords:

DSS
Affordances
Big data
Strategic information system
Decision-making
Distributed cognition
Performativity
Practice theory
Ferrari
Formula 1

ABSTRACT

Decision support systems (DSS) are sophisticated tools that increasingly take advantage of big data and are used to design and implement individual- and organization-level strategic decisions. Yet, when organizations excessively rely on their potential the outcome may be decision-making failure, particularly when such tools are applied under high pressure and turbulent conditions. Partial understanding and unidimensional interpretation can prevent learning from failure. Building on a practice perspective, we study an iconic case of strategic failure in Formula 1 racing. Our approach, which integrates the decision maker as well as the organizational and material context, identifies three interrelated sources of strategic failure that are worth investigation for decision-makers using DSS and big data: (1) the situated nature and affordances of decision-making; (2) the distributed nature of cognition in decision-making; and (3) the performativity of the DSS. We outline specific research questions and their implications for firm performance and competitive advantage. Finally, we advance an agenda that can help close timely gaps in strategic IS research.

Introduction

Decision support systems (DSS), which often process big data using models and output results through multiple interfaces, increasingly pervade knowledge-intensive professions from traffic control, health, to security, and finance (Constantiou and Kallinikos, 2015; Galliers et al., 2017; George et al., 2014). Data support strategic decision-making in various ways by feeding models and technologies of visualization and control (Baesens et al., 2014; Brynjolfsson and McAfee, 2012; Loebbecke and Picot, 2015; McAfee et al., 2012). Recently, scholars and practitioners have agreed on the burgeoning importance of DSS and big data for strategic decisions, which—if properly leveraged—can positively contribute to firm performance, profit, growth, and competitive advantage (Davenport and Harris, 2007; LaValle et al., 2011; McAfee et al., 2012). Information System (hereafter IS) research on big data and decision support systems has primarily focused on the technological aspects and design challenges of big data (Chen et al., 2012, 2014) and only recently started considering the organizational dimensions of strategic decision-making with big data (Constantiou and Kallinikos, 2015; Günther et al., 2017; Poletto et al., 2015). We argue that the design and use of tools in context deserve more attention given the well-known challenges of modern DSS, particularly when big data further complicate their functioning. This organizational dimension of decision-making builds on the managerial definition of big data and associated challenges (McAfee et al., 2012): (1) Sources of data become increasingly diverse, multiple, and dynamic; (2) More stakeholders in decision-making generate and analyze data using more and more devices; (3) Feedback speed and volume of data favors the non-human actors (e.g., Artificial Intelligence and similar solutions).

* Corresponding author.

E-mail address: haefliger@city.ac.uk (S. Haefliger).

<https://doi.org/10.1016/j.jsis.2018.03.002>

Received 29 July 2016; Received in revised form 8 March 2018; Accepted 9 March 2018

0963-8687/© 2018 Published by Elsevier B.V.

In this paper, our aim is to contribute to strategic IS research on DSS by showing the value for top management of considering the organizational dimension of decision-making with big data, in situations that are strategic to a firm's competitive advantage. To do so, we analyze in detail an extreme case of decision-making with DSS with big data leading to failure of strategic dimensions in Formula 1 (F1): the 2010 Abu Dhabi grand prix where the Ferrari team lost the F1 world championship due to what was considered by many a judgment error in retrospect (Allen, 2010; Collantine, 2010). We choose this event for three main reasons. First, given the clear relation between DSS and performance in F1 and the fact that, in this field, performance and competitive advantage are unmistakably measurable (Aversa and Berinato, 2017; Gino and Pisano, 2011; Marino et al., 2015), F1 has been mentioned as an ideal setting for studying the use of big data (George et al., 2014: 321), and it is particularly suitable to observe DSS-aided decision-making under pressure. Second, this decision failure case epitomizes business situations where time is critical and information systems cannot be separated from their context of use, neither in space nor in time. It is therefore an ideal case to shed light on the strategic implications of the design and use of DSS for organizations—which ultimately determine organizations' success or failure. Third, and importantly, this case exemplifies the three challenges of big data and creates inroads into a research agenda in strategic IS with the development of decision-making tools in mind. The development of tools and information technology artifacts is the domain of design science (Hevner et al., 2004; March and Smith, 1995) that includes the organizational domain by taking into account the user (Markus and Silver, 2008) as well as the openness of a system that remains incomplete (Garud et al., 2008; von Krogh and Haefliger, 2010).

In order to analyze this iconic case of DSS with big data under time pressure, we adopt a practice-based perspective (Gherardi, 2012; Nicolini, 2011). This perspective has gained increasing interest both in the IS (Arnott and Pervan, 2014; Cecez-Kecmanovic et al., 2014a, 2014b; Peppard et al., 2014) and strategic management (Cabantous and Gond, 2011; George et al., 2014; Jarzabkowski and Kaplan, 2015; Vaara and Whittington, 2012; Wagner et al., 2010; Whittington, 2014) communities over the recent years. As applied to strategic decision-making with DSS, a practice-based approach invites IS scholars to consider not just the individuals who make the decisions (together with their cognition) but instead to study the 'practice of deciding.' In other words, this perspective suggests approaching decision-making as a situated, social and material practice involving the decision-makers, the technologies, and the specificities of the decision contingencies, in order to study how the relations between all these elements constitute decisions and ultimately to evaluate their outcomes (Cabantous and Gond, 2011; Cabantous et al., 2010).

Our practice-based interpretation of the case leads us to question the public interpretations of the 'heroic' individual user of a DSS who succeeds or fails and we reveal three groups of insights: the first is about the closely connected sets of biases at the intersection of the human and the machine. IT and DSS with big data are not simply at the service of a boundedly rational human decision maker, even if that is the sole public interpretation of the events. A more nuanced analysis of this strategic decision failure reveals the importance of considering decision-making with big data as a socially situated practice, and hence to consider the affordances of IT artifacts and the organizational context. It also shows that strategic decision-making with big data must be understood within a distributed cognition approach; and finally shows the importance of considering the performative power of the models that aggregate and structure the data entering the DSS. Ultimately, our analysis shows the importance of considering decision-making with DSS and big data as a social and material practice given the diversity of uses of decision-making technologies and artifacts in time and space, while paying careful attention to their interpretive flexibility or affordance (Bernhard et al., 2014; DeSanctis and Poole, 1994; Junglas et al., 2013; Markus and Silver, 2008; Zigurs et al., 1988) as well as other intangible aspects such as organizational culture (Barney, 1986; McDermott and O'Dell, 2001; Schein, 1985; Suppiah and Singh Sandhu, 2011).

Overall, our analysis leads to more questions than answers because it invites a reading of the failure case that goes beyond what the press and observers took as a first conclusion in order to stimulate research in strategic IS and systems design. Our analysis also enables us to develop a compelling research agenda for strategic IS scholars, which, in line with recent key contributions (Arnott and Pervan, 2014; Peppard et al., 2014), pays particular attention to the role of recent DSS for strategic purposes, including the interactions between the technical and organizational dimensions of decision-making as a response to the challenges laid out by authors who recently addressed the business promise of big data (Baesens et al., 2014; Davenport and Harris, 2007; Jacobs, 2009; Lazer et al., 2014; Loebbecke and Picot, 2015; Poletto et al., 2015). We conclude our paper by discussing implications for design science and the management of strategic information systems.

Theoretical background

The strategic use of IS in practice can lead to individual and organizational failure, and it is one of the foremost challenges of scholarship to help decision makers and support their potential to make successful decisions (Günther et al., 2017; McAfee et al., 2012). Several key strategic domains in organizations – e.g., those related to business models, innovation, and operations – are strongly influenced by decisions taken with the help of DSS and big data. Advances in technology as well as in the theoretical understanding of the role that material artifacts such as IS play in collaboration and decision-making (Leonardi, 2011; Nicolini et al., 2012; Orlikowski, 2000) have led strategy and IS scholars to increasingly study practice as a sight of research (Jarzabkowski and Kaplan, 2015; Mazmanian et al., 2014; Scarbrough et al., 2015). Fundamentally, this is because the strategic outcome of decisions partly depends on the actual use, *in situ*, of the tools available to the decision makers. The input and models that constitute a DSS are as important as the decision makers who employ them towards a desired outcome, which is why "decision-making 'disasters' may stem from the oversimplification or misrepresentation encoded in tools" (Jarzabkowski and Kaplan, 2015: 538; March 2006). The affordances of the tools (e.g., DSS, models, screens with visual representations etc.) represent our first point of departure when studying a case of strategic decision failure.

DSS have a long history of taking into account groups of decision makers and the types of tasks they face (DeSanctis and Gallepe,

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