The Role of Information Behaviors and Values in Strategic Information Systems Utilization: an investigation in the Business Intelligence Systems context

Aleš Popovič
University of Ljubljana, Faculty of Economics, Slovenia University Nova, ISEGI, Portugal
ales.popovic@ef.uni-lj.si
Ray Hackney
Brunel University, Business School, UK
ray.hackney@brunel.ac.uk
Pedro Simões Coelho
University Nova, ISEGI, Portugal
psc@isegi.unl.pt
Jurij Jaklič
University of Ljubljana, Faculty of Economics, Slovenia University Nova, ISEGI, Portugal
jurij.jaklic@ef.uni-lj.si

Abstract

Although the constituents of information systems success and their relationships have been well documented in the business value of information technology literature, our understanding of how information behaviors and values affect the relationships among strategic information systems success dimensions is limited. In response, we conduct a quantitative study of 146 medium and large firms that have implemented a business intelligence system in their operations. Our results highlight that information sharing values, information informality, and information proactiveness act as significant moderators of information systems success relationships amidst volitional environment.

Keywords: Business value of IT, Strategic decision-making, Business intelligence systems, Information utilization, Information behaviors and values, Structural equation modelling

Highlights

- We examine effects of information behaviors and values on IS value relationships.
- Information use depends on information quality and system use intention.
- Information sharing subdues information quality – information use link.
- Increasing informality suppresses system quality influence on system use intention.
- Increasing proactiveness fortifies information use – system use relationship.

1. INTRODUCTION

The potential of information systems (IS) to improve decision-making and advance organizational performance has been emphasized in the information technology (IT) business value literature for quite some time (Davern and Kauffman, 2000; Melville et al., 2004; Mithas et al., 2011; Nevo and Wade, 2011). In firm performance studies, IS have been found to support timely decisions, provide information that enhances comparative advantage, promote innovation and offer a means to manage uncertainty inherent in the business environment (Daft and Lengel, 1986; Dewett and Jones, 2001; Melville et al., 2004; Thong, 1999). High quality information, i.e. information that is relevant, reliable, accurate and timely (Low and Mohr, 2001; Popovič et al., 2012; Wixom and Todd, 2005), enables improvements in decision quality and can, consecutively, promote improvements in firm performance (Raghunathan, 1999). To leverage the benefits of high quality information, firms are, therefore, increasingly investing in IT and infusing different technologies in firms' processes.

In the IS and business intelligence (BI) literature business intelligence systems (BIS) are well recognized to contribute to decision-making, especially when firms operate in highly competitive environments (Popovič et al., 2012). These systems are considered a contemporary answer to the call for development of IT capabilities to use information strategically (Johnston and Carrico, 1988). To date, the research addressing strategic BI issues is still scarce (Alhyasat and Al-Dalahmeh, 2013). BIS are typical complex IS and are rated among the top 10 strategic technologies (Gartner, 2012).They have been also identified as the most important key issue for CIOs (Luftman and Ben-Zvi, 2010). BIS are most commonly identified as technological solutions holding quality information in well-designed data stores, connected with business-friendly tools that provide users timely access, effective analysis and insightful presentation of the information generated by enterprise-wide applications, enabling them to make the right decisions or take the right actions (Elbashir et al., 2008; Popovič et al., 2009). In investigating business value of BIS, existing studies suggest BIS enable enhancements in firms' strategic planning, business processes, improvements of performance, and building of competitive advantage (Negash and Gray, 2008; Popovič et al., 2012; Shanks et al., 2012) whereas time savings and better information for supporting decision making are considered the main direct benefits of BIS implementation (Watson et al., 2002). Firms devote significant resources and effort to implementing BIS to leverage their business value and enhance competitive advantage (Davenport et al., 2010; Negash and Gray, 2008).

Nonetheless, researchers increasingly claim that leveraging such performance benefits depends less on possessing the technology and more on the ability to best utilize the information in decision-making processes (Davenport and Beers, 1995; Diamantopoulos and Souchon, 1999; Rindfleisch and Moorman, 2001). Studies on the relationships between IS quality, information quality (IQ) and their respective use have produced equivocal findings (e.g. Auster and Choo, 1993; Bokhari, 2005; Menon and Varadarajan, 1992; Todd and Benbasat, 1992). Scholars, therefore, have highlighted the role of organizational factors within firms that drive these relationships. One such increasingly considered organizational factor is information culture (Choo, 2013; Curry and Moore, 2003; Ginman, 1988). We understand information culture as a subset of the overall organizational culture *in which the value and utility of information in achieving operational and strategic success is recognized* and *where information forms the basis of organizational decision making* (Curry and Moore, 2003). Information culture encompasses socially shared behaviors, norms and values that define the importance, management and utilization of information in a firm (Choo et al., 2008). To profile a firm's information culture researchers emphasize various information behaviors and values (IBV), namely information integrity, information formality, information control, information sharing, information transparency, and proactiveness (Choo, 2013; Marchand et al., 2000). It seems that these behaviors and values are able to explain significant parts of the variance in information use (IU) outcomes (Choo, 2013). Emphasis is, therefore, increasingly placed on the underlying mechanisms that link investments in IS, the quality of their information and the firm's information culture to IU (Marchand et al., 2000).

Despite increasing recognition of the value that BIS investments can bring to firms and the recent developments in BIS discipline in both the academic and the business communities (Chen et al., 2012), our understanding of how IBV influence BIS use (BISU) and IU remains limited (Choo, 2013; Popovič et al., 2012). To address this gap, we conducted an empirical investigation using key informants, specifically strategic decision makers, in medium and large firms that use BIS to inform their decisions. We explored: (RQ1) What BIS and information characteristics are deemed important by end-users when valuing the system and its product? (RQ2) What IBV guide the intended use of BIS and its information, and how?

Our contribution to the BI and IT business value literature is threefold. Firstly, our results highlight the end-users' perceptions about underlying elements of BIS quality (BISQ) and BIS-enabled IQ. Secondly, we find that the greater the perceived quality of BIS and the quality of information provided through it are, the greater the intended use of BIS and information in decision-making respectively. Yet, thirdly, we identify information sharing, reliance on informal information sources, and proactive acting upon information as significant IBV shaping the BIS value relationships. Information sharing and reliance on informal information sources restrain the BISQ–BISU and IQ–IU relationship respectively whereas proactive acting upon information endorses the link between BISU and IU.

The remainder of this paper is organized as follows. We firstly set the theoretical background for our research. More specifically, we examine extant studies on BIS, IU, and IBV literature. We then outline the research approach followed in this study. We introduce the research model, hypotheses, outline the sources of data and explain our data analysis procedure. This is followed by our findings on key characteristics of BISQ and IQ, their influence on BIS and IU and on how IBV transform these relationships. In the discussion section, we explore the theoretical contributions and managerial implications of our findings. The paper concludes with its inherent limitations and avenues for future research.

2. THEORETICAL BACKGROUND

To set the theoretical foundations for our work, we first distinguish BIS from other IS, link BISQ and IQ to system use and IU respectively, introduce the concept of IBV, and develop the rationale for different IBV as individual characteristics that moderate BISQ influence on BISU, IQ effect on IU, and the link between BISU and IU.

2.1 Business intelligence systems

Following a lengthier period of substantial investments in setting up a technological foundation that supports business processes and strengthens the efficiency of operational structure, most firms have reached a point where the utilization of IT to support strategic decision making surfaces as more vital than ever (Petrini and Pozzebon, 2009). Perceived as a response to the growing needs for access to relevant information (Popovič et al., 2012) BIS have the potential to maximize IU (Watson et al., 2002), thereby creating competitive advantage (Davenport et al., 2010; Negash and Gray, 2008). From the perspective of organizational knowledge creation and through utilitarian view on IS BIS distinguish themselves from prior IS 1) through the authority to commence problem articulation and discussion, and 2) on data selection, by addressing various information needs of decision makers at different organizational levels (Ferrari, 2011; Shollo and Galliers, 2013). Such BIS capabilities play a strategic role for the firms, where the decision-making process is considered a critical success factor as it is by strategic management (Rossignoli et al., 2010).

2.2 Business intelligence systems quality and business intelligence systems use

In IS success literature the role of system quality and its link to system use have been well established (DeLone and McLean, 1992, 2003; Petter et al., 2008). With system quality we refer to the desirable characteristics of an IS (e.g. ease of use, system flexibility, system reliability, response time) whereas system use reflects the degree and manner in which users use the capabilities of an IS (e.g. amount of use, frequency of use, nature of use, extent of use, purpose of use) (Petter et al., 2013).

The literature examining the relationship between system quality and use at the firm level provides mixed support for this relationship. While some studies suggest a positive relationship between the two IS success dimensions (e.g. Caldeira and Ward, 2002; Fitzgerald and Russo, 2005), there are studies that offer no support for the link between system quality and system use (e.g. Gill, 1995; Premkumar et al., 1994) and others that suggest the relationship between them is negative (e.g. Weill and Vitale, 1999).

In BIS context, extant studies suggest a positive influence of BISQ on BISU and success (e.g. Wixom and Todd, 2005; Wixom and Watson, 2001). A high quality system can provide users with an improved understanding of the decision context, increase decision-making productivity, and alter the way how people perform tasks (Wixom and Watson, 2001). A BIS importantly affects how decision making for users is supported in the firm. When supplied with appropriate information access capabilities, users can perform decision-making tasks at various organizational levels faster and more systematically (Haley et al., 1999). Overall, BIS can modify the processes for providing users with access to information while decreasing the time and effort required to provide such access (Wixom and Watson, 2001).

2.3 Information quality and information use

While IS use has been widely documented as an important IS success dimension (Petter et al., 2013), there is an increasing need in the context of BIS to elucidate the distinction between the use of an IS for retrieving and analyzing information on one side, and effective use of IS-enabled information within business processes (Popovič et al., 2012) that aids improvements in firm performance on the other side.

The management, marketing and IS literatures have increasingly recognize the tie between IQ and information use (e.g. Citroen, 2011; Low and Mohr, 2001; Popovič et al., 2012). When considering IQ and system quality together, it is suitable to consider information as the product of an IS and the IS as the information processing system that produces the information (DeLone and McLean, 1992). Drawing upon this reasoning IQ can be viewed as desirable characteristics of the IS outputs (e.g. relevance, accuracy, conciseness, completeness, understandability, currency, timeliness) (Petter et al., 2013). Moreover, we identify information use as taking information into account when making decisions (Diamantopoulos and Souchon, 1999).

In the view of Stvilia et al. (2007), for firms' *processes that depend on information, the quality of information is one of the key determinants of the quality of their decisions and actions*. Such view is also shared by others, for example: Najjar (2002) connects IQ to service quality in the banking industry, Miller (2005) links IQ with firm's market share, Rossin (2007) associates IQ with the performance characteristics of supply chains, whereas Vanden (2008) emphasizes the significance of IQ in determining option prices.

While it is broadly recognized that quality information plays a critical role in the success of firms (Choo, 1996; Daft and Lengel, 1986; Porter and Millar, 1985), any information acquired by decision-makers will deliver little impact on firm performance if it is not actually utilized in the making of decisions (Davenport and Beers, 1995; Diamantopoulos and Souchon, 1999). IU is a critical aspect of information processing since in this stage the acquired information is applied to strategic and tactical outcomes to impact firm performance (Citrin et al., 2007).

In BIS context, the quality of information provided by the system and use of that information for decision-making are deemed one of the most important elements in achieving BIS success (Popovič et al., 2012).

2.4 Information behaviors and values

Early research has established a highly developed information culture to be positively associated with organizational practices, such as information utilization, that lead to successful firm performance (Ginman, 1988). From a BIS perspective, a key form of information use is instrumental utilization, which refers to the range of organizational outcomes and impacts that are a direct result of the applications of information (Todd, 1999). Yet, firms must carefully consider the decision environment (e.g. culture of information use) to gain full benefits from instrumental utilization of BIS-enabled information (Işık et al., 2013).

Information culture is manifested in the firm's values, norms, and practices that have an impact on how information is perceived, created and used (Choo et al., 2008; Oliver, 2003). Identified as one of the three information capabilities that help predict firm performance, IBV have been previously used to characterize the information culture of a firm (Marchand et al., 2000; Oliver, 2008). These IBV are *information integrity*, defined as the use of information in a trustful and ethical manner, *information formality*, defined as the willingness to use and trust institutionalized information over informal sources, *information control*, viewed as the extent to which information about performance is continuously presented to people to manage and monitor their performance, *information transparency*, defined as openness in reporting and presentation of information on errors and failures, *information sharing*, regarded as the willingness to provide others with information in an appropriate and collaborative way, and *information proactiveness*, observed as the active concern to think about how to obtain and apply new information in order to respond quickly to business changes and to promote innovation in products and services (Choo et al., 2008).

3. RESEARCH MODEL AND HYPOTHESES

Our research model is shown in Figure 1. Although both system quality and IQ are important for IU (DeLone and McLean, 2003; Petter et al., 2008), researchers have suggested that their effects may vary significantly depending on the context (Petter et al., 2013; Wixom and Todd, 2005). Similarly, the relative influence of respective quality dimensions of system quality and IQ – although considered to be generally applicable – are contingent on a specific system and setting (Nelson et al., 2005; Wixom and Todd, 2005; Xu et al., 2013). Accordingly, we examine the relative effects of each BISQ and IQ dimension within strategic use context on overall BISQ and IQ, theorize the relative impacts among the BIS success constructs, and develop our logic for IBV moderating the influences among BIS success constructs.

To begin with, BISQ is assessed through various IS quality dimension. BISQ refers to end-users' perceptions about the desirable characteristics of the system (Petter et al., 2013) and measures its technical success (DeLone and McLean, 2003). Compared to IQ, system quality has received less formal attention in the IS literature (Nelson et al., 2005). Moreover, elements of system quality often are combined with dimensions that are closely related to service quality and ease of use (Nelson et al., 2005). Prior literature (DeLone and McLean, 1992; Wixom and Todd, 2005) presents system quality specific antecedents derived from a decomposition and integration of factors identified in the user satisfaction literature. Most of these factors reflect the more engineering-focused performance features of the systems being studied.

For determining BISQ we adopt the system quality dimensions, namely reliability (Rl), accessibility (As), flexibility (Fl), data integration (Di), and speed of the system (Sp), that were increasingly employed in prior studies (e.g. Nelson et al., 2005; Wixom and Todd, 2005; Xu et al., 2013). Rl refers to the dependability of the operation of the IS over time, As refers to the comfort with which information can be accessed or extracted from the IS, Fl indicates the way the IS adapts to varying user demands and to environmental conditions, Di is associated with the ability of the IS to bring data from various sources together whereas Sp relates to the degree to which the IS provides timely responses to user requests for information (Nelson et al., 2005; Wixom and Todd, 2005).

In BIS context, As has been viewed as a key attribute of a firm's BIS capability and BIS success (Deng and Chi, 2012; Işık et al., 2013; Popovič et al., 2012). Data warehousing literature suggests As represents a necessary condition for system quality and has been empirically identified as one of the most influential determinants of BISQ (Nelson et al., 2005). Işık et al. (2013) even suggest that As is the foundation of the overall user satisfaction with BIS. The above leads to the following:

Hypothesis 1A (H_1A). *Perceived accessibility has a stronger influence on perceived business intelligence system quality than perceived reliability.*

Hypothesis 1B (H_1B). *Perceived accessibility has a stronger influence on perceived business intelligence system quality than perceived flexibility.*

Hypothesis 1C (H_1C). *Perceived accessibility has a stronger influence on perceived business intelligence system quality than perceived data integration.*

Hypothesis 1D (H_1D). *Perceived accessibility has a stronger influence on perceived business intelligence system quality than perceived speed.*

Next, a context-based view of the notion of IQ suggests *it needs to be defined relative to the user of the information, the task being completed, and the application being employed* (Nelson et al., 2005). Following this perspective, IQ refers to information characteristics to meet or exceed users' expectations, requirements or needs in completing a particular task (Nelson et al., 2005; Popovič et al., 2012). For assessing IQ scholars developed both generic IQ measurement scales (e.g. Eppler, 2006; Fraser and Salter, 1995; Wang and Strong, 1996) as well as more specific scales relevant to the type of IS under study (e.g. Coombs et al., 2001; Gable et al., 2003; Wixom and Watson, 2001). Collectively, there are myriad dimensions that can be considered under the label of IQ and there is little agreement on what creates a complete and yet parsimonious set of IQ dimensions (Stvilia et al., 2007; Wand and Wang, 1996). Building on the categorization of different IQ dimensions researchers have refined and used a core set of four IQ dimensions as follows: accuracy, completeness, currency, and format (DeLone and McLean, 2003; Nelson et al., 2005; Wixom and Todd, 2005). Accuracy (Ac) reflects the user's perception about the correctness of the available information, completeness (Co) represents the degree to which the IS provides all necessary information, currency (Cu) refers to the user's perception of the level to which the information is up to date, and format (Fo) as the user's perception of the soundness of information presentation (Nelson et al., 2005; Wixom and Todd, 2005). For the BIS perspective, another significant dimension of IQ is information relevance (Re) (Popovič et al., 2012), which represents the degree to which information is easily applicable to the problem at hand (Eppler, 2006).

From the above list of IQ characteristics, one of particular importance to the BIS context is Re. Within environments of increasing complexity and information load, such the ones BIS often operate in (Popovič et al., 2012), the utility or usefulness of information for a user performing a certain task is of high importance (O'Reilly III, 1982; Streufert, 1973). In terms of information evaluation, it appears that it is this aspect of IQ – linked both with fulfilling current as well as predicted needs as judged by the user – the most important in respect of information value (Darlington et al., 2008; Eppler, 2006). Such understanding about the significance of Re in valuing information has been emphasized in various fields, such as accounting (Lee, 1971), manufacturing planning and control (Gustavsson and Wänström, 2009) and corporate social responsibility (Ramchander et al., 2012). Based on the above we put forward the following hypotheses:

Hypothesis 2A (H_2A). *Perceived relevance of information has a stronger influence on perceived information quality than information completeness.*

Hypothesis 2B (H_2B). *Perceived relevance of information has a stronger influence on perceived information quality than information format.*

Hypothesis 2C (H_2C). *Perceived relevance of information has a stronger influence on perceived information quality than information currency.*

Hypothesis 2D (H_2D). *Perceived relevance of information has a stronger influence on perceived information quality than information accuracy.*

Next, several authors contend that, either directly (e.g. DeLone and McLean, 1992; DeLone and McLean, 2003) or through object-based attitudes (i.e. system satisfaction) and behavioral beliefs and attitudes (i.e. ease of use) (e.g. Wixom and Todd, 2005; Xu et al., 2013), IS quality is generally linked to IS use. While prior studies concerning various IS contexts suggest mixed support for this relationship, some recent conceptual and empirical BI and BIS studies (e.g. Işık et al., 2013; Popovič et al., 2010; Shollo and Galliers, 2013) suggest a positive relationship between BISQ and BISU. Indeed, when users perceive that their information processing needs are attainable through existing BIS technical capabilities (e.g. BIS provides appropriate access to information, brings together data from different business areas, provides information in a timely manner, and works reliably) they would be willing to engage in BISU behaviors that are conducive for performance outcomes. We therefore propose:

Hypothesis 3 (H_3). *Perceived business intelligence system quality has a positive impact on business intelligence system use.*

Extant IT/IS, marketing, and management literature suggests a positive relationship between IQ and IU (e.g. DeLone and McLean, 2003; Low and Mohr, 2001; O'Reilly III, 1982).

Similarly, prior BIS studies have produced comparable results (e.g. Popovič et al., 2012; Yeoh et al., 2008). Thus we put forward:

Hypothesis 4 (H_4). *Perceived information quality has a positive impact on information use.*

Although not previously hypothesized in IS success literature (Petter et al., 2008; Petter and McLean, 2009) we link system use to IU. Studies have found that IS use is positively associated with improved decision making or task performance (e.g. Burton-Jones and Straub, 2006; Petter et al., 2008; Yuthas and Young, 1998). For successful accomplishment of tasks or decisions, the acquired information from an IS needs to be applied to the problem to impact performance (Citrin et al., 2007). In addition, the importance of information processing, namely accessing, generating, analyzing and disseminating information, and acting upon that information has been reported as important determinant of firm performance (Diamantopoulos et al., 2003). Following this logic, users who strive for achievement in using a BIS further apply the obtained information towards the set objectives and goals. Such reasoning leads to the following:

Hypothesis 5 (H_5). *Business intelligence system use is positively related to information use.*

Motivation to effectively use an IS to reduce environmental uncertainty is contingent on the quality of an IS, yet, it can also be affected by the tendency to rely more on informal information sources over formal sources (Louis, 1980). Marchand et al. (2001) believe, for example, that through emphasizing information formality users will more likely use formal information sources and systems to assure efficiency in business operations and process management. Toward this end, an environment of prevailing willingness to use informal information sources (e.g., colleagues) can suppress users' perceptions about the value of an IS quality for its use. Through a qualitative study about use of healthcare management IS Kivinen and Lammintakanen (2013) report that historical reliance on informal information sources led to negative attitudes toward IS in general and lack of stimulus to use the management IS in their decision-making. Therefore, the current study hypothesizes that:

Hypothesis 6 (H_6). *As perceived information informality increases, the effect of perceived business intelligence system quality on business intelligence system use decreases.*

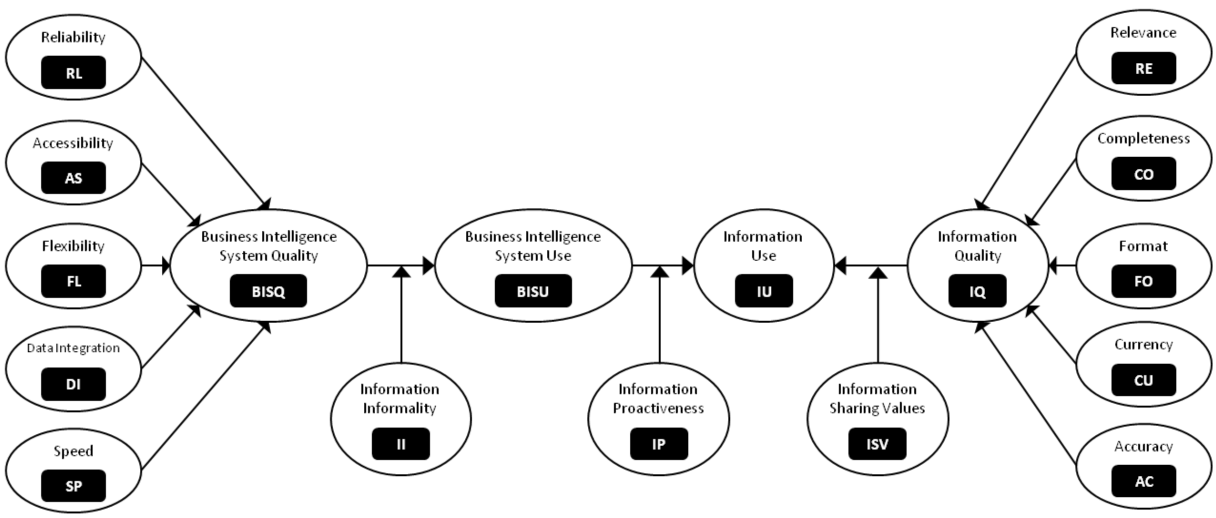
INS is concerned with selecting and providing information to others. Hwang et al. (2013) assert that people have their own INS values that will contribute to the overall IU motivation for completing the required tasks. Moreover, it has been reported that a higher level of INS values within a firm might enhance individual-held beliefs of information usefulness (Jarvenpaa and Staples, 2000) as well as the motivation to use the adequate IS product to reduce uncertainty (Constant et al., 1994). Thus, we collectively hypothesize that:

Hypothesis 7 (H_7). *As perceived information sharing increases, the effect of perceived information quality on information use increases.*

IP echoes the way users are inspired to reason about use information to create or enhance products and services, actively seek out information about conditions to assess these ideas, and react rapidly to this information (Hwang et al., 2013). Prior literature suggests a behavioral inclination toward information scanning and construction of meaning derives from personal predisposition tendency toward scanning as well as from factors under the control of the firm, namely the extent to which scanning was encouraged or expected and the characteristics of the IS itself (Vandenbosch and Huff, 1997). Specifically, a person who is more proactive in IU behavior is motivated to deliberate, discover, and respond to new information. Hwang et al. (2013) theorize that IP provides the prerequisites of IU motivation necessary for users to better define their information needs, allowing better fit of IT to decision-making activities. Moreover, extant studies suggest a close relationship between effective use of IS and proactive information behavior (Ashford and Black, 1996), and the influence of IP on users' motivation to act (Greenberger and Strasser, 1986). Thus, we posit that:

Hypothesis 8 (H_8). *As perceived information proactiveness increases, the effect of business intelligence system use on information use.*

Figure 1: Research model and hypotheses



H1A, H1B, H1C, H1D: $\beta_{RE \rightarrow IQ} > \beta_{CO \rightarrow IQ,\ FO \rightarrow IQ,\ CU \rightarrow IQ,\ AC \rightarrow IQ}$
H2A, H2B, H2C, H2D: $\beta_{AS \rightarrow BISQ} > \beta_{RL \rightarrow BISQ,\ FL \rightarrow BISQ,\ DI \rightarrow BISQ,\ SP \rightarrow BISQ}$
H3: $\beta_{IQ \rightarrow IU}$
H4: $\beta_{BISQ \rightarrow BISU}$
H5: $\beta_{BISU \rightarrow IU}$
H6: ISV (negatively) moderates $\beta_{IQ \rightarrow IU}$
H7: II (negatively) moderates $\beta_{BISQ \rightarrow BISU}$
H8: IP (positively) moderates $\beta_{BISQ \rightarrow BISU}$

4. RESEARCH DESIGN

4.1 Data collection

The target population for this study were all medium- and large-size firms operating in an EU country[1]. Firms were selected from the official database published by the Agency for Public Legal Records and Related Services. The agency is the primary source of official public and other information on business entities and their subsidiaries which perform profitable or non-profitable activities. The final list provided 810 firms eligible for inclusion in the study. The data were collected using Web surveys of employees estimated as having adequate knowledge of BIS and the quality of available information for decision-making within the target firms.

The questionnaire used in the survey queries the overall experience of the respondent with the quality and use of available information and BIS, and includes a set of questions regarding the constructs of our model: (1) perceived quality of BIS (BISQ); (2) intention to use BIS (BISU); (3) perceived IQ (IQ); (4) intention to use information for strategic decision-making purpose (IU); (5) respondents' tendency towards sharing information (INS); (6) attitudes towards the use of informal information sources (II); and (7) attitude towards proactive use of information (IP). Besides these constructs the questionnaire included an additional set of questions regarding BISQ and IQ characteristics, namely: reliability of BIS (Rl), accessibility of BIS (As), flexibility of BIS (Fl), capabilities for integrating data from various sources (Di), speed of BIS (Sp), relevance of available information (Re), completeness of information (Co), format of delivered information (Fo), currency of available information (Cu), and accuracy of available information (Ac). The rest of the questions in the questionnaire are used to identify the participating firm (e.g. industry, number of employees, sales volume).

From the initial call 123 completed Web surveys were received. To increase response rate follow-up reminders were sent out three weeks after the initial call and resulted in an additional 23 responses. The total number of valid observations was 146, with the final response rate of 18%.

The structure of respondents by industry type, average number of employees and sales are presented in Table 1. The distribution of the respondents is an adequate representation of the population of country's medium- and large-sized firms.

Table 1: Structure of the respondents by industry type, number of employees, and sales volume

Industry type		**Number of employees**		**Sales volume**	
Industry	*Share*	*Employees*	*Share*	*Sales amount*	*Share*
Agriculture, hunting and forestry	3.1%	50 – 99	18.11%	Under 500,000 €	4.26%
Manufacturing	40.6%	100 – 199	29.73%	500,001 € to 1 million €	10.61%
Electricity, gas and water supply	7.8%	200 – 249	17.23%	1 million € to 2 million €	15.85%
Construction	3.2%	250 – 499	14.51%	2 million € to 5 million €	21.23%
Wholesale and retail trade	21.7%	500 – 999	13.26%	5 million € to 10 million €	20.67%
Hotels and restaurants	5.6%	1000 or more	7.16	10 million € to 20 million €	14.53%

[1] The country is blinded to ensure anonymity during the review process. There is no need for keeping it secret afterwards.

Transport, storage and communication	9.1%		Over 20 million €	12.85%
Financial intermediation	8.9			

4.2 Operational measures

All constructs in the proposed model are based on reflective multi-item scales. Indicators of BISQ (along with quality criteria of Rl, As, Fl, Di and Sp), BISU, IQ (and its criteria Co, Fo, Cu and Ac), and IU are adopted from the work of Wixom & Todd (2005) since they have been previously verified and considered in other IS (e.g. Barki et al., 2007) and BIS studies (e.g. Nelson et al., 2005; Popovič et al., 2012; Wixom and Watson, 2001). The IQ dimension of Re was adopted from the study of Eppler (2006) and previously employed within the BIS context by Popovič et al. (2012). The measurement scale of IBV, namely II, IP and INS, is adopted from the studies of Choo et al. (2008; 2006) and adapted to the context under study. All indicators are measured with a seven-point rating scale, having 1 representing the lowest level and 7 the highest level. The table in the Appendix presents a detailed list of indicators used in the measurement model.

4.3 Estimation

The structural model consists of seventeen latent variables. It includes the constructs shown on Figure 1, along with three latent variables that represent interactions between original latent variables (II x BISQ, IP x BISU and INS x IQ). Following the approach of Chin et al. (2003), interaction terms were modelled creating new constructs, having as indicators the products of the standardized indicators relative to the underlying constructs involved in the interaction.

The model was estimated using partial least squares structural equation modelling (PLS-SEM) approach. This option is mainly motivated by the characteristics of the data and the properties of the model. In fact, PLS-SEM works efficiently with small sample sizes and complex models and makes practically no assumptions about the underlying data (Hair et al., 2012). What is more, PLS-SEM approach has gained attention in the prime IS journals (Ringle et al., 2012). All data analyses were done using SmartPLS (Ringle et al., 2007) and SPSS.

5. RESULTS

5.1 Descriptive analysis

The means and standard deviations of original variables can be found in Table 2. In the collected data set the means vary between 3.51 for II2 and 5.75 for IP3. The highest means are found in IP indicators and the lowest in the II construct. The means for most of the measures are around one scale point to the right of the center of the scale suggesting a slightly left (negative) skewed distribution. Standard deviations vary between 1.151 for IP2 and 1.728 for BISU1. BISU indicators are those that globally show the highest standard deviations and the indicators of IP construct are those with the lowest variability.

Table 2: Means, standard deviations and standardized loadings of manifest variables

Construct	*Indicator*	*Mean*	*Std. dev.*	*Loading*	*Construct*	*Indicator*	*Mean*	*Std. dev.*	*Loading*
	IQ1	5.16	1.461	0.9607*		BISQ1	5.05	1.553	0.9480*
IQ	IQ2	5.08	1.527	0.9772*	BISQ	BISQ2	5.05	1.564	0.9599*
	IQ3	5.10	1.535	0.9812*		BISQ3	5.08	1.532	0.9642*
	Re1	5.13	1.425	0.9035*		Rl1	5.23	1.408	0.9385*
Re	Re2	4.92	1.486	0.9230*	Rl	Rl2	5.28	1.312	0.9341*
	Re3	4.84	1.512	0.9177*		Rl3	5.36	1.437	0.9461*
	Cu1	5.10	1.512	0.9568*		As1	5.37	1.453	0.9055*
Cu	Cu2	5.11	1.472	0.9680*	As	As2	5.42	1.428	0.9392*
	Cu3	5.07	1.561	0.9320*		As3	5.31	1.455	0.9259*
	Ac1	5.34	1.455	0.9464*		Fl1	5.10	1.498	0.9300*
Ac	Ac2	5.32	1.504	0.9410*	Fl	Fl2	5.21	1.396	0.8881*
	Ac3	5.32	1.475	0.9513*		Fl3	4.84	1.476	0.9032*
	Fo1	4.92	1.532	0.9512*		Di1	5.18	1.495	0.9431*
Fo	Fo2	4.85	1.492	0.9603*	Di	Di2	5.10	1.539	0.9402*
	Fo3	4.77	1.517	0.9415*		Di3	4.99	1.536	0.9457*
	Co1	4.82	1.498	0.9418*		Sp1	4.21	1.624	0.9408*
Co	Co2	4.86	1.441	0.9492*	Sp	Sp2	5.18	1.414	0.9276*
	Co3	4.62	1.546	0.8842*		Sp3	5.10	1.430	0.3712
	IU1	5.00	1.558	0.9303*		BISU1	4.88	1.728	0.9380*
IU	IU2	4.89	1.607	0.9316*	BISU	BISU2	4.78	1.720	0.9366*
	IU3	5.04	1.593	0.8690*		BISU3	5.12	1.627	0.8721*
INS	INS1	5.63	1.287	0.9335*		IP1	5.61	1.211	0.9019*
	INS2	5.44	1.297	0.9312*	IP	IP2	5.63	1.151	0.8850*
	INS3	5.62	1.277	0.8479*		IP3	5.75	1.167	0.9182*
	II1	3.51	1.491	0.8051*					
II	II2	3.69	1.565	0.8441*					
	II3	4.80	1.474	0.8231*					

Note: *Significant at < 0.001 level (two-tailed test)

5.2 Measurement of reliability and validity

We first examine the reliability and validity measures for the model constructs (Table 3). All Cronbach's Alphas exceed the 0.7 threshold (Nunnally, 1978) and are usually higher than 0.9. Without exception, latent variable composite reliabilities (Fornell and Larcker, 1981) are higher than 0.80, and in general above 0.90, showing a high internal consistency of indicators measuring each construct and thus confirming construct reliability. The average variance extracted (AVE, Fornell and Larcker, 1981) is also always higher than 0.60, and mainly above 0.80, indicating that the variance captured by each latent variable is significantly larger than variance due to measurement error, and thus demonstrating unidimensionality and a high convergent validity of the constructs. Reliability and convergent validity of the measurement model was also confirmed by computing standardized loadings for indicators (Table 2) and Bootstrap *t*-statistics for their significance (Anderson and Gerbing, 1988). All standardized loadings – except for SP3, which was removed in the final run of the model – exceed the 0.7

threshold and they were found, without exception, significant at 1 percent significance level, thus confirming a high convergent validity of the measurement model.

Discriminant validity is assessed determining whether each latent variable shares more variance with its own measurement variables or with other constructs (Chin, 1998; Fornell and Larcker, 1981). In this vein, we compared the square root of the AVE for each construct with the correlations with all other constructs in the model (Table 4). A correlation between constructs exceeding the square roots of their AVE indicates that they may not be sufficiently discriminable. We can observe that the square roots of AVE (shown in boldface in the main diagonal of both matrices) are always higher than the absolute correlations between constructs. We conclude that all the constructs show evidence for acceptable validity.

Table 3: Reliability and validity measures

Construct	***Cronbach's Alpha***	***Composite reliability***	***Average variance extracted***
IQ	0.9719	0.9816	0.9469
Re	0.9025	0.9390	0.8368
Cu	0.9486	0.9670	0.9071
Ac	0.9416	0.9625	0.8955
Fo	0.9472	0.9660	0.9045
Co	0.9163	0.9471	0.8566
IU	0.8972	0.9358	0.8295
BISQ	0.9545	0.9706	0.9166
Rl	0.9337	0.9576	0.8828
As	0.9139	0.9457	0.8531
Fl	0.8924	0.9332	0.8232
Di	0.9377	0.9601	0.8892
Sp	0.8546	0.9321	0.8728
BISU	0.9037	0.9399	0.8392
INS	0.8905	0.9314	0.8192
IP	0.8855	0.9289	0.8132
II	0.7798	0.8641	0.6794

Table 4: Correlations between latent variables and square roots of average variance extracted

	IQ	Re	Cu	Ac	Fo	Co	IU	BISQ	Rl	As	Fl	Di	Sp	BISU	INS	IP	II
IQ	**0.9731**	0.8210	0.8201	0.7122	0.7940	0.7182	0.6222	0.5845	0.5752	0.6181	0.4734	0.5298	0.4175	0.3808	0.4532	0.4728	0.1826
Re		**0.9148**	0.8014	0.6438	0.7382	0.6608	0.6371	0.5160	0.5537	0.5952	0.4143	0.4566	0.3694	0.3507	0.3487	0.3538	0.1347
Cu			**0.9524**	0.7320	0.7637	0.7360	0.5677	0.5800	0.5593	0.6091	0.4304	0.4550	0.4235	0.3498	0.3988	0.3918	0.1465
Ac				**0.9463**	0.7637	0.672	0.5098	0.4575	0.5171	0.5132	0.3433	0.4139	0.3941	0.3702	0.3350	0.3810	0.0284
Fo					**0.9511**	0.8148	0.5348	0.5748	0.5633	0.6515	0.4627	0.5156	0.4176	0.3699	0.3342	0.4141	0.1339
Co						**0.9255**	0.5103	0.5977	0.5418	0.6232	0.4453	0.5122	0.3886	0.4012	0.3866	0.3402	0.1516
IU							**0.9108**	0.4073	0.4463	0.4644	0.4320	0.3024	0.3006	0.7085	0.3987	0.3565	0.1699
BISQ								**0.9574**	0.5765	0.7026	0.5465	0.5759	0.5418	0.5362	0.3386	0.4160	0.1718
Rl									**0.9396**	0.7265	0.5110	0.4371	0.5683	0.3406	0.4924	0.4211	0.0988
As										**0.9236**	0.5677	0.4812	0.5314	0.4518	0.4108	0.4461	0.2059
Fl											**0.9073**	0.5105	0.4852	0.4257	0.2720	0.2879	0.2765
Di												**0.9430**	0.3388	0.3979	0.2175	0.3839	0.1565
Sp													**0.9342**	0.2852	0.2967	0.2938	0.1279
BISU														**0.9161**	0.2935	0.3618	0.1445
INS															**0.9051**	0.6198	0.3475
IP																**0.9018**	0.4124
II																	**0.8243**

Note: Numbers shown in bold denote the square root of the average variance extracted

5.3 Model estimation results

Table 5 shows the explanatory power (through determination coefficient, R^2) of the equations explaining the endogenous constructs. It can be seen that the proposed model shows a high explanatory power for IQ (0.78), BISQ (0.60) and IU (0.69). The explanatory power for BISU use is still relevant (0.32) although smaller. Furthermore, the first part of Table 5 presents the estimates of path coefficients of the proposed model and respective significances. The effect sizes for evaluating the predictive importance of each determinant (original constructs and interaction terms) may also be found in Table 5 (origins of the effects in rows and destinations in columns). In what regards IQ only the effects of Re and Cu were found significant ($p<.01$) with a large effect size (0.18) showing high predictive importance of Re construct. Looking into the explanation of BISQ, it can be observed that As, Di and Sp were all found significant determinants of BISQ ($p<.01$ and $p<.05$ for Sp) with a large effect size (0.19) showing high predictive relevance of As construct. These results are consistent with the sets of hypotheses H_1 and H_2. Additionally, to formally test these two sets of hypotheses tests for differences between path coefficients are presented in the second part of Table 5. This was performed with pseudo *t*-tests using the distribution of the differences between path coefficients over the 1,000 bootstrap replicates. In what regards IQ, Re is found to have the largest effect among all the determinants ($p<.01$) thus confirming the set of hypotheses H_2. For BISQ, As was also found to have larger effects ($p<.01$) than the other BISQ determinants, confirming the set of hypotheses H_1. The effects of BISQ over BISU, of IQ over IU, and of BISU over IU and were all found significant ($p<.01$) confirming hypotheses H_3, H_4 and H_5. The three effects show large effects sizes, confirming relevant predictive relevance. Finally, it should be noted that the three constructs representing the moderating effects represented in hypotheses H_6, H_7 and H_8 are also found significant ($p<.05$). The II x BISQ path and the INS x IQ path were both found negative, while the IP x BISU path was found positive. Together, these results support the moderating role of II, INS, and IP. While H_6 and H_8 were confirmed as hypothesized, H_7 suggest the opposite influence as initially theorized. Consequently we conclude that for firms with high levels of II, BISQ will have a smaller effect over BISU. A similar phenomenon happens within organizations with high INS values, as in this case IQ will be less important for inducing IU. An opposite moderation effect is produced by IP, as its positive effect will work as a reinforcer of the importance of BISU as a driver of IU.

Table 5: Structural model results and effects sizes (f^2)

Criterion	*Predictors*	R^2	*Path coefficient*	f^2
Path coefficients				
IQ	Re	0.78	0.356**	0.18
	Co		0.046	0.00
	Fo		0.225	0.05
	Cu		0.267**	0.08
	Ac		0.085	0.01
BISQ	Rl	0.60	0.004	0.00
	As		0.432**	0.19
	Fl		0.074	0.01
	Di		0.266**	0.12
	Sp		0.184*	0.05
BISU	BISQ	0.32	0.514**	0.44
	II x BISQ		-0.167*	0.04
IU	BISU	0.69	0.552**	0.87
	IQ		0.411**	0.45
	IP x BISU		0.169*	0.10
	INS x IQ		-0.155*	0.09
Tests for differences				
IQ	Re - Co		0.294**	-
	Re - Fo		0.128**	-
	Re - Cu		0.078**	-
	Re - Ac		0.263**	-
BISQ	As - Rl		0.413**	-
	As - Fl		0.341**	-
	As - Di		0.148**	-
	As - Sp		0.240**	-

Notes: (ns) non-significant; * significant at 0.05 level (two-tailed test); ** significant at 0.01 level (two-tailed test);

6. DISCUSSION

Our findings reveal important insights for understanding the relative importance of IBV for IS success relationships, as well as for understanding the relative significance of system quality and IQ dimensions in the context of BIS.

6.1 Implications for theory

Our study confirms that previously theorized IS success relationships (DeLone and McLean, 2003; Petter et al., 2008; Wixom and Todd, 2005) hold stable also across the BIS context. By linking BISU to IU we add to the existing body of knowledge regarding IS success relationships through linking the ‘product’ side of an IS with the technological qualities of the solution itself (results reveal a significant strong positive impact of system use on IU).

We also contribute to our understanding of the influence that information culture characteristics exercise over the IS success relationships. With the introduction of IBV, namely II, IP and INS, we identify the differential influence of these behaviors and values on the relationships between system use and IU and their antecedents. We found that II, IP and INS had a significant impact on IS success relationships within an environment of volitional IS use. More specifically, a more fact-based behaviors and values – reflecting through higher levels of exploitation of formal sources and proactive IU actions – positively stimulate use behavior. Prior studies suggest that INS should act as a reinforcing agent to the relationship between IQ and IU (e.g. Constant et al., 1994; Jarvenpaa and Staples, 2000). However, our findings suggest that INS effect on the impact of IQ on IU is negative. Such finding has important theoretical implications. Accepting that the essence of INS is to let quality information timely reach the appropriate receiver (Li and Lin, 2006), it might be implicitly expected that shared information already meets the IQ needs of the target user. In this light the notion of IQ importance loses its power in IU behavior prediction. This draws our attention to the fact that the quality of information obtained from an IS incompletely explains intentions toward IU. Assessing information value through its utilization needs to be considered also through the lens of the forces of information culture values pertained to individual firm.

Our study also adds to the understanding of system quality and IQ dimensions in the context of BIS. In a prior study assessing the success of data warehousing data access software Wixom and Todd (2005) found Ac being the most important determinant of IQ whereas Rl was found to have the greatest relative impact in determining system quality. Clearly, this study drew upon more technical aspect of BIS. Expanding the understanding of BIS to both the system and the product we theorize that Re, namely the quality of the information content, is the most powerful predictor of IQ in relation to other IQ dimensions (H_2A, H_2B, H_2C, and H_2D). Moreover, advances in technological features of BIS shifted a prior relative importance of having reliable systems as the most influential system quality attribute to the comfort with which information can be accessed or extracted from the IS (H_1A, H_1B, H_1C, and H_1D) from various internal and external sources. This points to the critical role of the fit between IS capabilities and user needs in a specific context for achieving IS success.

6.2 Implications for practice

Managers should recognize that employees’ intention to use available information for their decision-making and process management activities depends on the quality of available information and the depth and extent of IS use. As IS use is closely linked to how the implemented system contributes to achieve work objectives, managers should pay attention to the quality of IS (Xu et al., 2013). They should recognize that employees are more likely to engage in utilizing IS-enabled information when its quality and the quality of the system itself meet employees’ information needs. This requires managers to go toward involving employees in the development of IS capabilities, by making the case that utilizing relevant information in their decision-making processes is useful to support their performance. Given that in the context under study system accessibility and relevance of available information were considered the most important determinants of system and IQ respectively, employees should actively participate in the development of information content and access quality (Popovič et al., 2012).

Given that IBV were found significant in shaping the influences on system use and IU, managers should recognize that these behavioral characteristics and values should not be underestimated. To begin with, managers can cultivate employees' inclination toward use of formal information sources by stimulating employees' trust in the IS through clearly embracing fact-based decision making themselves. Managers can also help employees set up meaningful performance objectives (e.g. through establishing key performance indicators) that could be accomplished through employees' effective IS utilization. Next, to inspire employees thinking about how to acquire and apply information to respond quickly to market demands and to promote innovation managers may also tactically emphasize material outcomes that the employees can obtain by utilizing the implemented IS. For example, managers could implement explicit reward policies to directly promote proactive behaviors (e.g. monetary awards). Moreover, the negative moderating effect of INS on the relationships between IQ and IU also sheds light for managers. Because INS is generally considered a desirable behavior within firms (Constant et al., 1994), it might be perceived by employees as an adequate alternative to seeking quality information for their decisions. Specifically, employees might believe that higher levels of INS values intrinsically include 'good' information being shared and therefore give less emphasis on IQ over IU. Managers who want their employees to leverage IU should focus on clarify and distinguish the importance of the INS process from the IQ itself.

6.3 Limitations and future research

Despite its contributions to theory and practice, our study has limitations and also opens opportunities for future research. Our conclusions regarding the relative impacts of IBV (i.e., II, IP, and INS) on IS success relationships are limited to one specific IS, namely a BIS, in a single country. Although effects were controlled for through the employment of theoretically unrelated control variable, and performing common method bias tests, caution should still be exercised when generalizing the findings to other user, technological, organizational and industrial contexts. For example, future research may investigate the validity of our research model across different user groups, e.g., early adopters and late adopters. Also, the prevailing type of organizational culture might be another concern with regard to generalizing our results. As such, we encourage future studies to examine the proposed research model and hypotheses in different settings.

Furthermore, we theorize IBV as independent impacts on IS success relationships, yet, certain organizational conditions, e.g. worker empowerment, team orientation, orientation toward creating change, firm's strategic direction, goals and objectives (Srite and Karahanna, 2006), might significantly facilitate or hinder the way IBV affect IS success relationships. Future research could also evaluate how IBV can be described and measured more richly through further elaboration of information management practice (Hwang et al., 2013). Additionally, future research can investigate the dynamics of IBV over time. For example, researchers may employ a longitudinal research design to examine the process through which and the reasons why IBV have more impact on a certain type of IS. Overall, we recommend that researchers carefully select contextual characteristics, including specific types of IS, to theorize the pertinent IBV in IS success relationships.

7. CONCLUSION

IU is key for managers amidst high competitive environments. This study explored how IBV influence IS and IU and highlighted what IS and information characteristics are deemed important by end-users when valuing the system and its product in strategic information utilization context. Drawing on business value of IT, user satisfaction, technology acceptance, and information culture literature facilitated the development of research hypotheses and a conceptual framework that explicate these relationships in the BIS context. We conducted an empirical study among medium and large firms that use BIS to test the research model and hypotheses. We found that for assessing BIS-enabled IQ end-users value Re and Cu whereas Ac, Co and Fo are not considered noteworthy characteristics of IQ. When evaluating BISQ end-users contemplate As, Di, and Sp as important attributes of system quality, with As being perceived as the most important determinant of BISQ.

We further found that II suppresses BISQ influence on intention to use BIS. We have confirmed that IQ and BISU intention use are both key drivers for IU and found INS and IP as relevant moderators of these relationships. In fact, INS negatively moderates the impact of IQ on BIS intention to use BIS-provided information while IP positively moderates the impact of BISU intention on intention to use BIS-provided information.

This study represents a significant advance in our theoretical understanding of information and IS use behaviors, the relationship between IQ, system quality and use behaviors, and the interaction effects between IBV and intention to use the system and information. The results also provide instrumental insights for managers to foster information culture to leverage implemented IS to extract their value potential more effectively. We hope that this work will inspire future attempts to elaborate our findings.

8. REFERENCES

Alhyasat, E.B., Al-Dalahmeh, M. (2013) Data Warehouse Success and Strategic Oriented Business Intelligence: A Theoretical Framework. Journal of Management Research 5, 169-184.

Anderson, J.C., Gerbing, D.W. (1988) Structural equation modeling in practice: A review and recommended two-step approach. Psychological bulletin 103, 411-423.

Ashford, S.J., Black, J.S. (1996) Proactivity during organizational entry: The role of desire for control. Journal of Applied Psychology 81, 199-214.

Auster, E., Choo, C.W. (1993) Environmental scanning by CEOs in two Canadian industries. Journal of the American Society for Information Science 44, 194-203.

Barki, H., Titah, R., Boffo, C. (2007) Information System Use–Related Activity: An Expanded Behavioral Conceptualization of Individual-Level Information System Use. Information Systems Research 18, 173-192.

Bokhari, R.H. (2005) The relationship between system usage and user satisfaction: a meta-analysis. Journal of Enterprise Information Management 18, 211-234.

Burton-Jones, A., Straub, D.W. (2006) Reconceptualizing System Usage: An Approach and Empirical Test. Information Systems Research 17, 228-246.

Caldeira, M.M., Ward, J.M. (2002) Understanding the successful adoption and use of IS/IT in SMEs: an explanation from Portuguese manufacturing industries. Information Systems Journal 12, 121-152.

Chen, H., Chiang, R.H., Storey, V.C. (2012) Business Intelligence and Analytics: From Big Data to Big Impact. MIS Quarterly 36, 1165-1188.

Chin, W.W. (1998). The partial least squares approach for structural equation modeling, in: Marcoulides, G.A. (Ed.), Modern methods for business research. Methodology for business and management. Lawrence Erlbaum Associates Publishers, Mahwah, NJ, US, p. 437.

Chin, W.W., Marcolin, B.L., Newsted, P.R. (2003) A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results From a Monte Carlo Simulation Study and an Electronic-Mail Emotion/Adoption Study. Information Systems Research 14, 189-217.

Choo, C.W. (1996) The knowing organization: How organizations use information to construct meaning, create knowledge and make decisions. International Journal of Information Management 16, 329-340.

Choo, C.W. (2013) Information culture and organizational effectiveness. International Journal of Information Management 33, 775-779.

Choo, C.W., Bergeron, P., Detlor, B., Heaton, L. (2008) Information culture and information use: An exploratory study of three organizations. Journal of the American Society for Information Science and Technology 59, 792-804.

Choo, C.W., Furness, C., Paquette, S., van den Berg, H., Detlor, B., Bergeron, P., Heaton, L. (2006) Working with information: information management and culture in a professional services organization. Journal of Information Science 32, 491-510.

Citrin, A.V., Lee, R.P., McCullough, J. (2007) Information Use and New Product Outcomes: The Contingent Role of Strategy Type. Journal of Product Innovation Management 24, 259-273.

Citroen, C.L. (2011) The role of information in strategic decision-making. International Journal of Information Management 31, 493-501.

Constant, D., Kiesler, S., Sproull, L. (1994) What's Mine Is Ours, or Is It? A Study of Attitudes about Information Sharing. Information Systems Research 5, 400-421.

Coombs, C.R., Doherty, N.F., Loan-Clarke, J. (2001) The importance of user ownership and positive user attitudes in the successful adoption of community information systems. Journal of Organizational and End User Computing 13, 5-16.

Curry, A., Moore, C. (2003) Assessing information culture - an exploratory model. International Journal of Information Management 23, 91-110.

Daft, R.L., Lengel, R.H. (1986) Organizational information requirements, media richness and structural design. Management Science 32, 554-571.

Darlington, M., Culley, S.J., Zhao, Y., Austin, S.A., Tang, L.C.M. (2008) Defining a framework for the evaluation of information. International Journal of Information Quality 2, 115-132.

Davenport, T.H., Beers, M.C. (1995) Managing information about processes. Journal of Management Information Systems 12, 57.

Davenport, T.H., Harris, J.G., Morison, R. (2010) Analytics at Work: Smarter Decisions, Better Results. Harvard Business School Publishing, Boston, Massachusetts.

Davern, M.J., Kauffman, R.J. (2000) Discovering Potential and Realizing Value from Information Technology Investments. Journal of Management Information Systems 16, 121-143.

DeLone, W.H., McLean, E.R. (1992) Information Systems Success: The Quest for the Dependent Variable. Information Systems Research 3, 60-95.

DeLone, W.H., McLean, E.R. (2003) The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. Journal of Management Information Systems 19, 9-30.

Deng, X., Chi, L. (2012) Understanding Postadoptive Behaviors in Information Systems Use: A Longitudinal Analysis of System Use Problems in the Business Intelligence Context. Journal of Management Information Systems 29, 291-326.

Dewett, T., Jones, G.R. (2001) The role of information technology in the organization: a review, model, and assessment. Journal of Management 27, 313-346.

Diamantopoulos, A., Souchon, A.L. (1999) Measuring Export Information Use: Scale Development and Validation. Journal of Business Research 46, 1-14.

Diamantopoulos, A., Souchon, A.L., Durden, G.R., Axinn, C.N., Holzmuller, H.H. (2003) Towards an understanding of cross-national similarities and differences in export information utilization: A perceptual mapping approach. International Marketing Review 20, 17-43.

Elbashir, M.Z., Collier, P.A., Davern, M.J. (2008) Measuring the effects of business intelligence systems: The relationship between business process and organizational performance. International Journal of Accounting Information Systems 9, 135-153.

Eppler, M.J. (2006) Managing Information Quality: Increasing the Value of Information in Knowledge-Intensive Products and Processes, 2nd ed. Springer.

Ferrari, A. (2011). Business Intelligence Systems, Uncertainty in Decision-Making and Effectiveness of Organizational Coordination, in: Carugati, A., Rossignoli, C. (Eds.), Emerging Themes in Information Systems and Organization Studies. Physica-Verlag HD, pp. 155-167.

Fitzgerald, G., Russo, N.L. (2005) The turnaround of the London Ambulance Service Computer-Aided Despatch system (LASCAD). European Journal of Information Systems 14, 244-257.

Fornell, C., Larcker, D.F. (1981) Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. Journal of Marketing Research 18, 39-50.

Fraser, S., Salter, G. (1995). A Motivational View of Information Systems Success: A Reinterpretation of DeLone and McLean's Model, in: Pervan, G., Newby, M. (Eds.), Sixth Australasian Conference on Information Systems, Curtin University of Technology, Perth, Australia, p. 119.

Gable, G.G., Sedera, D., Chan, T. (2003). Enterprise systems success: a measurement model, in: March, S.T., Massey, A., DeGross, J.I. (Eds.), Twenty-Fourth International Conference on Information Systems, Seattle, Washington, USA.

Gartner. (2012). Gartner Identifies the Top 10 Strategic Technology Trends for 2013, Orlando, Florida.

Gill, T.G. (1995) Early Expert Systems: Where Are They Now? MIS Quarterly 19, 51-81.

Ginman, M. (1988) Information culture and business performance. IATUL Quarterly 2, 93-106.

Greenberger, D.B., Strasser, S. (1986) Development and Application of a Model of Personal Control in Organizations. Academy of Management Review 11, 164-177.

Gustavsson, M., Wänström, C. (2009) Assessing information quality in manufacturing planning and control processes. International Journal of Quality & Reliability Management 26, 325-340.

Hair, J.F., Sarstedt, M., Ringle, C.M., Mena, J.A. (2012) An assessment of the use of partial least squares structural equation modeling in marketing research. Journal of the Academy of Marketing Science 40, 414-433.

Haley, B.J., Watson, H.J., Goodhue, D.L. (1999) The Benefits of Data Warehousing at Whirlpool. Journal of Cases on Information Technology 1, 14-25.

Hwang, Y., Kettinger, W.J., Yi, M.Y. (2013) A study on the motivational aspects of information management practice. International Journal of Information Management 33, 177-184.

Işık, Ö., Jones, M.C., Sidorova, A. (2013) Business intelligence success: The roles of BI capabilities and decision environments. Information & Management 50, 13-23.

Jarvenpaa, S.L., Staples, D.S. (2000) The use of collaborative electronic media for information sharing: an exploratory study of determinants. The Journal of Strategic Information Systems 9, 129-154.

Johnston, H.R., Carrico, S.R. (1988) Developing Capabilities to Use Information Strategically. MIS Quarterly 12, 37-48.

Kivinen, T., Lammintakanen, J. (2013) The success of a management information system in health care – A case study from Finland. International Journal of Medical Informatics 82, 90-97.

Lee, T.A. (1971) Utility and Relevance-the search for reliable financial accounting information. Accounting and Business Research 1, 242-249.

Li, S., Lin, B. (2006) Accessing information sharing and information quality in supply chain management. Decision Support Systems 42, 1641-1656.

Louis, M.R. (1980) Surprise and Sense Making: What Newcomers Experience in Entering Unfamiliar Organizational Settings. Administrative Science Quarterly 25, 226-251.

Low, G.S., Mohr, J.J. (2001) Factors Affecting the Use of Information in the Evaluation of Marketing Communications Productivity. Journal of the Academy of Marketing Science 29, 70-88.

Luftman, J., Ben-Zvi, T. (2010) Key Issues for IT Executives 2009: Difficult Economy's Impact on IT. MIS Quarterly Executive 9, 49-59.

Marchand, D.A., Kettinger, W.J., Rollins, J.D. (2000) Information orientation: People, technology and the bottom line. Sloan Management Review 41, 69-80.

Marchand, D.A., Kettinger, W.J., Rollins, J.D. (2001) Information Orientation: The Link to Business Performance. Oxford University Press.

Melville, N., Kraemer, K., Gurbaxani, V. (2004) Information Technology and Organizational Performance: An Integrative Model of IT Business Value. MIS Quarterly 28, 283-322.

Menon, A., Varadarajan, P.R. (1992) A Model of Marketing Knowledge Use within Firms. Journal of Marketing 56, 53-71.

Miller, H. (2005) Information quality and market share in electronic commerce. The Journal of Services Marketing 19, 93-102.

Mithas, S., Ramasubbu, N., Sambamurthy, V. (2011) How Information Management Capability Influences Firm Performance. MIS Quarterly 35, 237-256.

Najjar, L. (2002). The Impact of Information Quality and Ergonomics on Service Quality in the Banking Industry. University of Nebraska, Lincoln.

Negash, S., Gray, P. (2008). Business Intelligence, in: Burstein, F., Holsapple, C.W. (Eds.), Handbook on Decision Support Systems 2. Springer Berlin Heidelberg, pp. 175-193.

Nelson, R.R., Todd, P.A., Wixom, B.H. (2005) Antecedents of Information and System Quality: An Empirical Examination Within the Context of Data Warehousing. Journal of Management Information Systems 21, 199-235.

Nevo, S., Wade, M. (2011) Firm-level benefits of IT-enabled resources: A conceptual extension and an empirical assessment. The Journal of Strategic Information Systems 20, 403-418.

Nunnally, J.C. (1978) Psychometric Theory, 2nd ed. McGraw-Hill, New York, NY.

O'Reilly III, C.A. (1982) Variations in Decision Makers' Use of Information Sources: The Impact of Quality and Accessibility of Information. The Academy of Management Journal 25, 756-771.

Oliver, G. (2003) Cultural Dimensions of Information Management. Journal of Information & Knowledge Management 02, 53-61.

Oliver, G. (2008) Information culture: exploration of differing values and attitudes to information in organisations. Journal of Documentation 64, 363-385.

Petrini, M., Pozzebon, M. (2009) Managing sustainability with the support of business intelligence: Integrating socio-environmental indicators and organisational context. The Journal of Strategic Information Systems 18, 178-191.

Petter, S., DeLone, W.H., McLean, E.R. (2008) Measuring information systems success: models, dimensions, measures, and interrelationships. European Journal of Information Systems 17, 236-263.

Petter, S., DeLone, W.H., McLean, E.R. (2013) Information Systems Success: The Quest for the Independent Variables. Journal of Management Information Systems 29, 7-62.

Petter, S., McLean, E.R. (2009) A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. Information & Management 46, 159-166.

Popovič, A., Coelho, P.S., Jaklič, J. (2009) The impact of business intelligence system maturity on information quality. Information Research 14.

Popovič, A., Hackney, R., Coelho, P.S., Jaklič, J. (2012) Towards business intelligence systems success: Effects of maturity and culture on analytical decision making. Decision Support Systems 54, 729-739.

Popovič, A., Turk, T., Jaklič, J. (2010) Conceptual Model of Business Value of Business Intelligence Systems. Management 15, 5-30.

Porter, M.E., Millar, V.E. (1985) How information gives you competitive advantage. Harvard Business Review 63, 149-160.

Premkumar, G., Ramamurthy, K., Nilakanta, S. (1994) Implementation of Electronic Data Interchange: An Innovation Diffusion Perspective. Journal of Management Information Systems 11, 157-186.

Raghunathan, S. (1999) Impact of information quality and decision-maker quality on decision quality: a theoretical model and simulation analysis. Decision Support Systems 26, 275-286.

Ramchander, S., Schwebach, R.G., Staking, K.I.M. (2012) The informational relevance of corporate social responsibility: evidence from DS400 index reconstitutions. Strategic Management Journal 33, 303-314.

Rindfleisch, A., Moorman, C. (2001) The Acquisition and Utilization of Information in New Product Alliances: A Strength-of-Ties Perspective. The Journal of Marketing 65, 1-18.

Ringle, C.M., Sarstedt, M., Straub, D.W. (2012) Editor's Comments: A Critical Look at the Use of PLS-SEM in MIS Quarterly. MIS Quarterly 36, iii-xiv.

Ringle, C.M., Wende, S., Will, A. (2007). SmartPLS 2.0 M3, University of Hamburg.

Rossignoli, C., Ferrari, A., Mola, L., Bertoni, E. (2010). The Strategic Role of Business Intelligence Systems: An Assessment Model, in: D'Atri, A., De Marco, M., Braccini, A.M., Cabiddu, F. (Eds.), Management of the Interconnected World. Physica-Verlag HD, pp. 283-290.

Rossin, D.F. (2007) An Exploratory Analysis of Information Quality in Supply Chains: Efficient and Responsive Models. Journal of Global Business Issues 1, 151-158.

Shanks, G., Bekmamedova, N., Adam, F., Daly, M. (2012). Embedding Business Intelligence Systems within Organisations, in: Respício, A., Burstein, F. (Eds.), Fusing Decision Support Systems into the Fabric of the Context. IOS Press, pp. 113-124.

Shollo, A., Galliers, R.D. (2013). Towards an Understanding of the Role of Business Intelligence Systems in Organizational Knowing, 21st European Conference on Information Systems. Association for Information Systems, AIS Electronic Library (AISeL), Utrecht, The Netherlands, p. 12.

Srite, M., Karahanna, E. (2006) The role of espoused national cultural values in technology acceptance. MIS Quarterly 30, 679-704.

Streufert, S.C. (1973) Effects of information relevance on decision making in complex environments. Memory & Cognition 1, 224-228.

Stvilia, B., Gasser, L., Twidale, M.B., Smith, L.C. (2007) A framework for information quality assessment. Journal of the American Society for Information Science and Technology 58, 1720-1733.

Thong, J.Y.L. (1999) An integrated model of information systems adoption in small businesses. Journal of Management Information Systems 15, 187-214.

Todd, P., Benbasat, I. (1992) The Use of Information in Decision Making: An Experimental Investigation of the Impact of Computer-Based Decision Aids. MIS Quarterly 16, 373-393.

Todd, R.J. (1999) Back to our beginnings: information utilization, Bertram Brookes and the fundamental equation of information science. Information Processing & Management 35, 851-870.

Vanden, J.M. (2008) Information Quality and Options. The Review of Financial Studies 21, 2635-2676.

Vandenbosch, B., Huff, S.L. (1997) Searching and scanning: How executives obtain information from executive information systems. MIS Quarterly 21, 81-107.

Wand, Y., Wang, R.Y. (1996) Anchoring data quality dimensions in ontological foundations. Communications of the ACM 39, 86-95.

Wang, R.Y., Strong, D.M. (1996) Beyond accuracy: what data quality means to data consumers. Journal of Management Information Systems 12, 5-33.

Watson, H.J., Goodhue, D.L., Wixom, B.H. (2002) The benefits of data warehousing: why some organizations realize exceptional payoffs. Information & Management 39, 491-502.

Weill, P., Vitale, M. (1999) Assessing the Health of an Information Systems Applications Portfolio: An Example from Process Manufacturing. MIS Quarterly 23, 601-624.

Wixom, B.H., Todd, P.A. (2005) A Theoretical Integration of User Satisfaction and Technology Acceptance. Information Systems Research 16, 85-102.

Wixom, B.H., Watson, H.J. (2001) An empirical investigation of the factors affecting data warehousing success. MIS Quarterly 25, 17-41.

Xu, J.D., Benbasat, I., Cenfetelli, R.T. (2013) Integrating Service Quality with System and Information Quality: An Empirical Test in the E-Service Context. MIS Quarterly 37, 777-794.

Yeoh, W., Koronios, A., Gao, J. (2008) Managing the Implementation of Business Intelligence Systems: A Critical Success Factors Framework. International Journal of Enterprise Information Systems 4, 79-94.

Yuthas, K., Young, S.T. (1998) Material matters: Assessing the effectiveness of materials management IS. Information & Management 33, 115-124.

9. APPENDIX

Constructs and their indicators

Construct	*ID*	*Indicator*
Information Quality (IQ)	IQ1	Overall, I would give the information from BIS high marks.
	IQ2	Overall, I would give the information provided by BIS a high rating in terms of quality.
	IQ3	In general, BIS provides me with high-quality information.
Relevance (Re)	Re1	The information from BIS can be directly applied to solving problems.
	Re2	The information from BIS is easily understandable to the target group.
	Re3	The information from BIS is to the point, void of unnecessary elements.
Currency (Cu)	Cu1	BIS provides me with the most recent information.
	Cu2	BIS produces the most current information.
	Cu3	The information from BIS is always up to date.
Accuracy (Ac)	Ac1	BIS produces correct information.
	Ac2	There are few errors in the information I obtain obtained from BIS.
	Ac3	The information provided by BIS is accurate.
Format (Fo)	Fo1	The information provided by BIS is well formatted.
	Fo2	The information provided by BIS is well laid out.
	Fo3	The information provided by BIS is clearly presented on the screen.
Completeness (Co)	Co1	BIS provides me with a complete set of information.
	Co2	BIS produces comprehensive information.
	Co3	BIS provides me with all the information I need.
Information Use (IU)	IU1	I intend to use information provided by BIS as a routine part of my job over the next year.
	IU2	I intend to use information provided by BIS at every opportunity over the next year.
	IU3	I plan to increase my use of information provided by BIS over the next year.
Business Intelligence System Quality (BISQ)	BISQ1	In terms of system quality, I would rate BIS highly.
	BISQ2	Overall, BIS is of high quality.
	BISQ3	Overall, I would give the quality of BIS a high rating.

Construct	***ID***	***Indicator***
Reliability (Rl)	Rl1	BIS operates reliably.
	Rl2	BIS performs reliably.
	Rl3	The operation of BIS is dependable.
Accessibility (As)	As1	BIS allows information to be readily accessible to me.
	As2	BIS makes information very accessible.
	As3	BIS makes information easy to access.
Flexibility (Fl)	Fl1	BIS can be adapted to meet a variety of needs.
	Fl2	BIS can flexibly adjust to new demands or conditions.
	Fl3	BIS is versatile in addressing needs as they arise.
Data Integration (Di)	Di1	BIS effectively integrates data from different areas of the organization.
	Di2	BIS pulls together data that used to come from different places in the organization.
	Di3	BIS effectively combines data from different areas of the organization.
Speed (Sp)	Sp1	It takes too long for BIS to respond to my requests. (**reversed)
	Sp2	BIS provides information in a timely fashion.
	Sp3	BIS returns answers to my requests quickly.
Business Intelligence System Use (BISU)	BISU1	I intend to use BIS as a routine part of my job over the next year.
	BISU2	I intend to use BIS at every opportunity over the next year.
	BISU3	I plan to increase my use of BIS over the next year.
Information Sharing (INS)	INS1	I often exchange information with the people with whom I work regularly.
	INS2	I often exchange information with people outside of my regular work unit but within my organization.
	INS3	In my work unit, I am a person that people come to often for information.
Information Proactiveness (IP)	IP1	I actively seek out relevant information on changes and trends going on outside my organization.
	IP2	I use information to respond to changes and developments going on outside my organization.
	IP3	I use information to create or enhance my organization’s products, services, and processes.
Information Informality (II)	II1	I trust informal information sources (e.g. colleagues) more than I trust formal sources (e.g. memos, reports).
	II2	I use informal information sources (e.g. colleagues) extensively even though formal sources (e.g. memos, reports) exist and are credible.
	II3	I use informal information sources (e.g. colleagues) to verify and improve the quality of formal information sources (e.g. memos, reports).