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Searching for big data
How incumbents explore a possible adoption of big data technologies

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ABSTRACT

Big data is often described as a new frontier of IT-enabled competitive advantage. A limited number of exemplary firms have been used recurrently in the big data debate to serve as successful illustrations of what big data technologies can offer. These firms are well-known, data-driven organizations that often, but not always, are born digital companies. Comparatively little attention has been paid to the challenges that many incumbent organizations face when they try to explore a possible adoption of such technologies. This study investigates how incumbents handle such an exploration and what challenges they face. Drawing on a four-year qualitative field study of four large Scandinavian firms, we are able to develop a typology of how incumbents handle the exploration of and resistance to adopting big data technologies. Directly affecting the incumbents' exploration are two aspects that separate the adoption of big data technologies from that of other technologies. First, being an elusive concept, big data technologies can mean different things to different organizations. This makes the technologies difficult to explain before an investing body, while it simultaneously opens up possibilities for creative definitions. Second, big data technologies have a transformative effect on the organization of work in firms. This transformative capability will make managers wary as it might threaten their position in the firm, and it will create ripple effects, transforming other systems besides those directly connected to the technology.

1. Introduction

In the debate about the significance of big data for business, the phenomenon is often presented as a technology-based avenue to competitive advantage: a new frontier of IT-enabled experimentation, innovation, and customer centricity (Chen, Chiang, & Storey, 2012; Davenport, 2013; McAfee & Brynjolfsson, 2012; Parmar, Mackenzie, Cohn, & Gann, 2014). Much of this debate was initially driven by simplistic and optimistic notions often stemming from various evangelists, consulting firms, and other practitioners (e.g., Anderson, 2008;Chui, Manyika, & Bughin, 2011; Mayer-Schönberger & Cukier, 2013). Harnessing big data can allegedly produce outcomes recurrently described as ranging from better overall financial performance and optimized business prioritization to increased customer insight that can favorably affect innovation (Davenport, 2014; McAfee & Brynjolfsson, 2012; Pigni, Piccoli, & Watson, 2016; The Economist, 2012; Westerman, Bonnet, & McAfee, 2014). While the possibility for such outcomes to manifest themselves cannot be questioned, they have hitherto mostly been of a hypothetical nature, and to the extent that they reflect reality, it has mostly concerned a few actors that are repeatedly referred to in the debate as successful examples (cf. Goes, 2014). Among other things, these actors tend to have highly digitized operations, to be data-driven companies, and to have been frequently, but not exclusively, born digital, i.e. having embraced digital technologies since their inception. Examples of such firms are Amazon, Dell, eBay, Facebook, Google, LinkedIn, Netflix, Procter & Gamble, Target, Tesco, UPS, Walmart, and Zara (Davenport & Harris, 2007; Manyika et al., 2011; Smith & Telang, 2016; The Economist, 2010; Westerman et al., 2014).

However, the vast majority of organizations, particularly incumbent organizations, which make up the largest part of the economy, are not yet conversant with big data (Goes, 2014; Sanders, 2016). While many of these organizations understand that they operate in data-rich environments, they do not understand how to exploit that data (Ross, Beath, & Quaadgras, 2013). Vendors who promote various sets of technologies (e.g., Frizzo-Barker, Chow-White, Mozafari, & Ha, 2016; Wang, Xu, Fujita, & Liu, 2016) that, they argue, can enable clients to manage big data through, for instance, big data analytics (BDA) operations, often do so by adding to the choir of simplistic and optimistic chants (e.g., IBM, 2011; IBM, 2012; Manyika et al., 2011). Frequently the various sets of technologies are offered as generic solutions to problems that are not easily identified as such by the incumbents. The level of confusion only increases in organizations that are considering

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buying a set of technologies as these sets form a rather fragmented landscape of technologies (Goes, 2014). Judging from the aforementioned exemplary companies, positive big data outcomes are related to systematic and coordinated efforts "as part of an overarching strategy championed by top leadership and pushed down to decision makers at every level" (Sanders, 2016:27).

Despite the attention and significance attributed to big data by scholars lately (e.g., Abbasi, Sarker, & Chiang, 2016; Agarwal & Dhar, 2014; Chen et al., 2012; George, Haas, & Pentland, 2014; Goes, 2014; Kallinikos, 2013), very little is known about how incumbents explore and, if possible, implement big data technologies and what challenges are associated with such endeavors. Yet, it is incumbents that stand to gain the most when such technologies, in various forms, are applied in their organizations (e.g., Gandomi & Haider, 2015; Varian, 2013).

This paper presents a study that contributes to closing this gap. The question driving our investigation is, how do decision makers at incumbents evaluate the significance of big data for their organizations? By "evaluate" we mean, how do they go about exploring a possible adoption of big data technologies? For instance, how do they explore the merits of these technologies as well as investigate and satisfy necessary organizational preconditions and requirements showing that the technologies will ultimately result in beneficial outcomes, should they be implemented? The overall purpose of this paper is to investigate aspects – challenges and opportunities – that drive incumbents toward a positive or a negative conclusion on the adoption of big data technologies.

Our empirical basis consists of a four-year field study of four Scandinavian incumbents. The firms are large, nationally and internationally operating organizations that all explored the possible adoption of big data technologies. We followed their key project leaders in charge of these projects through recurrent roundtable discussions, personal interviews, visits, and presentations. Our interaction with them granted us insight into these projects and into the challenges and opportunities faced.

The rest of the paper is structured as follows. In the next section, we provide background to the phenomenon of big data's use in business and its rise in importance. Here we deal with big data's ascribed characteristics and the essence of the phenomenon, which we argue is a new form of knowledge production. The section that follows explains our research strategy. In section four we begin with a brief background of the incumbents before we depict each of the incumbent's efforts to explore the significance of big data at its organization. This within-case analysis is followed by a cross-case analysis in section five where our main findings are presented. Section six offers a discussion on the findings, before the final and concluding section.

2. The rise of big data

The information era (Beniger, 1986; Castells, 1999; Katz, 1988; Lyon, 1988) has been marked by increasingly pervasive digital technologies that have reconstituted organizational life and action. It has propelled the proliferation of data and has led to the formation of increasingly complex information environments in contemporary organizations (Kallinikos, 2006). While rich in data and information, organizations are many times poor in knowledge as they have difficulties turning that data and information into actionable knowledge (Caesarius, 2008). Efforts to harness data and capture their value have continuously been reported in the last decades (e.g., Caesarius, 2012; Chaudhuri, Dayal, & Narasayya, 2011; Davenport & Harris, 2007; Garcia Martinez & Walton, 2014; LaValle, Hopkins, Lesser, Shockley, & Kruschwitz, 2010). However, most of these efforts have yielded limited results and have been difficult or even impossible to sustain over time.

Big data is a product of the information era. It feeds off the everyday generation, storage, and distribution of voluminous sets of data, in widely varied formats, at extreme velocity, and with increasing granularity. This proliferation of data is prompted historically by several interrelated factors, all of which can be traced back to the introduction of compatible and interoperable digital mediating technologies (Kallinikos, 2011): first, the process of digitization that has been ongoing for decades following the infusion of information technology (IT) and increasingly more advanced database technologies in organizations (Kallinikos, 2006; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007; Zuboff, 1988); second, the emergence and development of the Internet, when digitization entered in a first wave the personal sphere and instigated social and cultural changes (Kjaerulff, 2010) as well as introduced new communication capabilities, altered work conditions (Cramton, 2001; Hinds & Mortensen, 2005), and radically changed the possibilities for information management (Jacobs & Yudken, 2003; Zittrain, 2008); third, the advent of social media, when digitization entered in a second wave the personal sphere and permeated the everyday lives of people, introducing a participatory mode of culture (Bruns, 2008; Jenkins, 2006) that affected collaboration (Wagner & Majchrzak, 2007) and innovation (von Hippel & von Krogh et al., 2003); fourth and finally, the arrival of network-connected artifacts that operate without the need for human involvement, popularly known as the Internet of Things (IoT). These artifacts are network-connected, uniquely identifiable technical artifacts, primarily sensors like cameras and RFIDs, which can provide a combination of actions such as detecting, recording, and responding by default (Borgia, 2014).

Contrary to the phenomenon's name, big data's novelty rests neither on size nor on any other characteristic specifically but on what these characteristics collectively imply in terms of the complexity found in the data structures it represents, the manners by which the data can be captured, and the ways they can be managed (cf. Agarwal & Dhar, 2014; Manovich, 2011). Big data, therefore, is a new phenomenon in that it breaks away from previous and more traditional ways of dealing with data in organizations (Kallinikos, 2013). Traditional IT tools, instruments, and techniques used in organizations have not been designed to take advantage of big data (Constantiou & Kallinikos, 2015).

New technologies and solutions that permit BDA promise a different way by which to transform data into valuable, actionable, and even automated decision support (e.g., Markus, 2015). These technologies are often concerned with various forms of data operations such as data discovery, data integration, and data exploitation (e.g., Miller & Mork, 2013; Wang et al., 2016). However, while this is technically correct, it is fundamentally wrong to equate big data with data operations. The significance of big data has less to do with data and more to do with knowledge. Big data proposes an altogether new form of knowledge production that rests on the computational manipulation of complex data sets with algorithmic accuracy to generate insights that were previously deemed impossible (Boyd & Crawford, 2012).

This sounds like an intriguing proposal, but as with any knowledge production form, it has its limitations. For example, it relies on data that is often de-contextualized, much of it produced outside of the organization by a multitude of actors (and devices), and later aggregated for analytical exercises (Constantiou & Kallinikos, 2015; Kallinikos, 2013). In this case, equating "big" with "better," "whole," or "complete" is troublesome. Furthermore, claims on capturing reality truthfully by being inherently objective are questionable as not all of reality is quantifiable and not all that is quantifiable is a relevant representation of reality (cf. Porter, 1995). Besides, quantification does not surrender truths easily without interpretation. This knowledge production's relationship to reality, which fundamentally drives incumbents' interest in big data technologies, is governed by its modes of measuring. These modes are by default authorized to also alter or reshape reality, since measuring per definition involves applying a particular perspective through which reality can be detected, identified, and visualized. This new knowledge production form proposed by big data has, therefore, its intrinsic flaws. This, however, does not mean that it lacks merit; the benefits have been hailed by many and can appear rather obvious. The question is rather to what degree and under what circumstances these benefits surrender themselves to incumbent