The Impact of Big Data Analytics Implementation on Data Analysts Behavior: The Role of Stress and Psychological Capital

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Research-in-Progress

Extended Abstract

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Abstract

Recently the application of big data analytics (BDA) technology has become a trend in improving business outcomes to capture valuable insights that were not achievable previously. Despite the positive impacts expected by the implementation of these technologies, the results show inconsistencies. This study uses the transactional theory of stress to elaborate on the role of implementation of BDA in such seemingly contradictory results. Specifically, we propose that depending on their psychological capital, data analysts may perceive such technological change either as inspirational or impeding. Analysts who can cope with the difficulties inherent to the new technology may be more motivated to learn analytical skills. In contrast, given the inability to manage their negative, stressful feelings, less psychologically competent data analysts would resist BDA implementation. The potential contributions to theory and practice will also be discussed.

Keywords

BDA implementation, hindrance and challenge stress, motivation to learn, resistance to implementing BDA

Introduction

The raw facts that represent an entity's characteristics are called data (Detlor et al. 2013). Data with high volume, high variety, and high velocity is called big data (Ghasemaghaei et al. 2018). Big data analytics indicates the utilization of advanced technologies such as Hadoop clusters and Spark to process and analyze big data and diagnose fruitful information (Gantz and Reinsel 2012). Many firms have recently begun to implement BDA to improve their performance and create firm values (Ghasemaghaei 2018). Previous studies have mentioned that firms using BDA can produce intelligence, enhance organizations' decision-making, and obtain competitive advantages; however, the development of modern technologies, novel types of data, and advanced analytical tools have also provided challenges for firms (Raguseo 2018). A recent survey represented that 85% of big data analytics projects fail in the preliminary stages (Asay 2017). Moreover, previous researchers also revealed that many firms implemented BDA could not wholly reap the benefits of using these tools (Ghasemaghaei et al. 2018). For instance, a recent study indicated that only 26% of firms announced that BDA's use has "significantly" improved their firm outcomes (Henke et al. 2016). By considering these statistics, firms may become uncertain about whether the advantages of utilizing BDA are more valuable and beneficial than its challenges (Kache and Seuring 2017).

A recent survey conducted by SAS (2014) indicates that 55% of 600 data scientists experience work-related stress. In this survey, 27% of male data scientists stated that they were "mildly stressed," and 25% of them said they were "heavily stressed." For female data scientists, those statistics increased up to 28% and 30%, respectively. These statistics represent that many data analysts are tolerating stress at their organization. Lazarus and Folkman (1984) mentioned that if individuals appraise stress as hindering proficiency, personal growth, or future benefits, it is called *hindrance stress*. On the other hand, if it is appraised as promoting competency, personal growth, or future benefits, it is called *challenge stress*. However, there is still a lack of understanding about the impact of announcing big data analytics implementation on data analysts' challenge and hindrance stress. In this study, we address this gap in the literature.

The survey conducted by SAS (2014) represents that individuals with specific personality types are more susceptible to work-related stress, while others can easily cope with stress. Notable differences in reactions to the same stressors at the same intensity can be seen in individuals with different personality types (Lecic-Tosevski et al. 2011). Folkman et al. (1986) mentioned that stress reactions are a personalized process and are highly related to individuals' characteristics. As a result, another purpose of this study is to understand the impact of the personality trait of data analysts, specifically their *psychological capital*, on their reactions to their stress resulted from announcing the implementation of BDA. Psychological capital is described as a positive psychological state of development that is associated with individuals' work behavior; it is made up of four elements of efficacy, optimism, hope, and resilience (Avey et al. 2009). Psychological capital is still a very new concept, and there is a lack of understanding of its value in the workplace (Min et al. 2015).

While stress perception may positively impact individuals' motivation to learn new skills, recent studies have indicated that stress as a prevalent predictor can lead to resistance against implementing a change (Halkos 2012; LePine et al. 2004). Kim and Kankanhalli (2009) stated that in information systems, one of the most important reasons for the failure of implementing new systems is user resistance, which should be understood and managed. Users' resistance may negatively affect organizations, such as increasing the duration for projects, overrunning the budgets, and decreasing the new system's utilization (Kim and Kankanhalli 2009). Therefore, in this study, we are going to investigate both the bright (i.e., data analysts' motivation to learn new analytical skills) and dark sides (i.e., data analysts' resistance to implementing BDA) of BDA implementation in firms, which can be inferred as a response to the calls for focusing on BDA benefits and risks (Clarke 2016).

Hence, the main research questions for this study are: **RQ1:** How does the announcement of BDA implementation impact data analysts' hindrance and challenge stress? **RQ2:** How do data analysts' hindrance and challenge stress affect data analysts' resistance to implementing BDA and their motivation to learn analytical skills? **RQ3:** How does data analysts' psychological capital impact the relationship between data analysts' feeling of stress and its outcomes? We used the transactional theory of stress proposed by Lazarus and Folkman (1984) to answer this study's research questions. This theory suggests that after stressful situations (e.g., implementing new technology) appraised as a challenge or hindrance, secondary appraisal examines how to cope. If individuals appraise a stressful situation as possibly negative, an emotional coping style is likely to happen (e.g., resistance to implementing new technology). On the

other hand, if they appraise the stressful situation as potentially positive, an active problem-solving style of behavioral coping is expected to occur (e.g., enhancing effort such as increasing motivation to learn to meet the situation's demands) (LePine et al. 2004).

Methodology

Experimental Design

In this study we will conduct an experimental design methodology. In the experimental design, data analysts will answer the related questions after reading a scenario. We will design an experiment manipulating announcing the implementation of BDA. Precisely, based on the study of Lewis et al. (2013), we will manipulate perceptions of riskiness of change (high/low) and sidedness of the announcement (one-sided/two-sided). As mentioned by Lewis et al. (2013), the announcement is one-sided only if the advantages and positive sides of the change are represented; however, in the two-sided announcement, not only advantages but also the disadvantages of the change are going to be presented for participants (Lewis et al. 2013). Besides, a change is risky when the change is perceived as potentially personally threatening.

We will conduct a pilot study involving 40 data analysts to test the experimental procedures and survey instrument. Furthermore, we aim to collect and analyze data from 200 data analysts to examine the hypothesizes identified in this study using an experimental method in which the implementation of big data analytics will be manipulated to explore how it impacts stress perceptions among data analysts in firms. Participants can voluntarily participate in this study, and monetary compensation will be given for their participation. The participants will be randomly assigned to read a scenario that introduces implementing BDA. They have to respond to the questionnaire, assuming that it is a real work situation and have received this memo from their managers. Four scenarios will be developed (a) high-risk change with the one-sided announcement, (b) low-risk change with the one-sided announcement, (c) high-risk change with the two-sided announcement, and (d) low-risk change with the two-sided announcement. For manipulating the sidedness, we mention both advantages (e.g., increasing innovation, efficiency, etc.) and disadvantages (increasing work overload, time pressure, etc.) of implementing BDA. For manipulating the risk of the change, we considered a job security issue. Because job insecurity is a type of risky change, and it will cause stress (Cavanaugh et al. 2000; Lewis et al. 2013). A manipulation check for the riskiness of change and sidedness of the announcement will be conducted using a respectively 4-item and 1-item scale adapted from Lewis et al. (2013).

Measurements

To ensure content validity, measurement scales for the constructs in this research will be selected from the extant literature. Hindrance and challenge stress of data analysts will be measured using a 3-item and a 3-item scale from Wang et al. (2018) and LePine et al. (2005). Data analysts' psychological capital will be measured using a 6-item scale for efficacy, a 6-item scale for hope, a 6-item scale for resilience, and a 6-item scale for optimism from Luthans et al. (2007). Data analysts' motivation to learn analytical skills will be measured using a 3-item scale from LePine et al. (2004). Data analysts' resistance to implementing BDA will be measured using a 4-item scale from Kim and Kankanhalli (2009).

Conclusion

In this study, we found a considerable gap in the information systems research about investigating both the bright and dark sides of implementing BDA in firms. We respond to a gap in the existing literature by extending the transactional theory of stress and explaining how the announcement of BDA implementation can lead to both hindrance and challenge stress for data analysts. We indicate how data analysts' feelings of hindrance and challenge stress affect data analysts' resistance against implementing BDA and data analysts' motivation to learn analytical skills. Subsequently, data analysts, based on the type of stress they perceive and their psychological capital, will engage in problem-solving or emotion-focused coping behavior that is motivated to learn analytical skills and resist against implementing BDA, respectively. Thereby, we contribute to the information systems literature by extending the transactional theory of stress to the context of BDA.

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