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Organizational Readiness for Business Intelligence and Analytics Systems Success

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Abstract

BI&A systems have the potential to improve business performance by facilitating innovations, creating new products and service, and enhancing decision making effectiveness. However, it requires certain technological and organizational capabilities to fully realize the values of BI&A systems. This study investigates how an organization needs to prepare itself to harvest from its investments in BI&A systems. We build a model using the contingency approach to test factors that affect the success of BI&A systems. The insights from this study can inform managers of business organizations about their organizational readiness for the success of their BI&A systems and identify best practices to implement BI&A systems in business organizations. It will also help advance our knowledge in how to accurately assess the success of BI&A systems.

Keywords

Business Intelligence and Analytics, System Success.

Introduction

The focus on Big Data has brought business intelligence and analytics (BI&A) to the forefront again as the academic and practitioner communities channel their efforts to assess BI&A systems success and their impacts. BI&A systems have the potential to improve business performance by facilitating innovations, creating new products and service, and enhancing decision making effectiveness. However, organizational readiness (e.g., culture, compatibility, organizational structure) for successful BI&A initiatives hinges on internal capabilities. As a result, justifying any investments in BI&A systems warrants an audit of an organization's infrastructure, people, organization structure, and culture to address the following questions as they relate to BI&A systems. Does the organizational IT infrastructure support the requirements of BI&A systems implementation? Do we have the technological capabilities for undertaking BI&A efforts? Does the current organizational structure and culture facilitate or hinder the success of BI&A systems? This research-in-progress proposes a model for empirical validation to address the aforementioned questions.

Our study has implications for practice and research. It advances our understanding of BI&A systems success and develops a comprehensive model to predict BI&A systems success. It will also assist managers in assessing their organization's readiness for BI&A systems as well as good business practices to adopt BI&A in organizations and the capabilities required to successfully assimilate BI&A systems.

Literature Review and Research Model Development

BI&A System Success

Information system (IS) success has been widely explored in the MIS literature. The seminal work by DeLone and McLean (1992) proposed six constructs representing IS success: system quality, information quality, IS use, user satisfaction, individual impact, and organizational impact. Seddon (1997) proposed

an alternative model that included three sets of constructs representing IS success: information and system quality, net profits of IS use, and behavior with respect to IS use and treated IS use as a proxy for benefits or an event in a process, leading to individual and/or organizational impact. These models were empirically tested in subsequent MIS research (Hunton and Flowers 1997; Rai et al. 2002). A modified Seddon model (Rai et al. 2002) was found performing the best in terms of model fit over the DeLone and McLean's (1992) model and Seddon's (1997) model. The modified Seddon's model included five constructs: system quality (represented by ease of use), information quality, perceived usefulness, user satisfaction, and IS use as a behavior. Past research indicates that the constructs for measuring IS success need to be carefully selected for different ISs and contexts (Rai et al. 2002; DeLone and McLean 2003). BI&A provide managers with analytical insights into current business operation performance and future potentials from processing multidimensional data, and the quality of information is critical to the quality of decision making outcomes. Accordingly, information quality can be considered as a key construct that determines the success of BI&A systems. Hence, we include information quality as one of the measures in assessing BI&A system success.

Although system use as a measure of IS success has been widely acknowledged, its operationalization has often been debated. Jasperson et al. (2005) conceptualized the post-adoptive system use (behavior) at the individual level and indicated that post-adoptive system use should be measured based on the use of system features. Similar to Jasperson et al.'s (2005) conceptualization, Burton-Jones and Straub (2006) defined system use from a systematic approach and emphasized that system use should be measured by using the functionality of the system under investigation. Following Burton-Jones and Straub's approach, Chen and Siau (2012) developed a measuring instrument to test the impact of BI system use on competitive performance. We include system use as a factor for BI&A systems success and adopt measures developed by Chen and Siau (2012).

Although we agree that past literature has considered system quality a valid measure of IS success, we believe that in the context of BI&A systems, system quality is an antecedent to the success of BI&A rather than a surrogate of the success. The quality of BI&A systems (as measured by the maturity of a BI&A system in this study) will have a direct impact on the quality of information or intelligence delivered by the system. Therefore, in the proposed model, system quality is treated as one of the technical factors that can determine the success of BI&A systems whereas information quality is treated as a measure of BI&A system success.

Studies found that decision making effectiveness and outcomes can be affected by decision making process (Dean and Sharfman 1996) and methods (Schmidt et al. 2001). Since BI&A tools (e.g., dashboards, visualization, and data mining) can help improve decision making processes and methods, we expect BI&A systems can help improve decision making effectiveness. Therefore, it is reasonable to assume that BI&A system success can be rationally measured by the decision making effectiveness.

Based on the discussion above, in this study we assess BI&A systems success using system use, information quality, and decision making effectiveness.

Antecedents of BI&A Systems Success

Contingency approach attempts to understand the interrelationships among environment, organizations, and organizational subsystems (Kast and Rosenzweig 1973; Weill and Olson 1989). The key assumption is that better fit among contingency variables leads to better performance (Weill and Olson 1989). According to the contingency theory, it is plausible to posit that better fit between values of an information system such as BI&A and its organizational context, the better is the performance of the system. We are interested in two broad constructs: organizational factors and technological factors. We want to investigate how some antecedent factors in these two broad constructs influence the performance of BI&A systems and users' perception of BI&A systems' success. The insights from this study will help managers adjust their organizational and technological settings to maximize the investment in BI&A systems.

Organizational Factors

Organizational culture is an important factor in determining the success of an information system. In a comprehensive review of research on culture and information systems, Leidner and Kayworth (2006) pointed out that organizational culture can influence successful implementation and use of information technology. MIS literature shows that a good fit between organizational culture and values generated from an information technology will lead to successful implementation and use of the technology (e.g., Alavi et

al. 2005; Hoffman and Klepper 2000; Schmiedel et al. 2014). If an organization has a culture that values the decisions based on data, users are likely to use a BI&A system to a greater extent. It is reasonable to assume that the BI&A culture has a positive impact on BI&A systems success. After reviewing the literature on culture in business process management, Brocke and Sinnl (2011) proposed the IS values need to fit with organizational cultural values in order to achieve success. Schmiedel et al. (2014) developed an instrument based on Brocke and Sinnl (2011)'s proposal to measure organizational culture for business process management. We follow Schmiedel et al.'s (2014) approach to build an organizational culture measurement instrument for BI&A systems, which measures organizational cultural attributes that may have impacts on BI&A systems success.

Compatibility is one of the five attributes that affect adoption of innovation in the innovation diffusion literature (Rogers 2003). *Compatibility* is defined as "the degree to which the innovation fits with the potential adopter's existing values, previous practices, and current needs." (Rogers 2003) It has been tested as an important determinant of innovation adoption (Macredie and Mijinyawa 2011; Oliveira et al. 2014; Sila 2010). Discussing the trends in BI&A, Halper and Stodder (2014) brought up an interesting term: operationalizing analytics, which refer to making analytics part of a business process. The compatibility of BI&A in this study measures how organizations operationalize analytics. We separate the value component in the Rogers (2003)' definition from the previous practices and current needs since the existing values are measured by the organization's culture. We define compatibility from the business operation perspective. We modified the Roger's definition for compatibility as "the degree to which the innovation fits with the adopter's previous practices and current needs".

BI&A maturity model was developed at TDWI by Halper and Stodder (2014). The maturity model assesses an organization's BI&A maturity on five dimensions: organization, infrastructure, data management, analytics, and governance. Based on the characteristics of the five dimensions, five stages of organizational BI&A maturity are introduced: nascent, pre-adoption, early adoption, corporate adoption, and mature/visionary. We will test the impact of maturity of the organization dimension on BI&A system success. This dimension of BI&A maturity measures how BI&A is viewed and how IT and business functions work together to realize the potential values of BI&A systems. In a more mature BI&A organization, IT and business units have the same goals and are likely to work together to provide more support, guidance, integration, and incentives for employees to use BI&A systems. Based on the discussion above, we theorize:

H_1: Organizational factors will influence BI&A success.

$H_{1.1}$: A data driven organizational culture will positively impact BI&A success.

$H_{1.2}$: BI&A Compatibility with organizational process and current needs will positively impact BI&A success.

$H_{1.3}$: Organizational maturity in BI&A will positively influence BI&A success.

Technological Factors

Technological capability has been identified as a key factor in determining IS success (Sabherval and Kirs 1994). There is a lack of empirical studies or efforts in investigating the effect of BI&A system capability on its success. Popovic et al. (2012) defined two dimensions for *BI&A system maturity*: data integration and analytical capability. We propose that data availability may be a good measure for data integration, which can be better operationalized in a survey. We define data availability as the degree to which relevant data are available for generating desired information. Prior literature has advocated using the features of an IS to measure its capability and use (Burton-Jones and Straub 2006; Chen and Siau 2012; Jasperson et al. 2005). Following the advocates, we will develop a new instrument to measure analytical capability of BI&A systems based on the common features of BI&A systems. Yeoh and Popovic (2015) also included data quality as a technology factor that affects BI&A system success. However, they did not consider it as a dimension of BI&A system maturity. We propose that data quality can be another dimension of BI&A system maturity. Data quality can reflect the robustness of data loading and cleansing process of a data warehouse. Ease of use is widely recognized as a key factor for information technology acceptance. Ease of use will affect users' attitude to use information for their decisions. A mature BI&A system should be easy to use for promoting its usage. Therefore we posit:

H_2: Technology factors will influence BI&A success.

$H_{2.1}$: Data availability will positively influence BI&A success.

$H_{2.2}$: Data quality will positively influence BI&A success.

$H_{2.3}$: Analytical capability will positively influence BI&A success.

$H_{2.4}$: The ease of use of BI&A systems will affect the BI&A system's success.

We summarized our research model with the graphical representation in Figure 1.

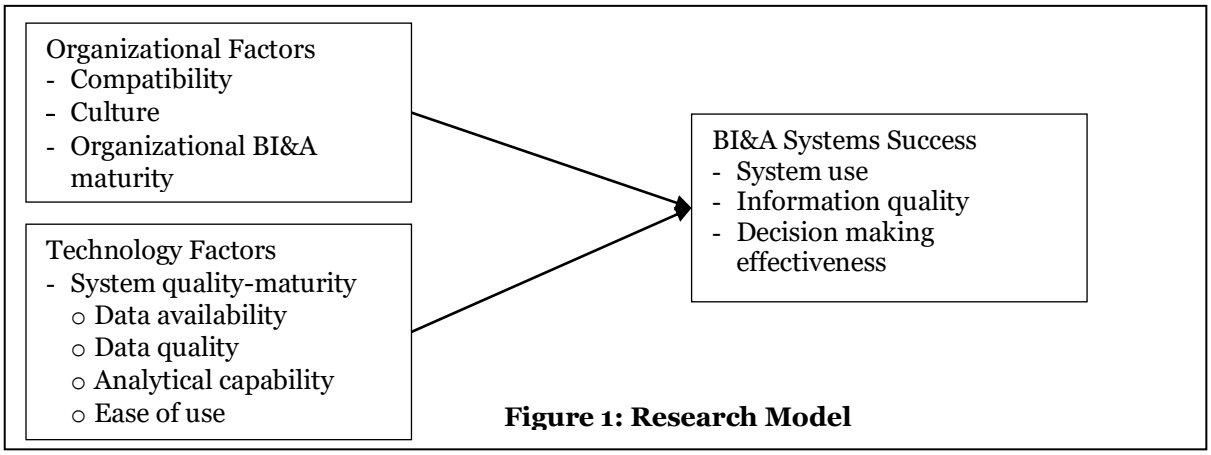

Figure 1: Research Model

Research Methods

We will test our research model using survey data. A cross-sectional survey study will be conducted to test the hypotheses. Although a survey is a non-experimental research method, it can be used to gather information about the characteristics, actions, or opinions of a large group of people and can be used to answer the question of why and to test theories and associative relationships (Neuman 2003; Pinsonneault and Kraemer 1993). The targeted respondents for the survey are business users who use BI&A software for their daily business activities. We will work with several BI&A vendors and professional associations to get information on organizations that have installed BI&A systems or have interests in deploying BI&A systems. We intend to collect data using an online survey hosted by Qualtrics.com. Emails will be sent out to the business users directly or through professional organizations to boost response rates.

Partial least squares (PLS) modeling will be used to assess the measurement model and to test the structural model. PLS is appropriate for this study because it is variance-based and places minimal restrictions on measurement scales, sample size, and residual distribution. It is also appropriate for building predictive models when there are new measurement instruments in the model (Chin et al. 2003).

Summary

In summary, this research investigates what factors affect BI&A systems success. We use contingency theory as the foundation to outline our model. We propose that organizational and technological factors that fit with the values of BI&A systems will determine users' perception of BI&A systems success.

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