

UNIVERSITY OF LJUBLJANA  
FACULTY OF ECONOMICS

TANJA GRUBLJEŠIČ

**DETERMINANTS OF BUSINESS INTELLIGENCE SYSTEMS  
EMBEDDEDNESS**

DOCTORAL DISSERTATION

Ljubljana, 2014



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## AUTHORSHIP STATEMENT

The undersigned Tanja Grublješič a student at the University of Ljubljana, Faculty of Economics, (hereafter: FELU), declare that I am the author of the doctoral dissertation entitled Determinants of business intelligence systems embeddedness (Dejavniki vpetosti poslovno inteligenčnih sistemov v poslovanje), written under supervision of prof. dr. Jurij Jaklič and co-supervision of prof. dr. Pedro Simões Coelho.

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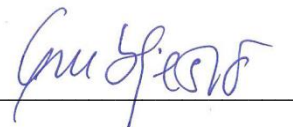
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## ACKNOWLEDGEMENTS

In the last three years of researching and writing the doctoral dissertation, with the help and support of exceptional people I have enjoyed a pleasant journey to the dissertation defense. I am grateful to everyone who kept me company on this path for their moral, intellectual, and spiritual support.

First and foremost, I would like to express my deepest gratitude and respect to my mentor, Professor Jurij Jaklič, who has guided me throughout the whole process of academic growth and promoted excellence. I would like to thank him for all the time and effort he has invested in me and for all his useful guidelines and advice. Without his constant moral, intellectual and spiritual support, I would have not advanced and finished my dissertation work with so many achievements (awards and publications) along the way and in such a short time. I believe he deserves a Best Mentor award.

I would also like to thank my co-mentor Professor Pedro Simões Coelho who contributed the methodological knowledge entailed in preparation of the doctoral dissertation. I thank him for all his useful guidelines and suggestions that helped improve my knowledge of empirical data analysis. Further, I would like to thank Aleš Popovič, Ph.D. and Professor Peter Trkman for their plentiful advice, suggestions, and guidelines that considerably improved the quality of my research work.

The committee for assessing the doctoral dissertation has been a key factor in refining the quality of the dissertation for which I thank Professor Tomaž Turk, Aleš Popovič, Ph.D. and Professor Vladislav Rajkovič.

Moreover, I would like to thank all my great colleagues in the RCEF department and my colleagues in the doctoral office for effectively and successfully dealing with all the administrative and operational issues that arose during the process. Great appreciation and gratitude also goes to Murray Bales, who has professionally edited my PhD, and by made more sense of what I was trying to convey.

I would also like to thank other colleagues and members of the department who accepted me as part of the research group and became my colleagues as well. Special thanks also go to Brina Buh, who was consistently there for me.

I also express great appreciation and gratitude to my family, my parents Nada and Drago and my sister Diana, who accompanied and stood by me throughout the entire journey. They are my spiritual and moral support. Special thanks from the depths of my heart go to my partner Matevž Vučnik, who always stood by me, encouraged me and instilled confidence in me.



# **DETERMINANTS OF BUSINESS INTELLIGENCE SYSTEMS EMBEDDEDNESS**

## **SUMMARY**

The growing investments in Business Intelligence Systems (BIS) reveal that organizations are seeing the potential of raising their business performance by implementing such technological innovations (Gartner Research, 2013, Wixom & Watson, 2008). To realize the benefits of BIS implementation, these should become an integral part of organizational activity (Furneaux & Wade, 2011) by being embedded into the routines of workers, organizational processes, technology infrastructure and strategy (Shanks et al., 2012). In order to achieve this integration or embeddedness, BIS have to be accepted and effectively used by employees. Literature has already established the importance of initial acceptance, but the effective long-term use is a key measure of ultimate system success (DeLone & McLean, 2003; Venkatesh & Bala, 2008).

Numerous cases show that BIS are underutilized by employees, thereby preventing organizations from achieving the promised benefits (Li et al., 2013). The purpose of the dissertation is therefore to improve the understanding of what drives the individual's motivation to use BIS and how and why individuals form beliefs to engage in the use of BIS and further continue their effective use. Understanding the structure of the determinants of the acceptance and effective use of BIS is crucial since that can provide leverage points to create favorable beliefs that encourage and motivate users to accept and effectively use BIS (Venkatesh, 2000). Although the literature provides valuable insights for understanding the generally applicable determinants of user acceptance and use of information systems (IS) across a broad range of IS settings, decisions to use BIS can be motivated by a specific set of drivers, reflecting their specific nature of use as compared to general or operational IS.

To study the determinants of the acceptance and effective use of BIS by individuals the study employs a sound research design comprising several scientific methods. It starts with a broad overview of the existing literature to identify the factors that should be relevant to the research. This is followed by an exploratory study including case studies and interviews in the context of interest, enabling an upgrade of the literature review, an understanding of the importance of context-specific determinants, and providing the basis for creating the conceptual research model. After conceptualizing the context-specific framework, a quantitative empirical analysis is carried out based on data gathered through collected survey data, followed by the establishment and verification of several hypotheses.

The findings of the dissertation provide many theoretical and practical contributions to the existing literature, reinforcing the importance and need for this research. The comprehensive systemization of the identified determinants of IS acceptance provides an upgraded summary of what was found in the literature (i.e. Legris, Ingham & Collerette, 2003; Lee et al., 2003; Chuttur, 2009; Sharp, 2007; Bilandzic et al., 2008) and can serve as a baseline for researching this phenomenon in other environments and settings. The extended identification of specific differences and characteristics of BIS compared to operational IS (Popovič et al., 2012)

related to the nature of their use further reveals context-specific issues that should be taken into account when studying BIS success. An exhaustive investigation of how and why individuals form decisions to accept and effectively use BIS contributes to existing studies in this context, where BIS success has mostly been studied in terms of system quality and critical implementation success factors (i.e. Wixom & Watson, 2001; Yeoh & Koronios, 2010; Popovič et al., 2012). Conceptualizing and measuring three different dimensions of effective BIS usage, comprising the intensity of use, the extent of use, and the embeddedness of BIS, represents another contribution to earlier studies of acceptance and use of IS where use has mainly been studied as intensity of use, neglecting how the system is used (i.e. Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008). This study provides important extensions and adaptations of traditional acceptance theories for the BIS use context. The findings reveal that the major drivers of the acceptance and effective use of BIS are considerably different than posited by traditional acceptance models. Traditional models and theories of acceptance of IS have predominantly investigated the impact of individual characteristics or individual perceptions related to system attributes (i.e. Davis et al., 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008). This study shows that in the BIS context the main focus is on organizational determinants and social aspects. These organizational environmental factors were mostly captured in existing acceptance models only through facilitating conditions (Venkatesh et al., 2008). In the BIS context, determinants such as result demonstrability, social influence, organizational customer orientation, and an open information culture with adequate support come to fore regarding the effective acceptance and use of BIS embedded into workers' routines. In addition, the study presents a comprehensive framework of the antecedent determinants to the acceptance of BIS, addressing the common criticism of acceptance theories (i.e. Lee et al., 2003; Benbasat & Barki, 2007; Venkatesh & Bala, 2008) and thereby providing actionable guidance to practitioners.

**Keywords:** Business intelligence systems, acceptance of BIS, effective use of BIS, embeddedness of BIS, organizational factors, social mechanisms, information culture.



# DEJAVNIKI VPETOSTI POSLOVNO INTELIGENČNIH SISTEMOV V POSLOVANJE

## POVZETEK

Vse večja vlaganja v poslovno inteligenčne sisteme (angl. Business Intelligence Systems, v nadaljevanju BIS), kažejo na to, da organizacije prepoznavajo potencial za povečanje poslovne uspešnosti z uvedbo takšnih tehnoloških inovacij (Garter Research, 2013; Wixom & Watson, 2008). Za uresničevanje prednosti po uvedbi bi morala uporaba BIS postati običajen sestavni del dejavnosti organizacije (Furneaux & Wade, 2011), tako da je vpeta v rutine zaposlenih, v izvajanje poslovnih procesov, tehnološko infrastrukturo in strategijo (Shanks et al., 2012). Da bi dosegli tako raven vpetosti, morajo zaposleni sprejeti in učinkovito uporabljati BIS. Pomembnost začetnega sprejetja je v literaturi že prepoznano, vendar pa je dolgoročna učinkovita uporaba ključno merilo uspeha sistema (DeLone & McLean, 2003; Venkatesh & Bala, 2008).

Številni primeri razkrivajo, da zaposleni premalo izkoriščajo možnosti, ki jih ponuja BIS, kar organizacijam onemogoča uresničevanje možnih koristi (Li et al., 2013). Namen doktorske disertacije je zato izboljšati razumevanje dejavnikov vpliva na motivacijo posameznika za uporabo BIS ter kako in zakaj posamezniki tvorijo prepričanja, da pričnejo uporabljati BIS ter nadaljujejo z njihovo učinkovito uporabo. Razumevanje strukture dejavnikov sprejemanja in učinkovite uporabe BIS je ključnega pomena, saj omogoča ustvarjanje ugodnih zaznav ter s tem spodbuja uporabniško sprejemanje in učinkovito uporabo BIS (Venkatesh, 2000). Kljub temu, da obstoječe raziskave ponujajo dragocen vpogled v razumevanje splošno veljavnih dejavnikov sprejemanja in uporabe IS v številnih okoljih, pa lahko na motivacijo za odločitev o uporabi BIS vpliva poseben sklop dejavnikov, ki odraža njihovo posebno naravo uporabe v primerjavi s splošnimi ali posebej z operativnimi IS.

Z namenom študija dejavnikov sprejemanja in učinkovite uporabe BIS je raziskava sledila širokemu raziskovalnemu okvirju, ki vsebuje več znanstvenih metod. Sprva je bil opravljen obsežen pregled obstoječe literature, na podlagi katerega so bili identificirani dejavniki, ki bi lahko bili pomembni za raziskavo. Temu je sledila kvalitativna raziskava s študijami primerov, v okviru katerih so bili izvedeni pol-strukturirani intervjuji, ki so omogočili nadgraditev pregleda literature, razumevanje pomena dejavnikov v specifičnem kontekstu ter podlago za oblikovanje konceptualnega raziskovalnega modela. Po konceptualizaciji raziskovalnega modela je bila izvedena empirična raziskava na podlagi podatkov zbranih s pomočjo analize anketne raziskave, s katero so bile preverjene postavljene hipoteze.

Ugotovitve doktorske disertacije ponujajo številne teoretične in praktične prispevke k obstoječi literaturi, kar krepi pomen in potrebo po opravljeni raziskavi. Obširna sistemizacija identificiranih dejavnikov sprejemanja IS predstavlja bolj izčrpen povzetek od najdenega v obstoječi literaturi (npr. Legris, Ingham & Collette, 2003; Lee et al., 2003; Chuttur, 2009, Sharp, 2007; Bilandžić et al., 2008) in lahko služi kot izhodišče za druge študije tega pojava v drugih okoljih uporabe. Razširjena opredelitev specifičnih razlik in značilnosti BIS v

primerjavi z operativnimi IS (Popovič et al., 2012), povezanih s posebno naravo njihove uporabe, dodatno razkriva kontekstno specifična vprašanja, ki jih je potrebno upoštevati pri študiju uspeha BIS. Izčrpna raziskava o tem, kako in zakaj posamezniki oblikujejo odločitve za sprejemanje in uporabo BIS, predstavlja prispevek k obstoječim študijam v tem kontekstu, kjer je bil uspeh BIS večinoma raziskovan z vidika kakovosti sistema in kritičnih dejavnikov uspeha in uvedbe BIS (npr. Wixom & Watson, 2001; Yeoh & Koronios, 2010; Popovič et al., 2012). Konceptualizacija in merjenje treh različnih dimenzij uporabe BIS, ki so intenzivnost uporabe, obseg uporabe in vpetost uporabe BIS, predstavlja še en prispevek k predhodnim študijam sprejemanja in uporabe IS, kjer je bila uporaba raziskovana predvsem kot intenzivnost uporabe, ki sledi sprejemanju, in s tem zanemarjeno, kako se sistem uporablja (npr. Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al. 2003; Venkatesh & Bala, 2008). Študija doktorske disertacije ponuja pomembne razširitve in prilagoditve tradicionalnih teorij sprejemanja in uporabe za BIS kontekst. Ugotovitve kažejo, da se glavni vzvodi sprejemanja in učinkovite uporabe BIS precej razlikujejo od poudarkov v tradicionalnih modelih sprejemanja. Tradicionalne teorije in modeli sprejemanja so pretežno raziskovali vpliv lastnosti posameznika in zaznave posameznikov povezane z značilnostmi sistema (npr. Davis et al., 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008). Ta raziskava razkriva velik pomen organizacijskih in družbenih dejavnikov v okviru uporabe BIS. Ti organizacijski in okoljski dejavniki so v obstoječih modelih večinoma zajeti le s podpornimi okoliščinami (Venkatesh et al., 2008). V okviru sprejemanja in učinkovite uporabe BIS, vpete v rutine delavcev, pridejo do izraza dejavniki kot so predstavljaljivost rezultatov, družbeni vpliv, organizacijska osredotočenost na stranke in odprta informacijska kultura z omogočanjem ustrezne podpore. Dodatno, študija ponuja obsežen okvir predhodnih dejavnikov sprejemanja BIS, in s tem obravnava pogosto kritiko modelov sprejemanja (npr. Lee et al., 2003; Benbasat & Barki, 2007; Venkatesh & Bala, 2008) ter ponuja smernice organizacijam za načrtovanje ukrepov za izboljšanje učinkovite uporabe BIS.

**Ključne besede:** poslovno inteligenčni sistemi, sprejemanje BIS, učinkovita uporaba BIS, vpetost uporabe BIS, organizacijski dejavniki, družbeni mehanizmi, informacijska kultura

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# 1 INTRODUCTION

## 1.1 DESCRIPTION OF THE PROBLEM

The acceptance and use of information systems (IS) in the workplace is one of the priority issues of IS research and practice (Venkatesh & Davis, 2000). Information technology (IT) is becoming increasingly complex and crucial for business operations as well as in managerial decision-making, thus making the issue of acceptance and use even more salient. Despite impressive advances in hardware and software capabilities, the problem of the underutilization of IS continues. There are numerous cases of failed IS implementation in organizations (Venkatesh & Bala, 2008). To ensure their success, IS must be accepted and used by employees in organizations (Venkatesh, Morris, Davis & Davis, 2003). While initial acceptance by users is important for the actual roll-out of IS, following initiation, organizational adoption and adaptation; effective long-term use of IS, including routinization and infusion or embeddedness, as suggested by Cooper and Zmud (1990) and Saga and Zmud (1994) stage model of IS implementation; is a key measure of ultimate IS success (DeLone & McLean, 2003; Venkatesh & Bala, 2008).

Extensive research has been conducted to understand user acceptance of IT (Taylor & Todd, 1995; Venkatesh & Davis, 2000) and consequently many different models and theories that incorporate a variety of behavioral, social and other control factors have been developed to explain IT acceptance (i.e. Davis, 1989; Venkatesh, et al., 2003; Venkatesh & Bala, 2008). The primary goal of such models is to “develop diagnostic tools to predict IS acceptance and facilitate design changes before users have experience with a system” (Taylor & Todd, 1995, p. 561).

The research stream examining and explaining adoption and acceptance is one of the most mature and rich streams in the IS field (e.g. Davis, 1989, Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008). In contrast, post-adoptive use behavior is still under-researched, often conceptualized as the increasing intensity or greater frequency of use (Jasperson, Carter & Zmud, 2005). Some efforts have already been made to show that post-adoptive use behavior may also diminish over time with gained experience (Bhattacharjee, 2001), or on the other hand become habitualized and routinized in individuals' work routines (Jasperson et al., 2005). Undoubtedly, research on technology acceptance and initial use can enrich our understanding of post-adoptive use behaviors and we can build on the findings and identified determinants influencing new IT application use. But the distinctions between pre- and post-adoptive beliefs and behaviors have already been observed (Agarwal & Karahanna, 2000; Karahanna, Straub & Chervany, 1999).

Although existing research provides valuable insights for understanding the determinants of acceptance and use of IT (i.e. Davis, 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008), attempts to identify the antecedents of these formed beliefs remain scarce (Venkatesh & Bala, 2008). The most common criticism of acceptance models is their lack of actionable guidance (Lee, Kozar & Larsen, 2003; Venkatesh et al., 2003; Benbasat & Barki, 2007; Venkatesh &

Bala, 2008). Recognizing the drivers of acceptance and use of IS holds immense value for organizations in order for them to proactively design interventions (Jasperson, Carter & Zmud, 2005; Venkatesh & Bala, 2008) and mitigate resistance to new IS implementation so as to improve the likelihood of success and business value of this new IS for organizations.

Advances in understanding the determinants of employees' IT acceptance and use are visible (Venkatesh et al., 2003), although academic literature and trade press still provide evidence that employees' underutilization of IS "results in the failure to garner the expected benefits of such implementations and threatens the long-term viability of such systems" (Venkatesh, Brown, Maruping & Bala, 2008, p. 284). Thus, understanding the structure of the determinants of user acceptance and usage of IS is critical since it can provide leverage points to create favorable perceptions and thereby encourage user acceptance and actual use (Venkatesh, 2000).

Even though a general set of acceptance and use determinants that span across a broad range of IS provides a broad framework and good starting point for understanding the concept of users' acceptance and use of IS (Venkatesh et al., 2003), developing context-specific acceptance and use determinants holds "immense value in theorizing richly about the specific IT artifact in question and identifying determinants that are specific to the type of technology being used" (Venkatesh & Bala, 2008, p. 275). Venkatesh, Thong, Chan, Hu & Brown (2011, p. 545) expose "the need to consider context-relevant variables when designing research to study technology adoption and use".

Investments in Business Intelligence Systems (BIS) have become "the hallmark of organizational strategies and competitive advantage" (Venkatesh et al., 2008, p. 484; Wixom & Watson, 2010). The IS literature emphasizes the positive impact of the information provided by BIS on decision making, particularly when organizations operate in highly competitive environments (Popovič, Hackney, Coelho & Jaklič, 2012). These technological innovations are a main source of competitive advantage for the long-term survival of organizations (Jourdan, Rainer & Marshal, 2008; Wixom, Watson, Reynolds & Hoffer, 2008). However, the key question is whether, after the implementation of BIS, users actually accept, use and take full advantage of their capabilities.

User acceptance and use are also crucial for BIS success although in this context, in contrast with operational systems, there is a particularly pronounced difference between on one hand using or accepting the system and, on the other, the long-term routinization (Bhattacharjee, 2001) of using the information provided by BIS in the context of post-adoptive use behavior leading to their effective use. BIS have many distinct specific characteristics compared to operational IS that affect their acceptance and nature of use. Therefore, to study effective BIS use we need to understand the specific determinants that influence their acceptance and various dimensions of their use from intensity of use, expansion of use to embeddedness, which capture how much and in what way BIS are used, leading to their effective use. This entire backdrop lays out the motivation for this study.

## 1.2 MOTIVATION

Although the literature provides valuable insights for understanding the generally applicable determinants of user acceptance and use of IS across a broad range of IS settings, decisions to use BIS can be motivated by a specific set of drivers, reflecting their particular nature of use as compared to general or operational IS. Understanding of *what* drives the individual's motivation to use BIS and *how* and *why* individuals form beliefs to engage in the use of BIS and further continue with their effective use is therefore vital.

The prominence of Business Intelligence (BI) and big data analytics (Gartner Research, 2013) is shown by the fact that ever more private and public organizations (including government) are displaying an interest in implementing BIS within their organizations (Wixom & Watson, 2010). The positive impact of the information provided by BIS on decision making has been emphasized in the IS literature, particularly when organizations operate in highly competitive environments (Popovič et al., 2012). According to Gartner Research (2013), analytics and business intelligence ranked first of the top Chief Information Officers (CIO) business and technology priorities in 2013, showing their growing strategic importance and emphasizing their need for greater attention in research studies.

BIS are most commonly described as solutions holding quality information in well-designed data stores connected with business-friendly tools. Their goal is to provide stakeholders at various levels in an organization with timely access, effective analysis, and an insightful presentation of the information generated by enterprise-wide applications, enabling them to make the right decisions or take the right actions across a broad range of business activities (Popovič, Coelho & Jaklič, 2009). The essential elements of BIS are not only the software or technology components but also the importance of human factors within an organization and its business environment. Accordingly, English (2005) defines BI more broadly as “the ability of an enterprise to act effectively through the exploitation of its human and information resources”. BI therefore cannot exist without the people to interpret the meaning and significance of the information and to act on the knowledge they gain (English, 2005).

Effective use of BIS is therefore seen as extremely important and presents a link between, on one hand, using or accepting the technology or a system and, on the other, the long-term routinization (Bhattacharjee, 2001) of using the information provided by BIS as a part of the business value generation process (Popovič et al., 2012). Effective use of BIS captures both routinization (systems become a part of the daily routine) and infusion (systems become embedded into the organization's work system) (Cooper & Zmud, 1990), as a part of the long-term sustained usage, leading to its success (DeLone & McLean, 2003). The implementation and existence of BIS in the enterprise are therefore not enough by themselves to record a better performance of the organization and the value added of BIS. The long-term sustainability of BIS and its success depend upon its ability to become embedded into workers' routines, the organization's processes and strategy (Shanks, Bekmamedova, Adam

& Daly, 2012). To achieve the level of embeddedness, we need to understand what motivates and shapes employees' decisions to use BIS.

For studying the influence of the determinants impacting BIS acceptance and the various dimensions of their use, namely in both pre- and post-technology adoption phases, it is important to identify the specific characteristics of BIS use environment compared to traditional, i.e. operationally oriented systems. The most noticeable specifics related to the nature of their use include voluntariness of use (Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008), a different structure of users (mostly managers), relatedly less structured information needs, much more aggregated and integrated information with more sharing of information (Negash & Gray, 2008), connected with the need for improvements in information culture (Marchand, Kettinger & Rollins, 2001) and an emphasis on the relevance of the information provided by BIS (Delone & McLean, 2003; Eppler, 2006; Popovič et al., 2009). Identifying the specific characteristics of their use environment can help reveal that different motivations than traditional models posit impact and shape their acceptance and use. Understanding how and why individuals form decisions to use BIS can potentially increase their effective use, embedded into workers' routines, organizational processes, technology infrastructure and strategy (Shanks et al., 2012). This deep usage involves advanced analytics with the creation of competitive and innovative knowledge that "takes managerial decision making to new levels of understanding and foresight" (Shanks et al., 2012, p. 114) and represents the main added value of using BIS, leading to a better organizational performance.

### **1.3 PURPOSE AND GOALS**

The purpose of the dissertation is to improve the understanding and provide a framework of *what* drives the individual's motivation to use BIS and *how* and *why* individuals form beliefs to engage in the use of BIS and further continue with their effective use, embedded into their routines. To the best of my knowledge, the literature is missing comprehensive research that provides a framework of the individual-level determinants of acceptance and different dimensions of BIS use along with the antecedents that shape these beliefs and behavior.

To realize this purpose, the dissertation has the following goals:

- to provide a broad overview of the general determinants of user acceptance and use, identified, systemized and categorized based on an extensive literature review;
- to identify the specific differences and characteristics of BIS compared to operational IS related to the nature of their use, as determined by the literature review and insights from interviews with experts from practice;
- to conceptualize a BIS acceptance model, based on exploratory case studies and interviews of experts from the field;
- to conceptualize a BIS extended use model, building on exploratory case studies and interviews with experts from the field;

- to define and conceptualize the embeddedness of BIS, developing a measurement scale for this construct, based on the literature review as well as the expert opinions and suggestions;
- to develop a model of the drivers of the three dimensions of BIS use, including intensity, extent and embeddedness, based on data gathered from survey analysis; and
- to develop a model of the antecedent determinants of intention beliefs to accept and use BIS based on data gathered from survey analysis.

## **1.4 HYPOTHESES**

The dissertation has one broad research question: What are the determinants of user acceptance and effective use of BIS that lead to its embeddedness? This is examined through several sub-questions that are investigated in different connected papers from which the dissertation's hypotheses are derived.

A review of models and theories of acceptance shows that these mostly include determinants of individual characteristics or individual perceptions related to system attributes (Venkatesh et al., 2003). An investigation and analysis of the specifics of BIS as compared to general or traditional operational IS, in terms of the nature of their use, reveals that these specifics could lead to the identification of a different set of acceptance and use determinants than general or traditional acceptance models posit, leading to the first hypothesis:

H1: A different but overlapping set of acceptance determinants than traditional models posit drives BIS use as a consequence of specific differences in the nature of BIS use.

A broader overview of several research streams of IS studies (e.g. IS adoption, IS implementation and success, IS acceptance, and theories of human social behavior) lead to the identification and systemization of a wide range of determinants including individual, technological, organizational and environmental ones that can impact the acceptance of IS. This guided the next hypothesis:

H2: A whole range of individual, technological, organizational, and social factors shape motivations to accept and use BIS.

Existing literature on BIS implementation and success reveals an emphasis on organizational support and commitment for BIS success (i.e. Wixom & Watson, 2001; Yeoh & Koronios, 2010). Based on this, it is inferred that these are also important for shaping the individual's BIS acceptance and use beliefs that are not included in traditional IS acceptance models (i.e. Davis, 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008), leading to the next hypothesis:

H3: Predominantly a broad range of organizational factors drives the acceptance and use of BIS.

BIS implementation and working with BIS mainly introduce changes in the information culture throughout the organization, particularly in the areas of information transparency,

information sharing and information proactiveness (Marchand et al., 2001). The information deriving from these systems is more aggregated and integrated at the organizational level (Frolick & Ariyachandra, 2006), with lots of sharing of information (Olszak & Ziemba, 2007), and the desired result of these systems is the proactive use of information from BIS for better decision making. Connected to this, the existing literature demonstrates the importance of the relevance of the information deriving from BIS so that users can produce high quality and relevant results with its use (Popovič et al., 2012). Information culture of the organization is reflected in three information capabilities (Marchand et al., 2001) of the organization: information technology practices (reflected in BIS quality and consequently the relevance of information deriving from BIS), information management practices (reflected in management support of BIS), and information behaviors and values (reflected in effective use of BIS by employees). Existing information culture throughout the organization can therefore importantly contribute, both positively and negatively (Choo, Bergeron, Detlor & Heaton, 2008), to the way, how effectively BIS are used by employees. High levels of an open information culture (Pijpers, 2002) throughout the organization should facilitate and add to the higher quality of information coming from BIS which should in synergy contribute to the greater acceptance and use of BIS, leading to our next hypothesis:

H4: An information culture along with providing quality information significantly contributes (both positively and negatively) to the acceptance and use of BIS.

A BIS use environment featuring information transparency and the sharing of information implies that users should form judgments to accept and use BIS in an organizational social environment that conveys an organizational collective inclination towards its use. Positive perceptions of organizational support and the encouragement of peers, superiors and dedicated assistance, along with the communication of the results of its use, should make up a big part of individuals' assessments to accept and use BIS. Based on this, the next hypothesis is formed:

H5: Determinants related to social aspects in an organizational environment are important drivers of acceptance and use in the BIS context.

Previous research on IS acceptance mostly studied use in terms of the increasing intensity, frequency or duration of use following acceptance (Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008). The objects of study are mostly traditional operational oriented IS, where use is seamlessly integrated with business process execution. But the nature of BIS use, also encompassing unstructured processes, research-oriented and innovative use reveals that pure measures of how much a BIS is used are not enough to apprehend its effective use. Therefore, in the BIS use context it is important to capture both how much and in what way the BIS is used to achieve the level of embeddedness, where use of the BIS becomes an integral part of organizational activity (Furneaux & Wade, 2011). On this basis, it is hypothesized that:

H6: Several dimensions (intensity, extent and embeddedness) encompass the effective use of BIS, leading to its embeddedness.

Acceptance models are often criticized for lacking actionable guidance to explain what drives the identified acceptance beliefs (Venkatesh et al., 2003; Jasperson et al., 2005; Venkatesh & Bala, 2008). Acceptance determinants comprising behavioral, normative, and control beliefs can vary as a function of a wide range of background factors including individual, social, and information (i.e. knowledge, interventions) aspects (Ajzen & Fishbein, 2005). Taking the BIS nature of use as a baseline, a wide range of antecedent determinants of acceptance beliefs is identified in the dissertation, including individual characteristics, BIS quality characteristics and organizational factors. The formation of acceptance beliefs is influenced by a wide variety of cultural, personal, and organizational determinants (Ajzen & Fishbein, 2005), leading to the next hypothesis:

H7: A whole range of antecedent determinants, identified based on BIS specifics, explains the variance in the acceptance determinants of BIS.

Identifying the acceptance determinants of BIS along with their antecedents and identifying drivers of different dimensions of effective use of BIS should provide actionable guidance in order to enhance the possibility of BIS becoming deeply embedded in the business to create “BI-driven decision-making routines and BI-enabled organizational processes that take managerial decision making to new levels of understanding and foresight” (Shanks et al., 2012, p. 114).

## **1.5 DESCRIPTION OF RESEARCH METHODS AND DATA**

Prior to conducting the research, a research plan was made to establish which data were required, which methods would be used to collect and analyze this data, and how all of this would answer the research questions. The scientific research methods used in the dissertation follow a sound research design to study the identified problem or phenomena. The research design starts with a broad overview of the existing literature to identify the factors that might be relevant to the research. This is followed by an exploratory study including case studies and interviews in the context of interest, allowing an upgrade of the literature review with context-specific determinants and providing the basis for creating the conceptual research model, obtaining better explanations and understandings of the examined phenomenon which would otherwise be lost in other quantitative designs. After conceptualizing the context-specific framework, a quantitative empirical analysis is carried out based on data collected through a survey, confirming the established hypotheses. All of the phases help answer the different research questions and achieve the goals of the dissertation.

First, an extensive review of scientific and professional literature related to the researched topic is carried out. It consists of a review of the existing theories and models dealing with the acceptance, adoption, implementation, and success of IS. Based on this, a collection of all identified determinants of user acceptance of IS is systemized and categorized, providing a

starting point and the basis for a context-specific exploration. Moreover, specific characteristics of BIS compared to operational IS are identified and systemized, revealing some differences in the nature of their use.

Second, an exploratory data collection is conducted. This stage involved obtaining data and information from two case studies including observations during project implementations and semi-structured interviews with professionals and experts in the area of the implementation, adoption, and acceptance of BIS in organizations. The methodological approach includes observation through project implementation, a collection of project documents, and semi-structured interviews with BI stakeholders. Semi-structured interviews are used to permit an in-depth exploration of the research questions with every study participant and to develop an understanding of the relevant issues as seen from the independent perspective of a range of BIS practitioners (Blumberg, Cooper & Schindler, 2008). An interview guide is purposefully constructed to permit a comprehensive exploration of the factors impacting BIS acceptance and different dimensions of their use in an organization and to allow the informants to express their views freely while also affording the opportunity to raise issues suggested by my a priori framework (Saunders, Lewis & Thornhill, 2009). The interview outline with baseline questions can be seen in Appendix A. Based on the information gained from this stage of research (along with the literature background), a model of BIS acceptance and use is conceptualized that identifies the determinants relevant in the BIS context of acceptance and use and establishing differences between the three different dimensions of BIS use: intensity, extent, and embeddedness. The conceptualization of the model is presented in Sections 3 and 4.

Third, empirical research is conducted based on survey analysis. A survey questionnaire is constructed based on the conceptualized model of BIS acceptance and use prepared in the previous phase. The measurement items are developed by building on the previous theoretical basis to assure content validity and were supported by expert opinions. To ensure face validity, the questionnaire was pre-tested (Cooper & Schindler, 2003) using a focus group comprising practitioners and IS academics from the field who were not included in the subsequent research. Minor changes were made based on their suggestions, mostly involving adaptation of the questionnaire items to the specific context of BIS use, i.e. integrating voluntariness of use in the indicators and unifying the operationalization of all indicators to measure perceptions. A structured questionnaire with seven-point Likert scales is used, with anchors ranging from totally disagree (1) to totally agree (7) for all items used in the study. The questionnaire (in Slovenian) that was sent to the target participants is included in Appendix B.

The data were collected through a survey of 2,173 medium- and large-sized business organizations in Slovenia with more than 50 employees. These organizations represent a whole population (according to the mentioned criterion) of registered organizations in the official database published by the national Agency for Public Legal Records and Related Services in March 2013. The participants were given an introductory letter explaining the



aims and procedures of the study, assuring them that the information collected would not be revealed in an individual form. An explanation and definitions of what BIS encompass was provided in order to elucidate who we would like to be qualified as target respondents since clearly not all of the sampled firms had implemented BIS to support their operations and processes. Questionnaires were addressed to a wide range of employees, that is, all users of BIS (top management, heads of departments and divisions, IS managers, etc.). The questionnaires were sent to the contact persons available in the database, with a request to distribute the questionnaires to relevant users of BIS. A total of 195 completed surveys were collected after a follow-up round.

The collected data are analyzed using a form of structural equation modeling (SEM). SEM techniques enable researchers to assess and modify theoretical models and are becoming increasingly popular in IS research because of their great potential for further theory development (Gefen, Straub & Boudreau, 2000). This is a widely used methodology in the IT and IS field as it is suitable for predicting and theory building since it examines the significance of the relationships between the research constructs and the predictive power of the dependent variables (Chin, 1998). PLS is suitable for complex models (consisting of many latent and manifest variables), relatively small sample sizes, research models in an early stage of development and testing, and where there are no normal distribution requirements (Henseler et al., 2009). To conduct the data analysis, partial least squares (PLS) path modeling using Smart PLS was chosen. Two empirical models are conceptualized and hypotheses developed and tested, described accordingly in Sections 5 and 6.

All of the methods used, their detailed descriptions and analyses of the collected data are described in the following sections.

## **1.6 CONTRIBUTION TO SCIENCE**

The dissertation provides many theoretical and practical contributions. The broadest contribution is the development of a comprehensive structure of individual-level determinants of acceptance and different dimensions of BIS use (encompassing its effective use), along with the antecedents that shape these determinants, capturing different perception beliefs leading to acceptance and use behavior. The framework incorporates and identifies key contextual perception beliefs and predictors, revealing how these operate in the context of BIS use so as to achieve effective use embedded into workers' routines. Several particular contributions related to the broad one can be identified.

The review and systemization of the identified determinants of IS acceptance provides an upgrade and much more comprehensive summary than what is found in the existing literature (i.e. Legris, Ingham & Colletette, 2003; Lee et al., 2003; Chuttur, 2009; Sharp, 2007; Bilandzic et al., 2008). This review can serve as a starting point for other studies of this phenomenon in different environments and settings.

The identification of the specific differences and characteristics of BIS compared to operational IS related to the nature of their use also provides an extension of the set of differences Popovič et al. (2012) identify.

Moreover, the comprehensive study of the acceptance and use of BIS on the individual level provides a contribution to existing studies in the BIS context. Prior research in this setting has mostly focused on improvements to system quality, design characteristics, and implementation efforts with critical success factors (i.e. Wixom & Watson, 2001; Yeoh & Koronios, 2010; Popovič et al., 2012). All these views are important and essential for system success, but still the bottom line for organizations to realize benefits and promised outcomes of BIS implementation is that BIS have to be effectively accepted and used by employees in organizations.

Previous research on the acceptance and use of IS has mainly studied use as the intensity of use and thereby neglected how the system is used (i.e. Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008). Therefore, this research offers novel insights by conceptualizing and measuring three different dimensions of BIS usage, namely: the intensity of use, the extent of use, and the embeddedness of BIS. Conceptualizing and operationalizing a construct of the embeddedness of BIS on the individual level represents an adaptation of Shanks et al.'s (2012) research effort where the dimensions of embeddedness on different levels in the organization were identified.

This study provides important extensions and adaptations of traditional acceptance theories for the BIS use context. Traditional acceptance models have largely focused on individualistic assessments of the effort needed and perceptions of performance improvements or IT artifact attributes and characteristics (i.e. Davis, 1989; Venkatesh & Bala, 2008). The results of this research show that in the BIS context use, effort and performance perceptions have no direct statistically significant effect on behavioral intention to use BIS (further impacting use), but these intentions instead work through social mechanisms where social influence and result demonstrability directly impact motivations to engage in the use of BIS.

Further, the study reveals the crucial role of a whole range of organizational factors in shaping either intentions to use BIS or different dimensions of its use. These organizational environmental (or external) factors were mostly captured in existing acceptance models only through facilitating conditions (Venkatesh et al., 2008). In addition, the study provides a comprehensive framework of the antecedent determinants for the acceptance of BIS, including individual, technological, and organizational factors. A common criticism of acceptance theories is their lack of actionable guidance (i.e. Lee et al., 2003; Benbasat & Barki, 2007; Venkatesh & Bala, 2008). The analysis of these antecedents again reveals that predominantly organizational factors, either directly or indirectly through building an open information culture, impact the individual's internal schema of considerations that shape intentions to use BIS. Suggestions and calls for including these broader organization environmental impacts for encouraging IS use have already been made in the literature (Benbasat & Zmud, 2003).

All these findings provide evidence for an important BIS-specific environment of use, but can also to some degree apply to other settings, providing many opportunities for future research. For example, the emergent determinants might also apply to other enterprise-wide systems, decision support systems and knowledge sharing domains or even broader in any voluntary use setting such as a consumer context or social media use. The emergence of social mechanisms and impacts of broad factors of the cultural environment for facilitating acceptance and use could be adapted to any group environment, operationalized for example as peer, group leader and friends' support and encouragement, sharing and communication of the results of use, proactive use of information for knowledge creation with adequate resources for assistance with system difficulties.

The biggest contribution to practice is the provision of actionable guidance to practitioners. Since the main drivers that impact and shape the individual's internal motivations to use BIS and further induce and enhance their effective use are organizational, this gives prescriptive guidance to organizations because these are the factors organizations can influence. These drivers could be called trans-implementational, including pre- and post-implementation issues that should be constantly nurtured and continuously evolving. These should go in the direction of building up a "BI culture", that is creating a culture that values business intelligence.

## **1.7 STRUCTURE OF THE DOCTORAL DISSERTATION**

The dissertation is structured as a collection of five papers logically following the research design and the development of a framework of the determinants of BIS embeddedness, which is the focus of this thesis. Each article is a standalone document, but there is a clear common thread running through all of them where the development of the dissertation research can be seen according to above-mentioned stages of research from broad conceptualization of the research area to refinement of the proposed model. Each section therefore has its own introduction, background, elaboration of the problem and findings and conclusion (with specific limitations).

Following the introduction, the second chapter provides a comprehensive literature review of theories and models dealing with the psychological, technological, organizational, and environmental impacts on the acceptance of IS. Based on this overview, a comprehensive set of all the identified determinants of acceptance is systemized into categories, including individual characteristics, technological characteristics, organizational factors, social characteristics, and environmental characteristics. Further, some preliminary specifics of BIS compared to operational IS are outlined. The chapter concludes by pinpointing the initial determinants of acceptance that are important in the BIS context.

The third section draws on the provided baseline and follows with an exploratory approach in order to conceptualize a business intelligence acceptance model. Findings from the literature review are reinforced with case studies including semi-structured interviews that allow the specifics of BIS acceptance to emerge. A conceptual model that distinguishes between object-

based beliefs and behavioral beliefs impacting the acceptance of BIS is proposed. Insights from the case studies and interviews are elaborated. The findings reveal the significant emphasis on organizational factors in the BIS acceptance context, such as result demonstrability, social influence, and facilitating conditions with sufficient resources that help build an adequate information culture, all substantially influencing the effective acceptance of BIS.

The fourth section continues with an analysis of the findings from the exploratory phase, focusing on an investigation of diverse post-adoptive BIS use behaviors. It identifies and theoretically elaborates the three dimensions of BIS use, namely intensity, extent, and embeddedness, and conceptualizes a business intelligence extended use model. The findings outline the crucial determinants for effective BIS use. Personal innovativeness and readiness for change are highlighted for boosting the transition to the BIS being embedded into workers' routines. The relevance of the information provided by BIS is further exposed as critical for the deep structural usage of BIS. The emphasis on organizational factors classified as trans-implementation issues, taken into account before, during and after the implementation that should be constantly evolving is elaborated with regard to effective BIS use.

The fifth section starts with an empirical analysis based on survey data. It theoretically conceptualizes a model of the drivers of the three dimensions of BIS use through the development of several hypotheses. The results of the model estimation provide support for conceptualizing the three dimensions of use (intensity, extent and embeddedness) as different constructs. The findings of the empirical analysis provide important insights in the BIS use context, such that traditional determinants of effort and performance perceptions play no significant role in predicting BIS acceptance and use, but organizational factors such as social influence, result demonstrability, facilitating conditions, and customer orientation boost the expansion of BIS use and a qualitative leap in use – embedding BIS into the routines of workers. The enriched understanding of the phenomena of post-adoption BIS use behavior is discussed.

The sixth section continues with an analysis of the empirical data. It addresses the critical research question extensively called for in the IS literature, namely what drives intention beliefs, providing actionable guidance that acceptance models were criticized for lacking. A comprehensive model of the antecedent determinants of intention beliefs to accept and use BIS is developed along with several hypotheses. The model captures a wide range of factors including individual, technological, and organizational factors that can impact the formation of favorable intention beliefs to use BIS, reflecting the specifics and nature of BIS use. The results of the study expose the significant antecedent drivers of acceptance in the BIS context by revealing the importance of a self-efficacy belief, presenting individual characteristics, and organizational factors that either directly or indirectly through building an open information culture impact the individual's internal schema of considerations that shape their intentions to use BIS. Several contributions are discussed, revealing organizational factors as antecedents

for creating intentions that organizations can influence in order to increase individuals' motivations to use BIS.

The seventh section provides a summary of the overall main findings of the dissertation. It arranges the all-embracing achievements of individual studies into an integrative and collective overview of the whole studied phenomena of the dissertation. This is followed by a reference section (Section 8) and appendices (Section 9).

## **1.8 LIMITATIONS**

Although this study provides valid and generalizable findings on acceptance and use in the BIS context, it also has some limitations that should encourage future related research. The limitations of the individual papers are listed at the end of the chapters, but the general limitations may be summarized as follows.

The first limitation concerns the generalizability of the specific set of significant results and findings, related to the investigated research setting (Johns, 2006), to other settings and information technologies. The primary purpose of the dissertation was to investigate context-specific BIS acceptance and use behavior by individuals in an organizational environment. Even though the research in the conceptual stages (by drawing on general acceptance and use theories) establishes many frameworks that could be more broadly applicable (i.e. tested in other contexts and settings), some results and findings might be specific to the BIS use context only. Nevertheless, Johns (2006) in his paper underlies and elaborates many ways of how studying context affects and contributes to the understanding of organizational behavior.

The second limitation concerns a single-country investigation. Hofstede (1991) notes, that national culture is to some degree reflected in organizational culture, which further impacts to some degree on how people behave at work. Therefore some of the results might be idiosyncratic to this specific country, and replication of this research in other countries would be beneficial to understand how these findings generalize to other countries. However, with Slovenia being part of the EU, the findings should not be considerably different than in any other Western nation. Furthermore, the culture at any level (national or organizational) does not significantly or directly affect the overall findings as we investigated more in depth only the type of information culture (as part of broader organizational culture) that fosters the greater acceptance and use of BIS, as driven or built by many other organizational determinants. Also, the results of the hypotheses testing are not constrained by the sample size since the whole population was invited to participate in the research.

The third limitation is related to the identification of a general set of acceptance and use determinants of BIS which on the other hand was the purpose of the study. The study did not investigate separate industry sector specifics, competitiveness of the environment pressure or any of the individual's demographic characteristics (e.g. age, gender, education). These should be tested either as moderating effects that might modify the hypothesized relationships or as multi-group analyses in the future. Such research might provide more group-focused

findings and guidance. In addition, a longitudinal study might be beneficial for providing an insight into how these motivations and behavior change over time and with gained experience.

## 2 ACCEPTANCE DETERMINANTS OF BUSINESS INTELLIGENCE SYSTEMS: A LITERATURE REVIEW<sup>1</sup>

### ABSTRACT

While there is growing interest in implementing Business Intelligence Systems (BIS), merely putting them into practice is not enough to realize the added value of BIS in terms of better performance. The business value stems from use of the information provided by such a system, meaning that users must both use and accept the system. Much research has tried to explain the user acceptance of information technology. The results are complementary theories and models that identify a number of acceptance determinants. The theory most commonly used to explain acceptance by the individual is the technology acceptance model (TAM). In this paper, I pinpoint the specific key determinants of BIS acceptance based on identification of the specifics of BIS and a prior extensive review and systemization of the general determinants of the acceptance of information technology (IT) derived from the most important theories. Understanding these determinants can lead to favorable perceptions and thus greater acceptance and use of BIS, and consequently improve utilization of their potential benefits and business value.

**Keywords:** Business Intelligence, Business Intelligence Systems, acceptance of IT, TAM, acceptance of BIS

### 2.1 INTRODUCTION

A growing number of private and public organizations (including governmental) show interest in implementing Business Intelligence Systems (BIS) (Gartner Research, 2009). In recent years, the Business Intelligence (BI) market has experienced significant growth and BI solutions have topped the list of priorities of many Chief Information Officers (CIOs) (Gartner Research, 2008; Gartner Research, 2009). Wixom and Watson (2010, p. 14) define BIS as “a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions”. BIS is therefore a broad term that includes the collection of data from source systems, storing and accessing data and analyzing it using BI technologies and applications (Wixom & Watson, 2010). The primary objective of BIS is to provide workers “at various levels of the organization with timely, relevant, and easy to use information” and with “the ability to analyze business information in order to support and improve management decision making across a broad range of business activities” (Elbashir, Collier & Davern, 2008, p. 135-136).

However, the essential elements of BIS are not only its software or technology components but also the importance of human factors within an organization and its business environment. Accordingly, English (2005) defines BI more broadly as “the ability of an enterprise to act

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<sup>1</sup> This chapter of the dissertation has been published as Grublješič, T. (2013). Dejavniki sprejemanja poslovnointeligenčnih sistemov, *Economic and business review*, 15, Special Issue, 5-37.

effectively through the exploitation of its human and information resources”. BI therefore cannot exist without people to interpret the meaning and significance of the information and to act on the knowledge they thereby gain (English, 2005). The business value of BIS should therefore be shown in an improved business process and thus an enhanced business performance (Popovič, Turk & Jaklič, 2010).

The acceptance and use of information systems (IS) in the workplace is a priority issue of IS research and practice (Venkatesh & Davis, 2000). Information technology (IT) is becoming increasingly complex and crucial for business operations as well as in managerial decision-making, thus making the issue of acceptance and use even more salient. Despite impressive advances in hardware and software capabilities the problem of the underutilization of IS remains. There are many cases of failed IS implementation in organizations (Venkatesh & Bala, 2008). Advances in understanding the determinants of employees’ IT acceptance and use are visible (Venkatesh, Morris, Davis & Davis, 2003); however, the trade press still suggests that the low acceptance and use of IT by employees continue to be major barriers to the successful implementation of IS in organizations (Venkatesh & Bala, 2008).

Extensive research has been conducted to understand user acceptance of IT (Taylor & Todd, 1995; Venkatesh & Davis, 2000). Consequently, many different models and theories that incorporate a variety of behavioral, social and other control factors have been developed to explain IT usage (i.e. Davis, 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008). The main goal of such models is to “develop diagnostic tools to predict IS acceptance and facilitate design changes before users have experience with a system” (Taylor & Todd, 1995, p. 561). The technology acceptance model (TAM) has, in particular, received substantial theoretical and empirical support. The TAM proposed by Davis (1989) is a well-researched theory of determining an end-user’s intention to use a technology. This model predicts that understanding a user’s perceived usefulness and their perceived ease of use of a technology determines their theoretical intention to use that technology. Numerous empirical studies confirm that the TAM consistently explains a large proportion of the variance (typically around 40%) in use intentions and behavior (Venkatesh & Davis, 2000). In order to address other aspects of human behavior that can determine a user’s intention to use a technology, many modified versions of the TAM have been developed (Venkatesh & Davis, 2000; Venkatesh, 2000; Venkatesh & Bala, 2008). Understanding the structure of the determinants of user acceptance and usage of IS is therefore crucial since it can provide leverage points to create favorable perceptions and thereby encourage user acceptance and use (Venkatesh, 2000).

Technological innovations such as BIS are one of the main sources of competitive advantage for the long-term survival of organizations (Jourdan, Rainer & Marshal, 2008; Wixom, Watson, Reynolds & Hoffer, 2008), but in situations where these promising innovations cannot be completely accepted and adopted their benefits cannot be fully realized. Actual and effective use of BIS is thus considered extremely important and represents a link between the information provided by BIS and the business value of BIS in the so-called “BI value chain”,



where the distinction between “having” and “using” is crucial. The implementation and existence of BIS in an enterprise are therefore not enough for an organization to record a better performance and the value added of BIS. The key question is hence whether, after the implementation of such a system, users actually accept, use and take full advantage of its capabilities. Understanding the adoption, acceptance and use of BIS is consequently a priority for both researchers and practitioners alike. Better understanding of these factors might improve the utilization and business value of BIS in organizations.

IT acceptance is a well-researched area but BIS have some specific use environment characteristics that make it necessary to research the acceptance of BIS separately. BIS are different from operational IS in several respects. The use of BIS is primarily voluntary and the benefits are more indirect and long-term compared to operational IS. Users are typically more educated and executive workers in organizations – managers, and the information collected is aggregated more on the level of the entire organization and there is greater sharing of information. The structuredness of information needs and the processes within which IS are used, and the structuredness of instructions for using the BIS is much lower because the use is usually more research and innovative. The focus is more on necessary data and their relevance rather than on a software solution, and in the context of BIS such data also come from external sources, not only from the processes themselves. Petter and McLean (2009) emphasize the need to analyze the link between the dimensions of performance for specific IS separately. There is also evidence that certain particular factors determine and encourage the adoption and implementation of strategic IS such as BIS (Seah, Hsieh & Weng, 2010).

Based on an extensive literature review, and a systemization of the general determinants of IT acceptance and identified specifics of BIS, the purpose of this paper is to highlight the key determinants of BIS users’ acceptance.

The rest of the paper is structured as follows. In the second section, a definition of acceptance is given, the central role of TAM in studying IT acceptance is exposed, and other relevant models relating to the studied problem are discussed. Based on the presented theories and models, the third section provides a systemization of all the determinants of acceptance identified in the literature, while section four presents the specifics of BIS acceptance while highlighting the key determinants of BIS acceptance that are identified according to their specific features after the literature review. This is followed by a conclusion containing a summary of the findings.

## **2.2 ACCEPTANCE OF INFORMATION TECHNOLOGY**

The goal of IT acceptance research is to identify the determinants by which researchers and developers can predict its degree. Several competing models of acceptance have been developed, each with a different range of acceptance determinants (Venkatesh et al., 2003), although with some overlapping among them. One stream of research is theories that investigate the psychological impact on technology acceptance with intention to use and systems use as the dependent variable or innovation aspects and processes; other streams

focus more on the success of planning and implementation of new technologies, the technology fit with the tasks of users, and on organizational and other determinants (Dillon & Morris, 1996). The determinants and models identified so far already provide a high degree of reliability in predicting the acceptance of IT.

Dillon and Morris define (1996, p. 4) user acceptance as “the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support”. The concept therefore does not apply to situations in which users claim they use a particular system without actual evidence of that or where the technology is used for purposes not foreseen by the designers or procurers (e.g. for personal use). The actual use may of course vary slightly from the idealized, planned use, but the essence of technology acceptance theory is that such deviations are not significant so that the process of accepting any technology can be modeled and predicted (Dillon & Morris, 1996). In terms of the activities needed in the stage model of IT implementation suggested by Cooper and Zmud (1990, p. 124), acceptance is a process in which “organizational members are induced to commit to IT application usage”. In this study, I use the definition of Dillon and Morris (1996).

### **2.2.1 Theories of the psychological impact on acceptance**

Acceptance is basically conceptualized as the result of a psychological process users undergo when making decisions about new technology (Dillon & Morris, 1996) so I first present theories which examine the psychological impact on acceptance. Many models have been proposed to interpret and predict behavioral intention and use of IS, including the TAM (Davis, 1989) which has attracted the greatest attention and is commonly described as the most influential and widely used theory in IS research (Lee, Kozar & Larsen, 2003; Benbasat & Barki, 2007; Chuttur, 2009).

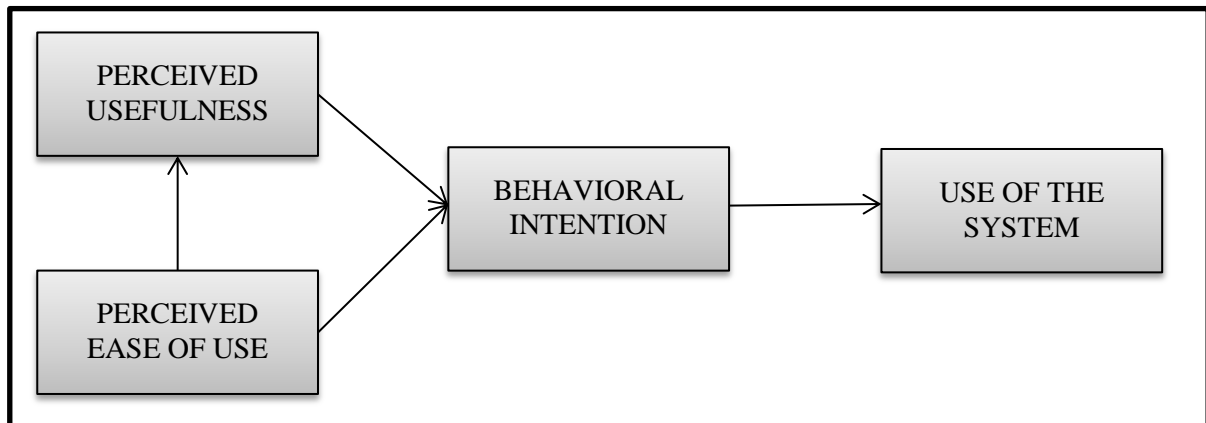
The TAM was developed based on two models of the socio-psychological theory of predicting behavioral intention and actual behavior. It is based on Fishbein and Ajzen’s (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980) Theory of Reasoned Action (TRA) that identifies the relationships between beliefs, attitudes, norms, intentions, and behavior. According to the TRA, an individual’s actual behavior is determined by behavioral intention, and this intention is determined by the individual’s attitude and subjective norms. Attitude (or attitude to the behavior) is determined by the individual’s subjective beliefs about the consequences of behavior and their emotional assessment (positive or negative feelings) of those consequences (Fishbein & Ajzen, 1975), and subjective norms are defined as the individual’s perception that most people who are important to him/her think that he/she should or should not be doing the behavior (Fishbein & Ajzen, 1975). Another important socio-psychological theory the TAM relates to is the Theory of Planned Behavior (TPB). The TPB (Ajzen, 1985, 1991) represents an upgrade of the TRA by adding a third antecedent determinant, perceived behavioral control, which is defined as “the perceived ease or difficulty of performing the behavior” (Ajzen, 1991, p. 188). Behavior is frequently not voluntary but mandatory. Therefore, in addition to an individual’s attitudes and subjective norms this determinant importantly affects their behavioral intention and actual behavior.

The TAM was developed to “provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations” (Davis, Bagozzi & Warshaw, 1989, p. 985). It proposes that two distinctive behavioral beliefs – perceived ease of use and perceived usefulness – determine an individual’s behavioral intention to use an IT, and that actual use is determined by behavioral intention.

Perceived ease of use is the extent to which someone believes that using a system will be free of effort. Bearing in mind that perceived ease of use is defined in terms of efforts, users might be expected to report on their evaluations or assessments of using the system, meaning that perceived ease of use can be understood as the expectations regarding use of the system. Perceived usefulness is the degree or extent to which someone believes that using a system will enhance their productivity or job performance. In contrast to perceived ease of use, where there is an expectation regarding use of the system, perceived usefulness is an expectation regarding use of the results of the system. Perceived ease of use, as the TAM proposes, should have a direct impact on the perceived usefulness as, with all other factors being constant, it is assumed that the greater the ease of using the system, the greater the usability for the user (Venkatesh & Davis, 2000).

The relationships between the constructs in the TAM are shown in Figure 1. Many studies support the validity of the TAM (Venkatesh, 1999).

Figure 1. Basic TAM model



Source: Davis, Bagozzi & Warshaw, *User Acceptance of Computer Technology: A Comparison of Two Theoretical Models*, 1989, p. 985

In order to better understand the two key determinants impacting on behavioral intention and use in TAM, many researchers have studied the antecedents of these two determinants. Venkatesh and Davis have extended the TAM in TAM 2 by including key variables affecting the perceived usefulness construct which encompass the determinants relating to processes of social influence and those relating to the cognitive process. Predecessors that explain perceived usefulness in TAM 2 are the subjective norm, that was summarized from the TRA and the TPB, image, job relevance, output quality and result demonstrability. The model also includes two mediating effects, namely voluntariness which is defined as a degree to which

potential users perceive the decision to accept a new system is voluntary, and thus distinguishes between voluntary and mandatory use, and the determinant of experience which detects that perceived usefulness and ease of use change with time and experience with the system. Venkatesh (2000) also developed a model of the antecedent determinants of perceived ease of use. These determinants include a user's general beliefs about computers and their use, namely computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, and adjustments which alter with experience of the system and are perceived enjoyment and objective usability. Venkatesh and Bala (2008) then combined all previously mentioned determinants within a comprehensive model called TAM 3 and added two more adjustments so that between the external variables that explain perceived usefulness and ease of use there are no cross-over effects while introducing new impacts between the constructs.

Following the model's introduction, researchers have employed the TAM in different contexts. The TAM has been used for varieties of IT applications, in longitudinal studies and other research environments, thereby proving it is a robust model and confirming the validity of its measurement instruments, and it has often been expanded by including additional variables from other theories in order to better explain the causal links between beliefs and their antecedents and better predict behavioral intention and use. With regard to the model, its achievements, constraints and extensions, several overview studies have been conducted (Legris, Ingham & Collette, 2003; Lee et al., 2003; Chuttur, 2009; Sharp, 2007; Bilandzic et al., 2008) and a number of meta-analyses (Ma & Liu, 2004; King & He, 2006; Schepers & Wetzels, 2007; Yousafzai, Foxall & Pallister, 2007a; Yousafzai et al., 2007b; Wu & Lederer, 2009; Turner et al., 2010; Wu, Zhao, Zhu, Tan & Zheng, 2011).

One of the strongest theories that also explains the individual's behavior is the Social Cognitive Theory (SCT) (Bandura, 1986). Compeau and Higgins (1995) applied and adapted the SCT to the context of IT utilization. The model predicts five key determinants that influence the acceptance and use of IT, namely performance outcome expectations, i.e. performance expectations regarding job-related outcomes; personal outcome expectations, related to personal expectations concerning an individual's self-esteem and sense of achieving self-improvement; self-efficacy, which is an individual's assessment of one's ability to use a technology to accomplish or complete a particular task; affect or an individual's fondness for using a particular technology; and anxiety, which represents an individual's emotional reactions to the use of IT. Performance outcome expectations and personal outcome expectations relate to perceived usefulness in the TAM, and self-efficacy, affect and anxiety to the determinant of perceived ease of use.

Triandis' (1979) theory of human behavior is a competing theory of the TRA and TPB within the psychological literature. Thompson, Higgins and Howell (1991) adapted and refined Triandis' theory for the IT context and proposed the Model of PC utilization (MPCU). The theory assumes that the use of a personal computer by workers in a volitional environment is influenced by the affect towards use, social factors associated with computer use, an

individual's expected consequences associated with the use of a personal computer and facilitating conditions for the use of a personal computer (Thompson et al., 1991). The model therefore proposes six key determinants influencing behavioral intention and use, namely job-fit, complexity, long-term consequences, affect towards use, social factors, and facilitating conditions. Job-fit, long-term consequences, and social influence determinants relate to the perceived usefulness construct in the TAM while complexity, affect towards use, and facilitating conditions relate to perceived ease of use.

Another stream of research of psychological effects on the acceptance and use of IT has examined the phenomenon from the point of view of Innovation Diffusion Theory (IDT) (Rogers, 1983). This theory examines various factors representing determinants of the acceptance and use of IT, such as the individual characteristics of users, information sources and communication channels and innovation characteristics. Moore and Benbasat (1991) integrated the concepts of behavioral and innovation literature into a model of determinants of individual technology acceptance by combining the concepts of the TRA and the perceived characteristics of an innovation. The model predicts that an individual's acceptance is influenced by seven constructs: relative advantage, defined as the degree to which an innovation is perceived as being better than the previous technology; ease of use, which is the level of difficulty of using an innovation; image, defined as the degree to which the innovation use is perceived to improve the image or status of an individual in their social system; visibility, denoting the degree to which an individual perceives that others in the organization use the system; compatibility, which is the extent to which an individual perceives that the innovation is in line with their existing values, needs and previous experience; result demonstrability, which is the tangibility (observability and communicability) of the results of using the innovation; and voluntariness of use, defined as the degree to which it is perceived it is voluntary to use an innovation (Moore & Benbasat, 1991). Moore and Benbasat's IDT model's predictive validity of an innovation's features has been supported by other researchers (e.g. Agarwal & Prasad, 1997, 1998; Karahanna, Straub & Chervany, 1999; Plouffe, Hulland & Vandenbosch, 2001).

Due to the need for a synthesis of different models of user acceptance presented in the literature, Venkatesh et al. (2003) developed a unified model named the Unified Theory of Acceptance and Use of Technology (UTAUT) which integrates elements from eight different models. Based on a comparison, Venkatesh et al. (2003) found that four constructs, formulated on the basis of the studied models' determinants, have a significant direct impact on behavioral intention and use, and these relationships are moderated by gender, age, experience, and voluntariness of use. These four main determinants are: (1) performance expectancy, defined as "the degree to which an individual believes that using the system will help him or her attain gains in the job performance" (and is the strongest predictor of intention to use the system); (2) effort expectancy, defined as "the degree of ease associated with the use of the system", and which impacts more on women and older users, and whose effect decreases with experience; (3) social influence, which represents "the degree to which an individual perceives that important others believe he or she should use the new system", and

which is more significant for older workers and women in the early stages of use and in mandatory settings (not significant in voluntary settings); and (4) facilitating conditions, defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system”, which are only significant with the inclusion of moderators for older workers in later stages of experience with the system and directly influence use (Venkatesh et al., 2003, p. 447-454).

Despite its impressive ability to predict the intention to use and system use, the TAM and its extensions and other models of individual technology acceptance only provide limited guidance on how to influence usage through the design and implementation of such a system. Designers therefore receive feedback regarding the ease of use and the usefulness of the system in general terms and regarding both the intention to use and use of the system, but they do not obtain actionable feedback about the important aspects of the IT artifact itself, such as flexibility, integration, the completeness of information and information accuracy (Taylor & Todd, 1995; Venkatesh et al., 2003; Wixom & Todd, 2005). The most common criticism of the TAM is therefore that it lacks useful guidelines for system development which could lead to the greater acceptance and use of IT. An undesirable and unintended side-effect of the TAM and other individual technology acceptance models is thus that they distract from the key research question of what really makes the technology useful and easy to use (Benbasat & Barki, 2007; Venkatesh & Bala, 2008). In accordance with this, Venkatesh et al. (2003) point out that the UTAUT is also a useful tool for managers and practitioners when assessing the likelihood of successfully implementing new technologies and helps them understand the driving determinants of acceptance which they can harness to proactively develop measures specifically aimed at a group of users that is less prone to accept and use a new technology. Further, in addition to forming the unified TAM 3 model of the antecedent determinants of perceived usefulness and ease of use, Venkatesh and Bala (2008) propose a full set of relevant measures (based on these two determinants) organizations can implement in order to increase intention and usage. These interventions are divided into two groups and refer to the pre-implementation phase, which includes design characteristics, management support, user participation and incentive alignment, and the post-implementation phase, which includes training, organizational support and peer support.

### **2.2.2 Theories of the technological impact on acceptance**

While findings concerning user acceptance as a psychological construct explain the forces that determine the behavior of individuals and allow researchers to predict with some accuracy how users will respond to a specific technology, there is also a need to consider acceptance as a starting point of a technology’s development, before an investment is made in the development itself. Even if it is possible to assess individuals’ acceptance, it is clear that implementation and use at the organizational level are not only composed of individuals’ assessments of the usefulness and ease of use (Dillon & Morris, 1996). The following theories thus provide valuable insights about user satisfaction and system performance, and the study of the technology fit with the tasks of users. This strand of the literature can provide guidance

for IT designers and developers so as to ensure or at least increase the acceptance of the systems they develop.

In order to ensure a universal and comprehensive definition of IS success, DeLone and McLean (1992) investigated the existing definitions of IS success and grouped the success criteria into six interdependent dimensions of system quality, information quality, use, user satisfaction, individual impact, and organizational impact. Based on the many subsequent contributions, ten years after publication of the original model DeLone and McLean (2003) proposed an updated model with six related dimensions: (1) system quality, (2) information quality, and (3) service quality affecting (4) use or intention to use and (5) user satisfaction and, as a result of system use, (6) net benefits can be achieved. These net benefits will in turn impact back (positively or negatively) on customer satisfaction and the continued use of IS.

User satisfaction research explains the expected characteristics of system design and information and is therefore useful for system development, but it is a weak predictor of use of the system. To build a theoretical framework that links the literature on user satisfaction and technology acceptance (particularly the TAM model), Wixom and Todd (2005, p. 85) developed and proposed an “integrated research model which distinguishes beliefs and attitudes about the system (object-based beliefs and attitudes) from beliefs and attitudes about using a system (behavioral beliefs and attitudes)”. The integrated model thus integrates decisions regarding the design and implementation of systems, which lies at the core of the user satisfaction literature, with the prediction of use of the system, which is at the heart of the technology acceptance literature (Wixom & Todd, 2005). Their model represents a connection between the two research streams, that have mostly been dealt with separately, and builds on the usefulness of each stream.

The task-technology fit (TTF) model examines (Goodhue & Thompson, 1995) additional determinants not studied by theories of individual acceptance which could impact on user acceptance. The TTF model points out that when the technology is compatible with users’ tasks, the users’ efficiency will be high (Goodhue & Thompson, 1995). This model attempts to define the characteristics of tasks and technology characteristics and the goodness of fit between the characteristics of the technology and the tasks of users. Goodhue and Thompson (1995) developed the criteria for the TTF model, which consists of eight factors: data quality (accuracy of data, access to the right data, the right level of detail); locatibility, meaning that it is easy to understand the meaning of the data; authorization to access data; compatibility of data; ease of use/training; timeliness of data; system reliability and relationships with users (IS understanding of business, IS interest and dedication, responsiveness, delivering an agreed-upon solution and technical and business planning assistance). Goodhue and Thompson (1995) found that the TTF criteria (as well as system characteristics and task characteristics) in connection to use significantly predict improved job performance as reported by users. Since it was developed, the TTF model has been applied to a wide range of information systems, modified to suit specific purposes of use, combined with other models or

used as an extension of other models. It has also been used as an extension of the TAM (Dishaw & Strong, 1999).

### **2.2.3 Theories of organizational and environmental impacts on acceptance**

Certain organizational capabilities and the environment in which the organization operates also impact on an individual's acceptance and use of technology and I therefore additionally present those theories that include these broader factors.

The concept of absorptive capacity was first defined by Cohen and Levinthal (1990, p. 128) as “the ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends”. They argue that absorptive capacity develops cumulatively and depends on the prior experience and path-dependent routes of firms and builds on existing knowledge (Cohen & Levinthal, 1990). Zahra and George (2002) extended this construct by defining four different dimensions of absorptive capacity, namely acquisition, assimilation, transformation and exploitation. Cohen and Levinthal (1990) introduced this concept for use on the organizational level, and the concept has also most commonly been used to examine the organizational absorptive capacity in other studies and proved to be very useful in providing a better understanding of knowledge transfer within organizations (the higher the absorptive capacity of firms, the greater the level of knowledge transfer should be) and thus the competitive advantage of firms. Absorptive capacity at the firm level depends on the degree of prior knowledge existing within the organization, and on the ability to communicate, share and integrate this knowledge within it. But the role of individuals is also important for the development, deployment and maintenance of this absorptive capacity. In its original conceptualization, Cohen and Levinthal (1990) argued that the absorptive capacity of an organization depends on the absorptive capacity of its individuals and is built according to the preliminary investment in the development of its employees and the absorptive capacity of those individuals. Minbaeva, Mäkelä, and Rabbiosi (2007, p. 3) further explain that “individuals are heterogeneous: they differ in the degree of their ability, motivation and the way they use those opportunities for knowledge sharing that are offered by the organization – and that these differences reflect their respective absorptive capacities”. The link between the organizational absorptive capacity and processes within the organization of knowledge transfer can therefore also be found at the individual level because, as Lane, Koka, and Pathal (2006, p. 854) argue, that “uniqueness arises from the personal knowledge and mental models of the individuals within the firm, who scan the knowledge environment, bring the knowledge into the firm, and exploit the knowledge in products, processes, and services”. Elbashir, Collier, and Sutton (2011) have examined the effect of absorptive capacity in the strategic use of BI. The results showed that organizational absorptive capacity, i.e. the ability of organizations to collect, absorb, and strategically use new information, is essential for the establishment of appropriate technology and infrastructure to adopt BI systems for the benefit of the organization. The results showed that while top management plays an important role in the efficient start-up of BI systems, their impact is indirect and a function of the absorptive capacity of operational managers. This indirect effect mainly shows that exploitation of the



potential of BI systems is managed from the "bottom up", unlike with most other strategic managerial systems where traditional leadership is recognized as a driving force (Elbashir et al., 2011). In their study of the adoption of data warehousing, Ramamurthy, Sen, and Sinha (2008) also identified the absorptive capacity as one of the most important factors of adoption, while Agarwal and Karahanna (2000) presented the cognitive absorption of individuals as a preliminary determinant of perceived usefulness and ease of use in the TAM model.

Resources specific to the organization also have a significant effect on the organizational performance and relate to the absorptive capacity of the organization. As described by Wade and Hulland (2004, p. 108), the resource-based view (RBV) theory argues that "firms possess resources, a subset of which enables them to achieve competitive advantage, and a further subset which leads to superior long-term performance". Resources that are valuable, rare and suitable, of which a company can assume benefits with ownership (or controlling) and productively use, provide a temporary competitive advantage. This advantage can be maintained in the long term if the company can protect itself against the imitation of these resources, their transfer or exchange, and these attributes can maintain their long-term value and rarity. Wade and Hulland (2004) used the RBV and extended it for use in the context of IS. They identified eight key categories of information resources: management relations in the field of IS with external stakeholders, responsiveness of the market, business partnerships of the IT staff, planning and change management of IT staff, IT infrastructure, technical skills of the IT department, IS development and cost-effective business services of IT staff (Wade & Hulland, 2004). They thereby proposed to researchers a way of understanding the role of IS in the organization, which can then be compared on equal terms with other assets of the organization to allow an integrated understanding of the long-term competitiveness of the organization. Based on the RBV, Bharadway (2000) studied the concept of IT as an organizational capability that contributes to the success of the organization. IT assets specific to the company are divided into tangible assets, which include physical IT infrastructure, human resources in the field of informatics, covering technical and managerial IT skills, and intangible assets in the field of IT, such as knowledge, customer orientation and synergies (Bharadway, 2000). Physical IT resources, which lie at the core of a company's information infrastructure, include computer and communications technology, technical platforms and databases, and are one of the most important business assets and a key means for achieving the organization's long-term competitiveness. Human resources in the field of IT comprise training, experience, relationships and the insights of employees. They are divided into technical and managerial skills, which are usually developed over time based on experience. Leadership skills are specific tacit knowledge that depends on the mutual relationships in the organization and is developed over a long period and is usually locally-specific for each organization separately. The RBV explicitly recognizes the value of intangible organizational assets, which include know-how, corporate culture, corporate reputation and environmental orientation, which all contribute to the superior performance of organizations. Intangible assets are usually tacit, idiosyncratic and deeply embedded in the organizational social

environment and its history (Bharadway, 2000). Wixom and Watson (2001) in their study of the success factors of data warehouse implementation specifically recognized the importance of organizational resources for successful implementation of the system. Resources including money, people and time are very important in the implementation of data warehouses since their implementation is expensive, time-consuming and requires large shares of organizational resources. The presence of available resources leads to better opportunities for overcoming organizational barriers and involves a high degree of organizational commitment (Wixom & Watson, 2001). In their study they found that management support and adequate resources help in solving organizational issues that arise during data warehouse implementation, and that resources, user participation and educated members of the project team all increase the chances the implementation project will be completed successfully and on time (Wixom & Watson, 2001).

Contingency theory (CT) (Fiedler, 1964) is a class of behavioral theory that asserts there is no single best way of organizing an organization or leading it or making decisions and that an organizational or management method which is effective in some situations may not be successful in others. The optimal organizational or leadership style depends on various internal and external factors. CT generally focuses on two groups of variables that affect the performance of organizations, namely the impact of environmental variables on organizational structure and the influence of subunit structure on organizational performance (Weil & Olson, 1989). Valuable ideas of CT are that there is no single best way to manage the organization and that its subunits must conform to the environment in which the organization operates. Lin and Shao (2000) used CT to study the relationship between user participation and involvement in the planning and development of IS and its success. They studied the relationships in a wider context where the effects of user participation, the attitudes of users and user involvement in success of the system occur simultaneously. Other situational determinants taken into account are the impact of the system, system complexity and system development methodology. The results confirm the positive relationship between user participation and IS success as measured by user satisfaction. Based on CT, Wu and Li (2007) extended the TAM by including human, emotional and social effects for the study of systems for knowledge management. Their results showed that situational consistency between the orientation in knowledge management and emotional factors (commitment as a positive emotion and fear as negative emotion) increases the internal (measured as perceived enjoyment and perceived playfulness) and extrinsic motivation (measured as perceived usefulness) of employees to use the system for knowledge management. Intrinsic motivation has an indirect impact on perceived usefulness and also a direct effect on the attitudes and behavioral intention to use the system. Social impacts, including internalization, identification and consent, directly and indirectly influence the attitudes and intended use of employees.

The issue of IT acceptance accordingly entails several theoretical perspectives and research topics such as the creation of human relationships and the psychology of individuals, system analysis, technological impacts and design of user interfaces, diffusion of innovation and the impact of different organizational and environmental determinants. Currently, there is no one

single theory covering both the interpretation and forecasting of IT acceptance as well as constituting a tool to ensure that every development of an IT/IS process leads to an acceptable result, but each of the approaches clearly contributes a share to the interpretation and understanding of this issue.

### 2.3 IDENTIFICATION OF THE DETERMINANTS OF ACCEPTANCE

An ongoing research question in the field of IS is the identification of the determinants that influence the acceptance and use of IS. Many theories and models addressing this problem have been developed in recent decades; the most relevant for the purpose of identifying the BIS acceptance determinants were presented in the previous section. Of all the theories, especially because of its clarity and simplicity, the TAM proves to be the most powerful, widespread and often used theory in this area, and was therefore also used as a basis for this research.

Building on an extensive literature review and previous overview studies which have partially summarized other variables included in the TAM model, in this chapter I identify all the other determinants that influence IT acceptance and have been included in research either as additional external factors affecting the basic TAM model (Davis, 1989) and thereby better predict technology acceptance, or as antecedent factors that better explain the two main belief constructs of perceived usefulness and perceived ease of use. The TAM has been expanded with the addition of determinants relating to the (1) individual, (2) technological, (3) social, (4) organizational, and (5) macro environmental characteristics in which the organization operates. In the following, all additional determinants of individual technology acceptance identified based on an extensive literature review are summarized in Table 1, classified by the mentioned categories. A brief description of each determinant and the reference studies which employed the variable in their research are given.

Table 1. Summary and categorization of all additionally identified determinants of user acceptance

Determinant	Description	Selected reference studies
<b>INDIVIDUAL CHARACTERISTICS</b>		
Gender	Male or female	Gopal, Miranda, Robichaux & Bostrom, 1997; Venkatesh & Morris, 2000; Venkatesh et al., 2003
Age	Age of user	Venkatesh et al., 2003
Computer literacy	Knowledge and ability to effectively use computers and related technology	Kay, Robin, 1990; Venkatesh et al., 2003
Education	The number of years of education completed	Aragwal & Prasad, 1999; Mahmood, Hall & Swanberg, 2001; Wu & Lederer, 2009
Attitude	An individual's positive or negative feelings (evaluative affect) on implementation of the target behavior (Fishbein & Ajzen, 1975, p.	Fishbein & Ajzen, 1975; Ajzen, 1985; Davis et al., 1989; Gopal et al., 1997; Karahanna, Straub & Chervany, 1999; Mahmood et al., 2001; Yang & Yoo,

	216)	2004; Sabherwal, Jeyaraj & Chowa, 2006; Kim, Chun & Song, 2009
Computer self-efficacy	The degree to which someone believes they have the ability to perform specific tasks using a computer (Compeau & Higgins, 1995, p. 191)	Bandura, 1986; Compeau & Higgins, 1995; Venkatesh & Speier, 1999; Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Computer playfulness	“The degree of cognitive spontaneity in microcomputer interactions” (Webster & Martocchio, 1992, p. 204)	Webster & Martocchio, 1992; Agarwal & Karahanna, 2000; Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Personal innovativeness	A characteristic of an individual that reflects a willingness to test any new technology (Agarwal & Karahanna, 2000, p. 677)	Agarwal & Prasad, 1998; Agarwal & Karahanna, 2000
Perceived enjoyment	The extent to which “the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use” (Venkatesh, 2000, p. 351)	Davis, Bagozzi & Warshaw, 1992; Teo, Lim & Lai, 1999; Venkatesh, 2000; Venkatesh & Bala, 2008
Computer anxiety	The degree of “an individual’s apprehension, or even fear, when he/she is faced with the possibility of using computers” (Venkatesh, 2000, p. 349).	Compeau & Higgins, 1995; Gopal et al., 1997; Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Prior experience	The duration or degree of an individual's prior use of computers or any information system in general (Sabherwal et al., 2006, p. 4)	Thompson et al., 1991; Igarria, Guimaraes & Davis, 1995; Taylor & Todd, 1995; Agarwal & Prasad, 1999; Dishaw & Strong, 1999; Agarwal & Prasad, 1999; Xia & Lee, 2000; Sabherwal et al., 2006
Positive mood	A positive mood is an internal factor that affects cognition and behavior and represents an individual's emotional state (not a reaction, but an attitude). Being in a state of positive mood affects how our thoughts are organized (Djambasi, Dishaw & Strong, 2010, p. 384).	Venkatesh & Speier, 1999; Djambasi, Strong & Dishaw, 2010
Outcome expectations	An individual’s self-prediction of their future behavior which helps take account of expected changes in the intention and explains the actual likelihood of behavioral acts (Warshaw & Davis, 1985, p. 213)	Warshaw & Davis, 1985; Venkatesh et al., 2003; King & He, 2006
Readiness for change	To have a positive perception of organizational changes and be ready for them. Antecedents of readiness for change are perceived personal competencies and organizational support (Kwahk & Lee, 2008, p. 475).	Kwahk & Lee, 2008

#### TECHNOLOGICAL CHARACTERISTICS

Relative advantage	The degree to which an innovation is perceived as being better than its precursor (Moore & Benbasat, 1991, p. 195)	Rogers, 1983; Moore & Benbasat, 1991; Premkumar & Potter, 1995; Karahanna et al., 1999; Venkatesh et al., 2003
Compatibility	The degree to which an innovation is perceived as being consistent with existing values, needs, and past experiences of potential adopters (Moore & Benbasat, 1991, p. 195)	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Xia & Lee, 2000; Venkatesh et al., 2003
Complexity	The degree to which an innovation is perceived as being difficult to use (Rogers, 1983, p. 16)	Rogers, 1983; Premkumar & Potter, 1995; Thompson et al., 1991; Karahanna et al., 1999
Result demonstrability	The degree to which an individual believes that the results of using a system are tangible, observable, and communicable (Moore & Benbasat, 1991, p. 203)	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Trialability	The degree to which an innovation may be experimented with before adoption (Rogers, 1983, p. 16)	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999
Objective usability	A “comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks” (Venkatesh, 2000, pp. 350-351)	Venkatesh & Davis, 2000; Venkatesh & Bala, 2008
Job relevance	Individual’s perceptions regarding the “degree to which the target system is applicable to his or her job” (Venkatesh & Davis, 2000, p. 191)	Thompson et al., 1991; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008
Output quality	The degree to which an individual believes that the system performs their job tasks well (Venkatesh & Davis, 2000, p. 191)	Venkatesh & Davis, 2000; Venkatesh & Bala, 2008
Accessibility	Physical accessibility is the extent to which someone has physical access to the hardware needed to use the system.  Information accessibility is the ability to retrieve the desired information from the system (Karahanna & Straub, 1999, p. 240).	Karahanna & Straub, 1999; Karahanna & Limayem, 2000
System quality	A measure of technical characteristics of the information system, which include reliability, flexibility, accessibility, integration, timeliness, portability, data quality and ease of use (Delone & McLean, 2003, p. 13; Wixom & Todd, 2005, p. 88)	DeLone & McLean, 1992; DeLone & McLean, 2003; Wixom & Todd, 2005; Sabherwal et al., 2006; Hartono, Santhanam & Holsapple, 2007
Information quality	A measure of the quality of outputs of the information system, which	DeLone & McLean, 1992; DeLone & McLean, 2003; Wixom & Todd, 2005;

	include accuracy, timeliness, completeness, adequacy, consistency and validity (Delone & McLean, 1992, p. 64; Delone & McLean, 2003, p. 15)	Khalil & Elkordy, 2005; Hartono et al., 2007; Marshall & Harpe, 2009; Popovič et al., 2010
User interface	A way of presenting information to users (Wixom & Watson, 2010, p. 25)	Davis et al., 1989; Wixom & Watson, 2010
Task-technology fit	The match between task needs of a user and the available functionality of the IT or IS (Dishaw & Strong, 1999, p. 9)	Goodhue & Thompson, 1995; Dishaw & Strong, 1999; Zigurs, Buckland, Connolly & Wilson, 1999; Venkatesh et al., 2003; Klopping & McKinney, 2004; King & He, 2006; Benbasat & Barki, 2007
<b>ORGANIZATIONAL CHARACTERISTICS</b>		
Facilitating conditions	The “degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al., 2003, p. 453)	Thompson et al., 1991; Igbaria, Guimaraes & Davis, 1995; Karahanna & Straub, 1999; Karahanna & Limayem, 2000; Venkatesh, 2000; Mahmood et al., 2001; Venkatesh et al., 2003; Sabherwal et al., 2006; Venkatesh & Bala, 2008
Management support	The degree of management support, which ensures “sufficient allocation of resources and act as a change agent to create a more conducive environment for IS success (Igbaria, Zinatelli, Cragg & Cavaye, 1997, p. 285)	Tyran & George, 1993; Igbaria et al., 1995; King & Teo, 1996; Igbaria, Zinatelli, Cragg & Cavaye, 1997; Wixom & Watson, 2001; Wade & Hlland, 2004; Sabherwal et al., 2006; Hartono et al., 2007; Liang, Saraf, Hu & Xue, 2007; Ke & Wei, 2008; Venkatesh & Bala, 2008; Rezaei, Asadi, Rezvanfar & Hassanshahi, 2009; Yeoh & Koronios, 2010; Žabjek, Kovačič & Indihar Štemberger, 2009; Seah et al., 2010
Shared beliefs	The creation of shared beliefs among organizational stakeholders through communication, which includes providing and obtaining information and creating understanding between organizational participants (Amoako-Gyampah & Salam, 2004)	Amoako-Gyampah & Salam, 2004
Participation and involvement of users in the implementation	The involvement and participation of users in the planning and development of the IS, which leads to better communication about their needs (Yeoh & Koronios 2010, p. 28)	Davis et al., 1989; Tyran & George, 1993; Jackson, Chow & Leitch, 1997; Wixom & Watson, 2001; Khalil & Elkordy, 2005; King & He, 2006; Sabherwal et al., 2006; Hartono et al., 2007; Žabjek et al., 2009; Seah et al., 2010; Yeoh & Koronios, 2010
Iterative development approach	The iterative development of an information system which allows the use and results of IS to be monitored, room for change and improvement and includes employees who become more receptive and willing to accept and realize the potential of the new system (Yeoh & Koronios 2010, p.	Yeoh & Koronios, 2010; Seah et al., 2010

	27)	
User training	The extent to which an individual is trained to use a particular IS through formal training, external courses, courses within the enterprise and self-directed learning (Sabherwal et al., 2006, p. 4)	Davis et al., 1989; Tyran & George, 1993; Igbaria et al., 1995; Igbaria et al., 1997; Karahanna & Straub, 1999; Xia & Lee, 2000; Mahmood et al., 2001; Amoako-Gyampah & Salam, 2004; Sabherwal et al., 2006; Žabjek et al., 2009
Organizational culture	The correlation between organizational culture and cultural assumptions embedded in a particular IS. Organizational culture is a complex system of norms and values that form over time. It is a set of common assumptions and understandings of employees on the operation of the organization (Ke & Wei, 2008, pp. 209-210).	Cooper, 1994; Denison & Mishra, 1995; Hoffman & Klepper, 2000; Cabrera, Cabrera & Barajas, 2001; Claver, Llopis; Park, Ribiere & Schulte, 2004; Wade & Hulland, 2004; Saleh & Rohde, 2005; Bradley, Pridemore & Byrd, 2006; Kappos & Rivard, 2008; Ke & Wei, 2008; Hamner & Qazi, 2009
Information culture	Information culture represents the values and attitudes regarding information and what to do (or not do) in relation to the processing, publication and transmission of information (Davenport, 1997). A supportive and open information culture positively impacts the use of IS (Jarvenpaa & Staples, 2000, p. 134).	Davenport, Eccles & Prusak, 1992; Davenport, 1997; Jarvenpaa & Staples, 2000; Marchand, Kettinger & Rollins, 2000; Marchand, Kettinger & Rollins, 2001; Claver et al., 2001; Pijpers, 2002; van den Hooff, Elving, Meeuwssen & Dumoulin, 2003
Change management	Change management encompasses the management of human resources and social change during implementation of a new system to prepare employees for change and reduce their reluctance to change (Žabjek et al., 2009, p. 591)	Wixom & Watson, 2001, Legris et al., 2003; Wade & Hulland, 2004; Žabjek et al., 2009; Seah et al., 2010
Organizational resources	The availability of organizational resources such as the money, people and time required to successfully implement a new IS (Wixom & Watson, 2001, p. 23)	Bharadway, 2000; Poon & Wagner, 2001; Wixom & Watson, 2001; Wade & Hulland, 2004; Saleh & Rohde, 2005; Rezaei et al., 2009
Organizational size	Size of the organization	Mahmood et al., 2001; Wade & Hulland, 2004; Lee & Xia, 2006; Liang et al., 2007
<b>SOCIAL CHARACTERISTICS</b>		
Voluntariness	The “extent to which potential adopters perceive the adoption decision to be non-mandatory” (Venkatesh & Davis, 2000, p. 188)	Moore & Benbasat, 1991; Hartwick & Barki, 1994; Agarwal & Prasad, 1997; Igbaria et al., 1997; Karahanna et al., 1999; Venkatesh et al., 2003; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008; Wu & Lederer, 2009
Image	The “degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system” (Moore & Benbasat, 1991,	Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh & Davis, 2000; Venkatesh et al., 2003

	p. 195)	
Visibility	The “degree to which the results of an innovation are visible to others” (Rogers, 1983, p. 16)	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Xia & Lee, 2000
Subjective norm	A “person’s perception that most people who are important to him think he should or should not perform the behavior in question” (Venkatesh & Davis, 2000, p. 187)	Fisbein & Ajzen, 1975; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000; Venkatesh et al., 2003
Trust	An “expectancy held by an individual or a group that the word, promise, verbal or written statement of another individual or a group can be relied on” (Gefen, 2004, p. 263)	Pavlou, 2003; Gefen, 2004; Wu et al., 2011
Risk	Perceived risk when using the system, environmental and behavioral uncertainty (Pavlou, 2003, p. 77)	Pavlou, 2003; King & He, 2006
National culture	The degree of impact of national and ethnic culture on the adoption of IS (Straub, Keil & Brenner, 1997, p. 2)	Straub et al., 1997; Venkatesh et al., 2003; Schepers & Wetzels, 2005; King & He, 2006; Avison & Malaurent, 2007; Seah et al., 2010
<b>ENVIRONMENTAL CHARACTERISTICS</b>		
Business sector	The sector in which the organization operates	King & Teo, 1996; Lee & Xia, 2006
Competitiveness of the environment	Competitiveness of the environment in which the organization operates (Wade & Hulland, 2004, p. 126)	King & Teo, 1996; Li & Ye, 1999; Wade & Hulland, 2004; Lee & Xia, 2006

Following an extensive literature review I identified nearly 50 additional determinants that influence technology acceptance and have been included in the original TAM in numerous studies to better explain the causal links and prediction of intention and use of IT.

## **2.4 DETERMINANTS OF BUSINESS INTELLIGENCE SYSTEMS ACCEPTANCE**

Business Intelligence Systems (BIS) refer to an important group of systems “for data analysis and reporting that provide managers at various levels of organizations with timely, relevant and easy to use information” in order to support and improve their decision-making across a broad range of business activities (Elbashir et al., 2008, p. 136). BIS typically require specialized IT infrastructure to function effectively, including tools for query, analysis, and reporting such as online analytical processing – OLAP, data mining tools, statistical analysis, forecasting, and dashboards; and the underlying specialized databases such as data warehouses and datamarts (Elbashir et al., 2008). They are also a tool for exploiting the huge data infrastructural investments made by firms, and have the potential to realize the substantial value locked up in firms’ data resources (Elbashir et al., 2008). Organizations and managers mainly connect BI with the introduction of a specific organizational philosophy and methodology, which is based on working with information, open communication, knowledge sharing together with a comprehensive and analytical approach to the management of business processes in organizations. The research results show that BIS contribute to



improving transparency and flows of information and knowledge management, and enable organizations to monitor the profitability of products sold, analyze costs, monitor their business environment and discover business anomalies and frauds (Olszak & Ziemia, 2007). The volume of investments in BIS (Gartner Research, 2009) shows their growing strategic importance and the need to pay them greater attention in research.

In terms of technology acceptance research, BIS differ from operational or transactional systems in several respects regarding use environment. The use of BIS is primarily optional or voluntary in comparison with an operational IS where the use is mostly mandatory or necessary for carrying out the business process. BIS users are generally more educated workers, mostly managers in the organization. The information collected is aggregated more at the level of the entire organization and there is greater sharing of information since the data in BIS are more integrated at the level of the entire organization. The information needs of operational IS primarily derive from the processes, and are more structured and well-defined at the operational level and thus the information needs are better defined, while in BIS they are much less structured and the needs are often ad-hoc in nature. Consequently, the methods used to identify the information needs of operational IS are much more defined and based on the defining and modeling of processes, while with BIS the identification of needs builds on performance management and the efficiency of operations. With operational systems the data that have to be processed are generated through the execution of processes themselves, while with BIS the data for analysis come from the operational processes as well as from external sources. Operational IS are focused more on a software solution, and BIS more on the necessary data. Concerning problems with the quality of information, with operational IS the focus is primarily on traditional problems of data quality (accuracy, completeness, etc.), whereas regarding BIS it is more a question of the relevance of the information provided by BIS. With operational IS, the level of integration is generally the process and with BIS it is usually the entire organization. The required reliability of IS is much higher with operational IS where the functioning of the system is usually a prerequisite of process execution. In general, compared to operational IS, the benefits of BIS are much more indirect and long-term, which may negatively affect their perceived usefulness and consequently their acceptance and use as the TAM predicts.

The TAM also provides a good basis for predicting a user's behavioral intention and use of BIS since perceived usefulness and perceived ease of use certainly impact on their acceptance and use, but their acceptance is influenced by certain additional determinants. Some other determinants from other theories and researchers that extend the TAM were presented in the previous section, and some of these are also important for predicting the acceptance and use of BIS. By taking the specifics of BIS into consideration and based on a comprehensive review of the literature, I further identify and highlight those determinants that are important in the field of BI and should be considered and researched in greater detail because they can be crucial for increasing the acceptance and use of BIS and thereby exploiting their potential benefits.

### **2.4.1 Task-technology fit in the Business Intelligence Systems context**

The TAM predicts that two distinctive behavioral beliefs – perceived ease of use and perceived usefulness – determine the behavioral intention to use a certain technology, and perceived ease of use also has an effect on perceived usefulness. In addition, the TAM includes an important assumption that the behavior is voluntary, allowing the freedom of choice of the individual, which is consistent with the use of BIS. The weakness of the TAM for understanding the use of IT is that it lacks a focus on tasks. Users perform organizational tasks with IT tools and applications. While the construct of perceived usefulness implicitly includes tasks, the more explicit inclusion of the features of working tasks could provide a better understanding and a model of IT use. The Task-Technology Fit (TTF) model addresses this problem.

Rational, experienced users will select those tools and methods that enable them to complete the task with the greatest net benefits. Information technology that does not offer sufficient benefits will not be used (Goodhue & Thompson, 1995). The concept of fit in the management of information systems literature (MIS) has several dimensions. Research studies on system development and implementation point to the need for a fit between tasks, technology and users. Research on data quality highlights the need for data to fit the needs of users' tasks. Problem-solving research has developed a concept of cognitive fit, which means that problem-solving works best when the problem representation and any tools or other devices support the processes required to perform these tasks (Dishaw & Strong, 1999).

Therefore, for a better understanding of the actual use of BIS it would be beneficial to consider both the TTF, which includes the characteristics of the tasks, as well as the TAM which includes behavioral intentions. These two models also significantly overlap and can together provide a better model for predicting the actual use of BIS. Applications of the TAM usually focus on an early outcome in the chain – on the intention to use or actual use, whereas TTF applications concentrate on later outcomes of actual use or on individual performance attributable to actual use (Dishaw & Strong, 1999).

The TTF construct is particularly important for BIS acceptance given the need to distinguish the two aspects of fit in the research: (1) technology fit with BIS tasks and the needs of users or processes; and (2) the information fit of the information that BIS provide for the tasks and needs of users (relevance of the information).

### **2.4.2 Management support and change management**

Previous research suggests that one of the most critical success factors when implementing complex systems is management support (Igarria et al., 1995; King & Teo, 1996; Igarria et al., 1997; Wixom & Watson, 2001; Wade & Hulland, 2004; Sabherwal et al., 2006; Ke & Wei, 2008; Venkatesh & Bala, 2008; Yeoh & Koronios, 2009; Žabjek et al., 2009; Seah et al., 2010). The implementation of these systems often requires major changes to the organizational structure, the role of employees and their current work positions, reward systems, supervisory and coordination mechanisms and business processes. Management

support in the form of commitment and communication relating to the system's implementation is therefore absolutely crucial to the success of these systems. Management support refers to the degree to which an individual believes management has committed to the successful implementation and use of the system. Management can intervene indirectly (e.g. sponsoring or championing, providing necessary resources, and issue directives) or directly (e.g. through the use of features of the implemented systems, directing enhancements or modifications to the applications, incentive structures and work processes) in the process of implementing the IS (Venkatesh & Bala, 2008).

Committed management support and sponsorship are widely recognized as the key determinants of the successful implementation of BIS (Wixom & Watson, 2001; Yeoh & Koronios, 2010; Seah et al., 2010). Consistent management support and sponsorship enable easier assurance of the necessary operational resources, such as financing, human resources and other requirements through the implementation process, since the entire implementation of BIS is an expensive and time-consuming process that requires large amounts of various resources. Dedicated management support motivates people in the organization to support the BI initiative and the inevitable organizational changes that come with it, and may help reduce the political resistance and encourage participants through the organization to commit to using the BIS. Users generally want to adjust to the expectations of management and are also more likely to accept a system which, in their perception, is supported by the leadership (Wixom & Watson, 2001). According to Yeoh and Koronios' study (2009), BI experts argue it is more useful if the BIS implementation is sponsored by the business side and not the IT department. Such sponsorship often has a strong desire to ensure BI initiative is successful. Typically, an application-focused funding model for implementing transactional systems cannot be used in the implementation of BIS that are evolutionary in nature. BIS are typically developed through an iterative process in accordance with dynamic business requirements, and therefore BI initiatives (especially those at the enterprise level) require the consistent allocation of funds directly by management in order to overcome the continuous organizational barriers. These organizational challenges arise through the process of interdepartmental implementations and often reveal issues in areas such as business processes, data ownership, data quality and stewardship, and organizational structure. Therefore, the commitment and involvement of management is indispensable, especially in removing barriers to changing the thinking within the organization (Yeoh & Koronios, 2009).

As a result, user-oriented change management, comprising the management of human resources and social changes upon implementation of a BI system in order to prepare employees for change and reduce reluctance to change, is extremely important (Žabjek et al., 2009). User involvement in the change process can lead to better communication about their needs, which can help ensure the successful deployment of the BI system. Key users must be involved throughout the whole BIS implementation process since they can provide useful information that the project group responsible for deploying the system might have overlooked (Yeoh & Koronios, 2009). For successful BIS implementation organizations must

therefore address this project as change management and focus on an integrated approach to business process management (Žabjek et al., 2009).

Venkatesh and Bala (2008) suggest that management support can impact on user perceptions of subjective norms and image, which are two important determinants of perceived usefulness in the TAM 3. Management support (particularly in the form of direct involvement in development of the system) and the implementation process contribute to the building of employees' assessments regarding job relevance, output quality, and result demonstrability of a system, which are all determinants of perceived usefulness. The direct involvement of management in modification of the system's features, incentive structures and work processes can reduce anxiety and fear related to the implementation and use of the new system and thus influence the determinants of perceived ease of use such as perceptions of external control.

### **2.4.3 Organizational culture**

The impact of organizational culture on the initial success or failure of implementing a new IS is often under-emphasized (Hoffman & Klepper, 2000). Many projects to implement a new IS are not successful, partly because that organizations pay too little attention to non-technical, i.e. human and other organizational, factors that are critical determinants of the effectiveness of the new system, and the importance of human factors is particularly stressed in the implementation of BIS (English, 2005). Putting a BIS into practice requires a high degree of change in organizational processes and work routines so managers need to take full responsibility for development a long-term strategic view to change and deal with change management by paying a high level of attention to people and organizational issues, thereby actively considering how this new BI technology will impact the way the work is organized. The desired effects of a new technology are frequently realized in organizations which introduce additional changes necessary to maintain the fit between the current organizational structure and organizational culture (Cabrera et al., 2001).

According to Schein's definition (1996, p. 11), culture can generally be understood as "a set of basic tacit assumptions about how the world is and ought to be that a group of people share and that determines their perceptions, thoughts, feelings, and, to some degree, their overt behavior". Hofstede (1991) contends three main factors determine to some degree the behavior of people at work, namely national culture, occupational culture and organizational culture. Organizational culture can be thought of as a collection of patterns of basic assumptions and beliefs developed by a certain social group throughout its history of internal integration and external adaptation that has worked reasonably well in the past for the group to consider it valid and important enough to be transferred to new members as the correct way of interpreting the organization's reality (Schein, 1990). Cooper (1991, p. 18) defines organizational culture as "the social or normative glue that holds an organization together and that expresses the values or social ideals and beliefs which organizational members come to share". Organizational culture is not necessarily homogeneous across all areas of the organization. While some norms apply to the whole organization, different groups within the organization can also develop their own subculture. Although there are several different

definitions of organizational culture, it is commonly agreed that organizational culture is “holistic, historically determined, and socially constructed, and it involves beliefs and behavior, exists at a variety of levels, and manifests itself in a wide range of features of organizational life” (Detert, Schroeder & Mauriel, 2000, p. 851).

A new BIS can have a significant impact on changing the very way work is performed so that it imposes new requirements on behavior expected from users. Whether or not a technological innovation, such as BIS, will bring the desired results depends in part on whether the behavioral requirements it imposes are compatible with the current culture or whether the current culture can be altered so as to become compatible with the new BIS’ requirements. Aligning the BIS with the existing culture is not easy, among other reasons because they both interrelate with other key organizational subsystems, such as the formal organizational structure and procedures, its processes and its strategic intent (Cabrera et al., 2001). Where a new BIS is not aligned with the existing organizational culture the resistance of organizational members can emerge to such a degree that the implementation fails or results in a sub-optimal organizational change. From the management perspective, this aspect of the link between the organizational culture and the new BIS is an important factor that should be controlled and monitored during the implementation process. To ensure the success of the BIS implementation these affected cultural aspects should be changed prior to or simultaneously with the BIS implementation. However, it is difficult to change an organizational culture. A large part of the organizational culture is taken for granted, and things that implicitly form part of people’s thinking and behavior are hard to change. A sizable share of the organizational culture also has deep historical roots. Certain power groups have strong personal interests in the beliefs and assumptions and are unlikely to be willing to discard them, and cultural change can also increase anxiety and fear among their members. Since changing the organizational culture challenges the dominant ideology, power relationships, systems of meaning and comport levels, such changes can be very complex and time-consuming. With such cultural intransigence it is therefore important that managers intending to introduce a new BI system evaluate the potential changes to the organizational culture and possible cultural conflicts (Cooper, 1994).

Studies have already confirmed the influence of organizational culture on the perceived usefulness and perceived ease of use, or a direct impact on the intention to use a new IT in the TAM (Saleh & Rohde, 2005; Hamner & Qazi, 2009). Since implementing a BIS requires substantial changes in business operations it should be inevitable to take the impact of organizational culture on their acceptance into account.

#### **2.4.4 Information culture**

Perspectives on the role of IT in the management of information vary. Today’s open economies are, rather than on the technology itself, much more focused on people and on how information is used. The use of a suitable IS, for example a BIS, is necessary but not sufficient to ensure quality information and its use. The organization's ability to operate well in a changing environment depends on the flexibility and dedication of its top managers in

leveraging information. As a result, it is not IT investments that are the key but how IT is used by every employee from the top to the bottom of the organization. If a company is becoming increasingly dependent on the sharing and use of information and knowledge, top management should pay special attention to the cultural values of the organization and behavior, both of which are associated with the information and use of IT. Changing the information culture of organizations requires changing “behavior, attitudes and incentives related to information” (Pijpers, 2002, p. 18).

According to Davenport (1997), information culture represents values and attitudes regarding information so the question arises of what to do (or not do) in relation to the processing, publishing and communication of information. Information culture is derived from individual and organizational values and behavior, which are associated with the activities of information processing. Davenport (1997) describes several ways information cultures can vary: open versus closed, factually oriented or rumor- and intuition-based, internally or externally focused, controlling or empowering. Information culture also includes preferences for certain types of information channels or media (telephone, face-to-face, electronic mail, video). Organizations have an open information culture when information is treated as an organizational resource that can be shared openly and freely, irrespective of the hierarchy and function of a person. In relation to information policies, Davenport et al. (1992) note that an information culture can also inhibit the exchange of information in technologically advanced environments. If jobs and the role of people in organizations become bound to the specific information individuals have available, individuals may be less inclined to share information which may be considered a source of their power and indispensability. Jarvenpaa and Staples (2000) note that an organizational information culture can significantly impact the use of IS. It is expected that an open and organic information culture can positively impact the use of IS in the organization. Such a culture is characterized by open exchanges, an outward orientation and a focus on the empowerment of individuals. The use of a particular IS is also importantly affected by the propensity to share information and knowledge, and information ownership.

When implementing BIS, top managers should have a clear vision of the BIS and facilitate the necessary resources and insist on the use of information in decision-making, which is contrary to deciding based on sense. The use of information and analytics must also become part of the organizational culture (Watson & Wixom, 2007). The attitude of top management to information and technology conveys the information culture of the organization. Their thinking, attitudes and practices regarding the implemented BIS may lead to it being seen as more credible by employees. In addition to participating in the development and implementation of BIS, top managers should also encourage employees to adopt the right behaviors and values for working with information (Marchand et al., 2001). Leading management’s behavior sends a strong message to employees across the organization and creates a culture imbuing a sense of what is acceptable behavior regarding the use and dissemination of information (Pijpers, 2002).

## 2.5 CONCLUSION

The growing volume of investments in BIS shows their rising strategic importance and emphasizes the need for greater attention to be paid to them in research. BIS bring many benefits to organizations, yet there are still many examples of their failed implementation in organizations, most of which are due to their unsuccessful acceptance. This study therefore sought to deepen knowledge of the determinants that affect the acceptance of BIS by individuals.

The issue of technology acceptance is a concern for all researchers and practitioners wishing to predict which potential technologies will prove most suitable for the organization and be best accepted by users. This paper therefore first presented a broad overview of the literature on IT acceptance. The key theories contributing to the understanding of IT acceptance were described, divided into theories of the psychological impact on acceptance, theories of technological impact, and theories of organizational and macro-environmental impacts on acceptance, and the central role of the TAM was revealed. Based on those theories and a comprehensive review of all additional theoretical and empirical literature, I identified and described all other determinants that extend the TAM and impact on the user acceptance of IT. Almost 50 extra determinants were identified and systemized into individual, technological, organizational, social and macro-environmental characteristics impacting acceptance.

BIS have some specific characteristics that justify researching their acceptance determinants separately. Therefore, in line with the objectives of this study, on the basis of the comprehensive range of determinants of IT acceptance and specifics of BIS I identified particularly important determinants for BIS acceptance: task-technology fit, management support, and the impact of organizational and information culture.

The determinants so identified represent the initial research efforts that will underpin creation of the conceptual model of BIS acceptance and need further attention. The behavioral intention to use BIS (and consequently its use) is thus impacted by the expected performance, the expected effort, social impacts and facilitating conditions; and these determinants are affected by individual characteristics, technological characteristics, organizational culture and BIS content fit, organizational and macro-environmental characteristics. The designed model of BIS acceptance is thus based on the TAM, but also differs from or upgrades it by taking the specifics of BIS into consideration.

In the next phases of the research, an exploratory study needs to be carried out based on semi-structured interviews with experts who in practice have implemented, adopted and accepted BIS in their organizations. This will enable further insights and help improve the conceptual model. Building on these two stages of research, a BIS acceptance model (Business Intelligence Acceptance Model – BIAM) will be proposed that will be empirically tested and evaluated. This further study will also indicate how strongly each determinant impacts on the acceptance and use of BIS. The proposed relationships will be tested by employing a form of

Structural Equation Modeling (SEM) relying on the data collected by questionnaires sent to individual users in organizations.

Understanding the key determinants of the acceptance of BIS is essential for both researchers and practice because this can provide leverage points to create favorable perceptions and thereby encourage the acceptance and use of BIS by users and potential changes to the way business is carried out due to the implementation of these systems, and increase their business value for organizations.



### 3 BUSINESS INTELLIGENCE ACCEPTANCE: THE PROMINENCE OF ORGANIZATIONAL FACTORS<sup>2</sup>

#### ABSTRACT

The specifics of BIS compared to operational IS motivate the necessity to research the BIS acceptance determinants separately. I followed an exploratory approach in order to conceptualize a business intelligence acceptance model. The findings show that in the BIS context, there is a significant emphasis on organizational factors, such as result demonstrability, social influence and facilitating conditions with sufficient resources that help build an adequate information culture all substantially influencing the effective acceptance of BIS.

**Keywords:** business intelligence systems, IT acceptance, specifics of BIS, acceptance and use of BIS

#### 3.1 INTRODUCTION

Ever more private and public organizations (including government) are showing an interest in implementing Business Intelligence Systems (BIS) within their organizations (Wixom & Watson, 2010), revealing the prominence of Business Intelligence (BI) and big data analytics (Gartner Research, 2013). The information systems (IS) literature has already emphasized the improvements in decision making based on the information provided by BIS, particularly when organizations operate in highly competitive environments (Popovič, Hackney, Coelho, & Jaklič, 2012). Further, Bronzo et al. (2013) show that Business Analytics as a part of BI has a positive effect on organizational performance when aligned with process orientation initiatives. The key question is thus whether after the implementation of BIS users actually accept, use and take full advantage of their capabilities. The business value of BIS should therefore be shown in an improved business process and hence an improved business performance (Popovič, Turk & Jaklič, 2010). Generally, BIS have the potential to increase the competitive advantage of organizations (Jourdan, Rainer & Marshal, 2008; Wixom, Watson, Reynolds & Hoffer, 2008). However their benefits can only be fully realized in situations where these promising innovations are completely accepted and adopted. It is therefore not surprising that extensive research has been conducted in the past to understand user acceptance of information technology (IT) (Taylor & Todd, 1995; Venkatesh & Davis, 2000). Consequently, many different models and theories incorporating a variety of behavioral, social and other control factors have been developed to explain IT usage (i.e. Davis, 1989;

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<sup>2</sup> This chapter of the paper has been accepted and is forthcoming to be published as Grublješič, T. & Jaklič, J. (2014). Business Intelligence Acceptance: The prominence of organizational factors, *Information Systems Management*, Forthcoming. Preliminary findings from this paper have been presented at international conferences as part of the works published in conference proceedings, namely Grublješič, T., & Jaklič, J. (2013). Conceptualization of BIS embeddedness determinants, *In Proceedings 19th Americas Conference on Information Systems, Chicago, Illinois, 15-17 August, 2013, Association for Information Systems, 2013*, 8 p. and Grublješič, T., Jaklič, J. (2013). Business intelligence embeddedness model. *In Proceedings 53rd annual IACIS International Conference, San Juan, Puerto Rico, October 2-5, 2013, IACIS*, p. 9-10.

Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh & Bala, 2008). Advances in understanding the determinants of employees' IT acceptance and use are visible (Venkatesh et al., 2003); nonetheless, the trade press still suggests that the low levels of acceptance and use of IT by employees are still major barriers to the successful implementation of IS in organizations (Venkatesh & Bala, 2008).

The motivation for this study is the call by DeLone & McLean (2003) for the nature of systems to be considered when researching IS success by determining whether a system is being used for the intended purposes. While one expects general acceptance models to be a good starting point for understanding the determinants of BIS acceptance, the specifics of BIS compared to operational IS make it necessary to research the BIS acceptance determinants separately. There is evidence that some specific factors determine and encourage the adoption and implementation of strategic IS such as BIS (Seah, Hsieh & Weng, 2010). In this study, I therefore extend the previous work in the field of IS acceptance with the main goal of understanding the mechanisms involved to increase the utilization and business value of BIS in organizations.

This study narrows the gap in the research by identifying and systemizing factors that influence BIS acceptance and the understanding of why and which of them can be specific to BIS. This research study applies an exploratory approach by first carrying out an extensive literature review in order to identify and systemize all of the general IT acceptance determinants. The findings of this review and the identified specifics of BIS provide an input for the primary data collection. In this stage two case studies including observations during project implementations and semi-structured interviews with professionals and experts in the area of the implementation, adoption, and acceptance of BIS in organizations were conducted. This helped identify the determinants of BIS acceptance and thereby extend the traditional acceptance models. Based on the findings from both phases, a conceptual model of BIS acceptance (Business Intelligence Acceptance Model – BIAM) is proposed. The findings from the primary data collection expose the prominence of organizational factors in modifying an individual's behavioral beliefs and can substantially improve individual acceptance of BIS. The rest of the paper is structured as follows. In the next section, a description of the specifics of BIS is given. The third section provides a definition of user acceptance, an overview of information technology acceptance models and theories and a summary of all general IT acceptance determinants. In the fourth section, the methodology used is described. The findings from the primary data collection are elaborated on in the fifth section. This is followed by a discussion and a conclusion.

### **3.2 SPECIFICS OF BUSINESS INTELLIGENCE SYSTEMS**

BIS can be defined as (Elbashir, Collier & Davern, 2008, p. 138) “specialized tools for data analysis, query, and reporting, (such as OLAP and dashboards) that support organizational decision-making that potentially enhances the performance of a range of business processes”. Similarly Negash (2004, p.178) describes BIS as systems that “combine data gathering, data

storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers”. BIS typically require specialized IT infrastructure to function effectively, including tools for query, analysis, and reporting such as online analytical processing – OLAP, data mining tools, statistical analysis, forecasting, and dashboards; and the underlying specialized databases such as data warehouses and datamarts (Elbashir et al., 2008). The volume of investments in BIS (Gartner Research, 2013) shows their growing strategic importance and emphasizes the need for greater attention in research studies.

In order to identify the acceptance determinants of BIS it is necessary to recognize the specific characteristics of BIS compared to operational or transactional IS (Popovič et al., 2012). Table 2 summarizes the typical differences between operational IS and BIS with references for BIS specifics. These specifics of BIS represent different impacts on their acceptance and use compared to operational IS.

Table 2. Typical differences between operational IS and BIS

	<b>Operational IS</b>	<b>BIS</b>
Level of voluntariness	Lower	Higher (Popovič et al., 2012)
Structuredness of processes in which IS are used	Higher	Lower (Popovič et al., 2012)
Methods for identifying information needs	Well-established (process-oriented)	Less established (Popovič et al., 2012)
Context for identifying information needs	Processes	Processes, business performance management (Popovič et al., 2012)
Data sources employed	Mostly from within the process	Additional data sources required (Popovič et al., 2012)
Focus of IS (orientation)	Application- and process-oriented	Data- and process-oriented (Popovič et al., 2012)
Main problems of information quality	Sound data and data access quality	Relevance (Eppler, 2006)
IS integration level	Process	Enterprise or departmental (spans over several processes) (Popovič et al., 2012)
Level of required reliability of IS	Higher	Lower (Popovič et al., 2012)
Benefits	Direct & immediate	Indirect & long-term (Gibson, Arnot & Jagielska, 2004)
Structure of users	All organizational and educational levels	Higher educated – management (Negash & Gray, 2008)
Structuredness of instructions for use	Higher	Lower (more research-oriented & innovative use) (Negash & Gray, 2008)
Aggregation level of collected information	Lower	Higher (Frolick & Ariyachandra, 2006)
Sharing of information	Lower	Higher (integrated and aggregated information) (Marchand et al., 2001, Olszak & Ziemia, 2007)

Source: based on Popovič et al., 2012

### **3.3 TECHNOLOGY ACCEPTANCE DETERMINANTS EMERGING FROM EXISTING THEORIES**

According to Dillon and Morris' definition (1996, p. 4), user acceptance is “the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support”. Of course, the actual use may vary slightly from the idealized, planned use, but the essence of technology acceptance theory is that such deviations are not significant so that the process of accepting any technology can be modeled and predicted (Dillon & Morris, 1996).

The goal of IT acceptance research is to “develop diagnostic tools to predict IS acceptance and facilitate design changes before users have experience with a system” (Taylor & Todd, 1995, p. 561). Several competing models of acceptance have been developed, each with a different range of acceptance determinants (Venkatesh et al., 2003), although with some overlap among them. One stream of research involves theories that investigate the psychological impact on technology acceptance by intention to use and systems use as the dependent variable or innovation aspects and processes; on the other hand, other streams focus more on the success of planning and implementation of new technologies and on technology fit to the tasks of users and also on organizational and other determinants (Dillon & Morris, 1996). Determinants and models identified so far already provide a high degree of reliability in predicting general IT acceptance.

#### **3.3.1 Theories of the psychological impact on acceptance**

Acceptance is basically conceptualized as the result of a psychological process through which users go when deciding on a new technology (Dillon & Morris, 1996). Many models have been developed to explain and predict intention to use and use of IS. Of these, TAM is the one that has attracted the most attention and is generally described as the most influential and most commonly used theory within IS research (Lee, Kozar & Larsen, 2003; Benbasat & Barki, 2007; Chatur, 2009).

The TAM model has been developed based on two models of the social psychological theory of predicting behavioral intentions and actual behavior, namely Fishbein and Ajzen's theory of reasoned action (TRA) (Fishbein & Ajzen, 1975) and the theory of planned behavior (TPB) (Ajzen, 1985). It proposes that two distinctive behavioral beliefs – perceived ease of use and perceived usefulness – provide the individual's behavioral intention to use a technology, and the actual use is determined by behavioral intention (Davis et al., 1989).

Due to the need for a synthesis of the different models of user acceptance that exist in the literature, Venkatesh et al. (2003) have developed a unified model named the unified theory of acceptance and use of technology (UTAUT) which integrates elements of eight different models. Based on the comparison, Venkatesh et al. (2003) have found that four constructs, drawn up on the basis of determinants of the studied models, have a significant and direct impact on the behavioral intention and use, and the connections are also influenced by four

moderators which are gender, age, experience, and voluntariness of use. The four main determinants are: (1) performance expectancy; (2) effort expectancy; (3) social influence; and (4) facilitating conditions (Venkatesh et al., 2003). Venkatesh et al. (2003) point out that UTAUT is also a useful tool for managers and practitioners for evaluating the potential success of implementing new technologies and helps them understand the factors driving the acceptance, allowing them to proactively develop measures aimed particularly at groups of users less inclined to acceptance and use.

Other theories of the psychological impact on acceptance include extensions of the TAM model, namely TAM 2 (Venkatesh & Davis, 2000) and TAM 3 (Venkatesh & Bala, 2008) and social cognitive theory (Bandura, 1986) which Compeau and Higgins (1995) have used and adapted to the field of acceptance and use of IT. Another type of research of psychological effects has studied the acceptance and use from the diffusion of innovation and is named the innovation diffusion theory (Rogers, 1983).

### **3.3.2 Theories of the technological impact on acceptance**

While findings of user acceptance as a psychological construct explain the forces that determine the behavior of individuals and allow researchers to predict with some accuracy how users will respond to a specific technology, there is also a need to consider acceptance as a starting point of technology development, before investments in the development itself. Even if it is possible to assess individuals' psychological reactions which lead to acceptance, it is clear that the implementation and use at the organizational level are not only composed of individuals' assessments of the usefulness and ease of use (Dillon & Morris, 1996).

In order to ensure a universal and comprehensive definition of IS success, DeLone and McLean (1992) have investigated the existing definitions of IS success and group the success criteria into six interdependent dimensions of system quality, information quality, use, user satisfaction, individual impact, and organizational impact. Based on many contributions, ten years after publication of the original model DeLone and McLean (2003) have proposed an updated model with six related dimensions: (1) system quality, (2) information quality, and (3) service quality affecting (4) use or intention to use and (5) user satisfaction and, as a result of system use, (6) net benefits can be achieved. These net benefits will back (positively or negatively) impact on customer satisfaction and the continued use of IS.

Maturity models provide another view on the success of the system, connected to its acceptance and use. BIS maturity models can characterize the capability and level of advancement of the studied initiative. In the case of BIS, most maturity models (Lukman, Hackney, Popovič, Jaklič & Irani, 2011) include aspects of technological maturity or system quality (such as data integration and analytical capabilities) and output quality, which refers to information quality, measured by many different criteria (Eppler, 2006). On the other hand, maturity models can provide the basis for understanding the use of BIS, that can lead to an increase in business performance and efficiency (Collins, 2001).

To build a theoretical framework that links the literature on user satisfaction and technology acceptance (particularly the TAM model) Wixom and Todd (2005, p. 85) develop and propose an “integrated research model which distinguishes beliefs and attitudes about the system (object-based beliefs and attitudes) from beliefs and attitudes about using a system (behavioral beliefs and attitudes)”.

The task-technology fit (TTF) model further points out that when the technology is compatible with users’ tasks, the users’ efficiency will be high (Goodhue & Thompson, 1995). This model attempts to define the characteristics of tasks and technology characteristics and the goodness of fit between the characteristics of the technology and tasks of users.

### **3.3.3 Theories of the organizational and environmental impacts on acceptance**

Certain organizational capabilities and the environment in which the organization operates also impact on individual acceptance and use of technology. The technology, organization and environment (TOE) framework identifies three aspects of an organization’s context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context, and environmental context (Tornatzky & Fleischer, 1990). The technological context describes both the internal and external technologies relevant to the firm, which includes current practices and equipment internal to the firm, as well as the set of available technologies external to the firm. Organizational context refers to descriptive measures about the organization such as scope, size and managerial structure. Environmental context includes the size and structure of the industry, the firm’s competitors, the macroeconomic context, and the regulatory environment (Tornatzky & Fleischer, 1990).

Further, contingency theory (Fiedler, 1964) which is a class of behavioral theory asserts that there is no single best way of organizing an organization or leading it or making decisions and that an organizational or management method which is effective in some situations may not be successful in others. The optimal organizational or leadership style depends on various internal and external factors. The main independent contingency constructs are strategy, technology, task, organizational size, structure and organizational culture (Weill & Olson, 1989) of which in my systemization I use those found to be important for individual acceptance.

## **3.4 SUMMARY OF TECHNOLOGY ACCEPTANCE DETERMINANTS**

The issue of IT acceptance accordingly has several theoretical perspectives and research topics such as the creation of human relationships and the psychology of individuals, system analysis, technological impacts and design of user interfaces, diffusion of innovation and the impact of different organizational and environmental determinants. Thus, a coherent overview of all the determinants that have been used to explain IS acceptance has been missing in literature. Based on an extensive literature review I have identified nearly 50 additional

determinants that influence IT acceptance and have been included in research studies either as additional external factors affecting the basic TAM construct and thereby better predict technology acceptance, or as antecedent factors that better explain the two main belief constructs of perceived usefulness and perceived ease of use. The determinants used in studies to explain IT acceptance are made up of determinants relating to (1) individual, (2) technological, (3) organizational, (4) social, and (5) macro environmental characteristics and are summarized in Table 3. The determinants are categorized based on the authors' conceptualization to fit the analysis of acceptance on the individual level which is based on the TOE framework (Tornatzky & Fleischer, 1990) extended with the inclusion of individual and social characteristics.

Table 3. Summary of identified determinants of user acceptance

<b>Determinant</b>	<b>Selected referred studies</b>
<b>INDIVIDUAL CHARACTERISTICS</b>	
Gender	Gopal, Miranda, Robichaux & Bostrom, 1997; Venkatesh & Morris, 2000; Venkatesh et al., 2003
Age	Venkatesh et al., 2003
Computer literacy	Kay, Robin, 1990; Venkatesh et al., 2003
Education	Aragwal & Prasad, 1999; Mahmood, Hall & Swanberg, 2001; Wu & Lederer, 2009
Attitude	Fishbein & Ajzen, 1975; Ajzen, 1985; Davis et al., 1989; Gopal et al., 1997; Karahanna, Straub & Chervany, 1999; Mahmood et al., 2001; Sabherwal, Jeyaraj & Chowa, 2006
Computer self-efficacy	Bandura, 1986; Compeau & Higgins, 1995; Venkatesh & Speier, 1999; Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Computer playfulness	Agarwal & Karahanna, 2000; Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Personal innovativeness	Agarwal & Prasad, 1998; Agarwal & Karahanna, 2000
Perceived enjoyment	Davis, Bagozzi & Warshaw, 1992; Venkatesh, 2000; Venkatesh & Bala, 2008
Computer anxiety	Compeau & Higgins, 1995; Gopal et al., 1997; Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Prior experience	Thompson, Higgins & Howell, 1991; Taylor & Todd, 1995; Agarwal & Prasad, 1999; Venkatesh et al., 2003; Venkatesh et al., 2008
Positive mood	Venkatesh & Speier, 1999; Djambasi, Strong & Dishaw, 2010
Outcome expectations	Compeau & Higgins, 1995; Venkatesh et al., 2003
Readiness for change	Kwahk & Lee, 2008
<b>TECHNOLOGICAL CHARACTERISTICS</b>	
Relative advantage	Rogers, 1983; Moore & Benbasat, 1991; Premkumar & Potter, 1995; Karahanna et al., 1999; Venkatesh et al., 2003
Compatibility	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Xia & Lee, 2000; Venkatesh et al., 2003
Complexity	Rogers, 1983; Premkumar & Potter, 1995; Thompson et al., 1991; Karahanna et al., 1999
Result demonstrability	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008
Trialability	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999
Objective usability	Venkatesh & Davis, 2000; Venkatesh & Bala, 2008
Job relevance	Thompson et al., 1991; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008

Output quality	Venkatesh & Davis, 2000; Venkatesh & Bala, 2008
Accessibility	Karahanna & Straub, 1999; Karahanna & Limayem, 2000
System quality	DeLone & McLean, 1992; DeLone & McLean, 2003; Wixom & Todd, 2005; Sabherwal et al., 2006; Hartono, Santhanam & Holsapple, 2007
Information quality	DeLone & McLean, 1992; DeLone & McLean, 2003; Wixom & Todd, 2005; Hartono et al., 2007; Marshall & Harpe, 2009; Popović et al., 2012
User interface	Davis et al., 1989; Wixom & Watson, 2010
Task-technology fit	Goodhue & Thompson, 1995; Dishaw & Strong, 1999; Venkatesh et al., 2003; King & He, 2006; Benbasat & Barki, 2007
<b>ORGANIZATIONAL CHARACTERISTICS</b>	
Facilitating conditions	Thompson et al., 1991; Igbaria, Guimaraes & Davis, 1995; Karahanna & Straub, 1999; Karahanna & Limayem, 2000; Venkatesh, 2000; Mahmood et al., 2001; Venkatesh et al., 2003; Sabherwal et al., 2006; Venkatesh & Bala, 2008
Management support	Tyran & George, 1993; Igbaria et al., 1995; King & Teo, 1996; Igbaria, Zinatelli, Cragg & Cavaye, 1997; Wixom & Watson, 2001; Wade & Hulland, 2004; Sabherwal et al., 2006; Hartono et al., 2007; Ke & Wei, 2008; Venkatesh & Bala, 2008; Yeoh & Koronios, 2010; Seah et al., 2010
Participation and involvement of users in the implementation	Davis et al., 1989; Tyran & George, 1993; Wixom & Watson, 2001; King & He, 2006; Sabherwal et al., 2006; Hartono et al., 2007; Seah et al., 2010; Yeoh & Koronios, 2010
Iterative development approach	Yeoh & Koronios, 2010; Seah et al., 2010
User training	Davis et al., 1989; Tyran & George, 1993; Igbaria et al., 1995; Igbaria et al., 1997; Karahanna & Straub, 1999; Xia & Lee, 2000; Mahmood et al., 2001; Sabherwal et al., 2006
Organizational culture	Cooper, 1994; Claver, Llopis; Park, Ribiere & Schulte, 2004; Wade & Hulland, 2004; Saleh & Rohde, 2005;; Kappos & Rivard, 2008; Ke & Wei, 2008
Information culture	Davenport, 1997; Jarvenpaa & Staples, 2000; Marchand, Kettinger & Rollins, 2001; Claver et al., 2001
Change management	Wixom & Watson, 2001, Legris et al., 2003; Wade & Hulland, 2004; Seah et al., 2010
Organizational resources	Bharadway, 2000; Poon & Wagner, 2001; Wixom & Watson, 2001; Wade & Hulland, 2004; Saleh & Rohde, 2005
Organizational size	Mahmood et al., 2001; Wade & Hulland, 2004; Lee & Xia, 2006
<b>SOCIAL CHARACTERISTICS</b>	
Voluntariness	Moore & Benbasat, 1991; Agarwal & Prasad, 1997; Igbaria et al., 1997; Karahanna et al., 1999; Venkatesh et al., 2003; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008; Wu & Lederer, 2009
Image	Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh & Davis, 2000; Venkatesh et al., 2003
Visibility	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Xia & Lee, 2000
Subjective norm	Fisbein & Ajzen, 1975; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000; Venkatesh et al., 2003
Trust	Pavlou, 2003; Gefen, 2004; Wu et al., 2011
Risk	Pavlou, 2003; King & He, 2006
National culture	King & He, 2006; Seah et al., 2010
<b>ENVIRONMENTAL CHARACTERISTICS</b>	
Business sector	King & Teo, 1996; Lee & Xia, 2006
Competitiveness of the environment	King & Teo, 1996; Wade & Hulland, 2004; Lee & Xia, 2006



### **3.5 PRIMARY DATA COLLECTION**

This research adopts an interpretive paradigm and follows a two-stage exploratory approach. As stated by Walsham (1993), interpretive research methods are “aimed at producing an understanding of the context of the information system, and the process whereby the information systems influences, and is influenced by the context”. Based on an extensive literature review, a research framework and associated research design for use in the second stage has been developed. In this stage two exploratory case studies in two different organizations have been conducted. The methodological approach included observation through project implementation, a collection of project documents, and semi-structured interviews with the BI stakeholders, to examine, refine and develop a BIS acceptance model. The initial set of determinants are deductively derived from the existing literature (Table 3) and subsequent primary data collection, reduction, display and analysis are then inductively conducted from the two case studies so as to allow a richer framework to evolve and be tested for its plausibility across data sets. The purpose of the primary data collection based on case studies is to identify how important the existing acceptance determinants are in the context of BIS and whether based on the interviews some additional determinants emerge as important concerning the specifics of BIS.

The case study methodology provides better explanations and understandings of the examined phenomenon which would otherwise be lost in other quantitative designs (Miles & Huberman, 1994; Yin, 2003). Case studies are particularly useful for in-depth studies of contemporary phenomena within the organizational context (Yin, 2003). I report one case study from an organization where BIS has been better accepted by users and another where BIS is not so widely used. This enables us to gain better understandings and increase the generalizability of the findings (Miles & Huberman, 1994). The research includes participant observation based on watching and listening, individual semi-structured interviews and document analysis to facilitate data triangulation. As a part of the research group I have in the role of external consultant been included throughout the BIS project implementations, that have in one case lasted 4 years and in the other 2 years. This has enabled us to observe on one hand the management and development of acceptance determinants, such as system quality and information quality with the focus on relevance of information, development of facilitating conditions, management support and the role of users, and on the other hand user acceptance of BIS over time. With semi-structured interviews I then furthered and deepened the findings and understanding gained through the observation. This study has not produced quantitative data, nor has any attempt been made to quantify essentially qualitative data. In all cases, the authors examine the presence or absence of a particular factor, while at the same time ascertain whether that characteristic has been fulfilled only superficially, or in a meaningful way.

As part of primary data collection semi-structured interviews have been used to permit an in-depth exploration of the research questions with every study participant and to develop an understanding of the relevant issues as seen from the independent perspective of a range of

BIS practitioners (Blumberg, Cooper & Schindler, 2008). An interview guide has purposefully been constructed to permit a comprehensive exploration of the factors impacting BIS acceptance in an organization and has allowed the informants to express their views freely while also affording us the opportunity to raise issues suggested by my a priori framework (Saunders, Lewis & Thornhill, 2009). The interviews typically began with generic questions allowing users to express their opinions on the acceptance of BIS before moving to more specific questioning to ensure that the data from each case covered similar areas, thus allowing a cross-case comparison, with the data collection ceasing at the point of data saturation (Miles & Huberman, 1994). The information gained from these interviews is incorporated within the theoretical background gained from the literature review and insights from projects observation to help refine the BIAM model and to gain a sense of completeness of the research model.

Purposeful, criterion-based sampling has been used to identify decision makers representing both IT and line-of-business functions at two different organizations of various sizes and operating in different industries (Paré, 2004). I have considered the richness of practitioners' BIS experience such as active participation in BIS implementation and thereby having knowledge of different types of ensuing problems and issues with BIS implementation, adoption and acceptance in different organizations and sectors. I have interviewed three different experts in one organization (see Table 4), namely the CEO and sponsor of the BIS project, a BIS project leader and a project manager, and a key user to obtain different perspectives on BIS implementation, adoption and acceptance within a single organization and, in addition, I have also interviewed the head of the IT department in another organization to gain extra insights into the researched issue. The selection of different types of experts also follows the recommendation of Myers and Newman (2007, p. 5) to prevent "elite bias".

Table 4. Information about the interviewees for BIS acceptance study

<b>Interviewee</b>	<b>Industry type (Business Sector)</b>	<b>Function in the organization</b>	<b>Function concerning BIS implementation</b>
Interviewee 1	Water supply, sewerage, waste management and remediation activities	Chief Executive Officer (CEO), Certified Senior Project Manager	Sponsor of BIS project
Interviewee 2	Water supply, sewerage, waste management and remediation activities	Assistant to the Director, Head of the Commercial and Finance Department	Key user of BIS
Interviewee 3	Water supply, sewerage, waste management and remediation activities	Information Technology Department, Project Manager	BIS project leader, BIS user
Interviewee 4	Arts, entertainment and recreation	Head of the Information Technology Department	BIS project leader, BIS user

Interviews were conducted in June and at the beginning of July 2012. The interviews lasted on average one hour. They have been recorded and transcribed by the researchers and the data has been analyzed using the content analysis technique, a constant comparison technique, to

identify the major themes (Miles & Huberman, 1994). In other words, the qualitative data have been examined thematically and emergent themes have been ranked by their frequency and later categorized. As a result, the theory developed reflects the actions, problems and issues practitioners face. The authors have employed independent cross-coding to reduce the subjectivity and increase the validity of the interpretation of the interview results. Finally, the results have been reflected upon in a discussion between the authors, according to additional clarifications from the literature, and a review of the findings by the interviewees as recommended in Carroll and Swatman (2000).

The interview results are further interpreted and elaborated in accordance with Saunders, Lewis and Thornhill (2006, p. 535) who suggest that “the results section may also contain verbatim quotes from interviewees” since “this is a particularly powerful way in which you can convey the richness of your data. Often, a short verbatim quote can convey with penetrating simplicity a particularly difficult concept that you are trying to explain”, and it is therefore suggested to “capture precisely what the interviewee said”.

### **3.5.1 Description of Case study 1: The waste and cleaning public company**

Before undertaking the BI project, the organization had already carried out a process renovation project and introduced ERP. In this context, owners of the end-to-end processes have been appointed and awareness of responsibility for the performance of the processes as a whole has increased, although the process owner role has not been fully internalized. Moreover, the leadership perceives the lack of a market orientation and the employees’ focus on customers at the lower levels. Planning, reporting and analytics have mostly been conducted in Excel.

In this case, the BI project had been implemented in a big-bang manner, where before the project of developing and introducing the BI solution a business requirement analysis and the concept of the solution had been set out. BIS has been designed as an extension of the existing ERP system. A comprehensive measurement system following the principles of a Balanced Scorecard had been designed, which was implemented through the project. The initiator of the project was a deputy director, and an active sponsor was the director of the organization who throughout the project’s duration drew attention to the project’s importance for the entire organization. At the beginning of the project, the purpose and objectives of the project were presented to all employees and potential users and all potential key users were constantly involved in it. As part of the project some of the key business terms were reconciled among key users of different processes, leading to a high level of data integration.

### **3.5.2 Description of Case study 2: Radio and television program producer and broadcaster**

Before the considered BI project commenced, a system for reporting already existed in the organization. Therefore, the main reason for initiating the project had been the non-existence of an application to adequately support financial and human resource planning processes. Consequently, the substantive focus when preparing the project was an analysis of these

processes. For reporting and analytics a key trigger was the perceived weaknesses of the existing tools that had mainly been used for financial reporting and the desire to change the current reporting system. As for the operational systems, the existing accounting system presented only one of the data sources for enterprise-wide business analytics, which was the primary objective of BIS. The BI project was implemented in a big-bang way, foreseeing the comprehensive computerization of planning processes not covered by other solutions (e.g. the planning of production and broadcasting) and reporting and analytics for a large number of business areas. The project's initiator was the deputy director who in the first part of the project was also an active sponsor and participated in all important meetings and dealt with conflicts. However, in the middle of the project she left the organization and the sponsorship was taken over by another person with less influence.

The organization was functionally organized with clear functional silos and gaps between them. As a consequence, some business key terms were not uniformly defined, hindering the flow of information. The IS support for operational business processes was also developed around the business functions. Responsibilities for the success of business processes were not comprehensively and clearly defined. The concept of Business Performance Management had not yet been established. The project included attempts to create a Balanced Scorecards, but were not realized until the end. Already at the beginning, the contractor had organized the project around functional areas whereby he formed the groups and persons responsible for each functional area which then led to problems with the integration of areas, which had been one of the project's key objectives.

### **3.6 FINDINGS**

#### **3.6.1 General acceptance of Business Intelligence Systems**

The interviewees were first asked about how their BIS solution was generally accepted by users following the implementation and how it was accepted over time. All of the interviewees answered that the BIS was not accepted as planned and did not achieve the expectations of acceptance. The expectations were higher than the actual use of the system that followed since the use of BIS is not mandatory or necessary to use in both of the interviewed organizations. One informant said the BIS is used according to the principle "*the less you know the less you are responsible for*". On the other side, in the other organization the general director uses BIS heavily and in so doing does not promote use of the system by the rest of the organization since he gets all the necessary information from the system. He himself says that "*now I have all the necessary information available 24 hours, and I no longer need to accelerate the planning and analytical services since all the data is in the BIS and there is no longer a need to validate the data*".

The observations of lower acceptance than planned are not infrequent in practice. Organizations usually expect that the implementation of an IS by itself will solve business problems and that users will automatically accept it. But in many cases, particularly in voluntary use environments (such as in BIS case), this is not the case. The outcome

observations of acceptance are many times lower than the expectations before the implementation. This issue actually presents a motivation for this study, where I in the following present what organizations can do or avoid for inducing and increasing acceptance and by that reaching the expected benefits and outcomes with implementation of BIS.

### **3.6.2 Importance of perceived usefulness and ease of use**

In theory, there is a distinction between perceived usefulness and perceived ease of use as the TAM model predicts. The interviewees were thus asked where the major problems were or if that has an impact on acceptance and use.

In one of the organizations, the informants said that some users perceive BIS as useful and others do not. But the main problem is that *“80% of the users do not use the system in its full capacity, and only 20% of the users conduct activities that result from use of the system”*. All of the others do not act on the outcomes they receive from the system. As one informant stated, users mostly work in terms of *“I do my work faster and easier, but do not take action”*, and so only a minority are active users of the system.

Perceived ease of use of BIS is quite high in both organizations. Most users know how to use the basic features of the system, but many do not know how to use the system in more depth. In one organization, the informant said that *“every change is hard for the user but most of them accepted the BIS as correct and easy to use as they got familiar with it”*. In the other organization, it was mentioned that *“the system is complex to use in terms of content rather than the technology perspective so that users must be able to correctly interpret what they would like to get as an output from the system”*. The users therefore had to become familiar with the content terminology, otherwise technologically speaking the BIS is easy to use. Therefore, the BIS is not complex to use, which is a determinant of system quality, but quite difficult to use from the content perspective, which could influence the users' effort perceptions.

### **3.6.3 Main reasons for high or low acceptance**

The interviewees were then encouraged to speak about the main reasons, in their opinion, for high or low acceptance. They were guided to talk about: (1) individual characteristics; (2) technological characteristics; (3) organizational factors; (4) social characteristics; and (5) macro-environmental characteristics, following the structure of acceptance determinants defined above (see Table 3) based on the TOE framework. As they spoke freely, the text below presents findings by their appearance in the interviews.

#### ***3.6.3.1 Organizational factors***

All of the interviewees first mentioned the importance of organizational factors. Facilitating conditions were exposed as a prerequisite for the initial acceptance, as well as for the intensive use of BIS. In one organization, the BIS project leader, who had helped a great deal to ensure the wider use of the BIS throughout the organization, left the organization one year and a half after the BIS had been introduced, which led to a decrease in BIS use and more

broadly in a “*decrease of BI culture*”. It was stated that a BIS project leader is required to develop a BI culture throughout the organization. Further on, having a pronounced sponsor of a BIS project helps a great deal for BIS to be accepted throughout the organization. This is due to the fact that the non-elementary use of BIS is largely voluntary, so it is necessary to build a culture of BIS use. In the other organization the facilitating conditions were not as appropriate. After the project had run for two years the offer was lower than the expectations. In this organization, they did not have a BIS sponsor and the first user satisfaction was only evident after almost two years of the project being in operation when the environment had somewhat stabilized. It is also necessary to provide a system of administration and support for BIS. Further on, every day support, assistance and mentoring in the introduction of BIS is necessary since without that only a few people would use the system.

Acceptance of BIS is particularly enhanced with management support connected with the management philosophy regarding the demand for information. As one informant said “*on one hand, you need a certain level of management maturity for BIS to be used and, on the other hand, you offer a system which somehow increases this level of maturity so it has a two-sided impact*”. But in none of the organizations does top management use BIS as had been expected with the introduction of the system. One informant stated that the factor which hinders the acceptance and use of the BIS is that “*our management is not directed towards leadership, they are unwilling to delegate responsibility and increase powers to subordinates*”, as BI is related to the transfer of responsibility. People might start using the system, but there will be no long-term interest in regular use since the results will not be visible, which further relates to social influence determinants. In addition, it would be necessary to “*have one BI manager, one who would be responsible for the content and not only during the project but especially in the later stages of use*” for BIS to be broadly accepted.

Both organizations had user trainings for BIS use which provided significant help for users to become familiar with the system, but that did not *per se* encourage use of the system. In one of the organizations they observed the stronger use of the system right after the trainings when, as the informant said, “*BIS use was at its high point*”. Later on the system was only used by those who had seen the benefits of using this system as they realized that “*the customer is the one, so they have to be informed*”. In the other organization, they have almost weekly workshops so the key users become familiar with the BIS and understand the functionality and logic of the tool, and also for the IT department to get familiar with the contents. As the informant stated, the key to the initial acceptance of BIS is “*to offer users the right functionality, which is relevant and it is much easier to offer that if the IT department clearly knows what users need*”.

Another key to the acceptance of BIS is user participation in implementation of the system. In one of the organizations the accounting users participated in all phases of the project so it was much easier for the IT department to develop the functionality they need, and also via their participation users understand the logic of the tool. The interviewee stated that what is very

important is *“the flexibility of the tool and also that users understand the logic of the tool, that users understand the semantics, how it came to that what users see or get from the system”*. The expectations of this organization’s top management were very ill-defined at the beginning as the performance indicators were not clearly identified. If they had been more clearly defined, the satisfaction and acceptance of management would have been much higher as the key for top management’s acceptance and use is whether they receive relevant information from the system.

With further regard to organizational factors, one informant mentioned that *“in those environments where responsibilities are more clarified; regardless of the type of organizational structure it is easier to implement the BIS”*. In organizations where things are softer, the introduction would be difficult as there would be more work with the clarifications. Another informant said that such a system *“requires a different organizational structure and the reorganization of the existing one”*. A different informant noted that there is a problem with the organizational culture, *“as responsibilities are not settled adequately and there is always a problem with the limited funds available for implementation of such a project”*. An open, transparent and proactive information culture (Marchand et al., 2001) was also exposed, as with BIS use there is a lot of sharing of information and a need to respond quickly to business changes. This is also connected to the competitiveness of the environment, as one informant stated that since *“we are a public company there is not so much pressure from the market, which would also increase use of the BIS”*.

### **3.6.3.2 Individual characteristics**

All of the informants agreed that individual characteristics are very important. One informant noted that *“the knowledge of users is very important and by that knowing the system”*. *“Those who understand the semantic more easily accept and use the new system”*. Skills regarding use of the BIS, as one of the informants put it, are *“dependent on that how the individual likes working with a computer, as some see benefits faster than the others”*. Thus, personal characteristics such as *“skills, curiosity, the desire for advancement and personal growth and confidence (sovereignty) of working with computers are very important”*. Another informant particularly exposed *“readiness (openness) for changes and new ways of working”*. This informant also pointed out that *“computer literacy presents a problem, especially for the older generation which is still largely present”*.

### **3.6.3.3 Technological characteristics**

Concerning technological characteristics, one of the informants noted *“the compatibility of the system and that it is important to think to which tool users are already accustomed to”* since if the BIS was very different from the other systems it would be harder to accept. Compatibility particularly influences the intensity of use. Another informant pointed out *“the flexibility of the system and also complexity”*, which is a major impediment to use. The third informant highlighted the importance of the *“content or relevancy of data”* since it is important that business users determine the content and not the IT department. The relevance

of data is particularly emphasized in the context of the BIS and contributes to its acceptance and use of information provided by BIS.

#### **3.6.3.4 Social characteristics**

Of the social characteristics one informant exposed that what is most important in this organization is that *“the director said that the BIS will be introduced and used”*, as in the public sector the director’s word carries a lot of weight. Also extremely important is the fact that *“the director was an active sponsor of the introduction of the system, and is now also very actively using the system”*. Another important social factor is visibility of use, even though that this is a public company, as one informant said *“people here also competed with each other in use of the BIS – who will be better and who will be able to quickly locate the necessary information”*.

#### **3.6.3.5 Conceptualization of the BIS acceptance model**

The interviewees were then given a list of all determinants of user acceptance of IT identified in the literature as presented in Table 3 herein and were asked to choose which of them are important for BIS acceptance. A BIS Acceptance Model (BIAM) is conceptualized based on this list (see Figure 2).

The model includes perceptions of information system success that have been investigated within two primary research streams – the user satisfaction literature (object-based beliefs and attitudes) and the technology acceptance literature (behavioral beliefs and attitudes) – as Wixom and Todd (2005) propose. In their work they connect user satisfaction, typically viewed as beliefs and attitudes that users’ have towards objects, information and other related characteristics, and technology acceptance, comprising behavioral beliefs and attitudes that lead to a behavior, that is intention and use of IS (Wixom & Todd, 2005). The determinants related to object-based beliefs and attitudes are categorized based on the TOE framework (Tornatzky & Fleischer, 1990) extended with the inclusion of individual characteristics to fit the analysis of acceptance and use on the individual level. The behavioral beliefs and attitudes side of the model includes determinants consistent with TAM (Davis, 1989) and more recent derivations such as UTAUT (Venkatesh et al., 2003) and TAM3 (Venkatesh & Bala, 2008). The existing research proposes that the mechanism of influence on usage (the target behavior) is driven through behavioral intention and also directly by facilitating conditions (Venkatesh et al., 2003). Facilitating conditions, although a part of the organizational factors, were already found in the literature to directly impact usage behavior (Venkatesh et al., 2003) and that was also confirmed in this research. Although conceptualization of object-based beliefs as the antecedents to behavioral beliefs (Wixom & Todd, 2005) is undoubtedly beneficial for constructing a framework of BIS acceptance, some other object-based determinants might also have direct impacts on acceptance or moderate the relationships between behavioral beliefs and intention to use or intensity of use. This is not shown in the conceptual model directly.



Figure 2. Conceptual BIS acceptance model (BIAM)

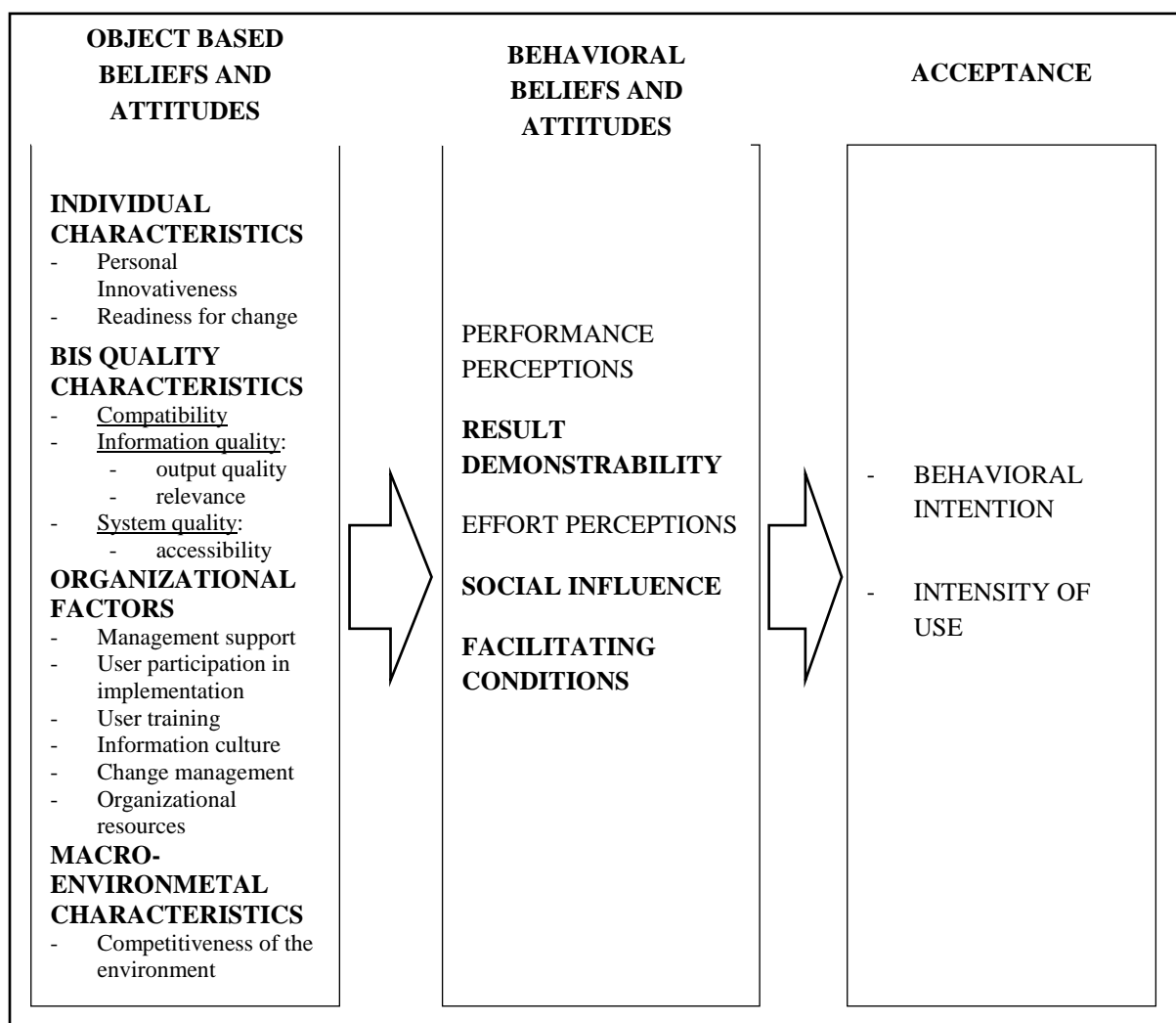


Table 5 presents which of the determinants from Table 3 individual interviewees found to be important for BIS acceptance and how pressing each determinant is. The right column of the table further shows which determinants were found important for individual behavioral intention as well as for the intensive BIS utilization. The determinants in Table 5 are categorized based on the proposed conceptual BIS acceptance model (see Figure 2).

Table 5. Interviewees answers about determinants influencing BIS acceptance

Determinant	Selected referred studies	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Determinants important for Behavioral intention and Intensity of use
<b>OBJECT-BASED BELIEFS AND ATTITUDES</b>						
<b>INDIVIDUAL CHARACTERISTICS</b>						
Age	Venkatesh et al., 2003	+	o	+	+	
Computer	Venkatesh et al.,	+	+	+	+	✓

literacy	2003					
Education	Agarwal & Prasad, 1999	+	+	+	o	
Prior experience	Taylor & Todd, 1995	+	+	o	++	✓
Attitude	Fishbein & Ajzen, 1975	+	+	+	+	✓
Computer self-efficacy	Venkatesh & Bala, 2008	+	o	+	+	
Personal innovativeness	Agarwal & Karahanna, 2000	+	+	+	++	✓
Computer anxiety	Venkatesh & Bala, 2008	+	o	+	o	
Readiness for change	Kwahk & Lee, 2008	++	o	+	+	✓
<b>BIS QUALITY CHARACTERISTICS</b>						
Compatibility	Moore & Benbasat, 1991	++	+	+	++	✓✓
Task-technology fit	Goodhue & Thompson, 1995	+	+	+	o	
Information quality	DeLone & McLean, 1992	+	+	++	+	✓
Output quality	Venkatesh & Bala, 2008	++	+	++	+	✓✓
Relevance	Eppler, 2006; <i>Emerged from the interviews</i>	++	++	+	+	✓✓
System quality	DeLone & McLean, 1992	+	+	+	+	✓
Complexity	Rogers, 1983	+	+	+	+	✓
Accessibility	Karahanna & Straub, 1999	++	+	+	+	✓✓
Trialability	Moore & Benbasat, 1991	+	+	+	o	
User interface	Davis et al., 1989	+	+	+	+	✓
<b>ORGANIZATIONAL FACTORS</b>						
Management support	Wixom & Watson, 2001	++	++	++	++	✓✓
User participation in implementation	Wixom & Watson, 2001	+	+	+	+	✓
Iterative development approach	Yeoh & Koronios, 2010	++	o	++	o	
User training	Karahanna & Straub, 1999	++	++	++	++	✓
Organizational culture	Kappos & Rivard, 2008	+	+	o	+	
Information culture	Marchand et al., 2001	++	++	++	++	✓✓
Change management	Wixom & Watson, 2001	++	+	o	+	✓
Organizational	Wixom &	++	++	+	+	✓✓

resources	Watson, 2001					
Organizational size	Wade & Hulland, 2004	+	o	o	+	
<b>MACRO-ENVIRONMENTAL CHARACTERISTICS</b>						
Business sector	King & Teo, 1996	o	+	o	+	
Competitiveness of the environment	King & Teo, 1996	+	++	+	+	✓
<b>BEHAVIORAL BELIEFS AND ATTITUDES</b>						
<b>PERFORMANCE PERCEPTIONS</b>						
Relative advantage	Moore & Benbasat, 1991	+	+	+	+	✓
Job relevance	Venkatesh & Bala, 2008	+	+	+	+	✓
Perceived usefulness	Davis, 1989	+	+	+	+	✓
<b>RESULT DEMONSTRABILITY</b>						
Result demonstrability	Venkatesh & Bala, 2008	++	+	+	+	✓✓
<b>EFFORT PERCEPTIONS</b>						
Ease of use	Davis, 1989	++	+	+	++	✓✓
<b>SOCIAL INFLUENCE</b>						
Voluntariness	Venkatesh et al., 2003	+	+	+	+	✓
Visibility	Moore & Benbasat, 1991	+	+	+	+	✓
Image	Moore & Benbasat, 1991	+	++	++	+	✓✓
<b>FACILITATING CONDITIONS</b>						
Facilitating conditions	Venkatesh et al., 2003	++	++	++	++	✓✓

*Note.* + – important, ++ – very important, o – not important, ✓ – important for behavioral intention or intensity of use, ✓✓ - very important for the behavioral intention and intensity of use

### 3.7 DISCUSSION

While theory in the field of IT acceptance is rich, there is a lack of understanding of the particular BIS acceptance determinants when the specifics of BIS are considered. This study confirms the importance of some of the general existing IT acceptance determinants, but also points to the prominence of context-specific issues, highlights contextual predictors and thereby produces novel insights valuable for research and practice. To the best of my knowledge, this is the first study to research these issues. Therefore, for the purpose of understanding these phenomena an exploratory research approach is appropriate.

The conceptualization of object-based beliefs and attitudes (found in the user satisfaction literature) as antecedent variables to behavioral beliefs and attitudes (found in the technology acceptance literature) following Wixom and Todd (2005) proved to be beneficial. This enables an understanding of what is needed or can be done to increase the chances of acceptance both in terms of the initial acceptance and the intensive BIS utilization, and refers

to the call of Benbasat and Barki (2007) to find antecedents of the beliefs contained in the acceptance models. In addition, the results of the research support the applicability of categorizing object-based beliefs and attitudes based on the TOE framework (Tornatzky & Fleischer, 1990) extended with the inclusion of individual characteristics that correspond to the analysis of acceptance and use on the individual level. Conceptualization of these external variables provides a “bridge between the internal beliefs, attitudes and intentions represented in TAM and the various individual differences, situational constraints and managerially controllable interventions impacting on behavior” (Davis et al., 1989, p. 988).

### **3.7.1 Important object based beliefs and attitudes exposing the prominence of organizational factors**

Of the individual characteristics already demonstrated in the existing literature (as shown in Table 3) it is age, computer literacy, education, prior experience, attitude, computer self-efficacy, and computer anxiety that importantly influence initial BIS acceptance. But the most pressing individual determinants proved to be personal innovativeness and readiness for change that were invariant across other demographic individual characteristics. Concerning the specifics of BIS, an individual’s personal innovativeness helps them use information in the less structured business processes where BIS is commonly used and enhances research and innovative use. Further, since the introduction of BIS often introduces new and fundamentally different ways of executing business processes, individuals must be ready for this change (Kwahk & Lee, 2008). Although Kwahk and Lee (2008) introduced this determinant as a necessary predictor of ERP acceptance, I found no other studies exposing the prominence of this factor so this determinant might be particularly important in the context of accepting complex systems.

Moving on to technological characteristics, as confirmed in previous studies (i.e. DeLone & McLean, 1992, 2003) system quality and information quality also prove to be important in the BIS context. With regard to system quality, a particularly emphasized factor is accessibility which means that the information should be readily available and easy to access (Wixom & Todd, 2005). Since BIS should provide competitive information based on which users can help improve the performance of the organization, the accessibility of information is the most pressing determinant of system quality and not the traditional determinants of reliability and complexity. Complexity and user interface were exposed as potential problems, but proved not to be a big issue in both organizations as BIS was recognized as easy, friendly and not complicated to use. The accessibility of information also relates to the most pressing determinants of information quality in this context which are the output quality (e.g. understandable meaning of information and accuracy of information) and the relevance of information. The relevance of information has not been highlighted in previous models of IT acceptance (see, for example, Wixom & Todd, 2005; UTAUT (Venkatesh et al., 2003); TAM (Davis, 1989)), but has already been confirmed in the literature as an important dimension of information quality for IS success because a key problem of information quality in unstructured business processes is providing relevant information to managers (Delone &

McLean, 2003; Eppler, 2006; Popovič et al., 2012). Moreover, compatibility from innovation diffusion theory (Rogers, 1983; Moore & Benbasat, 1991) and task-technology fit which Goodhue and Thompson (1995) highlight were found to be important BIS quality characteristics, especially for intensive BIS use, revealing the need for BIS to fit with different aspects and ways of an individual's style of work.

Previous studies of acceptance have largely shed light on the individual's behavioral determinants and system characteristics but have not considered organizational factors. Yet these factors have already been found to be a vital part of critical success factors for BIS success in Yeoh and Koronios' (2010) study and for data warehouse success that Wixom and Watson (2001) researched. Unlike for operational systems where use is mostly mandatory, for BIS where use is largely voluntary organizational factors can enhance individual acceptance. Facilitating conditions which directly influence usage behavior are shown to be very pressing, as already found important for acceptance in previous literature, especially in the UTAUT model (Venkatesh et al., 2003). Although, if we look at operational systems, support is chiefly necessary at the beginning and in the early stage of use until the system stabilizes, but for intensive use of BIS long-term constant support for system use is important or otherwise the use declines as the experts also pointed out. These also include the availability of sufficient organizational resources (Wixom & Watson, 2001) for successful BIS acceptance. In support of the existing literature (i.e. Davis et al., 1989), user involvement and participation in the implementation of BIS is particularly highlighted by the interviewees with regard to initial acceptance. Management support has already been suggested as one of the most critical success factors for complex systems (Venkatesh & Bala, 2008), and was also strongly stressed by the interviewees, suggesting changes in management practice and changes in operational processes. Further on, information culture, involving information transparency such as openness in reporting and the presentation of information on errors and failures, is emphasized and so too is information proactiveness for being able to respond quickly to business changes (Marchand et al., 2001). User training has already been confirmed in the existing literature as having an impact. However for BIS, training to assist with understanding the content is exposed, since the process of use is generally not embedded in the application as it is for operational IS, and there is a bigger gap between use of the system and use of the information provided by the system, assuming that BIS also provide relevant information. Another pressing factor the interviewees raised that was not found to be mentioned in the literature as a determinant of individual acceptance (but only important for the organizational adoption of IT (Tornatzky & Fleischer, 1990)) is the competitiveness of the environment. The interviewees stated that for a market-oriented company under greater pressure from a competitive environment this represents a priority issue and accordingly BIS is accepted and used more in those organizations since they are more dependent on innovative and competitive information. All of these soft organizational factors, such as committed management support, an adequate organizational and particularly information culture both efficiently developed and nurtured to support the evolution of a "BI culture" throughout the organization including appropriate change management practices, can importantly influence

individuals' cognitive beliefs and internal motivation to accept change and start using this prominent innovation.

### **3.7.2 Important behavioral beliefs and attitudes**

The findings for the behavioral-based beliefs and attitudes side of the model show that all five constructs, namely performance perceptions, result demonstrability, effort perceptions, social influence and facilitating conditions, are also crucial for the acceptance and intensive use of BIS. While these determinants are firmly rooted in the existing acceptance literature, particularly in the TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003) models, the findings reveal that a pivotal role in the acceptance of BIS is played by result demonstrability, social influence and facilitating conditions (as already elaborated). Perceived usefulness and ease of use work through other object and behavioral individual beliefs (such as perceptions of different determinants of organizational support, result demonstrability and social influence) and individual characteristics (for example prior experience, computer literacy and personal innovativeness) that importantly alter the perceptions of usefulness and ease of use.

In particular, result demonstrability that was found to be important in the TAM3 model (Venkatesh & Bala, 2008) has an effect on the acceptance of BIS. Venkatesh and Bala (2008, p. 277) define result demonstrability as “the degree to which an individual believes that the results of using a system are tangible, observable and communicable”. Social influence is the next important determinant. With operational systems the results of use are instantly visible; on the other hand, for BIS use it is important that users feel a social influence when using BIS. Therefore, if users perceive benefits particularly with regard to their image and that the results of use are visible as well as demonstrable, they will start using BIS intensively.

Social influence as well as the demonstrability of results are being increasingly recognized as influencing an individual's cognitive process to perform a behavior (Venkatesh et al., 2003; Venkatesh & Bala, 2008), and this motivation is especially highlighted in the BIS context acceptance since the use of BIS is largely voluntary and there is a lot of information sharing.

Both determinants again point out the context of the organization, particularly the organizational and information culture, because if users perceive that the results of use are tangible and communicable (that is demonstrable) and perceive personal image improvements potentially leading to higher social inclusion and status in the organization they will be more likely to accept and start using BIS intensively.

### **3.7.3 Implications for research**

The main theoretical contribution is the context-specific acceptance model (BIAM) that identifies the determinants relevant to the more effective use of BIS in an organization. This should improve the success chances of investments in such systems, following Huo's (2012) statement that the realization of business benefits from BI investments depends on supporting the effective use of BIS, and thereby contributes to the better performance of organizations. The conceptualization of BIAM is encouraged by the words of Wixom and Todd (2005, p. 99)

that researchers should “consider the principle of correspondence when designing research models that involve object-based and behavioral beliefs and attitudes”. Benbasat and Barki (2007, p. 215) also call for this as they say that “we need to identify the antecedents of the beliefs contained in the adoption models ... focusing on the mediators of the impact of IT design on adoption is beneficial to the extent that this identifies which ones are important”. I shed light on the specific determinants which need to be taken into consideration for the effective acceptance and use of BIS that also include system and information characteristics and task-technology fit which Benbasat and Barki (2007, p. 215) advocate since “that would provide finer and more focused design advice in a specific task context”. The TOE framework (Tornatzky & Fleischer, 1990) gave us an input that organizational factors should be considered when studying acceptance and these were mostly highlighted in the context of BIS acceptance, modifying individuals’ internal beliefs and motivations, such as particularly supportive management and change management practices, an open and proactive information culture, a market-oriented organizational culture, sufficient resources available for the support and training in BIS use.

#### **3.7.4 Implications for practice**

A key *implication for practice* of this study is that organizations can direct their efforts to the exposed influential determinants in order to successfully realize the potential benefits of implementing BIS. The study participants were experts from practice going through the BIS implementation process and were therefore able to first-handedly discuss the main success determinants of and barriers to effective BIS utilization. As Wixom and Todd state (2005, p. 99), “this can help with management activities such as task prioritization and resource allocation”. For BIS, which is in many cases an enterprise-wide (Negash & Gray, 2008) project aimed at monitoring and realizing strategy and BPM, issues that could be referred to as trans-implimental prove to be particularly important, by which the issues we have to take into account before, during and after the implementation are considered. Since the interviewees who participated in this study highlighted organizational factors as the most pressing ones, it is important that BIS projects are highly business-oriented, concentrating on strategic alignment, process orientation, a focus on customers, an analytical culture, committed management sponsorship and change management.

### **3.8 CONCLUDING REMARKS**

While BIS have been a common element of enterprise information architecture for some time, only recently have they been extensively researched on their own. By combining theories of acceptance, TOE and distinguishing between object-based beliefs and attitudes on one hand and behavioral beliefs and attitudes on the other, and by taking the specifics of BIS into account, the Business Intelligence Acceptance Model not only provides an understanding of the impact of direct determinants of different BIS technological characteristics, which by their nature are lagging, but also the leading determinants based on which we can accept appropriate measures for the long-term, sustainable and effective acceptance of BIS. An important finding of this study is that in the BIS context it is particularly organizational

factors that contribute to successful BIS utilization and can modify an individual's internal beliefs and motivation.

A limitation of this study concerns low number of case studies and interviewees done. Since, typical research problems concern limited resources (i.e. time and budget available), I do believe that for the purpose of this research, this limitation does not considerably impact the strength and importance of the conveyed research findings. I do encourage future research to replicate this primary data collection in other organizations and with more diverse types of BIS users. Another limitation is that the study examined a cross-section of interviewees' perceptions about determinants influencing BIS acceptance. It would be beneficial to perform longitudinal studies that test the proposed relationships as they unfold over time. In connection to this, future research should also investigate post-adoptive BIS use behavior since this is still an under-researched area. Due to the distinction in the BIS context between the use of the system and users' activities based on what the information system provides, different conceptualizations of BIS continued use might be beneficial and allow a richer understanding of BIS utilization to evolve. Future research might also include an empirical test and evaluation of the proposed research model as well as a test of how object-based beliefs might moderate the relationships between behavioral beliefs and acceptance or directly impact acceptance and use.



## 4 CONCEPTUALIZATION OF THE BUSINESS INTELLIGENCE EXTENDED USE MODEL<sup>3</sup>

### ABSTRACT

Business intelligence systems (BIS) are considered a potential source of competitive advantage but their benefits can be fully realized only when using BIS and the information provided by BIS become fully embedded into the routines of decision makers. This study thus adds to previous research of IS acceptance by investigating diverse post-adoptive use behaviors, which are the intensity, extent of use and embeddedness of BIS. I followed an exploratory approach to conceptualize a business intelligence extended use model. The findings show that personal innovativeness and readiness for change boost the transition to the embeddedness of BIS into workers routines. The relevance of the information provided by BIS is crucial for the deep structural usage of BIS, which has not been highlighted in previous models of IT acceptance. Besides taking pre- and post-implementation issues that address acceptance determinants into consideration, for the success of BIS we must consider trans-implementation issues.

**Keywords:** Business intelligence systems, Business intelligence extended use model, BIS embeddedness, acceptance and use of BIS

### 4.1 INTRODUCTION

The importance of business intelligence (BI) is becoming widely accepted as big data analytics and business intelligence have remained the top priority of Chief Information Officers (CIOs) for the second consecutive year (Gartner Research, 2013). In the information systems (IS) literature the positive impact of the information provided by Business Intelligence Systems (BIS) on decision making has been emphasized, particularly when organizations operate in highly competitive environments (Popovič, Hackney, Coelho, & Jaklič, 2012). English (2005) defines BI as “the ability of an enterprise to act effectively through the exploitation of its human and information resources”. The key question is thus whether after the implementation of BIS users actually accept, use and take full advantage of their capabilities. Generally, technological innovations such as BIS are one of the main sources of competitive advantage for the long-term survival of organizations (Jourdan, Rainer & Marshal, 2008; Wixom, Watson, Reynolds & Hoffer, 2008), but their benefits can only be

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<sup>3</sup> This chapter of the paper has been accepted and is forthcoming to be published as Grublješič, T. & Jaklič, J. (2015). Conceptualization of the business intelligence extended use model. *Journal of Computer Information Systems*, 15(3).

A part of the early stage findings of this paper have been presented at international conferences, as part of the works published in conference proceedings, namely Grublješič, T., & Jaklič, J. (2013). Conceptualization of BIS embeddedness determinants, *In Proceedings 19th Americas Conference on Information Systems, Chicago, Illinois, 15-17 August, 2013, Association for Information Systems, 2013, 8 p.* and Grublješič, T., Jaklič, J. (2013). Business intelligence embeddedness model. *In Proceedings 53rd annual IACIS International Conference, San Juan, Puerto Rico, October 2-5, 2013, IACIS, p. 9-10.*

fully realized in situations where these promising innovations are completely accepted and used.

Research stream examining and explaining adoption and acceptance is one of the most mature and rich streams in the IS field (e.g. Davis, 1989, Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh and Bala, 2008). But on the other hand post-adoptive use behavior is still under-researched, often conceptualized as increasing intensity or greater frequency of use (Jasperson, Carter & Zmud, 2005). Some efforts have already been made showing that post-adoptive use behavior may also diminish over time with gained experience (Bhattacharjee, 2001), or on the other hand get habitualized and routinized in individuals work routines (Jasperson et al., 2005). Undoubtedly, research on technology acceptance and initial use can enrich our understanding of post-adoptive use behaviors and we can build on the findings and identified determinants influencing new information technology (IT) application use, but the determinants influencing pre- or post-adoptive use behavior might be different. Although technology acceptance is a well-researched field, Jasperson et al. (2005) argue that post-adoptive use behaviors are still under-researched. Distinctions between pre- and post-adoptive beliefs and behaviors have already been observed (Agarwal & Karahanna, 2000; Karahanna, Straub & Chervany, 1999). While initial acceptance of IS is important, long-term effective use of IS is the ultimate measure of its success (DeLone & McLean, 2003). Understanding the factors that influence three conceptualizations of post-adoptive use behaviors in a specific context of BIS use is central to this work. Deng and Chi (2013) argue that BI application context offers an ideal opportunity to examine a variety of post-adoptive system uses.

While the use of IS is mostly seen as a tool to execute business processes for operational systems, for BIS there is a larger distinction between use of the system and users' activities based on the information provided by BIS, i.e. when the use of BIS becomes an integral part of the business value generation process. Although the initial acceptance is considered an important step towards IS success (DeLone & McLean, 1992), the long-term sustainability of an IS and its eventual success depend upon its ability to become embedded with the organization's processes, routines, and strategy rather than merely being used (Shanks, Bekmamedova, Adam & Daly, 2012). Infrequent, inappropriate, disconnected, and ineffective long-term use of IS often leads to business failures (Lyytinen & Hirscheim, 1987). Sustained effective use, embedded within the organization's work system, representing infusion (last) stage of IS implementation (Cooper & Zmud, 1990), should therefore present promised benefits of implementation efforts. Second, the specifics of BIS compared to operational IS make it necessary to research the BIS use determinants separately. There is evidence that some specific factors determine and encourage the adoption and implementation of strategic IS such as BIS (Seah, Hsieh & Weng, 2010, p. 368). In this study, I therefore extend the previous work in the field of IS acceptance, studying use only as mere frequency, with the main goal of understanding the mechanisms to increase the utilization and business value of BIS in organizations by increasing the possibility of BIS becoming deeply embedded within the business to create "BI-driven decision-making routines and BI-enabled organizational

processes that take managerial decision making to new levels of understanding and foresight” (Shanks et al., 2012).

This research study applies an exploratory approach, based on extensive literature review (Grublješič, 2013) by collecting primary data with case studies in an attempt to identify the determinants of different dimensions of BIS use, with focusing not only on the initial acceptance but particularly on long-term and embedded BIS use. Based on these findings a conceptual model of BIS extended use (business intelligence extended use model – BIEUM) is proposed.

The rest of the paper is structured as follows. In the next section, a description of the specifics of BIS is given and different dimensions of use behavior in the context of BIS are elaborated. In the third section, the methodology used is described. The findings from the qualitative phase are elaborated in the fourth section. This is followed by a discussion and a conclusion.

## **4.2 USE BEHAVIOR IN THE BUSINESS INTELLIGENCE SYSTEMS CONTEXT**

### **4.2.1 Specifics of Business Intelligence Systems**

BIS are most commonly identified as solutions holding quality information in well-designed data stores connected with business-friendly tools and their goal is to provide stakeholders at various levels in an organization with timely access, effective analysis and an insightful presentation of the information generated by enterprise-wide applications, enabling them to make the right decisions or take the right actions across a broad range of business activities (Popovič, Coelho, & Jaklič, 2009). To study the use of BIS and consequently its acceptance determinants one must understand the specific characteristics of BIS compared to operational or transactional IS (Popovič et al., 2012) particularly in post-technology adoption phase. The summary of all these typical differences between operational IS and BIS is provided in Table 6.

The use of BIS is primarily optional or voluntary in comparison with an operational IS where the use is mostly mandatory or necessary for carrying out the business process. BIS users are generally more educated workers, mostly managers in the organization (Popovič et al., 2012). The information collected is more aggregated at the level of the entire organization and there is more sharing of information since the data in BIS are more integrated at the level of the entire organization. The information needs of operational IS primarily derive from the processes, that are more structured and well-defined at the operational level and thus the information needs are better defined, while in BIS they are much less structured and the needs are often ad-hoc in nature. Consequently, the methods used to identify the information needs of operational IS are much more defined and based on the defining and modeling of processes, while with BIS the identification of needs is based on performance management and the efficiency of operations. With operational systems the data needed to process are generated with the execution of processes themselves, while with BIS the data for analysis come from the operational processes as well as from external sources. Concerning problems

with the quality of information, with operational IS the focus is primarily on traditional problems of data quality (accuracy, completeness, etc.), whereas regarding BIS it is more a question of the relevance of the information provided by BIS (Eppler, 2006). With operational IS the level of integration is generally the process and with BIS it is usually the entire organization. The required reliability of IS is much higher with operational IS where the functioning of the system is usually a prerequisite of process execution. Moreover, the directions for using an operational IS are much more structured than with BIS use where such use is much more research-oriented and innovative. In general, compared to operational IS the benefits of BIS are much more indirect and long-term (Gibson, Arnot & Jagielska, 2004) which may negatively affect their perceived usefulness and consequently their acceptance and use.

Table 6. Differences between operational IS and BIS

	<b>Operational IS</b>	<b>BIS</b>
Level of voluntariness	Lower	Higher
Structuredness of processes in which IS are used	Higher	Lower
Methods for identifying information needs	Well-established (process-oriented)	Less established
Context for identifying information needs	Processes	Processes, business performance management
Data sources employed	Mostly from within the process	Additional data sources required
Focus of IS (orientation)	Application- and process-oriented	Data- and process-oriented
Main problems of information quality	Sound data and data access quality	Relevance
IS integration level	Process	Enterprise
Level of required reliability of IS	Higher	Lower
Benefits	Direct & immediate	Indirect & long-term
Structure of users	All organizational and educational levels	Higher educated – management
Structuredness of instructions for use	Higher	Lower (more research-oriented & innovative use)
Aggregation level of collected information	Lower	Higher
Sharing of information	Lower	Higher (integrated and aggregated information)

Source: based on and extended from Popovič et al., 2012

#### 4.2.2 Dimensions of Business Intelligence Systems use<sup>4</sup>

Effective use at the individual level is defined as “using a system in a way that helps attain the goals for using a system” (Burton-Jones and Grange, 2013, p. 636). If meaningful or effective

<sup>4</sup> A research paper investigating and elaborating dimensions of effective BIS use, providing empirical proof for conceptualizing three different constructs of post-adoptive BIS use behavior is published as Grublješič, T. & Jaklič, J. (2014). Three dimensions of Business Intelligence Systems use behavior, *International Journal of Enterprise Information Systems*, 10(3), 65-79.

use is not a realized outcome for BIS, then these systems cannot have an impact on better performance (Straub & Guidice, 2012). Traditionally, the use of IS is measured primarily by frequency, intensity and duration of use (e.g. Davis, Bagozzi & Warshaw, 1989) since the object of use investigation has mostly been operational IS, where using an IS is seamlessly integrated with business process execution. On the other hand, it is important for BIS if BIS are deeply embedded within the business (Shanks et al., 2012) and therefore these measures are not enough to measure BIS use. Burton-Jones and Straub (2006) call for the developing of the conceptualization of usage and selecting usage measures for specific contexts. Therefore, moving from the use to the effective use of BIS requires an understanding of the nature and purpose of BIS (Burton-Jones & Grange, 2013). Burton-Jones and Straub (2006) elaborate that in the IS for the decision-making domain researchers typically study IS characteristics that improve user decision making related to the use of information from IS (i.e. users' information processing). Thus, for effective BIS use *informed action* (Burton-Jones & Grange, 2013) is necessary in the sense of acting upon the information obtained from BIS. Since in the BIS context the use of information from BIS is important, I employ Burton-Jones and Straub's (2006, p. 230) dimensions of system usage measured as the use of information from BIS, which are the frequency or intensity of use, the extent of use and the nature of use (in my case embeddedness).

*The intensity of use* (Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008; Venkatesh, Brown, Maruping & Bala, 2008) is the most commonly used dimension of measuring the use of IS in the literature. Ideally, the intensity of use should be understood as the "cognitive absorption" defined as the "extent to which a user is absorbed when using a system" (Burton-Jones & Straub, 2006, p. 236). Agarwal and Karahanna (2000) characterize the intensive use of systems as a form of usage that is very different from other ways of conceptualizing the human-computer interaction because it peers inside a person's mind when they are engaged with a computer.

*The extent of BIS use* measures the "extent to which the user employs the system to carry out the task" (Burton-Jones & Straub, 2006, p. 233). In the BIS context there is a need for multidimensional measures of how extensively BIS is utilized in an organizational context for decision support (problem solving and decision rationalization), work integration (horizontal and vertical integration), and customer service functions (Doll & Torkzadeh, 1998). In the post-implementation context, more use is also not always considered desirable. There is a plethora of social and economic impacts at the level of the individual, the work group, and the organization (Doll & Torkzadeh, 1998) which are not only captured by the intensity of use measure. Therefore, for BIS use it is important if users are acting on the basis of the information provided by BIS. The value of BIS is not only generated by the use of BIS, but by activities based on the information provided by BIS that are going in the right direction to achieve successful business performance.

For effective BIS use and system success the *nature of BIS use* should follow the principles of system *embeddedness* in a business. Embeddedness of BIS represents the infusion stage of

BIS implementation efforts (Cooper & Zmud, 1990) and is elaborated in depth in Grublješič & Jaklič (2014). Embeddedness has been conceptualized and named in several different ways in the literature, some of these I provide in the following.

The success of an organization's BIS implementation is influenced by embeddedness, which can be understood as "the extent to which the use of BIS is an integral part of organizational activity" (Furneaux & Wade, 2011, p. 579). In the post-implementation phase of IT implementation, use should evolve from initial acceptance of the new technology through the routinization phase to *infusion*, which occurs when technology becomes more deeply embedded within the organization's work system (Cooper & Zmud, 1990; Saga & Zmud, 1994). Notwithstanding this, we still commonly encounter the connection view of BIS in which BIS is understood and used only as a tool by people (managers) to help them in their work (ElSawy, 2003). But today's dynamic and turbulent business environment drives many organizations to take the next steps towards the immersion view of BIS where it is assumed as part of the business environment and cannot be separated from work, and the further fusion of BIS and business with the oneness-with-environment property (ElSawy, 2003). In the context of BIS, fusion involves deeply embedding BIS within the business to create "BI-driven decision-making routines and BI-enabled organizational processes that take managerial decision making to new levels of understanding and foresight" (Shanks et al., 2012) within the business performance management (BPM) framework. Bhattacharjee (2001, p. 352) has studied IS continuance as the post-acceptance stage and has found support for embedded use, which is a stage when use "transcends conscious behavior and becomes part of normal routine activity", also considering and explaining why some users discontinue IS use after initially accepting it. Expectation-confirmation theory posits (Oliver, 1980) that consumers' intention to continue using is primarily determined by their satisfaction with prior use, but embedded use not only looks at how much users use the system, but also how it is used. That is why Burton-Jones and Straub (2006, p. 236) conceptualize the dimension of *deep structure* usage as exploitive system usage, which is the "extent to which users exploit features of the system to perform the tasks". Straub and Guidice (2006, p. iv) introduce the notion of transformational (or transformative) uses of systems which are rarer and different and occur when users utilize the IS capabilities to create something new, an invention, or a new perspective. Jaspersen, Carter and Zmud (2005, p. 542) elaborate that much post-adoptive behavior or continuing IT use is likely to reflect a "habitualization of action, where the decision to use the IT application feature occurs more or less automatically via a subconscious response to a work situation" and Ortiz de Guinea and Markus (2009) support this habitual use. Ortiz de Guinea and Markus (2009, p. 434) argue that "automatic (i.e. habitual) IT use behavior may be much more extensive than the simple repetition of well-learned behavioral sequences", which in turn supports use embedded into the routines of users.

#### **4.2.3 Antecedents and drivers of Business Intelligence Systems use**

One of the ongoing research questions in the field of IS is the identification of determinants that influence the acceptance and continuous use of IS. Many theories and models addressing

this problem have been developed in recent decades. Of all the theories, especially because of its clarity and simplicity, Technology Acceptance Model (TAM) (Davis, 1989) proves to be the most powerful, widespread and often used theory in the area of IT and IS acceptance, and was therefore also used as a basis of this research when constructing the interviews. Other theories this research is based on are Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), TAM 3 (Venkatesh & Bala, 2008), Technology, Organization and Environment (TOE) framework (Tornatzky & Fleischer, 1990), the DeLone & McLean IS success model (2003) and Wixom and Todd's (2005) theoretical integration of user satisfaction and technology acceptance. Grublješič (2013) conducted an extensive literature review based on previous overview studies which have partially summarized variables included in the TAM model (Lee et al., 2003; King & He, 2006; Sharp, 2007; Yousafzai, Foxall & Pallister, 2007; Chuttur, 2009; Wu, Zhao, Zhu, Tan & Zheng, 2011), and has identified nearly 50 additional determinants that have been used in studies to explain IT acceptance and use. These have been included in research studies either as additional external factors affecting the basic TAM construct and thereby better predict technology acceptance, or as antecedent factors that better explain the two main belief constructs of perceived usefulness and perceived ease of use of an IS. The determinants used in studies to explain IT acceptance and use are made up of determinants relating to (1) individual, (2) technological, (3) organizational, (4) social, and (5) macro environmental characteristics. The determinants are categorized based on the author's conceptualization to fit the analysis of acceptance and use on the individual level which is based on the TOE framework (Tornatzky & Fleischer, 1990) extended with the inclusion of individual and social characteristics. Since continuous use follows initial acceptance I have also used the list of these identified determinants in order to examine which of them apply for continuous and the widespread use of BIS throughout the organization and for embedding BIS into the routines of workers.

### **4.3 QUALITATIVE DATA COLLECTION**

Since previous literature chiefly focuses on the narrower aspect of use and does not consider the specifics of BIS, the qualitative approach is based on case studies including semi-structured interviews with the BI stakeholders, observation through project implementation and a collection of project documents to examine, refine and develop a BIS extended use model. Therefore, the initial set of analytical categories are deductively derived from the existing literature (Grublješič, 2013) and subsequent primary data collection, reduction, display and analysis are then inductively conducted from the two case studies so as to allow a richer framework to evolve and be tested for its plausibility across data sets. The purpose of qualitative research based on case studies is to identify how important the existing antecedent determinants of use are in the context of BIS, with a focus on the effective use of BIS, where BIS is embedded in business processes and whether some additional determinants emerge as important concerning the specifics of BIS.

I report one case study from an organization where BIS is more embedded and another where BIS is not so widely used. This enables us to observe the embeddedness of BIS between

organizations and to gain better understandings and increase the generalizability of the findings (Miles & Huberman, 1994). The research has included participant observation based on watching and listening, individual semi-structured interviews and document analysis to facilitate data triangulation. The authors have in the role of external consultants been involved throughout the BIS project implementations, that have in one case lasted 4 years and in the other 2 years. This has allowed monitoring of system design and development, development of information and organizational culture and other organizational factors, users' responses during the project implementation and after the deployment, and the role and activities of management in both organizations.

Use of the semi-structured interviews has allowed the informants to express their views freely while also affording us the opportunity to raise issues suggested by my a priori framework (Saunders, Lewis & Thornhill, 2009). The interviews began with generic questions allowing users to express their opinions on the use of BIS before moving to more specific questioning to ensure that the data from each case covered similar areas, thus allowing a cross-case comparison, with the data collection ceasing at the point of data saturation (Miles & Huberman, 1994). The interviews started by a definition of the used terms, such as how BIS are defined and how I define and separate different dimensions of BIS use. The interviewees were first asked to talk freely about how their BIS solution was generally accepted by users following the implementation and how it was accepted and embedded over time. They were further asked what, in their assessment, were the most important determinants of users accepting or not accepting the BIS solution especially in the context of embedding its use into their routines. They were guided to talk about: (1) individual characteristics; (2) technological characteristics; (3) organizational factors; (4) social characteristics; and (5) macro-environmental characteristics, following the structure of acceptance determinants defined by Grublješič (2013) based on the TOE framework. Finally, the interviewees were asked to assess the importance of drivers of use, previously identified in the literature.

Purposeful, criterion-based sampling has been used to identify decision makers representing both IT and line-of-business functions at two different organizations (see Table 7) of various sizes and operating in different industries (Paré, 2004). The selection of different types of experts followed the need to obtain different perspectives from different types and profiles of users and also follows the recommendation of Myers and Newman (2007, p. 5) to prevent "elite bias". These different profiles of BIS users did somewhat affect their responses, as IT users were more focused on the technological characteristics of BIS and business users more exposed the determinants important for embedding BIS into the routines of workers. By that I have obtained all important determinants that different profiles of users observe.

Table 7. Information about the interviewees for BIS use study

<b>Interviewee</b>	<b>Industry type (Business Sector)</b>	<b>Function in the organization</b>	<b>Function concerning BIS implementation</b>
Interviewee 1	Water supply, sewerage, waste management and	Chief Executive Officer (CEO), Certified Senior	Sponsor of BIS project



	remediation activities	Project Manager	
Interviewee 2	Water supply, sewerage, waste management and remediation activities	Assistant to the Director, Head of the Commercial and Finance Department	Key user of BIS
Interviewee 3	Water supply, sewerage, waste management and remediation activities	Information Technology Department, Project Manager	BIS project leader, BIS user
Interviewee 4	Arts, entertainment and recreation	Head of the Information Technology Department	BIS project leader, BIS user
Interviewee 5	Arts, entertainment and recreation	Assistant to the Director	Key user of BIS

Interviews were conducted in June and at the beginning of July 2012 and 2013. The interviews lasted on average one hour. They have been recorded and transcribed by the researchers to yield a total of approximately 60 single-spaced pages of text. The data has been analyzed using the content analysis technique, a constant comparison technique, to identify the major themes (Miles & Huberman, 1994). The authors have employed independent cross-coding to reduce the subjectivity and increase the validity of the interpretation of the interview results. Finally, the results have been reflected upon in a discussion between the authors, according to additional clarifications from the literature, and a review of the findings by the interviewees as recommended in Carroll and Swatman (2000).

The interview results are further interpreted and elaborated in accordance with Saunders, Lewis and Thornhill (2006, p. 535) who suggest that “the results section may also contain verbatim quotes from interviewees” since “this is a particularly powerful way in which you can convey the richness of your data”.

#### **4.3.1 Case study description and observations**

In this section I describe the two case studies with providing findings from observation of BIS project implementations. For each case study I first discuss the organizational context and how BIS project was undertaken and addressed. I then discuss how BIS is accepted and used in an organizational context by providing comments about the extent of BIS use and infusion of BIS into the routines of workers.

##### ***4.3.1.1 Case study 1: The waste and cleaning public company***

Before undertaking the BI project, the organization had already carried out a process renovation project and introduced ERP. In this context, owners of the end-to-end processes have been appointed and awareness of responsibility for the performance of the processes as a whole has increased, although the process owner role has not been fully internalized. Moreover, the leadership perceives the lack of a market orientation and the employees’ focus on customers at the lower levels. Planning, reporting and analytics have mostly been conducted in Excel.

In this case, the BI project had been implemented in a big-bang manner, where before the project of developing and introducing the BI solution a business requirement analysis and the

concept of the solution had been set out. A comprehensive measurement system following the principles of a Balanced Scorecard had been designed, which was implemented through the project. The initiator of the project was a deputy director, and an active sponsor was the director of the organization who throughout the project's duration drew attention to the project's importance for the entire organization. At the beginning of the project, the purpose and objectives of the project were presented to all employees and potential users and all potential key users were constantly involved in it. As part of the project some of the key business terms were reconciled among key users of different processes, leading to a high level of data integration.

The use of the system that followed was satisfactory, although it varied among the different users. For some, independent searching for information and analysis even in ways not yet in place before the system was introduced was observed, although they needed the help of the support team and together came up with a solution. In the meantime, others remained passive and obtained only the critical information needed for reporting from the system. The director also played an important role in acceptance of the system by changing the way regular board meetings were conducted, which now include a review of the status of the efficiency and effectiveness indicators through BIS.

#### ***4.3.1.2 Case study 2: Radio and television program producer and broadcaster***

Before the considered BI project commenced, a system for reporting already existed in the organization. Therefore, the main reason for initiating the project had been the non-existence of an application to adequately support financial and human resource planning processes. Consequently, the substantive focus when preparing the project was an analysis of these processes. For reporting and analytics a key trigger was the perceived weaknesses of the existing tools that had mainly been used for financial reporting and the desire to change the current reporting system. The BI project was implemented in a big-bang way, foreseeing the comprehensive computerization of planning processes not covered by other solutions (e.g. the planning of production and broadcasting) and reporting and analytics for a large number of business areas. The project's initiator was the deputy director who in the first part of the project was also an active sponsor and participated in all important meetings and dealt with conflicts. However, in the middle of the project she left the organization and the sponsorship was taken over by another person with less influence.

The organization was functionally organized with clear functional silos and gaps between them. As a consequence, some business key terms were not uniformly defined, hindering the flow of information. The IS support for operational business processes was also developed around the business functions. Responsibilities for the success of business processes were not comprehensively and clearly defined. The concept of Business Performance Management had not yet been established. The project included attempts to create a Balanced Scorecards, but were not realized until the end. Already at the beginning, the contractor had organized the project around functional areas whereby he formed the groups and persons responsible for

each functional area which then led to problems with the integration of areas, which had been one of the project's key objectives.

Users of the BIS have chiefly remained those who previously used the earlier system and in the early stages were largely somewhat dissatisfied because they had to adapt to the new technology, although they have gradually accepted use of the new system. Use of the BIS has not expanded in a way such that users who are or should be responsible independently analyze the performance of processes and we therefore certainly cannot speak of any high level of embeddedness.

#### **4.4 FINDINGS**

First all interviewees exposed the importance of organizational factors for deep structural usage of BIS, which is particularly boosted with management support. Demand for information is very much connected with the management philosophy. If superiors expect to be kept informed about effectiveness and efficiency, the embeddedness of BIS will be higher. As one informant said *“on one hand, you need a certain level of management maturity for BIS to be used and, on the other hand, you offer a system which somehow increases this level of maturity so it has a two-sided impact”*. But in none of the organizations does top management use BIS as had been expected with the introduction of the system, and that is why the informants said that BIS had not been not infused so broadly throughout the organization. One informant noted that this was due to the fact that they had not yet introduced dashboards as intended because in the current phase the system was not mature enough, but they plan an upgrade of the system. In the other organization, they stated that *“some of the management uses the system on a daily basis but this is largely a reflection of individual personal characteristics”*.

A particularly emphasized factor for all three dimensions of BIS use (intensity, extent and embeddedness) is the information culture, i.e. how fact-based decision making is important for the organization and management. Marchand et al. (2001) identify six information behaviors that characterize the information culture of an organization: information integrity, informality, control, sharing, transparency, and proactiveness. An open information culture involving the sharing of information is particularly important for BIS use. Openness in reporting and the presentation of information on errors and failures is emphasized, thus making information transparency and information proactiveness relevant in order to respond quickly to business changes (Marchand et al., 2001). In one organization, they do not have such an information culture; management still receives the information they need directly from the accounting department and does not seek information from the BIS, which is also why the BIS was not embedded as much there. In the other organization, they have a very open information culture as they have invested significantly to raise it upon the introduction of the BIS and other information systems, and they have done this successfully. Consequently, the embeddedness of the BIS is also higher on the level of management since the quality of information emerging from the BIS is high and the demand for the information

is higher. Management obtains the information it needs faster than before the system was introduced, which also increases the use of the system.

With regard to the technological characteristics, one informant noted that the system reliability was inadequate even after two years of the project running. As the informant from this organization put it, *“the relevancy and quality of information are two key determinants for the acceptance and embedded use and also the key is to observe what users actually need since the BIS can provide some functionality which users then never need or use”*. The relevance of data is strongly highlighted as an additional aspect of the quality of data, which is particularly important in the context of BIS and ensures deep structural usage.

All of the informants agreed that individual characteristics are very important. One informant noted that *“the knowledge of users is very important and by that knowing the system”*. *“Those who understand the semantic more easily use the new system”*. Another informant said that *“the profiles of people are different: some are decision makers, some analysts, while others are visionaries”*. Personal characteristics such as *“skills, curiosity, the desire for advancement and personal growth and confidence (sovereignty) of working with computers are very important”*. Therefore personal innovativeness has an effect on how users find ways to routinely use BIS in their work. Another informant particularly exposed *“readiness (openness) for changes and new ways of working”*. The use of outputs from the BIS should change processes in the long term, but since the use is not mandatory the unwillingness of each user to accept changes is a major impediment to effective long-term use (monitoring the performance of processes and their changes). This informant also pointed out that *“computer literacy presents a problem, especially for the older generation which is still largely present”*.

In one of the organizations it was mentioned that, since they are not market-oriented, a much greater inner impulse and energy is needed to encourage the use of BIS because using the BIS is voluntary. The director there gives the initiative and leads by example, which has a large impact. One informant said that what is most important in this organization is that *“the director said that the BIS will be introduced and used”*, as in the public sector the director’s word carries a lot of weight. Also extremely important is the fact that *“the director was an active sponsor of the introduction of the system, and is now also very actively using the system”*. Another important social factor is that, even though that this is a public company, as one informant said *“people here also competed with each other in use of the BIS – who will be better and who will be able to quickly locate the necessary information”*. Visibility of use could be important following the initial acceptance for the BIS to become embedded into the business, and for the expansion of the BIS throughout the organization.

Competitiveness of the environment was identified as the most important factor of the macro-environmental characteristics in both organizations. One informant stated that since *“we are a public company there is not so much pressure from the market, which would also increase use of the BIS”*. On the other hand, another informant stated that because they are market oriented, *“BIS acceptance and embeddedness is necessary as large vendors can only be good if they have good, timely information in order to act on it”*. In this organization the users were

not those saying “another one of the new applications which we must learn”, but have claimed this system. This is because they are more responsible for the success as they are rewarded for performance and results.

The interviewees were then given a list of all drivers of use of IT identified in the literature (Grublješič, 2013) and were asked to choose which of them are important for different dimensions of BIS use and how pressing each determinant is. Their assessment of the importance of each selected determinant for different dimensions of BIS use can be seen in Table 8.

Table 8. Interviewees answers about determinants influencing different dimensions of BIS use

Determinant	Selected referred studies	Intensity of BIS use	Extent of BIS use	Embeddedness of BIS
<b>OBJECT-BASED BELIEFS AND ATTITUDES</b>				
<b>INDIVIDUAL CHARACTERISTICS</b>				
Age	Venkatesh et al., 2003	+o	o	o
Computer literacy	Venkatesh et al., 2003	+	o	o
Education	Wu & Lederer, 2009	+	o	o
Prior experience	Taylor & Todd, 1995	+o	o	o
Attitude	Davis et al., 1989	+	o	o
Computer self-efficacy	Venkatesh & Bala, 2008	+o	o	o
Personal innovativeness	Agarwal & Prasad, 1998; Agarwal & Karahanna, 2000	+	o	++
Computer anxiety	Venkatesh & Bala, 2008	+o	o	o
Readiness for change	Kwahk & Lee, 2008	+	+	++
<b>BIS QUALITY CHARACTERISTICS</b>				
Compatibility	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999	++	+	o
Task-technology fit	Goodhue & Thompson, 1995	++	+	o
Information quality	DeLone & McLean, 1992; DeLone & McLean, 2003; Wixom & Todd, 2005	++	+	+
Output quality	Venkatesh & Davis, 2000; Venkatesh & Bala, 2008	++	+	+
Relevance	Eppler, 2006; <i>Emerged from the interviews</i>	++	+	++
System quality	DeLone & McLean, 1992; DeLone & McLean, 2003; Wixom & Todd, 2005	++	++	++
Complexity	Rogers, 1983; Karahanna et al., 1999	++	+	o
Accessibility	Karahanna & Straub, 1999	++	++	+
Triability	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999	+	o	o
User interface	Davis et al., 1989; Wixom &	+	o	o

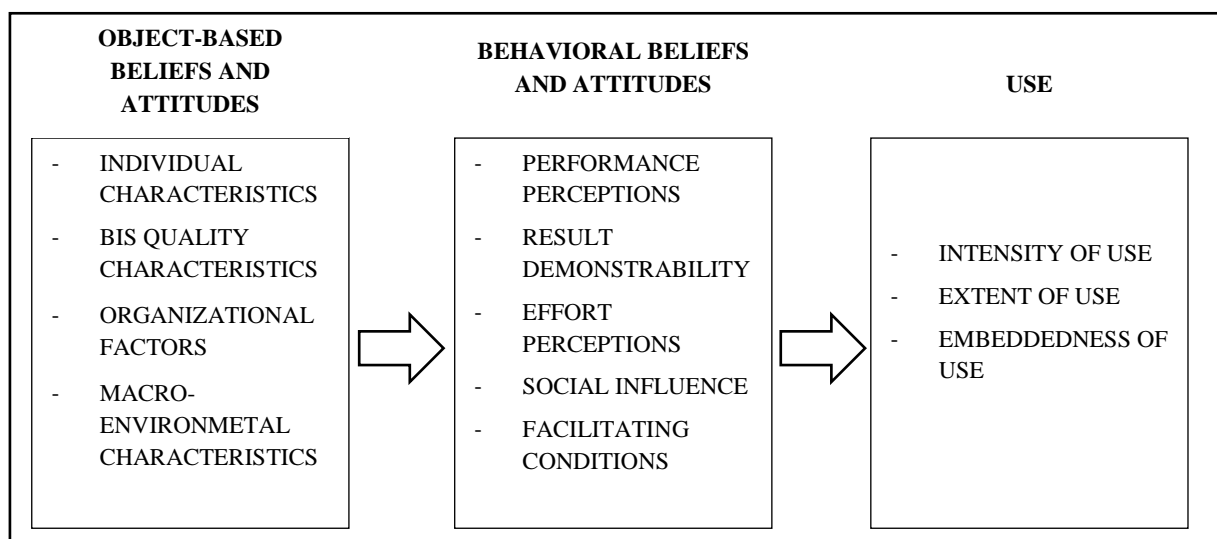
	Watson, 2010			
<b>ORGANIZATIONAL FACTORS</b>				
Focus on the customer	<i>Emerged from the interviews</i>	o	++	++
Management support	Wixom & Watson, 2001; Yeoh & Koronios, 2010	+	+	++
User participation in implementation	Wixom & Watson, 2001; Yeoh & Koronios, 2010	++	o	o
Iterative development approach	Yeoh & Koronios, 2010; Seah et al., 2010	+	o	o
User training	Karahanna & Straub, 1999	++	++	o
Organizational culture	Wade & Hulland, 2004	+o	+	+
Information culture	Davenport, 1997; Marchand, Kettinger & Rollins, 2001	++	++	++
Change management	Wixom & Watson, 2001; Legris et al., 2003; Wade & Hulland, 2004	+	o	+
Organizational resources	Wixom & Watson, 2001; Wade & Hulland, 2004	++	o	+
Organizational size	Wade & Hulland, 2004; Lee & Xia, 2006	+o	+	+
<b>MACRO-ENVIRONMENTAL CHARACTERISTICS</b>				
Business sector	King & Teo, 1996; Lee & Xia, 2006	+o	o	o
Competitiveness of the environment	King & Teo, 1996; Wade & Hulland, 2004; Lee & Xia, 2006	+	+	++
<b>BEHAVIORAL BELIEFS AND ATTITUDES</b>				
<b>PERFORMANCE PERCEPTIONS</b>		+	++	o
Relative advantage	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999			
Job relevance	Venkatesh & Davis, 2000; Venkatesh & Bala, 2008			
Perceived usefulness	Davis, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008			
<b>RESULT DEMONSTRABILITY</b>		+	o	o
Result demonstrability	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008			
<b>EFFORT PERCEPTIONS</b>		+	o	o
Ease of use	Davis, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008			
<b>SOCIAL INFLUENCE</b>		o	++	++
Voluntariness	Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh et al., 2003; Wu & Lederer, 2009			
Visibility	Rogers, 1983; Moore & Benbasat, 1991; Karahanna et al., 1999			
Image	Moore & Benbasat, 1991; Karahanna et al., 1999; Venkatesh & Davis, 2000			
<b>FACILITATING CONDITIONS</b>		++	+	++
Facilitating conditions	Karahanna & Straub, 1999; Venkatesh et al., 2003; Venkatesh & Bala, 2008			

*Note.* ++ – very important, + – important, +o – somewhat important, o – not important

A BIS extended use model is conceptualized based on this list (see Figure 3), while the importance of each determinant for different dimensions of use can be seen in Table 8. The model includes perceptions of information system success that have been investigated within

two primary research streams – the user satisfaction literature and the technology acceptance literature – as Wixom and Todd (2005) propose. I thus distinguish beliefs and attitudes about the system (object-based beliefs and attitudes) from beliefs and attitudes about using the system (behavioral beliefs and attitudes). The determinants related to object-based beliefs and attitudes are categorized based on the TOE framework (Tornatzky & Fleischer, 1990) extended with the inclusion of individual characteristics to fit the analysis of use on the individual level. The object-based belief side of the model therefore includes individual characteristics, BIS quality characteristics, organizational factors and environmental characteristics. By contrast, the technology acceptance literature (i.e. TAM and UTAUT) provides sound predictions of usage, “by linking behaviors to attitudes and beliefs that are consistent in time, target and context with the behavior of interest” (Wixom & Todd, 2005, p. 85) which is system usage. The behavioral beliefs and attitudes side of the model accordingly includes performance perceptions, result demonstrability, effort perceptions, social influence and facilitating conditions consistent with TAM (Davis, 1989) and more recent derivations such as UTAUT (Venkatesh et al., 2003) and TAM3 (Venkatesh & Bala, 2008).

Figure 3. Conceptual BIS extended use model (BIEUM)



#### 4.5 DISCUSSION

Although this study has confirmed some of the findings from previous research on IT use, some interesting insights have emerged that enable an understanding of the specifics of BIS use and which determinants influence the shift from mere intensity of use following initial acceptance to extensive BIS utilization and further infusion of use, where BIS becomes embedded into the business.

This study confirms that of individual characteristics it is age, computer literacy, education, prior experience, attitude, computer self-efficacy, and computer anxiety that importantly influence intensive BIS utilization as already demonstrated in the existing literature. Moreover, compatibility from innovation diffusion theory (Rogers, 1983; Moore & Benbasat,

1991) and task-technology fit which Goodhue and Thompson (1995) highlight were found to be important BIS quality characteristics especially for the intensity of BIS use. In support of the existing literature (i.e. Davis et al., 1989), user involvement and participation in the implementation of BIS is particularly highlighted by the interviewees with regard to intensive BIS use. Facilitating conditions which directly influence all BIS usage behavior are exposed as very pressing, as already found important for acceptance in previous literature especially in the UTAUT model (Venkatesh et al., 2003), but in the BIS context these are particularly emphasized as critical for continuous BIS use as well as for the intensity, as for extent and embeddedness of BIS use. If we look at operational systems, support is chiefly necessary at the beginning and in the early stage of use until the system stabilizes, but for the deep structural usage of BIS long-term constant support for system use is important, otherwise the use declines as the experts also pointed out.

Personal innovativeness and readiness for change serve particularly important roles for the transition from merely using a system occasionally to routine or habitual usage since the use of BIS is more research-oriented and innovative as elaborated in the specifics of BIS section and methods for identifying information needs are less established compared with operational IS. Specifically for effective BIS use, personal innovativeness (Agarwal & Prasad, 1998) as a necessary characteristic of an individual is particularly exposed as it allows information to be used properly in the less structured business processes where BIS is commonly used, and provides long-termed embeddedness in managerial (less structured) business processes where new requirements for using information are constantly emerging. In addition, readiness for change, as the extent to which an individual holds positive views about the need for change and believes that changes are likely to have positive implications (Kwahk & Lee, 2008), has an impact on the routinization and infusion of BIS use within an individual's work system. These two determinants impact on how users find ways to embed BIS in their work.

Although existing research has already confirmed the importance of system quality (especially complexity and accessibility) and information quality, for effective BIS use a particularly pertinent determinant of information quality is the relevance of information, which has not been highlighted in previous models of IT acceptance (see for example Wixom & Todd, 2005; UTAUT (Venkatesh et al., 2003); TAM (Davis, 1989)), but has already been confirmed in the literature as an important dimension of information quality for IS success. A key problem of information quality in unstructured business processes is providing relevant information to managers (Delone & McLean, 2003; Popovič et al., 2009). In accordance with the specifics of BIS, relevance is a problem of information quality for BIS and the context for identifying information needs are processes as well as business performance management. For BIS it is particularly important that it reduces the gap between what the system offers and what users actually need so that it increases the relevance of information. Hue (2012) also includes a "content" (relevance) construct when examining the effect of user satisfaction with BIS on BIS usage. This study points out that the relevance of information from BIS influence both the intensity of use and deep structural usage.



Previous studies on IT use have focused predominantly on individual determinants and on system characteristics and not on organizational factors, yet these factors are found to be a vital part of critical success factors for BIS success (Yeoh and Koronios, 2010) and for data warehouse success (Wixom and Watson, 2001). Precisely because of the specifics of BIS, organizational factors enhance effective BIS use and the interviewees exposed them as being critical for the infusion of BIS within an organization's work system. Unlike for operational systems where use is mostly mandatory, for BIS where use is largely voluntary organizational factors can impact on how BIS is used and how it becomes embedded into the routines of decision makers. Management support, information culture and a focus on customers are found to be especially important for the infusion of BIS in organizational processes. These determinants are all strongly related to changes in management practice and to changes in operational processes and thus to the effective use of information provided by BIS. An open information culture enhances the deep structural usage of BIS since use is not mandatory and there is a need to share information. A highly developed information culture is positively associated with organizational practices that lead to a successful business performance (Choo et al., 2008). Information transparency, as openness in reporting and the presentation of information on errors and failures, is emphasized and so too is information proactiveness for being able to respond quickly to business changes (Marchand et al., 2001). Another pressing factor the interviewees mentioned that was not found in the literature as a determinant of acceptance is a focus on customers, which is related to the competitiveness of the environment. Employees in organizations that focus on customer satisfaction use BIS more and BIS is more embedded into the business since they are more dependent on innovative and competitive information. User training has already been confirmed in the existing literature as having an impact, but for BIS training for understanding the content is exposed since the process of use is generally not embedded into the application as it is for operational IS and there is a bigger gap between use of the system and use of the information provided by the system.

The findings show that, on the behavioral-based beliefs and attitudes side of the model, all five constructs, namely performance perceptions, result demonstrability, effort perceptions, social influence and facilitating conditions play pivotal role for effective BIS use. While these determinants have roots in the existing literature (Davis, 1989; Venkatesh et al., 2003), my findings show that what is especially important for the expansion of use and deep structural usage of BIS are performance perceptions and social influence. Performance perceptions such as relative advantage, job relevance and perceived usefulness are exposed as pertinent, especially for the expansion of BIS use. If users perceive the results of BIS use on their performance, the use will spread throughout the organization. Social influence is the next important determinant of the widespread use and embedding of a BIS into the routines of workers as the benefits of use are more indirect and long term for BIS than for operational systems. With operational systems the results of use are instantly visible; on the other hand, for BIS use it is important that users feel social influence when using BIS. Therefore, if users

perceive benefits particularly on their image and that the results of use are visible as well as demonstrable, the use of BIS will become more embedded into their routines.

There are several *implications for research*. The main theoretical contribution is the context-specific use model (BIEUM) that identifies the determinants relevant to the more effective use of BIS in an organization, which should improve the success chances of investments in such systems, following Huo's (2012) statement that the realization of business benefits from BI investments depends on supporting the effective use of BIS, and thereby contributing to the better performance of organizations. The study further contributes to theory on another important issue as it identifies and analyzes relevant elements of BIS usage and thereby responds to the call of Burton-Jones and Straub (2006) to develop conceptualizations of usage for specific contexts. Jaspersen et al. (2005) call for a consideration of the distinctive features of an IT application when researching variations in individual post-adoptive behaviors. Following this and the recommendation of Burton-Jones and Grange (2013) that one must understand the information system's nature and purpose, I consider the specifics of BIS and propose relevant dimensions of usage (intensity, extent and embeddedness) that must be taken into consideration for the effective use of BIS. In his model of IS continuance, Bharachatterjee (2001) elaborates that users change their usage behavior after their initial acceptance (that can lead to continuous usage or discontinuance), which is determined by users' satisfaction with IS use. Therefore, if users are satisfied with a BIS, considering the identified dimensions of use, they first start intensively using BIS and after the use expands throughout the organization and becomes deeply infused into the routines of workers while, on the other hand, if users are dissatisfied this will lead to discontinuance even after evident acceptance. This study proves that various determinants influence different dimensions of use, i.e. the transition from initial acceptance, through the extension of use to embeddedness. This has not been considered in previous studies of acceptance and the finding holds important implications for practice.

A key *implication for practice* of this study is therefore that managers now have a way to assess individual characteristics, system and information characteristics and organizational factors and then reliably investigate their impacts on different dimensions of BIS usage through the proposed causal chain in order to potentially increase effective BIS use and realize greater benefits from its implementation. As Wixom and Todd state (2005, p. 99), "this can help with management activities such as task prioritization and resource allocation". Venkatesh and Bala (2008) classify these issues into pre-implementation interventions (i.e. design characteristics, management support, user participation, incentive alignment), which can potentially lead to greater acceptance of the system, and post-implementation interventions (i.e. training, organizational support, peer support), which take place after the deployment of a system to enhance the level of user acceptance of the system. But these determinants actually represent the critical success factors (CSF) that need to be considered before, during and after implementation, and being accounted for prior to the implementation can increase the readiness for implementation of the BIS as well as in post-implementation phase boost the expansion and more effective use of the BIS throughout the organization.

Organizational factors are the most pressing ones therefore, for BIS, which is an enterprise-wide project aimed at monitoring and realizing strategy and BPM, issues that could be referred to as *trans-implementation* prove to be particularly important, by which issues that have to take into account before, during and after the implementation are considered. Thus, it is important that BIS projects are highly business-oriented, focusing on strategic alignment, process orientation, a focus on customers, an analytical culture, committed management sponsorship and change management.

#### **4.6 CONCLUDING REMARKS**

In the BIS context there is a particularly pronounced difference between on one hand using or accepting the system and on the other routinization of the use of information provided by the system within management of organization and business processes. Therefore, understanding the determinants through the various stages of use from initial intensive use through the expansion of use to infusion enables decisions on actions that can contribute significantly to the value or BIS success. The Business Intelligence Extended Use Model (BIEUM) not only provides an understanding of the impact of direct determinants of different dimensions of BIS use, which by their nature are lagging, but also the leading determinants based on which we can accept effective measures for the long-term, sustainable and effective use of BIS embedded in business processes.

A limitation of this study is that it examined a cross-section of interviewees' insights about determinants influencing BIS embeddedness. It would be beneficial to perform longitudinal studies that test the proposed relationships as they unfold over time. Further, the results might be biased by the limited number of interviewees as it would be useful to include a larger number of interviewees for the results to be more representative of the whole population of BIS users. Since, typical research problems concern limited resources (i.e. time and budget available), I do believe that for the purpose of this research, this limitation does not considerably impact the strength and importance of the conveyed research findings. In addition, a study by different types of BIS projects and a study of different sectors might be beneficial.

This conceptualization of the model provides sound foundation for future research that should include an empirical test and evaluation of the proposed research model.

## 5 TOWARDS THE EMBEDDEDNESS OF BUSINESS INTELLIGENCE SYSTEMS: THE DETERMINANTS OF THREE USE DIMENSIONS<sup>5</sup>

### ABSTRACT

It is insufficient to merely capture intensity of use in the context of effective utilization of Business Intelligence Systems (BIS) because the use of BIS is not necessarily seamlessly integrated with execution of the business process. It is thus important whether they are deeply embedded into workers' routines. Previous research on the acceptance and use of IS has mainly studied use as intensity of use and thereby neglected how the system is used. Therefore, this study offers novel insights by conceptualizing and measuring three different dimensions of BIS usage, namely: the intensity of use, the extent of use, and the embeddedness of BIS. I further introduce customer orientation as a predictor in addition to the combined impact of established acceptance and use determinants, which has not previously been studied. I develop a BIS embeddedness model that provides evidence about which determinants drive the acceptance and effective utilization of BIS. The model was tested and analyzed by structural equation modeling based on survey data gathered from employees in medium- and large-sized organizations. The model estimation provides sound support for conceptualizing the three dimensions of use as different constructs. In the BIS context use, the traditional determinants of effort and performance perceptions play no significant role in predicting BIS acceptance and use, but rather organizational factors, such as social influence, result demonstrability, facilitating conditions and customer orientation, boost the expansion of BIS use and a qualitative leap in use – embedding BIS into the routines of workers. Overall, the findings enrich our understanding of the phenomena of post-adoption BIS use behavior.

**Keywords:** Business intelligence systems, acceptance of BIS, intensity of BIS use, extent of BIS use, embeddedness of BIS use

### 5.1 INTRODUCTION

Extensive research has been conducted to understand the user acceptance and continued use of information technology (IT) (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008) and, consequently, many different models and theories incorporating a variety of behavioral, social, technological, and other control factors have been developed to explain the use of IT (i.e. Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh & Bala, 2008). To ensure their success (DeLone & McLean, 2003), information systems (IS) must be accepted and effectively used by employees in organizations (Venkatesh et al., 2003). Although research in the field of acceptance and use of IS is exhaustive, it is always necessary to understand context-specific issues.

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<sup>5</sup> Preliminary findings from this chapter are published as part of the work Grublješič, T., Coelho, P. S., & Jaklič, J. (2014). The importance and impact of determinants influencing business intelligence systems embeddedness. *Issues in Information Systems*, 15(1), 106-117, and have been presented at an international conference 54th annual IACIS International Conference, Las Vegas, Nevada, October 1-4, 2014, IACIS. As the leading author I also won the Jay Liebowitz Outstanding Student Research Award, awarded at the mentioned conference.

The IS literature emphasizes the positive impact of the information provided by Business Intelligence Systems (BIS) on decision making, particularly when organizations operate in highly competitive environments (Popovič, Hackney, Coelho, & Jaklič, 2012). Kim, Shin, Kim & Lee (2011) have proved that capitalizing business intelligence and analytics act as a full mediator between IT capabilities and financial performance. These technological innovations are a main source of competitive advantage for the long-term survival of organizations (Jourdan, Rainer & Marshal, 2008; Wixom, Watson, Reynolds & Hoffer, 2008). However the key question is whether, after the implementation of BIS, users actually accept, use and take full advantage of their capabilities. User acceptance is also crucial for BIS success although in this context, in contrast with operational systems, there is a particularly pronounced difference between, on one hand, using or accepting the system and, on the other, the long-term routinization (Bhattacharjee, 2001) of using the information provided by BIS as an integral part of the business value generation process (Popovič et al., 2012). Effective use of BIS captures both routinization (systems become a part of the daily routine) and infusion (systems become embedded into the organization's work system) of Cooper and Zmud (1990) IS implementation stage model, as a part of the long-term sustained usage, leading to its ultimate success (DeLone & McLean, 2003). This can be first achieved through successful acceptance stage (Cooper & Zmud, 1990). Therefore, in the BIS context we need to understand the specific determinants that influence their acceptance and various dimensions of use from initial acceptance through the expansion and intensity of use to embeddedness.

Previous research on IT acceptance has mainly focused on general IS and thereby only considered the narrower aspect of use, merely the frequency of use and not how IS are used (Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). Thus, when studying what is effective BIS acceptance and use I broaden the notion of use by considering different dimensions of it. I thus extend earlier work on IS acceptance by providing evidence of the specific determinants influencing various dimensions of BIS use. The main goal is to understand the mechanisms for increasing the utilization and business value of BIS in organizations by enhancing the possibility of BIS becoming deeply embedded in the business to create "BI-driven decision-making routines and BI-enabled organizational processes that take managerial decision making to new levels of understanding and foresight" (Shanks, Bekmamedova, Adam & Daly, 2012).

The conceptualization of the BIS Embeddedness model includes the determinants that appeared to be vital for effective acceptance and use in the BIS context ((Grublješič & Jaklič, 2014). The framing of drivers of effective use is based on the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) with the inclusion of result demonstrability as an important behavioral belief from the Technology Acceptance Model 3 (TAM3) (Venkatesh & Bala, 2008). A vital contextual determinant of "Customer orientation" is included presenting an important external factor for embedding BIS in the business. Use of BIS is measured by three different dimensions, namely intensity, extent and embeddedness, that reflect the specifics of BIS and encompass its effective utilization.

I therefore address the gap in the literature by integrating knowledge concerning technology adoption and consider the context-specific issues encompassing the extended view on use behavior. In doing so, I follow the advice of Venkatesh et al. (2003) to tie this mature stream of research with other established streams of research with a view to guiding us toward a more cumulative nomological network. Venkatesh and Bala (2008) show that developing context-specific determinants of acceptance and use is very valuable when seeking to richly theorize about a specific IT artifact. The results provide valuable guidance for organizations, not only for those that are market oriented, where customer focus is the key motivation for using BIS. Any organization can leverage synergies from investing in BIS with enhancing organizational aspects, such as collective organizational support for BIS use reflected in social recognition and acknowledgement of the results of using BIS that lead to effective BIS utilization.

The structure of the paper is as follows. In the next section, the specifics of BIS embeddedness are elaborated. The research model is then conceptualized and hypotheses are developed. Further on, the research design, methodology, and results of the estimation are given. This is followed by a discussion of the results, including the implications for research and practice and a conclusion with suggestions for future research.

## **5.2 THE SPECIFICS OF BUSINESS INTELLIGENCE SYSTEMS EMBEDDEDNESS**

BIS are most commonly described as solutions holding quality information in well-designed data stores connected with business-friendly tools. Their goal is to provide stakeholders at various levels in an organization with timely access, effective analysis and an insightful presentation of the information generated by enterprise-wide applications, enabling them to make the right decisions or take the right actions across a broad range of business activities (Popovič, Coelho, & Jaklič, 2009; Trkman, McCormack, de Oliveira & Ladeira, 2010).

To study the influence of determinants impacting BIS acceptance along with various dimensions of their use, that is in both pre- and post-technology adoption phases, it is important to understand the specific characteristics of BIS use environment compared to operational systems (see Table 9) (Popovič et al., 2012). The use of BIS is voluntary in most cases. Venkatesh and Davis (2000), Venkatesh et al. (2003) and Venkatesh and Bala (2008) have already identified the importance of the voluntariness of use when studying IS usage behavior. Further, the structure of users is different where BIS users are generally more educated workers and mostly managers (Negash & Gray, 2008). The data in BIS are more aggregated and integrated at the level of the entire organization and there is more sharing of information, which relates to the need for an improved information culture (Marchand et al., 2001). The information needs in BIS are much less structured and the methods for identifying them are often ad-hoc, research-oriented and innovative in nature. Operational IS as well as older decision-support systems and executive IS are more oriented to the software solution and BIS more to the necessary data, centered around data warehousing and providing the analytical tools required to integrate and analyze organizational data (Frolick & Ariyachandra,

2006). With operational IS, the focus on information quality problems entails traditional problems of data quality such as accuracy and completeness, whereas the focus of BIS is more on the relevance of the information that is provided (Delone & McLean, 2003; Eppler, 2006; Popovič et al., 2009). In general, compared to operational IS, the benefits of BIS are much more indirect and long-term (Gibson, Arnot & Jagielska, 2004) which may negatively affect their perceived usefulness and, thus, their acceptance and use. All these specifics can shape the acceptance and use determinants of BIS.

Table 9. Table of differences between operational IS and BIS

	<b>Operational IS</b>	<b>BIS</b>
Level of voluntariness	Lower	Higher
Structuredness of processes in which IS are used	Higher	Lower
Methods for identifying information needs	Well-established (process-oriented)	Less established
Context for identifying information needs	Processes	Processes, business performance management
Data sources employed	Mostly from within the process	Additional data sources required
Focus of IS (orientation)	Application- and process-oriented	Data- and process-oriented
Main problems of information quality	Sound data and data access quality	Relevance
IS integration level	Process	Enterprise
Level of required reliability of IS	Higher	Lower
Benefits	Direct & immediate	Indirect & long-term
Structure of users	All organizational and educational levels	Higher educated – management
Structuredness of instructions for use	Higher	Lower (more research-oriented & innovative use)
Aggregation level of collected information	Lower	Higher
Sharing of information	Lower	Higher (integrated and aggregated information)

*Source:* based on and an extension of Popovič et al., 2012

When BIS are introduced, users need to adapt to fundamentally different ways of carrying out business processes (Deng & Chi, 2013). Organizations often experience considerable time lags in achieving routinized use before users learn and adapt to new system, often experiencing performance declines during those periods (Sharma, Yetton & Zmud, 2008), which is even more emphasized in the BIS context due to lower structuredness of processes in which IS are used. To ensure the better performance of the organization and the value added of BIS, users should accept, use and take full advantage of its capabilities. Understanding what is effective (Burton-Jones & Grange, 2013) and meaningful (Straub & Guidice, 2012) use of BIS is thus critically important (Straub & Guidice, 2012, p. iii) for achieving their designed goals and benefits. According to Burton-Jones and Grange (2013, p. 4), effective use

at the individual level is defined as “using a system in a way that helps attain the goals for using a system.” As the object of use investigated in acceptance models has mostly been general IS and in many cases at least implicitly operational IS, where using an IS is seamlessly integrated with execution of the business process, the use of IS has primarily been measured by the frequency, intensity and duration of use (e.g. Davis, Bagozzi & Warshaw, 1989). However when it comes to BIS use these measures are insufficient since, for BIS to be effectively used, mere intensity does not reflect the desired and promised outcomes from these systems as it is essential for them to be deeply embedded within the business (Shanks et al., 2012). Burton-Jones and Straub (2006) call for the development of the conceptualization of usage and the selection of usage measures for specific contexts. Therefore, moving from the use to the effective use of BIS requires an understanding of the nature and purpose of BIS (Burton-Jones & Grange, 2013). For effective BIS use, *informed action* (Burton-Jones & Grange, 2013) is thus necessary in the sense of acting upon the information obtained from BIS. I therefore employ Burton-Jones and Straub’s (2006, p. 230) dimensions of system usage measured as the use of information from BIS, which are the frequency or intensity of use, the extent of use and the nature of use. Embeddedness can be understood in the BIS context as the desired or preferred nature of use.

*The intensity of use* (Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008; Venkatesh, Brown, Maruping & Bala, 2008) is the dimension most commonly employed in the literature to measure the use of IS. This dimension of use has most often been conceptualized and operationalized as the frequency or duration, based on users’ self-assessment of the time spent using a system (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008) or the duration of their usage via system logs (Taylor & Todd, 1995; Venkatesh et al., 2003). However, these conceptualizations are limited because they do not capture the difference between effective and meaningful use and the problems users report when using the system leads to lost work time (Ceaparu et al., 2004, Deng & Chi, 2013). The intensity of use measure ignores how IS is used in an organizational context by overlooking the accounted costs with no meaningful usage or is only related to simple compliance that does not reflect the system’s success (Doll & Torkzadeh, 1998). However intensity of use is an important quantitative aspect of use, capturing how much BIS is used (frequency, intensity and duration) and is therefore also included and examined in the model as one of use dimensions.

*The extent of BIS use* should capture the extent to which the user employs the system to carry out different tasks (Burton-Jones & Straub, 2006). In the post-adoption context, more use (captured only by intensity of use) is not always considered desirable. There is a plethora of social and economic impacts at the level of the individual, the work group, and the organization (Doll & Torkzadeh, 1998) which are not only captured by the intensity of use measure. Melone (1990) argues that the use construct should describe “performance-related” usage behaviors that reflect how IT is actually used in organizations. The value of BIS is not only generated by the use of BIS, but by activities based on the information provided by BIS that are going in the right direction to achieve successful business performance management.



Therefore, for BIS use it is important if users are acting on the basis of the information provided by BIS. In this context, there is a need for measures showing how extensively BIS is utilized in an organizational context for decision support (problem solving and decision rationalization), work integration (horizontal and vertical integration), and customer service functions (Doll & Torkzadeh, 1998). Doll & Torkzadeh (1998, p. 172) state that “how extensively IT is used to perform these functions defines how effectively it is used in the organizational context.” In relation to this, Po-An Hsieh and Wang (2007, p. 216) introduce the term “extended use” that refers to using more of the complex system’s features to support an individual’s task performance, that can potentially lead to better results and realize the promised return on investments (Jasperson, Carter & Zmud, 2005). The extent of use dimension in the model captures the variety of using different BIS features to support individual’s task performance.

*Embeddedness* represents a qualitative leap in use and can be understood as the level “to which the use of BIS is an integral part of organizational activity” (Furieux & Wade, 2011, p. 579). Embeddedness has been conceptualized and named in several different ways in the literature. In the post-adoption phase of BIS implementation, from the technology diffusion perspective, use should evolve from initial acceptance through the *routinization* phase to *infusion*, which occurs when a business information system becomes more deeply embedded within the organization’s work system (Cooper & Zmud, 1990; Saga & Zmud, 1994). Importantly, routinization and infusion coexist in the post-acceptance stage and do not necessarily occur in sequence but rather occur in parallel (Po-An Hsieh & Wang, 2007, Cooper & Zmud, 1990). In the context of BIS, fusion (ElSawy, 2003) involves deeply embedding BIS within the business to create “BI-driven decision-making routines and BI-enabled organizational processes that take managerial decision making to new levels of understanding and foresight” (Shanks et al., 2012). Bhattacharjee (2001, p. 352) studied IS continuance as the post-acceptance stage based on expectation-confirmation theory (Oliver, 1980) and found support for embedded use, which is the stage when the use “transcends conscious behavior and becomes part of normal routine activity”, also considering and explaining why some users discontinue using an IS after having initially accepted it. Expectation-confirmation theory posits (Oliver, 1980) that consumers' intention to continue using is primarily determined by their satisfaction with prior use, but embedded use not only looks at how much users use the system, but also how it is used. That is why Burton-Jones and Straub (2006, p. 236) conceptualize the dimension of *deep structure* usage as exploitive system usage, which is the “extent to which users exploit features of the system to perform the tasks.” Deep structural usage can occur in the way a person restructures information or any other way that facilitates interesting new ways of seeing (Straub & Guidice, 2012). Jasperson et al. (2005, p. 542) elaborate that much post-adoptive behavior or continuing IT use is likely to reflect a “habitualization of action, where the decision to use the IT application feature occurs more or less automatically via a subconscious response to a work situation” and Ortiz de Guinea and Markus (2009) support this habitual use. Ortiz de Guinea and Markus (2009, p. 434) argue that “automatic (i.e. habitual) IT use behavior may be much more extensive than

the simple repetition of well-learned behavioral sequences”, which in turn supports use embedded into the routines of users. Li, Po-An Hsieh & Rai (2013) investigate the distinct intrinsic and extrinsic motivations for two post-acceptance usage behaviors: routine and innovative use describing their coexistence in association with routinization and infusion stages (Cooper & Zmud, 1990). Employees may display variations of both behaviors during a work day, dependent of their job position and different tasks they need to perform (Li, Po-An Hsieh & Rai, 2013). Embedded BIS use refers to both routinized and innovative use. Baxter and Berente (2010) elaborate this as embedding or making IS an integral part of work practices in order to create innovative knowledge. It captures if use of BIS is integrated into decision-making routines (both standardized and innovative decision making processes), if its use is seamlessly integrated with business process execution (where organizational processes are not interrupted by use of BIS but rather supported, enhanced and improved) and if use of insights from BIS is aligned with the organizational business strategy and overall organizational objectives.

### **5.3 CONCEPTUALIZATION OF THE RESEARCH MODEL**

Research on individual-level IT acceptance and use has provided rich theories of the determinants that influence acceptance and decisions about the use of IT. Although isolated impacts of individual, technical, social, and organizational factors on IT use are well recognized (i.e. Moore & Benbasat, 1991; Dishaw & Strong, 1999; Agarwal & Karahanna, 2000; Wixom & Watson, 2001; DeLone & McLean, 2003; Pavlou, 2003; Kwahk & Lee, 2008), a more comprehensive understanding of the various factors that explain the acceptance and continued use of a specific (in my case BIS) artifact is needed. Petter and McLean (2009) point to the need to analyze the link between the dimensions of performance for specific IS separately. Venkatesh and Bala (2008, p. 275) also say that developing context-specific acceptance and use determinants has “immense value in theorizing richly about the specific IT artifact in question and identifying determinants that are specific to the type of technology being used.” To address this gap, I explore how the interplay of previously identified factors from existing IT/IS acceptance models with contextual extensions enriches the explanation of the acceptance and effective use of BIS. As encouraged in Venkatesh et al. (2008) I go beyond *intentionality* framework, and expand our understanding by providing drivers of different conceptualizations of BIS use.

The motives underlying BIS acceptance and effective use indeed introduce additional significant constructs (like customer orientation) that cannot be satisfactorily dealt with or explained solely by existing theoretical frameworks or acceptance models individually. Based on this, I propose an integrated theoretical framework created from a synthesis of the relevant constructs of existing theories and extended with additional constructs derived from case studies in a context-specific environment (Grublješič & Jaklič, 2014). The research model (see

Figure 4) is empirically validated through a survey analysis. The rationale for including the factors in the model and the relationships between the factors are described below.

### **5.3.1 The impacts of effort perceptions, performance perceptions, social influence, and result demonstrability**

Behavioral, normative and control beliefs form individual's intention to perform a behavior (Ajzen & Fishbein, 2005). These variables represent three major kinds of considerations that influence the decision to engage in a given behavior: "the likely positive or negative consequences of the behavior, the approval or disapproval of the behavior by respected individuals or groups, and the factors that may facilitate or impede performance of the behavior" (Ajzen & Fishbein, 2005, p. 193). The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) incorporates three distinctive behavioral, normative and control beliefs – performance expectancy, social influence and effort expectancy – that provide the individual's behavioral intention to use a technology. In addition to these another important behavioral belief – result demonstrability was found to be crucial for BIS acceptance in Grublješič and Jaklič's (2014) case study and was thus included in the model. The UTAUT's "performance expectancy" and "effort expectancy" are operationalized as perceptions based on the TAM's perceived usefulness and perceived ease of use (Davis, 1989) since all other antecedents also measure perceptions and this study has captured the perceived beliefs influencing BIS acceptance and use that are based on hands on experience (Venkatesh & Bala, 2008) of using BIS.

Effort perceptions encompass the extent of ease associated with BIS use and performance perceptions the extent to which a person believes that using BIS enhances his or her work performance (Venkatesh et al., 2003; Venkatesh & Bala, 2008). Research reveals that effort perception of using BIS are generally not problematic and that users in general perceive BIS as easy to use (Grublješič & Jaklič, 2014). These two represent individualistic effort and performance considerations that form one's intention.

But one's decisions to engage in a behavior are formed also as a consequence of one's interaction in an organizational environment. Therefore social influence as well as result demonstrability are being increasingly recognized as having an influence on an individual's cognitive process to perform a behavior (Venkatesh et al., 2003; Venkatesh & Bala, 2008). Venkatesh et al. (2003, p. 451) define social influence as "the degree to which an individual perceives that important others believe he or she should use the new system". The inclusion of social influence points to the fact that individuals also behave according to their beliefs about how others will view them as a result of having used the technology. In the BIS context, social influence plays an especially important role for the widespread use and embedding of BIS into a business (Grublješič & Jaklič, 2014), since BIS use is mostly voluntary and the benefits of use are more indirect and long-term compared to operational IS. Therefore, if users perceive that the results of use are visible (Venkatesh & Davis, 2000) and that the organization promotes its use (Moore & Benbasat, 1991) the use of BIS will become more embedded into their routines.

Relatedly, the demonstrability of results of using BIS, such as having knowledge of the actual results of work activities, presents the key psychological state underlying work motivation (Hackman & Oldham, 1976). Agarwal and Prasad (1997) found a significant relationship between result demonstrability and usage intentions. Venkatesh and Bala (2008, p. 277) define result demonstrability as “the degree to which an individual believes that the results of using a system are tangible, observable and communicable” and the independent impact of this construct was included and supported in their TAM3 model.

The tangible recognition of benefits, as measured by result demonstrability, is positively correlated with performance perceptions, as Agarwal and Prasad (1997, p. 571) state that they “appear to work in tandem” since users are concerned with “rationalizing their decisions both to themselves as well as to the others to avoid cognitive dissonance.” These two constructs are therefore related but measure different perceptions. Performance perceptions relate to efficient (and immediate) worker performance using the system while result demonstrability to effectiveness of an individual relating to long-termed impact of using the system on organizational performance. Since in the BIS context, benefits of its use are more indirect and long-termed and connected to organizational performance we should expect that result demonstrability should have greater impact on individual intentions to use BIS (than performance perceptions). The importance of social approval and recognition of the results of using BIS is also connected to BIS specific as compared to operational IS, that with BIS use there is much more sharing of information and higher level of information transparency. Otherwise the potential increase in transparency may be considered in some environments as undesirable and lead to the level of use below expectancies.

Most of the acceptance models postulate behavioral intention to accept IS as the primary direct determinant of behavior, and Taylor and Todd (1995) provide support for the predictive power of behavioral intention as an important mediating variable influencing behavior. I thus include behavioral intention as a key dependent variable in the model through which effort perceptions, performance perceptions, social influence, and result demonstrability influence use. Based on this, I posit the first set of four hypotheses:

*H1: Effort perceptions positively influence Behavioral intention to use BIS.*

*H2: Performance perceptions positively influence Behavioral intention to use BIS.*

*H3: Social influence positively influences Behavioral intention to use BIS.*

*H4: Result demonstrability positively influences Behavioral intention to use BIS.*

### **5.3.2 Usage behavior**

Several prior studies have employed existing technology acceptance models to explain continued usage behavior, and empirically demonstrated their capability in predicting initial usage as well as use behavior occurring long after initial acceptance (Straub, Limayem & Karahanna, 1995; Parthasarathy & Bhattacharjee, 1998; Karahanna, Straub & Chervany, 1999; Venkatesh & Morris, 2000; Legris, Ingham & Collerette, 2003; Liu & Forsythe, 2011;

Venkatesh, Thong & Xu, 2012). Some efforts have also been made to study different conceptualizations of use through the lens of the TAM and UTAUT, but they still only focused on the frequency, duration and intensity of use (Venkatesh et al., 2008) or extended use in the sense of using more of the technology's features (Po-An Hsieh & Wang, 2007; Venkatesh et al., 2012). Nevertheless, all these studies suggest it is appropriate to study effective BIS use to reflect different stages of post-adoptive use behavior grounded on these seminal frameworks extended with context-specific issues. Moreover, Venkatesh et al. (2012, p. 173) suggest that future research should build on the UTAUT2 by "including more structural elements of use." Venkatesh et al. (2008, p. 498) also note that multiple measures of system use "reduce the threats of common method bias and enhance construct validity."

Burton-Jones and Straub (2006) state that TAM (Davis, 1989) explains IT acceptance, but that the dependent variables are usage intentions and usage behavior and it is unclear whether either of these constructs captures the notion of acceptance and use. Therefore, Burton-Jones and Straub (2006, p. 228) present a "systematic approach for reconceptualizing the system usage construct in particular nomological context". They propose that researchers should define system usage in a particular context and explicate its underlying assumptions. Further on, they should justify which elements of usage are most relevant for their study, and choose measures for each element that tie closely to the other constructs in their nomological network. I thus employ Burton-Jones and Straub's (2006) dimensions of BIS usage measured as the use of information provided by BIS. In order to know how to improve each dimension of use, we need to understand the mechanisms that can achieve that. Research suggests that the amount of time spent on an activity (intensity and duration of use) is best predicted by internal motivation and that individuals tend to spend more time on activities they are internally motivated to perform (Csikszentmihalyi & LeFevre, 1989). Empirical evidence indicates that behavioral intention is driven by and reflects various internal motivations (Venkatesh, 2000; Venkatesh et al., 2003). External factors, particularly an organization's customer orientation which depends on the environment in which the organization operates, should on the other hand impact more on how system use is embedded in work routines. The work activities that make up an employee's job are not typically driven by internal motivation, but are instead determined by external needs that relate to the work environment (Venkatesh et al., 2008). Through this reasoning, I thus hypothesize that the antecedents of use behavior will exert varying impacts on different dimensions of use.

### **5.3.3 Impact of behavioral intention**

Behavioral intention is an indication of a person's "readiness to perform a behavior" (Fishbein & Ajzen, 2011, p. 39). Behavioral intention is an important causal predictor of behavior that mediates the influence of various behavioral, normative and control beliefs (e.g. effort perceptions, performance perceptions, result demonstrability and social influence) on behavior (Davis et al., 1989). This subjective probability (Fishbein & Ajzen, 2011) captures individuals' internal motivation to perform a behavior based on volitional control and their free will. Voluntariness of use is one of the specific characteristics of using BIS as compared

to operational IS where use is mostly mandatory or necessary for carrying out business processes. The formation of an intention to carry out a behavior is thought to be a necessary precursor to behavior and the inclusion of intention has been found to increase the predictive power of models relative to models which do not include intention (Taylor & Todd, 1995). However individuals' beliefs and consequently their behavioral intention can change when they are faced with new information and due to various internal and external stimuli they may become less predictive of behavior over time (Venkatesh et al., 2008). Greater usage experience may imply "opportunities to strengthen the link between cues and behavior, which then facilitates habitualization" (Venkatesh et al., 2012, p. 166). We should therefore expect that behavioral intention should have varying impacts on different dimensions and complexities of BIS use, from the greatest positive impact on intensity, a smaller one on extent of use and the least on embeddedness. Following this rationale, I hypothesize:

*H5a: Behavioral Intention positively influences the Intensity of BIS use.*

*H5b: Behavioral Intention positively influences the Extent of BIS use.*

*H5c: Behavioral Intention positively influences the Embeddedness of BIS.*

*H5d: Behavioral Intention has different positive impacts on the three dimensions of the use of BIS.*

#### **5.3.4 Impact of facilitating conditions**

Organizational factors and its environment are exposed to importantly impact BIS implementation and use throughout the organization (Wixom & Watson, 2001; Yeoh & Koronios, 2010, Grublješič & Jaklič, 2014). These refer to external factors that can impact behavior directly (Venkatesh et al., 2008). Behavioral intention is "a reflection of an individual's *internal* schema of beliefs" and it "does not represent the *external* factors that can influence the performance of a behavior" (Venkatesh et al., 2008, p. 485). These external factors "consider nonvolitional factors for which behavioral intention is unable to account" (Venkatesh et al., 2008, p. 485).

Facilitating conditions are used in acceptance models as a construct that should address the role of external factors. They are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453). This determinant also proved to be vital for the initial acceptance, expansion and long-term use of BIS in Grublješič and Jaklič's (2014) case study analysis and is hence included in the model. In the UTAUT (Venkatesh et al., 2003), the determinant of facilitating conditions is hypothesized to directly influence system use based on the idea that in an organizational environment many aspects of facilitating conditions, such as training and support provided, will be available freely across users within an organization (Venkatesh et al., 2012).

It has been demonstrated that when both performance expectancy and effort expectancy constructs are present, facilitating conditions become non-significant for predicting behavioral

intention (Venkatesh et al., 2003). Venkatesh (2000) also found support for full mediation of the influence of facilitating conditions on intention by effort expectancy. Facilitating conditions thus have a direct influence on usage beyond that which is explained by behavioral intention and are modeled as a direct antecedent of usage.

Facilitating conditions generally refer to individual perceptions of the availability of technological and/or organizational resources that can remove barriers to using a system (Venkatesh et al., 2008, p. 485). In the BIS context, there is a particular emphasis on the presence of a BIS project leader and having a pronounced sponsor of BIS, which helps a great deal in ensuring the BIS becomes embedded throughout the organization and in building a culture of regular, deep structural BIS usage (Grublješič & Jaklič, 2014). Thus, the questions of how much, how extensively and how routinely users use BIS depend on the quality and presence of facilitating conditions. After integrating these arguments, I put forward the next hypotheses:

*H6a: Facilitating conditions positively influence the Intensity of BIS use.*

*H6b: Facilitating conditions positively influence the Extent of BIS use.*

*H6c: Facilitating conditions positively influence the Embeddedness of BIS.*

*H6d: Facilitating conditions have different positive impacts on the three dimensions of the use of BIS.*

Facilitating conditions have limitations that constrain their overall scope in capturing the broad effect of external factors (Venkatesh et al., 2008). These include the presence of incomplete information and uncertainty regarding a behavior (Sheeran, Trafimow & Armitage, 2003).

### **5.3.5 Impact of customer orientation<sup>6</sup>**

Through the lens of importance of external factors in predicting behavior I introduce a customer orientation construct. An organizational customer orientation emerged as a salient determinant influencing BIS acceptance and use in the case-study analysis of Grublješič and Jaklič (2014) and was thus included in the BIS embeddedness model as having a direct impact on use behavior. This determinant has not been included in previous IT acceptance models and provides valuable insights particularly for BIS context use.

Customer orientation is most commonly employed as a construct in marketing research and is defined as a “set of beliefs that customer needs and satisfaction are the priority of an organization” (Liu, Luo & Shi, 2002, p. 369), while not excluding the needs of “all other stakeholders such as owners, managers, and employees, in order to develop a long-term

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<sup>6</sup> A whole paper devoted to researching the importance of customer orientation for embeddedness of BIS has been published as Grublješič, T., & Jaklič, J. (2014). Customer oriented management practices leading to BIS embeddedness. *The Online journal of applied knowledge management*, 2(1), 11-27. The paper was also presented at the Knowledge Management Conference 2014 (KM 2014), Blagoevgrad, Bulgaria, International Institute for Applied Knowledge Management, and has won the Best Research Paper Award.

profitable enterprise” (Deshpande et al., 1993, p. 27). Customer orientation relates to the competitiveness of the environment in which organizations operate and hence market-oriented organizations are more dependent on innovative and competitive information (Lee & Xia, 2006). As BIS provide innovative information (Elbashir, Collier & Sutton, 2011), they are a prerequisite for many organizations to compete in the marketplace (Wixom & Watson, 2010), particularly when they operate in highly competitive environments (Popovič et al., 2012). The technology, organization and environment framework includes environmental competitiveness to have an impact on the adoption and acceptance of an IT innovation (Tornatzky & Fleischer, 1990). Deshpande, Farley & Webster (1993) treat customer orientation and market orientation as interchangeable concepts. Birgelen, Ruyter and Wetzels (2003) posit that decision makers acting in a setting where customer satisfaction is more strongly embedded are more inclined to set customer-oriented priorities on the basis of customer satisfaction information. A customer orientation should have a favorable impact on business performance and enhance customer satisfaction as well as organizational productivity (Deshpande et al., 1993; Karimi, Somers & Gupta, 2001).

Literature suggests that IT implementation plays the role of a complementary asset for communication with customers (Feng, Sun, Zhu & Sohal, 2012, Petter, DeLone & McLean, 2012). Tallon, Kraemer & Gurbaxani (2000) found that market-focused firms use IT to create or enhance a value proposition for their customers. Bearing in mind the specific characteristics of BIS, they can enable reliable information sharing, increase knowledge reach and richness, reduce ambiguity and increase the profundity of new information and knowledge gained from customer information (Alavi & Leidner, 2001). Accordingly, the extent of BIS use dimension also measures the use of BIS to provide a more differentiated and customized service to customers (Doll & Torkzadeh, 1998).

While behavioral, normative and control beliefs directly form one’s behavioral intention, customer orientation is an external facet and similarly as facilitating conditions directly influences one’s behavior (Venkatesh et al., 2008). This is based on the idea that in an organizational environment customer orientation can serve as a proxy for actual behavioral control, representing “opportunities needed to perform a behavior” (Taylor & Todd, 1995, p. 150) and influence behavior directly (Venkatesh et al., 2012). This determinant capturing organizational environment and culture also represents a nonvolitional factor that behavioral intention is unable to account for (Venkatesh et al., 2008). Customer orientation is thus hypothesized to have a direct but varying impact on different dimensions of BIS use. Integrating all these arguments, we should expect employees in organizations that focus on customers should use BIS more and that particularly BIS should be more embedded in their routines. On this basis, I hypothesize:

*H7a: Customer orientation positively influences the Intensity of BIS use.*

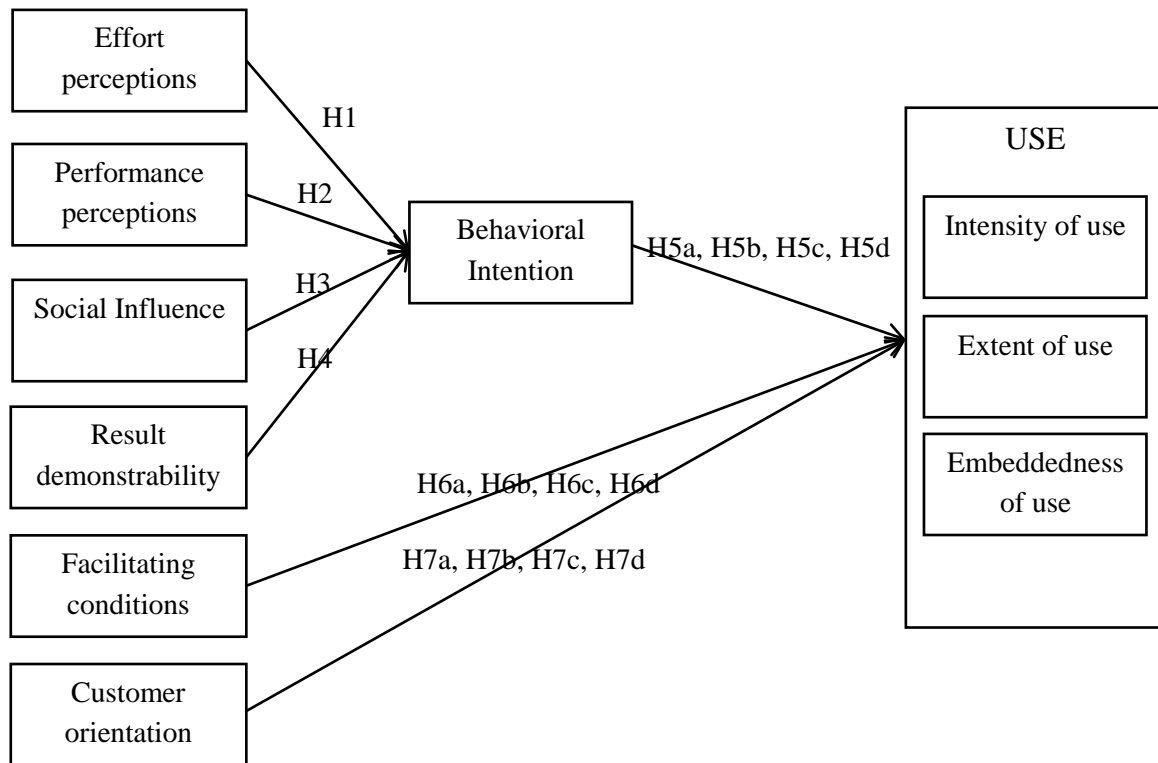
*H7b: Customer orientation positively influences the Extent of BIS use.*

*H7c: Customer orientation positively influences the Embeddedness of BIS.*



*H7d: Customer orientation has different positive impacts on the three dimensions of the use of BIS.*

Figure 4. The BIS embeddedness conceptual model



## 5.4 RESEARCH DESIGN AND METHODOLOGY

### 5.4.1 Research instrument

The questionnaire was developed by building on the previous theoretical basis to assure content validity. To ensure face validity, the questionnaire was pre-tested (Cooper & Schindler, 2003) using a focus group comprising practitioners and IS academics from the field who were not included in the subsequent research. Minor changes were made based on their suggestions, mostly involving the adaptation of the questionnaire items to the specific context of BIS use, i.e. integrating voluntariness of use in the indicators and unifying operationalization of all indicators to measure perceptions. I used a structured questionnaire with seven-point Likert scales, with anchors ranging from totally disagree (1) to totally agree (7), for all items used in the study to measure the impacts on BIS acceptance and the different dimensions of use, except for the extent of BIS use which was measured with anchors ranging from not at all (1) to a great deal (7). Coelho and Esteves (2007) argue that a scale with more than five points generally shows higher convergent and discriminant validity than a five-point scale and thereby has greater explanatory power and thus confirms the higher nomological validity.

### 5.4.2 Measures

The measurement items were developed based on the extensive literature review and supported by expert opinions. All constructs in the proposed models are based on reflective multi-item scales.

To measure the effort perceptions construct, I used previously researched and validated items (four items) provided by Venkatesh et al. (2003), operationalizing them to measure perceptions based on the TAM's perceived ease of use (Davis, 1989), as I was questioning users with experience of using BIS. I used six items to measure performance perceptions, which were taken from Venkatesh et al. (2003), Davis et al. (1989), Venkatesh & Bala (2008), Compeau & Higgins (1995) and Compeau, Higgins & Huff (1999) in order to fully capture and reflect context-specific performance perceptions. Four items for measuring social influence were adapted from Venkatesh et al. (2003). Result demonstrability was measured by four validated items taken from Venkatesh and Bala (2008) based on Moore and Benbasat (1991). The facilitating conditions scale was developed by combining four items from Venkatesh et al. (2003), one item from Goodhue (1998) and another item that was established based on the renewal capability dimension of Shanks et al. (2012) which measures whether BIS capabilities are continuously renewed to provide valuable insights. Combining all these items captures the full capacity of facilitating conditions needed for effective BIS use. Customer orientation construct was measured using six items with the highest factor loadings from Liu et al. (2002). The behavioral intention three-item scale was drawn from Wixom and Todd (2005), and operationalized to measure the creation of beliefs dependent on the volitional state.

Use behavior was measured as a reflective composite index of three dimensions – capturing the intensity, extent and embeddedness of BIS use – following Burton-Jones and Straub's (2006) classification. These three aspects of BIS use were conceptualized as three different constructs since it is expected that there will be varying impacts on them. I search for impacts on pure quantitative aspect – of how much BIS is use (intensity), on the scope of diversities of use (extent) and on qualitative aspect of how it is infused into workers routines (embeddedness). None of the original measurements of use alone captures the whole concept of effective BIS use and therefore use of BIS was measured with previously researched and validated indicators for intensity of use and extent of use, while BIS embeddedness items were developed based on the dimensions of BIS embeddedness in the business from Shanks et al. (2012). The three intensity of use items were adapted from Wixom and Todd (1995), capturing the increasing intensity of BIS use. The extent of BIS use construct was measured by adapting Doll and Torkzadeh's (1998) measures (having highest factor loadings and being relevant for the BIS use context) of how extensively BIS is utilized in an organizational context for decision support, divided into problem solving and decision rationalization (explaining decisions and improving decisions); then work integration, divided into horizontal integration and vertical integration (work planning and vertical communication); and customer service functions. It measures the scope and variety of uses of BIS features. No

established measures were available to specifically measure embedded use. Nevertheless, Shanks et al. (2012) provide five dimensions of BIS embeddedness synthesized from the literature, namely: technology, business processes, evidence-based management, renewal capability, and business strategy. The technological component of embeddedness is already captured in the performance perceptions construct and renewal capability in organizational facilitating conditions. The remaining three were thus used to operationalize embedded BIS use. They capture individual's perception of whether their use of BIS is seamlessly integrated with execution of the business process, whether BIS is embedded into their decision-making routines and their perceptions of whether the importance and use of insights from BIS are embedded in the business strategy formulation process, leading to the alignment of the BIS and business strategy (Shanks et al., 2012). All three manifest items had large factor loadings in the confirmatory factor analysis, proving the reliability and validity of these measures for the BIS embeddedness construct. Appendix C provides a detailed list of all of the indicators used in the measurement model.

The proposed measurement model included 60 manifest or observable variables loading on to 10 latent constructs (for a detailed description of the indicators, see Appendix C): (1) *Effort perceptions*; (2) *Performance perceptions*; (3) *Social influence*; (4) *Result demonstrability*; (5) *Facilitating conditions*; (6) *Customer orientation*; (7) *Behavioral intention*; and three dimensions of BIS use, namely (8) *Intensity of BIS use*; (9) *Extent of BIS use*; and (10) *BIS embeddedness*.

### **5.4.3 Data collection**

The data were collected through a survey of 2,173 medium- and large-sized having more than 50 employees business organizations in an EU country, namely Slovenia. These organizations represent a whole population (by the mentioned criterion) of registered organizations in an official database published by a National Agency for Public Legal Records. The participants were given introductory letter explaining the aims and procedures of the study, assuring them that the information collected will not be revealed in an individual form. An explanation and a definitions of what BIS encompass was provided in order to elucidate who I would like to be qualified as target respondents, since most definitely not all of the sampled firms have implemented BIS to support their operations and processes. Questionnaires were addressed to a wide range of employees, that is, all users of BIS (top management, heads of departments and divisions, IS managers, etc.) The questionnaires were sent to the contact persons available in the database, with a request to distribute the questionnaires to relevant users of BIS. A total of 157 individuals responded while at the same time 75 questionnaires were returned to researchers with "return to sender" message, indicating that the addresses were no longer valid or the companies had ceased to exist. Subsequently, follow up surveys were sent out, resulting in an additional 38 responses, yielding altogether a sample of 195 completed surveys. I have discounted the number of "return to sender" mails following the approach of Prajogo and McDermott (2005), so the final response rate was 9.3 %. This response rate was

calculated according to the whole population of contacted firms. Since not all contacted firms count as the target sample the actual response rate might be much higher.

#### **5.4.4 Data analysis**

A form of structural equation modeling (SEM) was used to carry out the data analysis. SEM techniques enable researchers to assess and modify theoretical models and are becoming increasingly popular in IS research because of their great potential for further theory development (Gefen, Straub & Boudreau, 2000). To conduct the data analysis, partial least squares (PLS) path modeling using Smart PLS was chosen. This is a widely used methodology in the IT and IS field as it is suitable for predicting and theory building because it examines the significance of the relationships between the research constructs and the predictive power of the dependent variables (Chin, 1998).

Four reasons motivated the choice of PLS path modeling. First, PLS path models can be very complex, i.e. they consist of many latent and manifest variables, and the number of these may be high in relation to the number of observations (Henseler, Ringle & Sinkovics, 2009) as in this case. The second is its suitability for a relatively small sample size as is the case in this research (Henseler et al., 2009). The guideline for such a sample size when using PLS modelling is that the sample should be equal to or larger than ten times the largest number of paths directed at a particular construct in the mode (Chin, 1998). The minimum acceptable sample size is thus forty, derived because the largest number of structural paths directed at the construct result demonstrability is four. Third, the PLS path modeling approach is “more appropriate when the research model is in an early stage of development and has not been tested extensively” (Zhu, Kraemer, Gurbaxani & Xu, 2006, p. 528). The literature review showed that empirical tests of BIS and particularly tests of the acceptance and effective use of BIS are still scarce. The fourth reason in favor of the use of this approach is that the assumptions about the randomness of the sample and the normality of the distribution are less stringent (Bagozzi, 1994) and “there are no distributional requirements” (Fornell, 1982, p. 443). The estimation and data manipulation were performed using Smart PLS (Ringle, Wende & Will, 2005).

### **5.5 RESULTS**

#### **5.5.1 Descriptive analysis**

Table 10 presents the means and standard deviations of the manifest variables. In the collected dataset the means vary between 4.071 for FC3 (the BIS is not compatible with other systems I use) and 6.051 for PP1 (I would find the BIS to be useful in my job), which indicates that users in general perceive the BIS to be beneficial for their work performance. The highest means are found in the behavioral intention indicators, showing that people are in general internally motivated to use the BIS, while the lowest means are found in the extent of use construct. The means for all of the measures (the average mean is 5.200) are around 1.7 scale points to the right of the center of the scale, suggesting a slightly left (negative) skewed distribution. Standard deviations vary between 1.087 for PP6 and 0.990 for PP1. The extent of

BIS use indicators are those that globally show the highest standard deviations, whereas the effort perceptions indicators are those with the smallest variability.

### 5.5.2 Measurement of reliability and validity

I first examined the reliability and validity measures (see Table 10) for the reflective measurement model and all of them were satisfactory in the initial model (Henseler et al., 2009) so I further tested the loadings of the items against the value 0.7 (Hulland, 1999). The manifest variables PP6, RD4 and FC3 had very weak, although statistically significant (at the 0.05 significance level) loadings on their respective latent constructs and were thus removed. Manifest variables FC1, FC2 and CO1 had marginal loadings to 0.7 (0.68, 0.68 and 0.62, respectively) and were retained for sound theoretical reasons. Once the manifest variables that did not load satisfactorily had been removed, the model was rerun. Since all reliability and validity measures in the final model showed a substantial increase, it was appropriate to discard the indicators with low standardized loadings (Henseler et al., 2009).

In the final model, all instances of Cronbach's alpha, which is usually the first criterion for internal consistency and provides an estimate of the reliability based on the indicator correlations (Henseler et al., 2009), by far exceeded the 0.7 threshold (Nunnally & Bernstein, 1994). The composite reliability measure, which takes into account that indicators have different loadings (Henseler et al., 2009), was then applied. Without exception, the latent variables' composite reliabilities are higher than 0.8 and in most cases even higher than 0.9 (which are the thresholds for more advanced stages of research) showing the high internal consistency of indicators measuring each construct and thus confirming the construct reliability (Nunnally & Bernstein, 1994). As suggested by Fornell and Larcker (1981), the average variance extracted (AVE) was used as a criterion of convergent validity. The AVE is generally around 0.6 or higher, hence exceeding the threshold of 0.5 (Fornell & Larcker, 1981). The reliability and convergent validity of the final measurement model were also confirmed by computing standardized loadings for the indicators and Bootstrap t-statistics for their significance (see Table 10). All standardized loadings of the indicators in the final model exceeded (or were marginal to) the 0.7 threshold and without exception they were found to be significant at the 0.001 significance level.

Table 10. Means and standard deviations and reliability and validity measures of the measurement model for BIS embeddedness model

Constructs	Ind.	Mean	Std. Dev.	Initial model		Final model		Estimates (initial model)			Estimates (Final model)		
				Loadings	t-Values	Loadings	t-Values	Cronbach's Alpha	Composite reliability	Average Variance Extracted	Cronbach's Alpha	Composite reliability	Average Variance Extracted
Effort Perceptions	EP1	5.594	1.029	0.8752	42.6655	0.8752	44.0949	0.8511	0.8976	0.6877	0.8511	0.8976	0.6877
	EP2	5.525	1.103	0.8901	53.8780	0.8901	51.1977						
	EP3	5.091	1.234	0.7819	12.1467	0.7819	11.4503						
	EP4	5.182	1.147	0.7623	14.2646	0.7623	13.8375						
Performance Perceptions	PP1	6.051	0.990	0.8753	35.4333	0.8827	39.2592	0.8928	0.9211	0.6718	0.9282	0.9458	0.7777
	PP2	5.747	1.239	0.8605	15.0293	0.8634	15.5777						
	PP3	5.853	1.139	0.9327	61.2760	0.9373	64.3095						
	PP4	5.763	1.257	0.8939	24.3525	0.8916	24.0298						
	PP5	5.723	1.246	0.8365	14.1878	0.8307	14.1167						
	PP6	4.247	1.807	0.3943	4.4299								
Social	SI1	5.058	1.584	0.7849	13.2918	0.7849	13.7186	0.8042	0.8714	0.6290	0.8042	0.8714	0.6290

Influence	SI2	5.123	1.522	0.7995	13.2799	0.7995	13.7521						
	SI3	5.576	1.252	0.8220	18.7695	0.8220	18.4359						
	SI4	5.695	1.242	0.7647	11.3863	0.7647	11.0090						
Result Demonstrability	RD1	5.646	1.093	0.8857	46.3059	0.8979	49.0824	0.8153	0.8782	0.6495	0.8558	0.9123	0.7763
	RD2	5.607	1.076	0.8914	41.6365	0.9019	43.7826						
	RD3	5.720	1.123	0.8348	16.0673	0.8422	13.3874						
	RD4	4.977	1.737	0.5675	7.1293								
Facilitating Conditions	FC1	5.297	1.547	0.6811	12.3014	0.6768	11.1274	0.7781	0.8475	0.5006	0.8233	0.8774	0.5914
	FC2	5.508	1.247	0.6811	12.4714	0.6892	12.5535						
	FC3	4.071	1.623	0.2711	2.4388								
	FC4	5.234	1.600	0.8271	20.9498	0.8429	24.8785						
	FC5	5.223	1.556	0.8622	39.5826	0.8725	45.3976						
	FC6	4.789	1.527	0.7581	17.9887	0.7430	16.0425						
Customer Orientation	CO1	5.508	1.533	0.6187	7.1457	0.6187	7.4044	0.8732	0.9037	0.6121	0.8732	0.9037	0.6121
	CO2	5.419	1.365	0.8207	20.9663	0.8207	20.0357						
	CO3	5.039	1.466	0.8046	17.4539	0.8046	18.8432						
	CO4	5.469	1.477	0.8188	21.2109	0.8188	21.2997						
	CO5	4.723	1.678	0.7884	14.5884	0.7884	14.3022						
	CO6	4.727	1.654	0.8227	21.1741	0.8227	20.6765						
Behavioral Intention	BI1	5.769	1.387	0.9663	128.112	0.9663	133.8429	0.9630	0.9759	0.9311	0.9630	0.9759	0.9311
	BI2	5.665	1.415	0.9734	128.637	0.9734	136.4015						
	BI3	5.665	1.473	0.9551	71.5714	0.9552	77.1354						
BIS use													
Intensity of BIS use	IU1	5.379	1.484	0.8970	32.8202	0.8970	29.8016	0.8879	0.9304	0.8168	0.8879	0.9304	0.8169
	IU2	4.956	1.626	0.9304	92.7760	0.9302	91.6165						
	IU3	5.356	1.421	0.8833	26.1379	0.8836	27.6668						
Extent of BIS use	PS1	5.127	1.539	0.7569	17.2411	0.7564	17.4118	0.9738	0.9757	0.6577	0.9738	0.9757	0.6578
	PS2	5.273	1.449	0.8435	30.3366	0.8433	31.4192						
	PS3	5.193	1.491	0.8473	32.7674	0.8472	32.3620						
	ED1	5.011	1.592	0.8261	23.2312	0.8259	24.0616						
	ED2	5.225	1.505	0.8764	38.4005	0.8763	38.8311						
	ED3	5.198	1.532	0.8713	36.4255	0.8711	37.2776						
	ID1	5.066	1.573	0.8779	41.0467	0.8778	40.9514						
	ID2	5.106	1.562	0.8758	37.6814	0.8757	37.8242						
	ID3	5.194	1.532	0.8853	42.8322	0.8852	44.2679						
	HI1	4.809	1.690	0.8205	25.8931	0.8205	26.2844						
	HI2	4.792	1.659	0.8212	23.4496	0.8213	24.2043						
	HI3	4.977	1.648	0.8210	22.6901	0.8213	23.0713						
	WP1	5.083	1.610	0.7749	14.3216	0.7751	14.6442						
	WP2	4.553	1.690	0.7397	18.5075	0.7397	20.0423						
	WP3	4.680	1.699	0.7387	17.5119	0.7387	17.9606						
	VC1	4.787	1.733	0.7316	15.0580	0.7321	14.7176						
	VC2	5.017	1.737	0.7485	14.4860	0.7492	14.8239						
	VC3	5.000	1.764	0.7616	15.1343	0.7623	15.3225						
	CS1	4.937	1.624	0.7800	19.5023	0.7800	19.5552						
	CS2	4.989	1.632	0.8044	21.4949	0.8043	22.6800						
	CS3	4.891	1.621	0.7955	21.1395	0.7955	21.9562						
BIS embeddedness	EMB1	5.060	1.413	0.8891	35.3388	0.8888	33.9114	0.9123	0.9450	0.8514	0.9123	0.9450	0.8514
	EMB2	5.069	1.433	0.9513	83.1864	0.9514	87.4007						
	EMB3	4.965	1.434	0.9266	54.0618	0.9269	55.5824						

The discriminant validity is shown by the following two procedures: (1) a comparison of the item cross-loadings with the construct correlations (Gefen & Straub, 2005); and (2) a determination of whether each latent variable shares more variance with its own measurement variables or with other constructs (Fornell & Larcker, 1981; Chin, 1998).

The assessment of the indicator loadings on their corresponding constructs is the first procedure for testing the discriminant validity. As shown in Appendix D, the figures indicate that the manifest variable correlations with their theoretically assigned latent variables are in order of magnitude larger than other loadings on other constructs (Gefen & Straub, 2005). Since the loadings are larger than the other values in the same rows, that is cross-loadings (Henseler et al., 2009), all of the item loadings met the criteria of the first procedure in the assessment of discriminant validity.

For the second procedure, I have compared the square root of AVE for each construct with the correlations with all other constructs in the model (see Table 11). Theory suggests that the square root of the AVE of each construct should be much larger than the correlation of the

specific construct with any of the other constructs in the model (Chin, 1998) and should be at least 0.50 (Fornell & Larcker, 1981). It can be observed that all of the square roots of AVE are significantly higher (and also substantially larger than the threshold) than the correlations between the constructs.

Table 11. Correlations between the latent variables and square roots of the average variance extracted for BIS embeddedness model

	Effort Perceptions	Performance perceptions	Social Influence	Result Demonstrability	Facilitating Conditions	Customer Orientation	Behavioral Intention	Intensity of BIS use	Extent of BIS use	BIS Embeddedness
Effort perceptions	<b>0.8292</b>									
Performance perceptions	0.4941	<b>0.8818</b>								
Social Influence	0.3677	0.4362	<b>0.7930</b>							
Result Demonstrability	0.7371	0.5715	0.3632	<b>0.8810</b>						
Facilitating Conditions	0.5863	0.4513	0.4286	0.5014	<b>0.7690</b>					
Customer Orientation	0.1783	0.2469	0.2016	0.2182	0.2395	<b>0.7823</b>				
Behavioral Intention	0.3980	0.4138	0.4026	0.4548	0.4520	0.1934	<b>0.9649</b>			
Intensity of BIS use	0.5325	0.4959	0.4715	0.4919	0.6304	0.1951	0.5871	<b>0.9038</b>		
Extent of BIS use	0.4419	0.4698	0.4752	0.4158	0.5014	0.2481	0.4502	0.7646	<b>0.8110</b>	
BIS Embeddedness	0.3231	0.3886	0.4162	0.3527	0.5166	0.3485	0.4455	0.7250	0.6736	<b>0.9227</b>

The results of both tests show sufficient discriminant validity confirming that all the measurements are assigned to the appropriate and theoretically different concepts.

Diamantopoulos and Winklhofer (2001, p. 272) note that “under reflective measurement, multicollinearity [a high degree of correlation between indicators] is not an issue because only simple regressions are involved (in which the indicator serves as the criterion and the latent variable as predictor)”. The test of multicollinearity is therefore problematic and necessary only for formative models, involving multiple regressions, where excessive collinearity (VIF higher than 10) among indicators makes it difficult to separate the distinct influences of manifest variables on latent variables.

### 5.5.3 Results of the model estimation

After establishing that the outer model estimations are reliable and valid, estimates of the inner path model can be evaluated (Henseler et al., 2009), including a test of the significance of the hypothesized relationships between the constructs. For this propose, bootstrapping with 1,000 replicates was conducted. The structural model was then assessed (see Figure 5) by examining the coefficients of determination ( $R^2$ ) of the endogenous latent variables, the estimates for the path coefficients of relationships in the structural model and their significance levels (via bootstrapping) (Chin, 1998).

As shown in Figure 5, the influence of effort perceptions, performance perceptions, social influence, and result demonstrability explain about 28.7% of the variance in behavioral intention. Looking at the explained variability of the intensity of BIS use, it can be seen that 51.2% of the variance in intensity of use is accounted by the influence of behavioral intention and facilitating conditions (as customer orientation was found to play no significant role). Further on, the influence of behavioral intention and facilitating conditions account for 32.6% of the variance in the extent of BIS use (as once again customer orientation influence proves to be statistically insignificant). Finally, it can be seen that 36.7% of the variance in embeddedness of BIS is explained by the influence of behavioral intention, facilitating conditions and customer orientation. Since the exogenous variables explain moderate to high proportions of the variance of the endogenous variables, it may be concluded that the model holds sufficient explanatory power and is capable of explaining the constructed endogenous latent variables (Chin, 1998; Henseler et al., 2009).

The impact of effort perceptions on behavioral intention was found to be non-significant, thus hypothesis H1 is rejected. This shows that effort perceptions do not have a significant impact on formation of one's behavioral intention to use BIS. Hypothesis H2 is also rejected (or could be conditionally supported at a 10% significance level, but the effect of performance perceptions on behavioral intention shows a weak magnitude ( $\hat{\beta}=0.144$ )). Therefore also performance perceptions do not play a significant role in explaining one's behavioral intention to use BIS. The path coefficients associated with H3 and H4 are statistically significant at the 5% and 1% significance levels, respectively, thus supporting these two hypotheses. As indicated by the path loadings, social influence (H3:  $\hat{\beta}=0.228$ ) and result demonstrability (H4:  $\hat{\beta}=0.242$ ) have a significant direct and positive influence on behavioral intention.

Hypotheses H5a, H5b and H5c are supported, where behavioral intention has statistically significant (at the 0.1% significance level for intensity and extent of BIS use, and at 1% for embeddedness of BIS) direct and positive influences on all three dimensions of use. The path loadings indicate that behavioral intention positively influences intensity of BIS use ( $\hat{\beta}=0.378$ ), extent of BIS use ( $\hat{\beta}=0.269$ ), and embeddedness of BIS ( $\hat{\beta}=0.243$ ). To check whether the hypothesized impacts are significantly different (H6d), I tested the t-statistics for the differences between pair-wise impacts (see Table 12). The first pair-wise comparison is



conditionally supported (t-value=1.84 and p=0.07). The difference between the second listed comparison proved to be statistically significant (t-value=2.38 and p=0.02), thus confirming that the two hypothesized impacts are indeed different. The last comparison showed a statistically non-significant difference, hence the impact of behavioral intention on extent of BIS use and the impact of behavioral intention on embeddedness of BIS are not significantly different.

The results also show full support for hypotheses H6a, H6b and H6c, showing that facilitating conditions have statistically significant (at the 0.1% significance level) direct and positive influences on all three dimensions of use. As indicated by the path loadings, facilitating conditions positively influence intensity of use ( $\hat{\beta}=0.456$ ), extent of use ( $\hat{\beta}=0.353$ ) and embeddedness of BIS ( $\hat{\beta}=0.355$ ). To check whether the hypothesized impacts are significantly different (H5d), I tested the t-statistics for the difference between pair-wise impacts of facilitating conditions on the three dimensions of use (see Table 12). The t-test for the first pair-wise comparison is 1.96 with p=0.05, hence confirming that the two hypothesized impacts are indeed different. The second pair-wise comparison proved to be conditionally significant (at p=0.09) with a t-value of 1.71, while the last comparison was found to be statistically non-significant.

The hypotheses associated with the impact of customer orientation on different dimensions of use were not all supported. The impact of customer orientation on intensity of use ( $\hat{\beta}=0.013$ ) and on extent of use ( $\hat{\beta}=0.112$ ) was found to not be statistically significant, hence the hypotheses H7a and H7b are rejected. On the other hand, the path loading indicates that customer orientation has a direct and positive statistically significant ( $\hat{\beta}=0.217$ , p<0.001) influence on embeddedness of BIS. The results therefore indicate that organizational customer orientation directly impacts on embedding BIS into the routines of workers, organizational processes and strategy. To see whether the hypothesized impacts of customer orientation on different dimensions of use are significantly different (H7d), I also tested the t-statistics for the difference of the pair-wise comparisons of impacts. The first comparison was conditionally supported (with t-value=1.79 and p=0.07). The difference between the second pair-wise comparison proved to be statistically significant (t-value=3.10 and p=0.002), hence confirming that the two hypothesized impacts are indeed different. The last pair-wise comparison showed no statistically significant difference between the impacts of customer orientation on the extent and embeddedness of BIS and thus H7d is partially supported. The consequences of these findings will be discussed in the next section.

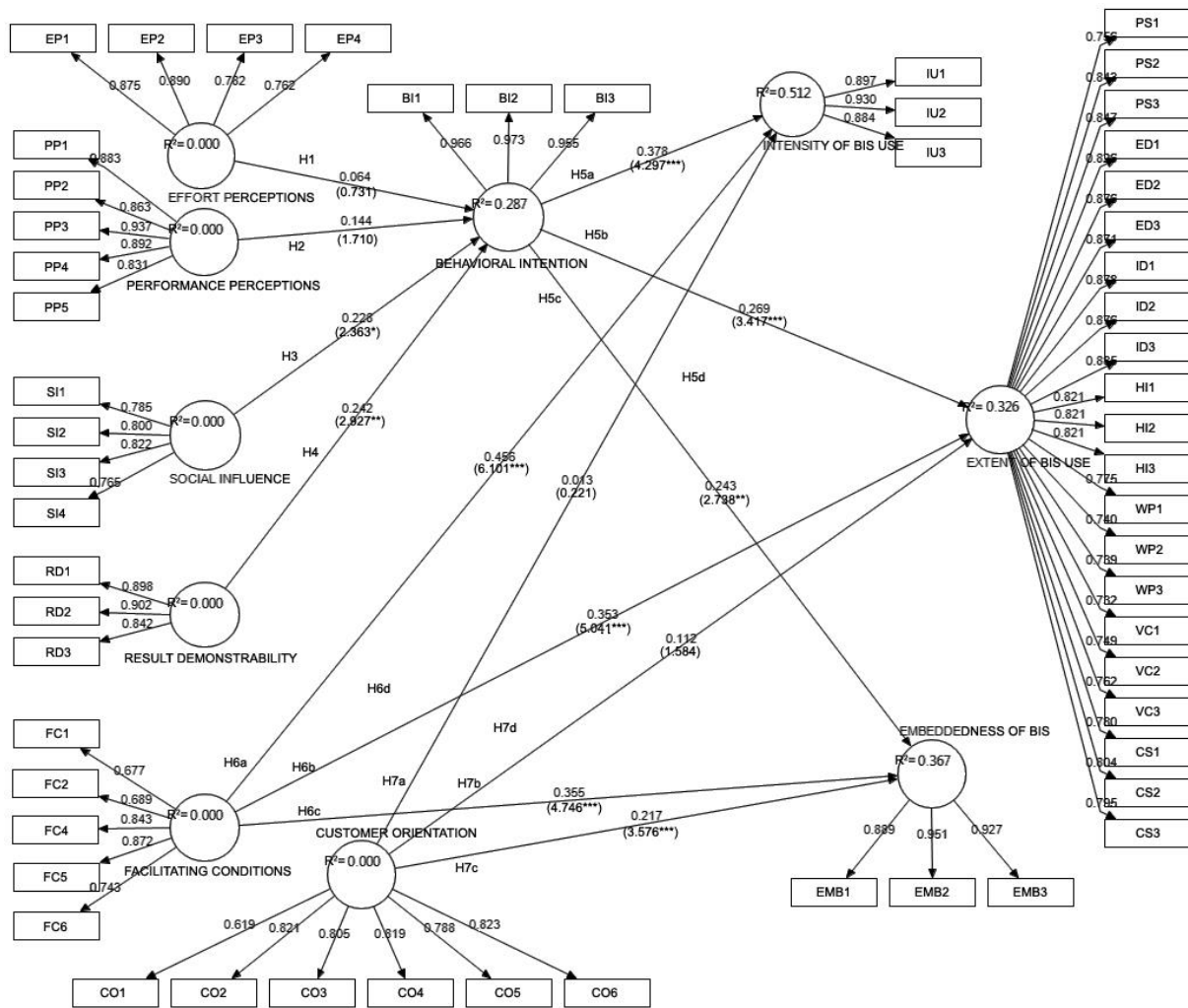
Table 12. T-statistics of the differences of two pair-wise impacts

Comparison of the difference between impacts	t-statistics	p-value
$\hat{\beta}$ (Facilitating conditions impact on Intensity of BIS use) = $\hat{\beta}$ (Facilitating conditions impact on Extent on BIS use)	1.96*	0.05
$\hat{\beta}$ (Facilitating conditions impact on Intensity of BIS use) = $\hat{\beta}$ (Facilitating conditions impact on Embeddedness of BIS)	1.71'	0.09
$\hat{\beta}$ (Facilitating conditions impact on Extent of BIS use) = $\hat{\beta}$ (Facilitating conditions impact on Embeddedness of BIS)	0.03	0.97

$\hat{\beta}$ (Behavioral intention impact on Intensity of BIS use) = $\hat{\beta}$ (Behavioral intention impact on Extent on BIS use)	1.84'	0.07
$\hat{\beta}$ (Behavioral intention impact on Intensity of BIS use) = $\hat{\beta}$ (Behavioral intention impact on Embeddedness of BIS)	2.38*	0.02
$\hat{\beta}$ (Behavioral intention impact on Extent of BIS use) = $\hat{\beta}$ (Behavioral intention impact on Embeddedness of BIS)	0.38	0.71
$\hat{\beta}$ (Customer orientation impact on Intensity of BIS use) = $\hat{\beta}$ (Customer orientation impact on Extent on BIS use)	1.79'	0.07
$\hat{\beta}$ (Customer orientation impact on Intensity of BIS use) = $\hat{\beta}$ (Customer orientation impact on Embeddedness of BIS)	3.10**	0.002
$\hat{\beta}$ (Customer orientation impact on Extent of BIS use) = $\hat{\beta}$ (Customer orientation impact on Embeddedness of BIS)	1.40	0.16

Note. (ns) non-significant; ' conditionally significant at the 0.1 level (two-tailed test); \* significant at the 0.05 level (two-tailed test); \*\* significant at the 0.01 level (two-tailed test); \*\*\* significant at the 0.001 level (two-tailed test)

Figure 5. The final BIS embeddedness research model



Note. (ns) non-significant; \* significant at the 0.05 level (two-tailed test); \*\* significant at the 0.01 level (two-tailed test); \*\*\* significant at the 0.001 level (two-tailed test)

## 5.6 DISCUSSION WITH IMPLICATIONS FOR RESEARCH AND PRACTICE

This study introduces an important external factor of customer orientation into the nomological network related to BIS system use and reveals that different drivers than

traditional models posit shape behavioral intention and further links these drivers to different conceptualizations of effective BIS use. By doing so, I respond to the call made in IS research to “embrace context when investigating individuals’ use of technology artefacts” (Venkatesh, Thong, Chan, Hu & Brown, 2011, p. 545; also see Orlikowski & Iacono, 2001). That is considered to be an important contribution to theory development and advancement (Alvesson & Karreman, 2007). I found and elaborated some interesting new insights that proved to be critical in the context of BIS use. By that I support the conclusion of Venkatesh et al. (2011, p. 545) about “the need to consider context-relevant variables when designing research to study technology adoption and use.”

This work’s broadest, most important *contribution to research* is therefore the development of a comprehensive model of the underlying phenomena that identifies different conceptualizations of use within acceptance and use studies, incorporates key contextual behavioral, normative and external beliefs, and reveals how these predictors operate in the context of BIS use.

The findings provide proof supporting the conceptualizing of the three different dimensions of BIS use. The rich measurement of different types of usage is a response to the observation of Jasperson et al. (2005, p. 544) that researchers have examined use “quite simplistically in terms of the frequency, or level, of use of the whole technology rather than capturing users’ patterns of use regarding the technology’s features”. They therefore encourage researchers to move beyond such simplistic views of use in order to “expose the sufficiently rich depictions of use history required to surface, study, model, and understand the path-dependent episodes of use leading to routinized or habitual use of an IT application” (Jasperson et al., 2005, p. 544). Thus, indeed intensity of use, the dimension most commonly used to measure the usage of IS in the literature (i.e. Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008; Venkatesh, Brown, Maruping & Bala, 2008), proves to be only one aspect of use in this context, and there are two more dimensions that more profoundly encompass the whole sphere of BIS usage. How extensively BIS is used in an organization and how it is embedded in the business both reveal how effectively it is used and this contributes to the success of BIS (Doll & Torkzadeh, 1998; Shanks et al., 2012). This study offers insights freshly applied to BIS context concerning how to measure different dimensions of BIS use, what are the antecedents that influence them, and how to analyze them in an important specific context of BIS use.

The results of this study provide support for some of the findings from existing verified models of IT acceptance, but also contrast them with important established conceptions revealing the context specific drivers to use BIS. Traditional models such as the TAM (Davis, 1989) and the UTAUT (Venkatesh et al., 2003) posit that performance perceptions, effort perceptions and social influence drive individual’s internal behavioral intention to use IT, with performance expectancy being the strongest driver of employees’ technology use intentions and behaviors in both voluntary and mandatory settings (Venkatesh et al., 2003; Venkatesh et al., 2012). However, in the BIS context, it is evident that effort perceptions and

performance perceptions have no significant impact on creation of intentions to engage in BIS use. The finding that effort perceptions do not have an effect is consistent with Junglas Goel, Abraham & Ives (2013) conclusion that with the inclusion of “sociability” effort perceptions constructs have no effect at all. Users of BIS are therefore willing to invest more effort to use BIS, even in early stages of this new behavior, which is in contrast to the findings of Venkatesh et al. (2003). Individuals therefore do not form intentions to use BIS based on assessments of effort needed or ease of use, which could be due to the fact that users’ are generally more educated workers and managers with stronger sense of self-efficacy or judgments about ability/knowledge as a control belief regarding their ability to use a new system (Ajzen & Fishbein, 2005; Venkatesh & Bala, 2008). Also BIS users do not form intentions based on performance perceptions, since when using BIS the focus is not so much on improving the effectiveness, such as the speed of work performance, but mostly to make better decisions (Popovič et al., 2012). Therefore, in this context carrying out processes quickly is not as great a priority as ensuring that managers make better decisions with the use of and by embedding BIS into their routines (Shanks et al., 2012). Perceived utility (Tennakoon, da Silveira & Taras, 2013) of BIS is therefore perceived through communicable results and consequences of using BIS.

In the BIS context, social influence and result demonstrability are determinants that shape individual’s behavioral intention to use BIS, and not the traditional and well-recognized perceptions of effort and performance as the TAM model posits (Davis, 1989). These findings follow the encouragement of Junglas et al. (2013) that “future IS research should consider the inclusion of a social component into its utilization and acceptance models”. This reveals that internal decisions to use BIS are weighted based on individual’s perceptions of organizational collective inclinations towards BIS use. Hsu & Chiu (2004) found out that users’ perceptions of interpersonal influence is positively associated with their satisfaction with IS leading to continuance intentions. Also literature has already established the importance of social influence and organizational commitment in creating intentions in knowledge sharing domains (Chennamaneini, Teng & Raja, 2012; Tsai & Cheng, 2012; Shin, 2013). If users perceive benefits of BIS use for example on their potential social status gains (Venkatesh et al., 2003) weighted by perceptions of approval of this behavior by respected others, they will more likely engage in this behavior. Also if they perceive that the results of BIS use are visible, demonstrable and acknowledged in the organization (perceiving that the organization and particularly senior management has been supportive and leads by example in using BIS) they will be more ready and prepared to use BIS. This is consistent with the findings of Venkatesh and Davis (2000, p. 189) who argue that in voluntary settings the mechanism of “internalization” comes to the fore, which refers to the process “by which, when one perceives that an important referent thinks one should use the system, one incorporates the referent’s belief into one’s own belief structure.” Further, internalization explains why the direct impact of performance perceptions on intention appears not to play a significant role, but is instead incorporated in social influence and result demonstrability, as Venkatesh and Davis (2000, p. 189) say “if a superior or co-worker suggests that a particular system might be

useful, a person may come to believe that it actually is useful, and in turn form an intention to use it.” Therefore, intention to use BIS is not driven by performance perceptions, i.e. perceptions of faster and easier access to information, but by perceptions that they can contribute to and improve the organizational business performance (Popovič et al., 2012). The importance of social influence and result demonstrability in creating intentions to use BIS is also consistent with another important specific of BIS use as compared to operational IS. Since the information in BIS is integrated and aggregated at the organizational level with lots of sharing of information connected with higher information transparency, social recognition and communication of the results are better drivers of intentions than pure individualistic assessments of effort needed and performance improvements.

Prior research has shown that “high levels of behavioral intentions to use a system lead to increased use of information systems” (Santhanam, 2002, p. 135). I support this substantiated finding by showing that behavioral intention proves to be a strong predictor of behavior, particularly of intensity of use (frequency, duration). It is evident from the results that behavioral intention also explains the variation in the extent and embeddedness of BIS use, but this direct impact is somewhat smaller than on the intensity of use. As individuals’ beliefs and consequently their behavioral intention can change with experience and when facing new information (Venkatesh et al., 2008), the appropriateness of behavioral intention for explaining different conceptualizations and complexities of behavior may vary, and become less predictive of behavior with habitualization and routinization of use, particularly in volitional settings (Venkatesh, Maruping & Brown, 2006). The results about differentiated impacts of behavioral intention on different dimensions of use reveal that the impact of formed intentions is different and clearly the strongest on the quantitative aspect of use (frequency and intensity) than on the qualitative aspects of how and why BIS is used (the extent of use and embeddedness).

The model provides support for the strong impact of facilitating conditions on intensity of use, and shows the predictive ability of facilitating conditions in removing barriers to sustained usage. Therefore, users’ beliefs about the existence of organizational and technical infrastructure to support BIS use (Venkatesh et al., 2003) has the strongest impact on intensity of use, and thereby represents a prerequisite for the expansion of use and the embeddedness of BIS into the routines of workers. The findings associated with facilitating conditions having different impacts on different dimensions of use show that the impact of facilitating conditions clearly differs and is the strongest on intensity of use (quantitative view) than on extend and embeddedness representing qualitative aspect showing that different facilitating support is needed for different types of BIS use. Facilitating conditions in the BIS context encompass support in various forms, such as providing the necessary infrastructure – resources, knowledge and specific people available for assisting with system difficulties and use, creating dedicated help (or a helpdesk) for assistance with accessing and understanding the data and having defined and routinely used governance mechanisms for BIS renewal (Shanks et al., 2012).

The results show that an organizational customer orientation impacts on the embeddedness of BIS in an organization's work system. This driver has not been considered in previous studies of IT acceptance and use, and thus this finding provides an important contribution to theory advancement, particularly in the context of BIS utilization. There was no statistically significant impact of customer orientation on intensity of BIS use, nor on the extent of use, but it influences the integration of BIS use with business processes, the embeddedness of BIS in the decision-making routines and the alignment of insights from BIS with the business strategy (Shanks et al., 2012). These results are in line with the findings of Birgelen et al. (2003, p. 777) that "commitment toward customer satisfaction has a positive impact on the acceptance and use of customer satisfaction information for the purpose of customer-oriented priority setting". If organizations are focused on customers' needs, then the management of processes, data analysis and fact-based decision making using BIS has to be routinized and embedded into the decision-makers' routines for the purpose of satisfying customers. This is consistent with Birgelen et al. (2003, p. 777) findings that a level of decision-makers' embeddedness of customer satisfaction, "the personal importance being attached to, and prior knowledge on customer satisfaction will increase the level to which one thinks about satisfying customers and what the benefits for the firm are", and embedding BIS can leverage these synergies. Customer orientation proved to be an important external motivation driving effective integration of BIS into the organizational work system.

The first important *implication for practice* is that if the organization is focused on its customers it would be reasonable to invest in BIS as they provide innovative and competitive information (Elbashir et al., 2011) and strategically oriented information processing and analysis for effective decision making (Isik et al., 2013). Such organizations should have greater utilization of BIS because they will be more embedded into the routines of workers and organizations should thereby have increased customer satisfaction and organizational productivity (Deshpande et al., 1993; Karimi, Somers & Gupta, 2001) and ultimately a better organizational performance (Popovič et al., 2012).

One of the challenging tasks managers face today is how to enhance BIS use (Venkatesh et al., 2008). Despite the huge investments made in BIS in recent years (Isik et al., 2013), there is a concern "that the implemented systems are underutilized and that users restrict themselves only to using the basic functionalities of the system" (Venkatesh et al., 2008, p. 498; Jaspersen et al., 2005, Grublješič & Jaklič, 2014). Managers can now consider interventions to positively influence individuals' intentions and effective BIS utilization through the proposed causal chain, which provides understandings of what motivates these different dimensions of BIS use and how to potentially increase effective use of BIS. Sharma, Yetton and Zmud (2008) refer to these management interventions as internal resources necessary to successfully implement a system to achieve long-term routinized use.

The findings of this research emphasize the importance of organizational factors, and not so much individual s' individualistic beliefs of effort and performance perceptions in facilitating prolific BIS utilization, that managers should contemplate. These encompass establishing an

appropriate organizational or narrower information culture, an organizational customer orientation, management support and peer support, and these interventions cannot be classified as either pre- or post-implementation issues but as *trans-implementation issues* that have to be constantly nurtured and are continually evolving. Jackson (2011, p. 79) points out that “ongoing attentiveness to culture should be embedded in the management process” when implementing new IS, and given the fact that drivers of BIS use primarily encompass perceptions of organizational collective support, the establishment of this “BI culture” is important for achieving regular, deep structure or embedded use of BIS.

## **5.7 LIMITATIONS AND FUTURE RESEARCH**

Although this study provides valid and generalizable results of acceptance and use in this context specific environment, it also has some limitations that should encourage future related research. First, the antecedents to forming the investigated beliefs, such as individual characteristics (personal innovativeness and readiness for change), system characteristics (system and information quality), particular organizational factors (user training, organizational culture types) and macro environmental characteristics (competitiveness of the environment and business sector) have not been investigated and their impact should be researched in the future. Second, the proposed conceptualizations of use are primarily developed for BIS context use specifically, but could, on the other hand, also be incorporated in other technology adoption research. This would be beneficial especially in studies investigating post-adoption behavior, as a one-dimensional measure of use (particularly the most commonly used frequency of use measure), does not capture the whole process of IS utilization, and different types of use might be more meaningful for different system settings. The literature has already raised the issue of a “productivity paradox – that is, a contradictory relationship between IT investment and firm performance” related to misconceptions associated with conclusions that greater use should lead to greater performance (Venkatesh et al., 2008, p. 274). Investigating different dimensions of use of interest in addition to just intensity in different system settings might improve the understanding of what is meaningful system use leading to better performance.

## 6 ANTECEDENT DETERMINANTS OF BELIEFS UNDERPINNING THE INTENTION TO ACCEPT AND USE BUSINESS INTELLIGENCE SYSTEMS

### ABSTRACT

By drawing together the implications from several streams of IS research, this study identifies the antecedents of an individual's behavioral and normative beliefs that shape intentions to use Business Intelligence Systems (BIS), and thereby facilitates greater understanding of how those internal motivations are formed. It addresses the critical research question posed extensively in the IS literature concerning what drives the beliefs that provide actionable guidance and underpin intention, an aspect acceptance models have been criticized for lacking. This comprehensive model of such antecedents captures a wide range of factors including individual, technological and organizational factors that can impact the formation of favorable beliefs triggering the intention to use BIS, reflecting the specifics and nature of BIS use. The model was tested and analyzed with structural equation modeling based on survey data gathered from employees of medium- and large-sized organizations. The results of the study show that, besides the self-efficacy belief entailing individual characteristics, organizational factors either directly (user training and management support of BIS use) or indirectly through the building of an open information culture impact the individual's internal schema of considerations that shape their intentions to use BIS. Drivers that help build a higher-level information culture are management support of BIS implementation, organizational implementation success factors and customer orientation. Contrary to expectations, BIS information and system quality (technology characteristics) do not have a direct impact on the creation of behavioral beliefs. The results of the study provide several theoretical and practical implications by shedding light on the importance of organizational factors in creating intentions that organizations can influence in order to increase individuals' motivations to use BIS.

**Keywords:** drivers of the individual's internal motivations, business intelligence systems, organizational factors, information culture

### 6.1 INTRODUCTION

Although prior research has provided valuable insights to help understand the determinants of the acceptance and use of information technology (IT) (i.e. Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh & Bala, 2008), attempts to identify the antecedents of those formed beliefs, particularly in a context-specific environment are still scarce (Venkatesh & Bala, 2008). Recognizing the drivers of acceptance and use of specific information systems (IS) holds immense value for organizations in order for them to proactively design interventions (Jasperson, Carter & Zmud, 2005; Venkatesh & Bala, 2008) and mitigate resistance to implementing new IS so as to improve the likelihood of success and the business value of this new IS for such organizations.



The positive impact on decision-making of the information provided by Business Intelligence Systems (BIS) is emphasized in the IS literature, particularly when organizations operate in highly competitive environments (Popovič, Hackney, Coelho, & Jaklič, 2012). These technological innovations are a main source of competitive advantage for the long-term survival of organizations (Jourdan, Rainer & Marshal, 2008; Wixom, Watson, Reynolds & Hoffer, 2008), but the key question is whether, after the implementation of BIS, users actually accept, use and take full advantage of the system's capabilities. It is essential to distinguish different dimensions of BIS use and determine the acceptance determinants that lead to BIS' long-term embeddedness into workers' routines (Grublješič, Coelho & Jaklič, 2014). The next important step for organizational success is to understand the antecedents to these formed perceptions that organizations can have an influence on in order to maximize the benefits of the implemented system. I explore how the interplay of factors previously identified in existing IT/IS acceptance and adoption models with contextual extensions enriches the explanation of acceptance beliefs leading to the effective use of BIS, and in the process address the gap in the literature (Venkatesh, Thong, Chan, Hu & Brown, 2011). I focus on the critical research question of *what* drives the motivation to use BIS and *how* and *why* do individuals form these intentions to engage in the use of BIS.

General predictors of behavioral intentions and use of technology from the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) are well known in the literature. Although the UTAUT's determinants have been proven generalizable in many different settings and replications (Venkatesh et al., 2012), I build on the fact that significantly different acceptance beliefs drive BIS use (Grublješič et al., 2014). Previous studies in the BIS context demonstrate that effort and performance perceptions have no direct statistically significant effect on behavioral intention to use BIS (further impacting their use), but instead work through social mechanisms where social influence and result demonstrability directly impact motivations to engage in the use of BIS (Grublješič et al., 2014). Taking this baseline of behavioral and normative beliefs into consideration, I further look for the antecedents to the formation of beliefs people hold about certain behavior – that is, using BIS. These internal motivational beliefs to perform a behavior may be influenced by a wide variety of personal, cultural and situational factors (Ajzen & Fishbein, 2005). The model of the antecedent drivers of internal motivations to use BIS includes individual, technological, and organizational determinants and thus provides “actionable guidance to practitioners” (Venkatesh & Bala, 2008; Lee et al., 2003). By presenting the precursors to formed individual internal beliefs, I address the limitation of acceptance models mentioned by Lee et al. (2003) and Venkatesh and Bala (2008) who call for future studies to also address the antecedents of acceptance determinants in a context-specific environment. Understanding these determinants can lead to the greater acceptance and effective utilization of BIS.

The structure of the paper is as follows. In the next section, the theoretical background is elaborated. The research model is then conceptualized and hypotheses are developed. Further, the research design, methodology, and results of the estimation are given. This is followed by

a discussion of the results, including the implications for research and practice and a conclusion with limitations and suggestions for future research.

## **6.2 THEORETICAL BACKGROUND**

BIS refer to solutions that hold quality information in well-designed data stores connected with business-friendly tools. Their goal is to provide stakeholders at various levels of an organization with timely access to, effective analysis and an insightful presentation of the information generated by enterprise-wide applications, enabling them to make the right decisions or take the right actions across a broad range of business activities (Popovič, Coelho, & Jaklič, 2009; Trkman, McCormack, de Oliveira & Ladeira, 2010). The main attributes of BIS are (Negash & Gray, 2004): combining enterprise data for successful analytics and knowledge management, and providing competitive and innovative information to planners and decision-makers.

BIS have some specific characteristics compared to operational IS (Grublješič & Jaklič, 2014) that impact their acceptance and effective use, such as: voluntariness of use (Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008), a different structure of users (mostly managers) related to less structured information needs, much more aggregated and integrated information with greater sharing of information (Negash & Gray, 2008), connected with the need for improvements in the information culture (Marchand, Kettinger, Rollins, 2001) and an emphasis on the relevance of the information BIS provide (DeLone & McLean, 2003; Eppler, 2006; Popovič et al., 2009). All of these specifics show that different motivations (Grublješič et al., 2014) than those posited by traditional models impact their acceptance and use, and that a different interplay of antecedents thus influences the formation of these behavioral and normative beliefs.

Research on individual-level IT acceptance provides rich theories on the determinants that influence acceptance and decisions about the use of IT. Although isolated impacts of individual, technological, social, and organizational factors on IT use are well recognized (i.e. Moore & Benbasat, 1991; Dishaw & Strong, 1999; Agarwal & Karahanna, 2000; Wixom & Watson, 2001; DeLone & McLean, 2003; Venkatesh et al., 2003; Venkatesh & Bala, 2008), a more comprehensive understanding is needed of the actionable determinants that explain how and why individuals form acceptance beliefs (Wixom & Todd, 2005) about using a specific (in my case BIS) artifact.

Wixom and Todd (2005) proposed distinguishing beliefs and attitudes about the system (object-based beliefs and attitudes) found in the user satisfaction literature from beliefs and attitudes about using the system (behavioral beliefs and attitudes) found in the technology acceptance literature (i.e. TAM and UTAUT) as a useful categorization for further theory development. The former can be considered as determinants or antecedents of the latter. This categorization includes perceptions related to the IT artifact. However, individual intentions to engage in a behavior consist of these mentioned behavioral beliefs as well as normative

(social) considerations (Ajzen & Fishbein, 2005). Both of these are further influenced by a wide variety of cultural, personal, and situational determinants (Ajzen & Fishbein, 2005).

The technology, organization, and environment (TOE) framework identifies three aspects of an organization's context that influence the process by which it adopts and implements a technological innovation: technological context, organizational context, and environmental context (Tornatzky & Fleischer, 1990). I apply this classification of determinants on the organizational level to the analysis of the antecedents to acceptance and use on the individual level, including widely recognized individual characteristics (i.e. Moore & Benbasat, 1991; Venkatesh, 2000; Venkatesh & Bala, 2008). Ajzen & Fishbein (2005, p. 194) elaborate that the antecedents of intentions and behavior represent individual personal factors, the physical environment, the social environment and exposure to information. The significance of specific antecedents of acceptance determinants in the BIS context has not been researched yet.

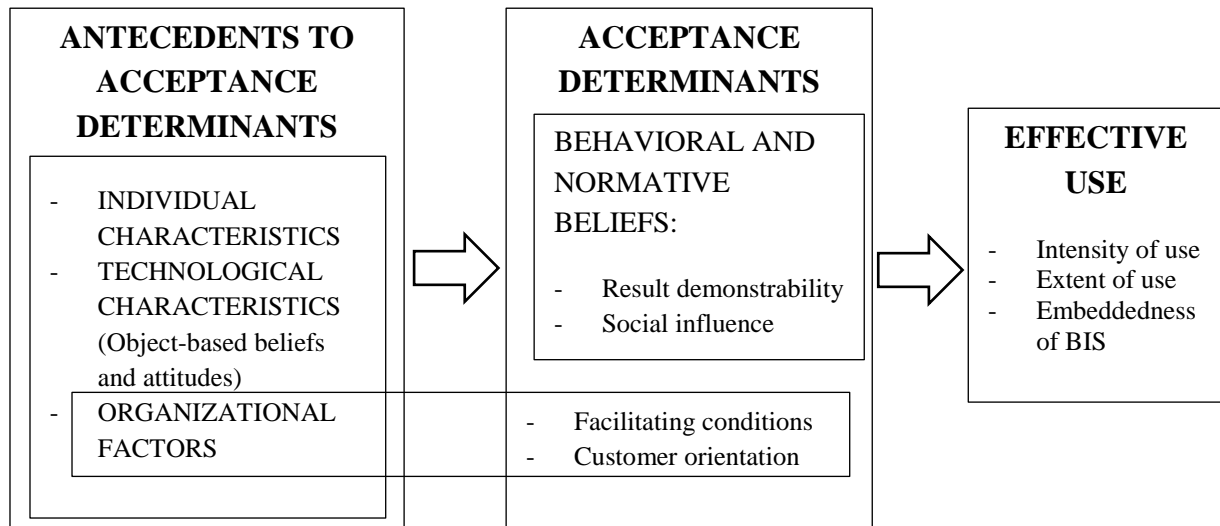
The UTAUT (Venkatesh et al., 2003) identifies general IS acceptance determinants, capturing performance perceptions, effort perceptions, social influence and facilitating condition. The first three represent behavioral and normative beliefs and indirectly impact use through behavioral intention. Facilitating conditions, representing external beliefs and considered as part of organizational factors, have been proven to directly impact use (Venkatesh et al., 2003) and, together with beliefs underpinning intention, represent acceptance determinants.

However, in the BIS context use, the traditional determinants of effort and performance perceptions (postulated in TAM (Davis, 1989) as salient beliefs of acceptance) play no significant role in predicting behavioral intention to use BIS, but social processes and mechanisms such as social influence and result demonstrability of using BIS come into play instead (Grublješič et al., 2014). This is consistent with Junglas Goel, Abraham & Ives's (2013) findings that constructs have no effect at all with the inclusion of "sociability" effort perceptions. Further, the tangible recognition of benefits, as measured by result demonstrability which captures an individual's effectiveness relating to the long-term impact of using the system on organizational performance, is more important than performance perceptions relating to efficient (and immediate) worker performance using the system. Result demonstrability captures the system utility aspect (Tennakoon, da Silveira & Taras, 2013) in the BIS use context.

When studying acceptance as a means for BIS success in terms of using BIS in a sustainable and effective way, three important dimensions of effective (Burton-Jones & Grange, 2013) BIS use must be taken into consideration: intensity of use, extent of use, and embeddedness of the BIS. Behavioral intention driven by social mechanisms importantly influences all three dimensions of use, and in addition there is the great influence of organizational factors such as facilitating conditions and customer orientation that boost the expansion of BIS use and its embeddedness into workers' routines (Grublješič et al., 2014). I assume that these organizational aspects also shape the creation of beliefs underpinning intention.

Figure 6 summarizes the findings of previous studies applied to the BIS use context (Grublješič & Jaklič, 2014). Clearly, there is a need to understand what shapes and forms the beliefs underpinning the intention to accept BIS and the different dimensions of use in a specific BIS context.

Figure 6. Summary of the theoretical background for BIS acceptance and use



### 6.3 CONCEPTUALIZATION OF THE RESEARCH MODEL

The research model is based on a synthesis of the relevant constructs from existing theories and extended with additional constructs derived from case studies in a context-specific environment (Grublješič & Jaklič, 2014). The categorization of the antecedent determinants constitutes individual characteristics, technological characteristics, and organizational factors (including environmental aspects) as elaborated in the previous section, while the rationale for including the determinants in the model and the relationships between the determinants is described below.

#### 6.3.1 Behavioral and normative beliefs

Behavioral and normative beliefs represent the individual's "internal schema" of considerations that influence the decision to perform a behavior (Ajzen & Fishbein, 2005; Venkatesh, Brown, Maruping & Bala 2008). Behavioral intentions (formed by behavioral and normative beliefs) are important and good predictors of behavior particularly under volitional control (Fishbein & Ajzen, 2011), which is also the case of the BIS. Employees are therefore more likely to use BIS if they are internally motivated to perform and engage in this behavior. Since in the BIS use context performance perceptions and effort perceptions play no significant role in predicting intentions to use BIS, but instead result demonstrability and social influence shape intentions (Grublješič et al., 2014), I search for the antecedent determinants of these two behavioral and normative beliefs. Karahanna, Straub and Chervany (1999) suggest that sociological variables (i.e. result demonstrability and social influence) are more important for explaining the mental acceptance of innovation, in my case BIS.

Venkatesh et al. (2003, p. 451) define social influence (normative beliefs) as “the degree to which an individual perceives that important others believe he or she should use the new system”. The inclusion of social influence points to the fact that individuals also behave according to their beliefs about how others will view them as a result of having used the technology. Further, Venkatesh and Bala (2008, p. 277) define result demonstrability (behavioral beliefs) as “the degree to which an individual believes that the results of using a system are tangible, observable and communicable”. Agarwal and Prasad (1997) found a significant relationship between result demonstrability and usage intentions. The demonstrability of the results of using BIS, such as having knowledge of the actual outcomes of work activities with BIS use and social influence, represents the key psychological state underlying the motivation to use BIS (Hackman & Oldham, 1976).

Agarwal and Fishbein (2005) point out that behavioral and normative beliefs can vary as a function of a wide range of background factors including individual, social, and information (i.e. knowledge, interventions) aspects.

### **6.3.2 Individual characteristics**

Individual characteristics or differences are well recognized in traditional acceptance models (i.e. Venkatesh, 2000; Agarwal & Karahanna, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008) for having an impact on how individuals form beliefs about accepting or using a new system. These personality characteristics, such as IT anxiety and computer self-efficacy (Venkatesh, 2000), capture individual beliefs and perceptions associated with computers and computer use (Venkatesh & Bala, 2008). Social cognitive theory (Bandura, 1986) suggests that IT anxiety and computer self-efficacy are reciprocal determinants. IT anxiety is defined as “an individual’s apprehension, or even fear, when she/he is faced with the possibility of using computers” (Venkatesh, 2000, p. 349), whereas computer self-efficacy relates to judgments about ability/knowledge or an individual’s control beliefs regarding their ability to use a new system (Venkatesh & Bala, 2008). Karahanna et al. (1999) argue that the concepts of effort perceptions and performance perceptions are actually incorporated in the computer self-efficacy construct. The first is reflected in the early stage of use when one is learning how to use a system, and the latter displaces perceptions in the continuous use phase involving the efficacy of the innovation to increase one’s job performance. Venkatesh (2000) further points out that it is questionable if the emotion of IT anxiety is still relevant in these current times of computer use. Nevertheless, I still test the possibility of IT anxiety along with computer self-efficacy having an impact on result demonstrability because BIS use is still recognized to be innovative and research-oriented in nature, and the identification of information needs is based on performance management and the efficiency of operations (Grublješič & Jaklič, 2014). Accordingly, I would expect that users without a fear of using a new and innovative system along with a positive judgment about being able to successfully handle this new system should be more able to demonstrate the results of its use. These personality traits regarding computer use should impact on how users believe they are able to communicate and demonstrate the results of using BIS, whereas beliefs concerning the social influence of how

the organization supports BIS use and how others will view them as a consequence of BIS use should be influenced by some other determinants. Applying this reasoning, I hypothesize:

*H1: IT anxiety negatively influences result demonstrability.*

*H2: Computer self-efficacy positively influences result demonstrability.*

### **6.3.3 Business Intelligence Systems quality characteristics**

BIS quality characteristics like system quality, measuring the technical success of the system and information quality, and measuring the quality of IS output are well documented in the literature for having an impact on users' perceptions and beliefs about the system, which in turn affect intentions and system usage (DeLone & McLean, 1992; DeLone & McLean, 2003, Wixom & Todd, 2005). Wixom and Todd (2005) elaborate that system and information quality characteristics are typically viewed as the attitudes users have towards IS and therefore represent object-based beliefs and attitudes that further shape behavioral beliefs about using the system. I thus include these characteristics as the antecedents to the behavioral belief of result demonstrability.

For users to attribute gains in their job performance, a system should produce "effective job relevant results desired by a user" (Venkatesh & Davis, 2000, p. 192). This "tangibility of the results of using the innovation" (Moore & Benbasat, 1991, p. 203) captured by result demonstrability should therefore be shaped by user satisfaction (system satisfaction and information satisfaction) with the system (DeLone & McLean, 2003; Wixom & Todd, 2005). This level of satisfaction (object-based attitude) is influenced by object-based perceptions and beliefs of system and information quality (Wixom & Todd, 2005). When users perceive a good quality BIS (such as its accessibility, reliability, flexibility and integration), i.e. they more easily retrieve the necessary data for making better decisions and better results and thus find it easier to demonstrate the results of system use. Connectedly, perceived BIS information quality (such as relevance, accuracy, currency and format) representing the quality of the content should lead to the easier interpretation and demonstration of the results of using BIS (DeLone & McLean, 2003). After integrating these arguments, I put the next hypotheses forward:

*H3: System quality positively influences result demonstrability.*

*H4: Information quality positively influences result demonstrability.*

### **6.3.4 Organizational factors**

Organizational factors were found to be the vital part of the critical success factors for BIS success in Yeoh and Koronios's (2010) study and for data warehouse success as researched by Wixom and Watson (2001). Yet the existing acceptance models mostly focus on individual determinants and system characteristics (i.e. Davis, 1989; DeLone & McLean, 2003; Wixom & Todd, 2005) and do not consider organizational traits as an important contributor to the individual's IS acceptance. Facilitating conditions representing organizational and technical

infrastructure supporting system use are found to directly impact usage in the UTAUT (Venkatesh et al., 2003). I believe that as part of organizational factors these also shape intentions to use BIS. Isolated impacts of the importance of management support, facilitating conditions and user training for inducing intentions to use IS have already been demonstrated (i.e. Igarria, Guimaraes & Davis, 1995; Karahanna & Straub, 1999; Kwahk & Lee, 2008). Organizational factors have been shown to exert a crucial external influence that shapes the individual's intentions and use of BIS in a case study analysis (Grublješič and Jaklič, 2014). Organizational factors can influence the way in which the information that forms the behavior is perceived and judged (Fazio & Olson, 2003). More specifically, Ajzen and Fishbein (1980, p. 9) argue that "external variables may influence the beliefs a person holds or the relative importance he attaches to the attitudinal and normative considerations". I argue that a broad spectrum of organizational impacts forms the creation of the individual's intentions to use BIS. I investigate how management support, organizational resources, organizational implementation success factors, user training, information culture and customer orientation directly or indirectly through the building of an information culture shape the individual's behavioral and normative beliefs forming intentions to use BIS. BIS specifics and the nature of their use all highlight the importance of a supportive organizational environment for motivating their effective use.

Management support for implementing the system is found in the literature to be one of the key success factors for the system to be favorably received and for the implementation to be deemed successful (Hartono, Santhanam & Holsapple, 2007). Wixom and Watson (2001) confirm that a high level of management support is associated with a high level of organizational implementation success. Since BIS often change traditional flows of information, it is absolutely necessary that support from top management comes in the early phases of BIS development via participation in the implementation and supporting the provision of adequate resources (Bajwa, Rai & Brennan, 1998). Organizational resources include "the money, people, and time that are required to successfully complete the project" (Wixom & Watson, 2001, p. 23). Since BIS usually require a substantial amount of resources, it is essential that top management allocates the necessary resources (Bajwa et al., 1998). Integrating these arguments, I posit the next hypothesis:

*H5: Management support of BIS implementation positively drives the establishment of organizational resources.*

Management support of the BIS implementation also motivates people in the organization to support the BIS initiative and the organizational changes that inevitably accompany it (Wixom and Watson, 2001). One of the most evident organizational changes that comes with BIS implementation is the change in the information culture, particularly in the areas of information transparency, information sharing and information proactiveness (Marchand et al., 2001). Information deriving from these systems is more aggregated and integrated at the organizational level, with lots of sharing of information, and the desired result of these systems is the proactive use of information from BIS for better decision-making (Grublješič &

Jaklič, 2014). Active management support of the BIS implementation should emphasize the organizational value of BIS and thus improve the information culture throughout the implementation process. Based on this, I hypothesize:

*H6: Management support of BIS implementation positively impacts information culture.*

Management support of BIS use concerns all types of management's sponsorship of the use of BIS following the implementation, such as leading by example by using BIS and encouraging decision-making based on the information provided by BIS. Users tend to conform to the expectations of management and are more likely to use a system they perceive to be backed by the management of their organization (Wixom & Watson, 2001). Management support of BIS use represents the most salient aspect of the social normative component (social influence) with respect to the individual's motivation to use IS in organizations, along with supervisors, peers, and the organization's MIS department (Karahanna et al., 1999). Following this, I hypothesize:

*H7: Management support of BIS use positively impacts social influence.*

Facilitating conditions are defined as "the degree to which an individual believes that organizational and technical infrastructure exists to support the use of the system" (Venkates et al., 2003, p. 453). In order to assure adequate facilitating conditions, sufficient organizational resources encompassing physical, human, and organizational aspects (Kim, Shin, Kim & Lee, 2011) should be provided. Accordingly, I hypothesize:

*H8: Organizational resources positively impact facilitating conditions.*

The allocation of adequate organizational resources leads to better facilitating conditions being provided and higher perceptions of system quality. Kim, Shin, Kim & Lee (2011) argue that well-developed facilitating conditions enabling a flexible IT infrastructure contribute to "strategic innovations in business processes by allowing development of necessary applications, facilitating information-sharing across business units, and making it easy to develop common systems integrating various organizational functions" (Kim et al., 2011, p. 493). They further find (2011, p. 501) that both IT personnel expertise and IT infrastructure flexibility demonstrate a firm's capacity "to facilitate better information sharing/communication, making operational processes more cost-effective, and drawing on business intelligence and analytical strength to respond to looming challenges". I therefore posit that facilitating conditions, such as having resources, knowledge and specific people available to assist with system difficulties (Venkatesh et al., 2003) and governance mechanisms for BIS renewal (Shanks, Bekmamedova, Adam & Daly, 2012), importantly influence perceptions of system quality that in turn contributes to BIS success and user satisfaction with its implementation (Wixom & Todd, 2005). I thus put forward the next hypothesis:

*H9: Facilitating conditions positively influence system quality.*



Research suggests that user training influences user attitudes, behavior, and performance and that the impact of training on behavioral intention is mediated by behavioral belief mechanisms (Yi & Davis, 2001; Amoako-Gyampah & Salam, 2004). Training allows users to interact with the BIS, provides mechanisms to disseminate useful and pertinent information about it and how it fits with the existing and proposed organizational work system (Amoako-Gyampah & Salam, 2004). “Effective training can prevent the lack of skills from impeding potential effectiveness gains from decision technologies”, state Yi and Davis (2001, p. 521). Training outcomes can be measured by three dimensions of learning: cognitive (knowing), skill-based (acting), and affective (feeling), serving as important precursors to behavior (Kraiger, Ford & Salas, 1993). Learning through training induces knowing, skills, and perceptions of ease of use and usefulness (affect), leading to behaviors on the job and desired organizational results (Goldstein, 1991). I thus posit that organizational user training will positively influence recognition of the results of using BIS and finding it easy to communicate the outcomes of its use to others:

*H10: Organizational user training positively impacts result demonstrability.*

Any IS implementation can cause organizational change that people tend to resist (Markus, 1983). Such resistance increases with the scope and magnitude of the changes the implementation creates (Tait & Vessey, 1988). BIS in particular have profound effects on organizations as changes occurring upon their implementation include shifts in data ownership, use and access patterns; changes in how jobs are performed; and modifications in business processes execution, leading to strong potential resistance to change from managers, data suppliers and end users (Wixom & Watson, 2001). The changes that come with BIS particularly impact the organizational information culture (Marchand et al., 2001). Information culture encompasses all those elements of organizational culture that influence the management and use of information throughout the organization (Choo, Bergeron, Detlor & Heaton, 2008). “Information culture is manifested in the organization’s values, norms, and practices that have an impact on how information is perceived, created and used” (Choo et al., 2008, p. 793). BIS mostly introduce changes to three aspects of *information behaviors and values* (Marchand et al., 2001) including information transparency, information sharing, and information proactiveness. Organizational implementation success factors represent the encouragement needed to effectively address the issues that arise from change in order for BIS to be successfully integrated into the organizational work process. These include change management practices that effectively deal with political resistance when it arises, and encouraging people throughout the organization to embrace BIS (Wixom & Watson, 2001). When integrating these arguments, organizational implementation success factors including effective change management should have a positive influence on addressing potential issues that emerge with changes in the organizational information culture and induce a more open information culture:

*H11: Organizational implementation success factors positively impact information culture.*

Organizational customer orientation is defined as a “set of beliefs that customer needs and satisfaction are the priority of an organization” (Liu, Luo & Shi, 2002, p. 369), while not excluding the needs of “all other stakeholders such as owners, managers, and employees, in order to develop a long-term profitable enterprise” (Deshpande et al., 1993, p. 27). A customer orientation should have a favorable impact on the business performance and enhance customer satisfaction as well as organizational productivity (Deshpande et al., 1993; Karimi et al., 2001). Market- and customer-focused firms use IT to create or enhance a value proposition for their customers (Karimi, Somers & Gupta, 2001). As BIS enable greater information sharing, increase knowledge reach and richness, and improve the profundity of analyzing information and knowledge about customers (Alavi & Leidner, 2001), they represent a prerequisite for many organizations to successfully compete in the marketplace (Wixom & Watson, 2010). Research shows that an organizational customer orientation has an impact on the embeddedness of BIS into the routines of workers and the organizational environment (Grublješič et al., 2014). I therefore expect that, if the organizational business objective and strategy are focused on customers, the analysis and management of customer information should be a high priority which should induce behavioral and normative beliefs leading to stronger motivations to use BIS. Users in such environments would perceive a high social influence (peer and management support) leading towards BIS use and should be able to more easily demonstrate the results of BIS use connected with organizational objectives driven by customer satisfaction. I therefore hypothesize:

*H12: Customer orientation positively impacts result demonstrability.*

*H13: Customer orientation positively impacts social influence.*

Indicators of customer orientation also measure the free communication of information about the customer experience across all business functions and proactive acting based on this information (Liu et al., 2002). An organizational customer orientation should therefore induce an open information culture in terms of information transparency, sharing, and proactiveness (Marchand et al., 2001), leading to the next hypothesis:

*H14: Customer orientation positively impacts information culture.*

I have hypothesized that many organizational aspects supporting BIS implementation and use (such as management support of BIS use, effective change management and customer orientation) drive improvements in the organizational information culture. According to Marchand et al. (2001), six information behaviors and values characterize the information culture of an organization: information integrity, formality, control, sharing, transparency, and proactiveness. An open information culture concerning BIS use includes behaviors and values in the organization regarding information transparency, information sharing, and information proactiveness (Marchand et al., 2001). *Information transparency* captures openness in the reporting and presentation of information on errors and failures, allowing members to learn from mistakes. *Information sharing* is the willingness to exchange information with others in the organization in an appropriate and collaborative manner. *Information proactiveness*

represents an active concern and thinking about how to obtain and apply new information in order to respond quickly to business changes and to promote innovation (Marchand et al., 2001, pp. 124-126; Choo et al., 2008, p. 794). A highly developed information culture indicates to BIS users that the organization values the importance of information use, the exchange of information and action upon the information provided by BIS. In this kind of environment, users would therefore perceive that information use is an organizational norm or expected behavior, and they will also recognize the value of BIS use and find it easier to recognize and demonstrate the results of BIS use. I thus hypothesize:

*H15: Information culture positively impacts result demonstrability.*

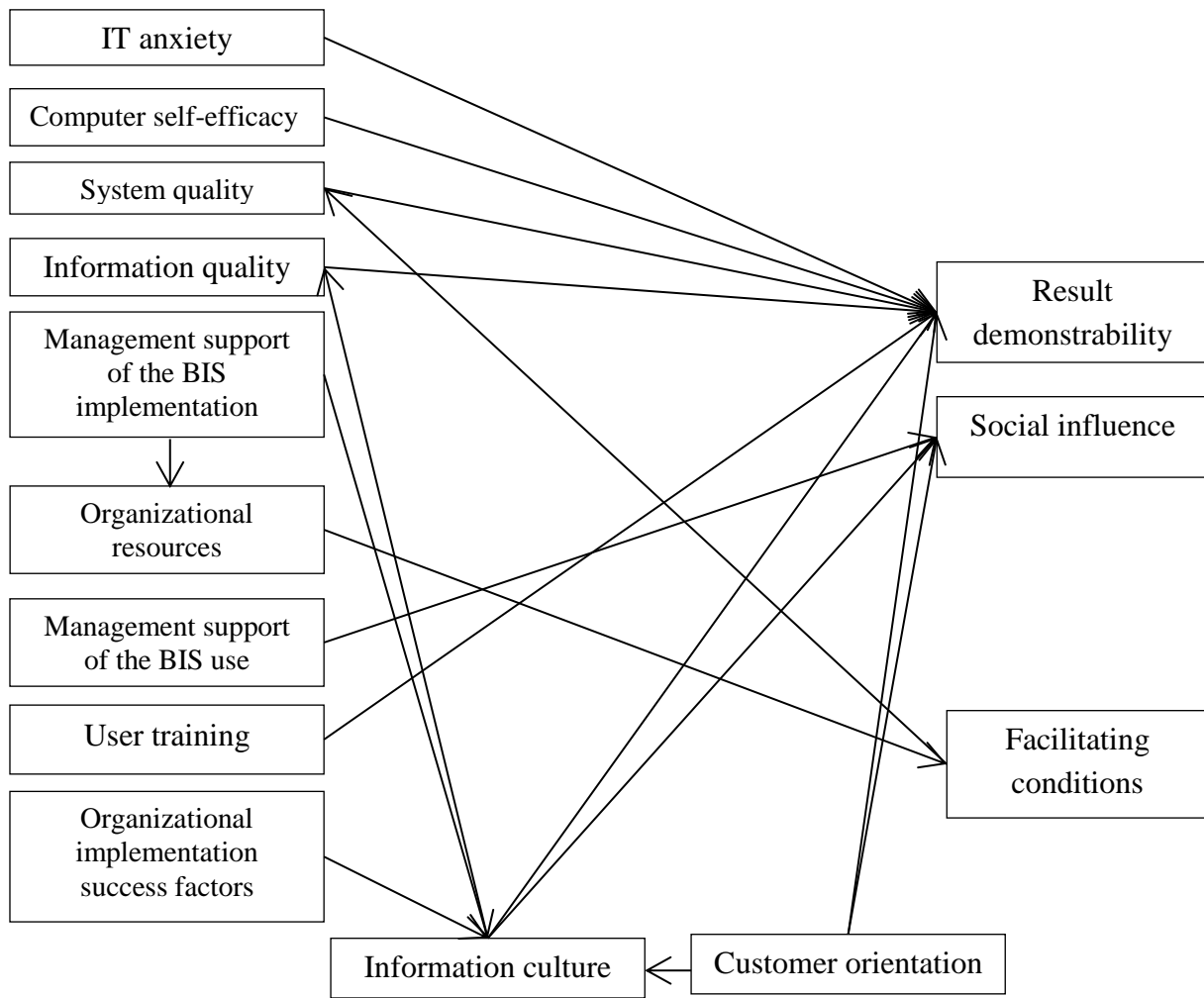
*H16: Information culture positively impacts social influence.*

Finally, an open information culture (Pijpers, 2002) will in turn also impact the quality of the information BIS provide. An important aspect of BIS is their provision of high-quality and relevant data to decision-makers (Wixom & Watson, 2001). As the level of information culture in terms of transparency and sharing increases, we may anticipate an increase in BIS information quality through improvements in the ability to integrate data, a reduction of data inconsistencies, and a better understanding of decision-makers' needs for addressing enterprise-wide business issues. A higher level of open information culture, reflected in better organizational information technology practices (Marchand et al., 2001), adds to the information quality, namely the relevance of information deriving from BIS, completeness, currency, accuracy, and format of the information (DeLone & McLean, 2003; Wixom & Todd, 2005). With this, I put forward the last hypothesis:

*H17: Information culture positively influences information quality.*

Conceptual model of the antecedents of BIS use is shown in Figure 7.

Figure 7. Conceptual model of the antecedents of BIS use



## 6.4 RESEARCH DESIGN AND METHODOLOGY

### 6.4.1 Research instrument

The questionnaire was developed by building on the previous theoretical basis to assure content validity. To ensure face validity, the questionnaire was pre-tested (Cooper & Schindler, 2003) using a focus group comprising practitioners and IS academics from the field who were not included in the subsequent research. Minor changes were made based on their suggestions, mostly involving the adaptation of the questionnaire items to the specific context of BIS use, i.e. integrating voluntariness of use in the indicators and unifying the operationalization of all indicators to measure perceptions. I used a structured questionnaire with seven-point Likert scales, with anchors ranging from totally disagree (1) to totally agree (7) for all items used in the study. Coelho and Esteves (2007) argue that a scale with more than five points generally shows higher convergent and discriminant validity than a five-point scale and thereby has greater explanatory power and thus confirms the higher nomological validity.

### **6.4.2 Measures**

The measurement items were developed based on the extensive literature review and supported by expert opinions. All constructs in the proposed models are based on reflective, multi-item scales.

To measure IT anxiety, I used three previously researched and validated items measuring computer anxiety provided by Venkatesh and Bala (2008), operationalizing them as IT anxiety. I employed three items from Venkatesh and Bala (2008) to measure computer self-efficacy. Three items for measuring information quality and three items for measuring system quality were adapted from Wixom and Todd (2005). To measure management support of the BIS implementation, three items from Hartono et al. (2007) were used. The management support of the BIS use scale was developed by using one item from Wixom and Watson (2001) while I myself developed two more items (supported by expert opinions) deriving from the specifics of BIS. The organizational resources scale was drawn from Wixom and Watson (2001) as was the organizational implementation success factors scale. The user training construct was measured using three items provided by Amoako-Gyampah and Salam (2004). The information culture scale was developed by taking one item from each of the components of information quality from Choo, Bergeron, Detlor and Heaton (2008) who developed the scale based on Marchand et al. (2001). The customer orientation construct was measured using six items with the highest factor loadings from the customer orientation construct of Liu et al. (2002). Result demonstrability was measured by four validated items taken from Venkatesh and Bala (2008) based on Moore and Benbasat (1991). Four items for measuring social influence were adapted from Venkatesh et al. (2003). The facilitating conditions scale was developed by combining four items from Venkatesh et al. (2003), one item from Goodhue (1998) and another item that was established based on the renewal capability dimension of Shanks et al. (2012) which measures whether BIS capabilities are continuously renewed to provide valuable insights. Combining all these items captures the full scope of the facilitating conditions needed for effective BIS use.

The proposed measurement model includes 54 manifest or observable variables loading onto 14 latent constructs (for a detailed description of the indicators, see Appendix A): (1) *IT anxiety*; (2) *Computer self-efficacy*; (3) *Information quality*; (4) *System quality*; (5) *Management support of the BIS implementation*; (6) *Management support of the BIS use*; (7) *Organizational resources*; (8) *User training*; (9) *Organizational implementation success factors*; (10) *Information culture*; (11) *Customer orientation*; (12) *Result demonstrability*; (13) *Social influence*; and (14) *Facilitating conditions*.

### **6.4.3 Data collection**

The data were collected through a survey of 2,173 medium- and large-sized business organizations with more than 50 employees in an EU country, namely Slovenia. These organizations represent the whole population (according to the mentioned criterion) of registered organizations in the official database published by the national Agency for Public

Legal Records and Related Services. The participants were given an introductory letter explaining the aims and procedures of the study, assuring them that the information collected would not be revealed in an individual form. An explanation and definitions of what BIS encompass were provided in order to elucidate who I would like to be qualified as target respondents since clearly not all of the sampled firms have implemented BIS to support their operations and processes. The questionnaires were addressed to a wide range of employees, that is, all users of BIS (top management, heads of departments and divisions, IS managers, etc.). The questionnaires were sent to the contact persons available in the database, with a request to distribute the questionnaires to relevant users of BIS that could meaningfully contribute to the research results. A total of 157 individuals responded, while 75 questionnaires were returned with a “return to sender” message, indicating that the addresses were no longer valid or the companies had ceased to exist. Subsequently, follow-up reminder letters were sent out, resulting in 38 more responses, altogether yielding a sample of 195 completed surveys. I discounted the number of “return to sender” mails following the approach of Prajogo and McDermott (2005), so the final response rate was 9.3%. This response rate was calculated according to the whole population of contacted firms. Since not all of the contacted firms count as the target sample the actual response rate might be much higher.

#### **6.4.4 Data analysis**

A form of structural equation modeling (SEM) was employed to carry out the data analysis. SEM techniques enable researchers to assess and modify theoretical models and are becoming increasingly popular in IS research because of their great potential to further theory development (Gefen, Straub & Boudreau, 2000). To conduct the data analysis, partial least squares (PLS) path modeling using Smart PLS was chosen. This is a widely used methodology in the IT and IS field as it is suitable for predicting and theory building because it examines the significance of the relationships between the research constructs and the predictive power of the dependent variables (Chin, 1998).

Four reasons motivated the choice of PLS path modeling. First, PLS path models can be very complex, i.e. they consist of many latent and manifest variables, and the number of these may be high in relation to the number of observations (Henseler, Ringle & Sinkovics, 2009), as in this case. The second is its suitability for a relatively small sample size as is the case in this research (Henseler et al., 2009). The guideline for such a sample size when using PLS modelling is that the sample should be equal to or larger than ten times the largest number of paths directed at a particular construct in the model (Chin, 1998). The minimum acceptable sample size is thus seventy, derived because the largest number of structural paths directed at the construct result demonstrability is seven. Third, the PLS path modeling approach is “more appropriate when the research model is in an early stage of development and has not been tested extensively” (Zhu, Kraemer, Gurbaxani & Xu, 2006, p. 528). The literature review showed that empirical tests of BIS and particularly tests of the acceptance and effective use of BIS are still scarce. The fourth reason for using this approach is that the assumptions about

the randomness of the sample and the normality of the distribution are less stringent (Bagozzi, 1994) and “there are no distributional requirements” (Fornell, 1982, p. 443). The estimation and data manipulation were performed using Smart PLS (Ringle, Wende & Will, 2005).

## 6.5 RESULTS

### 6.5.1 Descriptive analysis

Table 13 presents the means and standard deviations of the manifest variables. In the collected dataset the means vary between 3.608 for IC1 (Among the people I work with regularly, it is normal to leverage information for personal advantage) and 6.109 for IT ANX1 (IT does not scare me at all), which means that users generally do not fear using IT. The highest means are found in the IT anxiety construct, again showing that people are predominantly not scared of using IT, while the lowest means are found in the organizational implementation success factors construct, revealing that people generally do not have strong beliefs about organizations adequately managing the BIS implementation. The means for all of the measures (the average mean is 5.233) are around 1.7 scale points to the right of the center of the scale, suggesting a slightly left (negative) skewed distribution. Standard deviations vary between 1.955 for IC1 and 0.995 for IC3. The organizational resources indicators are those that globally show the highest standard deviations, whereas the information quality indicators are those with the smallest variability.

### 6.5.2 Measurement of reliability and validity

I first examined the reliability and validity measures (see Table 13) for the reflective measurement model. In the initial model, not all the reliability and validity measures were satisfactory. The loadings of the items were tested against the value 0.7 (Hulland, 1999) on the construct being measured. The manifest variables CSE3, IC1, IC4, IC6, IC7, RD4 and FC3 had very weak, although statistically significant (at the 0.05 significance level) loadings (except IC6) on their respective latent constructs and were thus removed. Manifest variables IT ANX2, IT ANX3, IC5, CO1, SI1, SI2, FC1 and FC2 had marginal loadings to 0.7 and were retained for sound theoretical reasons. Once the manifest variables that did not load satisfactorily had been removed, the model was rerun. Since all reliability and validity measures in the final model showed a substantial increase, it was appropriate to discard the indicators with low standardized loadings (Henseler et al., 2009).

Table 13. Means and standard deviations and reliability and validity measures of the measurement model for the antecedents of BIS use model

Construct	Indicator	Mean	St. Dev.	Initial model		Final model		Estimates (initial model)		Estimates (Final model)	
				Load.	t-values	Load.	t-values	Composite reliability	Average Variance Extracted	Composite reliability	Average Variance Extracted
IT Anxiety	IT ANX1	6.1088	1.4265	0.8142	10.4748	0.8177	9.3722	0.7624	0.5193	0.7616	0.5184
	IT ANX2	6.1047	1.3217	0.6963	5.5457	0.6910	5.2492				
	IT ANX3	6.0318	1.5639	0.6404	4.8621	0.6397	4.3126				
Computer self-	CSE1	5.3560	1.4864	0.9131	25.6710	0.9466	57.2282	0.8298	0.6353	0.9325	0.8736

efficacy	CSE2	5.2760	1.5011	0.9185	41.7617	0.9226	39.8518				
	CSE3	5.4688	1.5916	0.4782	3.6349						
System quality	SQ1	5.2400	1.1140	0.9487	68.4591	0.9483	72.0378				
	SQ2	5.2171	1.1541	0.9668	145.4288	0.9669	145.4272	0.9688	0.9120	0.9688	0.9120
	SQ3	5.1818	1.1617	0.9494	65.4687	0.9497	64.4313				
Information quality	IQ1	5.2682	1.0577	0.9489	58.7197	0.9494	59.5109				
	IQ2	5.2584	1.0580	0.9714	153.1122	0.9715	149.7782	0.9737	0.9250	0.9737	0.9250
	IQ3	5.2809	1.0576	0.9648	97.9693	0.9642	93.3713				
Management support of the BIS implementation	MGM-IMPL1	5.8000	1.0828	0.8670	26.8639	0.8686	29.9591				
	MGM-IMPL2	5.4229	1.3058	0.8992	44.8903	0.8983	45.0664	0.9133	0.7783	0.9133	0.7784
	MGM-IMPL3	5.3966	1.3929	0.8801	42.5825	0.8796	41.5041				
Management support of the BIS use	MGM-USE1	5.6171	1.3072	0.9168	55.8083	0.9167	51.9950				
	MGM-USE2	5.1462	1.4579	0.8672	27.3846	0.8675	26.2123	0.9250	0.8044	0.9250	0.8045
	MGM-USE3	5.5581	1.1956	0.9059	63.3837	0.9058	66.1922				
Organizational resources	OR1	5.1104	1.6272	0.9074	60.7177	0.9068	58.4028				
	OR2	4.7368	1.6060	0.9165	40.6588	0.9169	41.1650	0.9311	0.8183	0.9311	0.8183
	OR3	4.8121	1.4949	0.8897	35.7244	0.8900	33.1013				
User training	UT1	4.9112	1.4753	0.8616	31.9576	0.8633	34.4251				
	UT2	5.3434	1.3426	0.9280	56.7880	0.9272	51.7749	0.9361	0.8302	0.9361	0.8302
	UT3	5.3212	1.3159	0.9419	84.0418	0.9411	80.9539				
Organizational implementation success factors	OISF1	4.6196	1.6148	0.8532	27.5013	0.8635	29.0741				
	OISF2	4.9448	1.3665	0.8778	24.9050	0.8726	24.7597	0.9064	0.7635	0.9362	0.7631
	OISF3	4.9217	1.3706	0.8900	45.6046	0.8844	42.3254				
Information culture	IC1	3.6089	1.9554	-0.4637	5.2255						
	IC2	5.2404	1.2954	0.7327	14.7368	0.7926	18.8334				
	IC3	5.8085	0.9949	0.7760	20.4793	0.8014	19.2404				
	IC4	4.5249	1.6383	0.5857	7.9178			0.6084	0.3228	0.8052	0.5806
	IC5	5.5753	1.0792	0.6249	9.5410	0.6865	9.9015				
	IC6	4.2324	1.5725	0.0454	0.3537						
	IC7	5.7243	1.2575	0.4124	3.6396						
Customer Orientation	CO1	5.5082	1.5330	0.6511	9.3389	0.6449	8.9531				
	CO2	5.4190	1.3648	0.8296	23.6779	0.8311	22.5517				
	CO3	5.0391	1.4663	0.8215	24.2965	0.8258	23.7604	0.9045	0.6136	0.9041	0.6127
	CO4	5.4689	1.4773	0.8177	20.1398	0.8256	21.6891				
	CO5	4.7232	1.6778	0.7660	13.5588	0.7599	13.3541				
	CO6	4.7273	1.6541	0.7996	18.7772	0.7929	19.2631				
Result Demonstrability	RD1	5.6457	1.0934	0.8823	40.8141	0.8870	42.2226				
	RD2	5.6069	1.0764	0.9025	58.1046	0.9069	53.8701	0.8748	0.6448	0.9124	0.7766
	RD3	5.7200	1.1226	0.8461	14.2493	0.8488	13.9606				
	RD4	4.9770	1.7369	0.5198	5.9546						
Social Influence	SI1	5.0581	1.5842	0.6768	6.9168	0.6587	6.1757				
	SI2	5.1226	1.5219	0.6866	6.7763	0.6683	6.0665	0.8600	0.6092	0.8571	0.6046
	SI3	5.5756	1.2519	0.8954	36.6130	0.9043	41.3282				
	SI4	5.6949	1.2421	0.8401	15.4411	0.8486	16.3447				
Facilitating Conditions	FC1	5.2971	1.5472	0.6653	11.4068	0.6602	10.9987				
	FC2	5.5084	1.2469	0.6391	10.7419	0.6482	10.5421				
	FC3	4.0706	1.6230	0.2908	2.9673			0.8477	0.5007	0.8770	0.5916
	FC4	5.2343	1.5999	0.8382	30.7304	0.8582	34.3632				
	FC5	5.2235	1.5562	0.8656	44.9551	0.8791	46.5858				
	FC6	4.7895	1.5271	0.7853	20.8831	0.7698	20.1982				

I first checked the composite reliability measure, which takes the fact that indicators have different loadings into account (Henseler et al., 2009). All constructs' composite reliabilities reach the threshold of 0.8 and in many cases are even above 0.9 (which are the thresholds for more advanced stages of research), showing the high internal consistency of the indicators measuring each construct and thus confirming the construct reliability (Nunally & Bernstein, 1994). As suggested by Fornell and Larcker (1981), the average variance extracted (AVE)



was used as a criterion of convergent validity. The AVE is generally around 0.6 or higher, hence exceeding the threshold of 0.5 (Fornell & Larcker, 1981). The reliability and convergent validity of the final measurement model was also confirmed by computing standardized loadings for the indicators and Bootstrap t-statistics for their significance (see Table 1). All standardized loadings of the indicators in the final model exceeded (or were marginal to) the 0.7 threshold and without exception were found to be significant at the 0.001 significance level.

The discriminant validity is shown by the following two procedures: (1) a comparison of the item cross-loadings with the construct correlations (Gefen & Straub, 2005); and (2) a determination of whether each latent variable shares more variance with its own measurement variables or with other constructs (Fornell & Larcker, 1981; Chin, 1998).

The assessment of the indicator loadings on their corresponding constructs is the first procedure for testing the discriminant validity. As shown in Appendix B, the figures indicate that the manifest variable correlations with their theoretically assigned latent variables are in order of magnitude larger than other loadings on other constructs (Gefen & Straub, 2005). Since the loadings are larger than the other values in the same rows, that is cross-loadings (Henseler et al., 2009), all of the item loadings met the criteria of the first procedure for assessing the discriminant validity.

For the second procedure, I compared the square root of the AVE for each construct with the correlations with all other constructs in the model (see Table 2). Theory suggests that the square root of the AVE of each construct should be much larger than the correlation of the specific construct with any of the other constructs in the model (Chin, 1998) and should be at least 0.50 (Fornell & Larcker, 1981). It can be observed that all of the square roots of the AVE are significantly higher (and also substantially larger than the threshold) than the correlations between the constructs.

Table 14. Correlations between the latent variables and square roots of the average variance extracted for the antecedents of BIS use model

Construct	IT Anxiety	Computer self-efficacy	System quality	Information quality	Management support of the BIS implementation	Management support of the BIS use	Organizational resources	User training	Organizational implementation success factors	Information culture	Customer Orientation	Result Demonstrability	Social Influence	Facilitating Conditions
IT Anxiety	<b>0.7200</b>													
Computer self-efficacy	0.3503	<b>0.9347</b>												
System quality	0.0305	0.0685	<b>0.9550</b>											
Information quality	0.1509	0.0999	0.6860	<b>0.9618</b>										
Management support of the BIS implementation	0.1889	0.0656	0.3684	0.3536	<b>0.8823</b>									

<b>Management support of the BIS use</b>	0.1159	-0.0220	0.3025	0.2504	0.8314	<b>0.8969</b>								
<b>Organizational resources</b>	0.1621	0.1301	0.2398	0.2364	0.5499	0.5087	<b>0.9046</b>							
<b>User training</b>	0.1518	0.0596	0.3947	0.3035	0.4981	0.4946	0.6335	<b>0.9112</b>						
<b>Organizational implementation success factors</b>	0.1699	0.1356	0.3542	0.3010	0.6104	0.5725	0.6921	0.6151	<b>0.8736</b>					
<b>Information culture</b>	0.2025	0.2171	0.3256	0.2663	0.4204	0.3050	0.2571	0.2890	0.3788	<b>0.7620</b>				
<b>Customer Orientation</b>	0.1107	0.0931	0.2754	0.2170	0.4421	0.3510	0.3592	0.3226	0.3451	0.3402	<b>0.7828</b>			
<b>Result Demonstrability</b>	0.2887	0.3668	0.3683	0.3158	0.3393	0.2755	0.2947	0.4318	0.3560	0.4591	0.2176	<b>0.8813</b>		
<b>Social Influence</b>	0.0466	-0.0683	0.2726	0.1598	0.5300	0.5466	0.3631	0.3541	0.3758	0.4133	0.2303	0.3731	<b>0.7776</b>	
<b>Facilitating Conditions</b>	0.1617	0.1741	0.4523	0.3607	0.3839	0.3488	0.4874	0.4429	0.4218	0.4536	0.2460	0.4849	0.4532	<b>0.7692</b>

The results of both tests show sufficient discriminant validity, thus confirming that all the measurements are assigned to appropriate and theoretically different concepts.

Diamantopoulos and Winklhofer (2001, p. 272) note that “under reflective measurement, multicollinearity [a high degree of correlation between indicators] is not an issue because only simple regressions are involved (in which the indicator serves as the criterion and the latent variable as predictor)”. The test of multicollinearity is therefore problematic and necessary only for formative models, involving multiple regressions, where excessive collinearity (VIF higher than 10) among indicators makes it difficult to separate the distinct influences of the manifest variables on the latent variables.

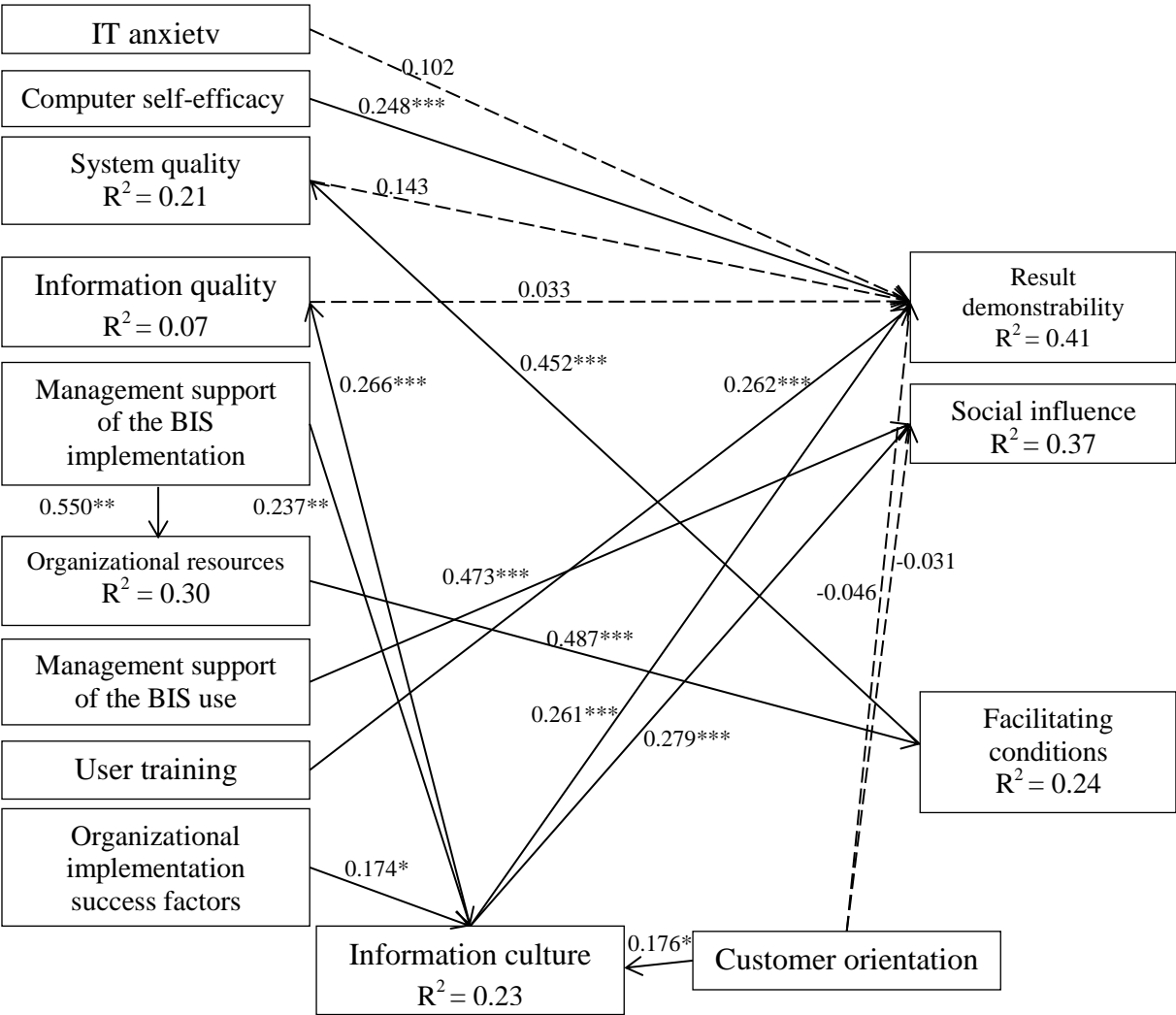
### 6.5.3 Results of the model estimation

After establishing that the outer model estimations are reliable and valid, estimates of the inner path model can be evaluated (Henseler et al., 2009), including a test of the significance of the hypothesized relationships between the constructs. For this propose, bootstrapping with 1,000 replicates was conducted. The structural model was then assessed by examining the coefficients of determination ( $R^2$ ) of the endogenous latent variables (representing the amount of variance explained by the independent variables), the estimates for the path coefficients of the relationships in the structural model (indicating the strength of the relationships between the dependent and independent variables) and their significance levels via bootstrapping (see Figure 8 and Table 15) (Chin, 1998). The tests of the structural model indicate how well the data support the hypothesized model.

Figure 8 shows the results of the test of the hypothesized structural model. The influence of computer self-efficacy, user training, and information culture together explain about 41.4% of the variance in result demonstrability. All the other hypothesized impacts on result demonstrability were not significant. Looking at the explained variability of the social influence, it can be seen that 36.7% of the variance is explained by the influence of management support of the BIS use and information culture (as the impact of customer

orientation was found to be non-significant). Management support of the BIS implementation has a significant impact on organizational resources and accounts for 30.2% of the variance in organizational resources. Organizational resources have a significant influence on facilitating conditions and account for 23.8% of the variance in facilitating conditions. Further, the results show significant direct effects of management support for the BIS implementation, organizational implementation success factors and customer orientation on information culture, accounting for 22.5% of the variance in information culture. In addition, 20.5% of the systems quality variability is explained by the significant influence of facilitating conditions. Information culture accounts for 7.1% of the variation in information quality. Information culture accounts for 7.1% of the variation in information quality.

Figure 8. Antecedents of BIS use research model results



Note. – (straight line): supported hypothesis, - - (dashed line): hypothesis not supported, \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Table 15 shows a detailed list of all the hypothesized paths, the significance of the relationships with t-statistics and the path loading coefficients ( $\hat{\beta}$ ). The  $\hat{\beta}$  estimates vary from 0.487 to 0.174. The elaboration of the results and the consequences of these findings are discussed in the next section.

Table 15. Estimations of the hypotheses

Constructs	Hypothesis	T-statistics	Path loading ( $\hat{\beta}$ )	SIG/NON SIG
IT ANX-> RD	H1	1.582	0.102	NON SIG
CSE->RD	H2	4.498***	0.248	SIG
SQ->RD	H3	1.411	0.143	NON SIG
IQ->RD	H4	0.365	0.033	NON SIG
MNGM IMPL->OR	H5	9.336***	0.550	SIG
MNGM IMPL->IC	H6	2.676**	0.237	SIG
MNGM USE->SI	H7	6.673***	0.472	SIG
OR->FC	H8	8.391***	0.487	SIG
FC->SQ	H9	7.508***	0.452	SIG
UT->RD	H10	4.220***	0.272	SIG
OISF->IC	H11	1.993*	0.174	SIG
CO->RD	H12	0.656	-0.041	NON SIG
CO->SI	H13	0.371	-0.031	NON SIG
CO->IC	H14	1.999*	0.176	SIG
IC->RD	H15	3.777***	0.264	SIG
IC->SI	H16	4.464***	0.280	SIG
IC->IQ	H17	3.269***	0.266	SIG

Note. (ns) non-significant; \* significant at the 0.05 level (two-tailed test); \*\* significant at the 0.01 level (two-tailed test); \*\*\* significant at the 0.001 level (two-tailed test)

## 6.6 DISCUSSION WITH IMPLICATIONS FOR RESEARCH AND PRACTICE

By combining several streams of IS research, this study identifies antecedents to an individual's beliefs underpinning the intention to use BIS and thereby facilitates greater understanding of how this cognitive phenomenon (Venkatesh et al., 2003) is formed. In doing so, it follows several recommendations and calls made in IS research, providing theoretical and practical implications:

First, it provides context-specific determinants that influence the formation of the intention to use BIS. Venkatesh et al. (2011, p. 545) expose "the need to consider context-relevant variables when designing research to study technology adoption and use". Within this, it investigates and identifies antecedents to the formation of the beliefs behind intention (which acceptance models were criticized for lacking) providing guidance to organizations on how to proactively design interventions that they can have an influence on in order to maximize the individual's acceptance (calls made in Venkatesh et al., 2003; Jaspersen et al., 2005; Venkatesh & Bala, 2008). It thereby reveals what drives the motivation to use BIS, and how and why individuals form these intentions (calls made in Lee et al., 2003; Benbasat & Barki, 2007; Venkatesh & Bala, 2008). Further, it investigates the effects of the IT artifact itself –

object-based beliefs (BIS system and information quality) as the antecedent to acceptance beliefs as encouraged in Wixom and Todd (2005). To widen the scope, it includes individual (personal), technological (context or situation of use) and organizational (social and physical environment) antecedents that represent the “background factors” influencing the formation of an individual’s behavioral and normative beliefs as proposed in Ajzen and Fishbein (2005). Finally, it exposes the importance of organizational factors in shaping an individual’s intentions to use BIS, following the suggestion of Benbasat and Zmud (2003, p. 186) that researchers should focus on the “managerial, methodological, and operational practices for directing and facilitating IT artifact usage”.

### **6.6.1 Implications for research**

This work’s broadest and most important *contribution to research* is the development of a comprehensive model of the antecedent drivers of BIS acceptance determinants. The article integrates the findings of several IS research streams (i.e. organizational-level IS adoption, IS implementation and success, IS acceptance, and theories of human social behavior) into a nomological network of drivers that shape the individual’s behavioral and normative beliefs leading to intentions to engage in the use of BIS.

The main message conveyed by this study’s results is that, besides the self-efficacy belief, believing that one can produce desired effects by using BIS (Bandura, 1998), impacting on the demonstrability of the results of using BIS; organizational factors, either directly (user training and management support of BIS use) or indirectly through the building of an open information culture impact an individual’s cognitive process and internal motivation to use BIS. A discussion of specific significant relationships and interdependencies among the constructs now follows.

Individual or personal characteristics capturing personal internal control/knowledge (computer self-efficacy) and emotion regarding IT use (IT anxiety) show how individual differences impact the formation of behavioral beliefs. The results indicate that IT anxiety, the emotion of apprehension and fear when using IT, has no effect on result demonstrability. This might be due to the fact that users of BIS are generally better educated workers, mostly managers (Negash & Grey, 2008), with greater IT use experience, and therefore do not exhibit such emotions. This conclusion is also supported by the high mean results that show almost total agreement with not being scared of using IT. But, when viewed from a more general standpoint, given today’s pervasiveness of computer use and IT both in the workplace and at home, I believe that it is reasonable to question whether IT anxiety still has any effect at all, an issue already raised by Venkatesh (2000). I believe that IT anxiety has already become obsolete these days when computers and IT are embedded practically everywhere. In contrast, computer self-efficacy, the belief in having the knowledge to perform a specific task and produce desired effects (Bandura, 1998; Venkates & Bala, 2008), impacts the result demonstrability of using BIS. The importance of self-efficacy beliefs is already widely recognized in the literature (e.g. Bandura, 1998; Venkatesh, 2000; Ajzen & Fishbein, 2005). These “regulate motivation by determining the goals people set for themselves, the strength of

commitment to them and the outcomes they expect for their efforts” (Bandura, 1998, p. 625). For intentions to use BIS self-efficacy, affecting whether one makes good or poor use of the skills one possesses (Bandura, 1998) is also important.

Investigation of the effects of object-based beliefs or the effects of the IT artifact itself (system and information quality) as antecedents to behavioral beliefs (proposed in Wixom & Todd, 2005) revealed interesting and important findings. The results show that system and information quality have no significant effect on the result demonstrability of using BIS. Although the respondents generally found that their BIS is high in quality and provides high-quality information (according to the mean results), these system characteristics do not shape beliefs that would lead to BIS use. Venkatesh (2000, p. 359) already found that “system-independent constructs play a stronger role than constructs that are a result of the user-system interaction” in creating intentions. Internal motivation to use BIS is therefore not created or shaped by system attributes per se.

The results of this study show that organizational factors are major significant predictors of behavioral and normative beliefs that influence the decision to engage in the use of BIS. Apart from the impact of the individual’s self-efficacy, they explain all of the other captured variance in these two beliefs leading to intention. These findings represent an important contribution to theory, demonstrating that organizational variables should be incorporated in models investigating employees’ acceptance and use of IT in the organizational context in general as important antecedents driving and shaping beliefs that lead to intention.

Management support of BIS implementation importantly influences the related organizational resources that are provided, further driving the establishment of adequate facilitating conditions comprising organizational and technical infrastructure to support the use of BIS. Well-developed facilitating conditions also positively influence system quality. These are all important considerations for organizational BIS implementation success (Wixom & Watson, 2001) but that does not per se drive the individual’s internal motivation to engage in the use of BIS.

Important direct predictors of beliefs leading to intention are user training and management support of BIS use. Management support of BIS use is an important predictor of an individual’s normative beliefs. This impact refers to the “internalization” mechanism (Venkatesh & Davis, 2000) that is particularly enhanced under volitional control. If management supports, encourages and leads by example in the use of BIS individuals incorporate these norms into their own belief structure (Venkatesh & Davis, 2000). Management support of BIS use represents a salient influence on the normative belief structure, entailing the component of social influence where individuals consider their peers’ approval of a behavior. Positive perceptions of the approval and encouragement of the use of BIS will strengthen motivations to engage in the use of BIS. I have theorized and conceptualized two distinct management support mechanisms, and demonstrated that they have different impacts. Venkatesh & Bala (2008) called for richer conceptualizations of management support in order to enhance the understanding of its role in the IT acceptance

context. The findings show that management support of BIS implementation does not have a direct impact on creating an individual's intentions, but it is necessary for the legitimacy of the implementation process (Venkatesh & Bala, 2008) and induces the building of a higher-level information culture, with a subsequent direct impact on intentions. On the other hand, management support of BIS use demonstrates organizational normative practices that are important for employees' morale, and in turn directly and positively shapes individuals' normative beliefs leading to favorable intentions to use BIS.

User training directly impacts individual behavioral beliefs. Research has already provided proof of the impact of training on behavioral intention mediated by behavioral belief mechanisms (Yi & Davis, 2001). Successful training affects the ability to communicate the results of using BIS. The training program should focus on understanding the content, i.e. the information provided by BIS (Grublješič & Jaklič, 2014). This highlights the different specific context of BIS use as compared to operation IS, namely that BIS are predominantly used in unstructured business processes, reinforced by the fact that the instructions for using BIS are less developed and systemized. Yi and Davis (2001, p. 525) point out that learning through training, particularly for decision technologies, is "more effective when the training environment promotes more meaningful symbolic transformation of the action patterns and deeper processing of information". Effective training improves the level of understanding and gives confidence to individuals and thereby increases motivations to use BIS.

A particularly important finding is that the organization's information culture directly drives an individual's internal motivation to use BIS. It impacts on the behavioral belief of result demonstrability and on the normative belief of social influence. Therefore, an organization's values, norms, and practices regarding the information reflected in the organizational information culture (Choo et al., 2008) impact an individual's considerations that then form their intention to use BIS. The pure nature of BIS use exposes the importance of using the information that comes from BIS, the importance of the relevance of this information (Eppler, 2006) and the sharing of information where information collected in BIS is aggregated at the organizational level (Negash & Grey, 2008). The results of the factor analysis showed that the information behaviors and values that are important in the BIS context are information transparency, sharing, and proactiveness. In order for BIS to be favorably and desirably embraced and accepted by users, organizations should establish and maintain an open information culture, treating information as an organizational resource shared openly and freely, while supporting proactive use of it (Davenport, 1997).

Many organizational factors further discussed can help build higher levels of an open information culture. The results show that management support of BIS implementation, organizational implementation success factors, and customer orientation are significant drivers of information culture. We can see that *management support of BIS implementation* does not have an impact on an individual's motivation to use BIS through the quality of the resulting IS, but has an impact by building higher levels of information culture during the BIS implementation activities. Further, *organizational implementation success factors*, comprising

effective dealing with the potential resistance and change that come with BIS implementation due to changes in data ownership, how jobs are performed and business process executions (Wixom & Watson, 2001) also drive higher levels of information culture. Another important significant predictor of information culture is *customer orientation*. Previous studies showed that a customer orientation directly impacts the embeddedness of BIS in the organizational work system (Grublješič et al., 2014). This is because customer orientation as an important external or environmental factor drives individuals in market-oriented and more competitive environments to integrate BIS use into their routines as a mandatory step. I tested the possibility of whether a customer orientation also drives an individual's internal motivations. The results show that a customer orientation does not have a direct impact on beliefs leading to intention but has an impact via improvements in information culture. An organizational customer orientation includes collecting customer information, monitoring organizational commitment to customers, open communication of customer experience information, and proactively acting based on customer satisfaction information all incorporated in the business strategy (Liu et al., 2002). All of these actions improve information transparency, sharing, and proactiveness, making up an information culture that drives an individual's internal motivations to use BIS. A higher level of information culture also impacts the quality of information emerging from BIS. BIS information quality does not have a further impact on beliefs leading to the intention to use a BIS, but should have an effect on the relevance and quality of the output people produce by using it, in turn providing benefits for the organization.

### **6.6.2 Implications for practice**

This research *contributes to practice* in important ways. It highlights several factors that play a role in influencing and inducing beliefs leading to intention or internal motivations to use BIS. Since the main drivers of such beliefs to use BIS are organizational, this gives actionable guidance to organizations since these are factors organizations can influence. These motivational drivers could be called *trans-implementation* issues, including pre- and post-implementation aspects, that should be constantly nurtured and continuously evolving (Grublješič & Jaklič, 2014). These should move in the direction of building up a “BI culture”, that is creating a culture that values business intelligence. The results of the model point to some enablers or propose a mechanism through which this can be achieved and fostered.

First, management should support BIS use by encouragement, leading by example, and supporting fact-based decision-making based on the information provided by BIS. This conveys the organization's normative values and practices, thus motivating users to engage in such behavior. The next important organizational factor is building up an open information culture, featuring information sharing, transparency, and proactiveness, which gives a message to users to embrace the right behavior and values for working with information (Marchand et al., 2001). This can be induced by management support of the BIS implementation, showing the importance of BIS not being an IT-driven initiative but more a business-driven one (Yeoh & Koronios, 2010). Through management support of the BIS



initiative, the information culture starts to develop by raising awareness of working with information. Effective change management goes along with this by dealing with the political resistance and organizational change that come with BIS implementation, such as changes in data ownership, the shift to sharing and the transparency of information and changes in business processes that stimulate a more open information culture. Incorporating in the business strategy an organizational customer orientation, including open communication and the collection of customer information and action on customer satisfaction information, again reflects and builds information sharing, transparency, and proactiveness by building higher levels of information culture, driving users to engage in the use of BIS. If organizations are customer-oriented they realize the potential of good data and information impacting on a higher-level information culture, increasing an individual's awareness of the meaning of working with data and information. Organizations should also provide adequate user training, focusing on training for understanding the content or information provided by BIS. Venkates and Bala (2008) already suggested that the role of training can be even more important in the context of decision-support systems that are more disruptive in nature and more likely to invoke resistance. Through content training, users improve their level of understanding and are more likely to develop favorable perceptions about BIS. They build their confidence along with their skills, improving their self-efficacy (Compeau & Higgins, 1995) and motivating them to engage in the use of BIS, particularly in a more explorative and innovative manner (Ahuja & Thatcher, 2005).

Understanding what shapes beliefs leading to an intention to perform a behavior is particularly important in volitional situations where intentions are core predictors of actual behavior (Ajzen & Fishbein, 2005) as in predominantly in the BIS use environment (Popovič et al., 2012). A conducive organizational environment conveying the support and promotion of the use of business intelligence through an open information culture can shape the thinking of individuals and motivate them to use BIS. This is especially important for effective BIS use, exposing the specific nature of BIS use involving unstructured, i.e. research-oriented and innovative, use. The development of positive internal motivation to use BIS is not essential for simply using the basic functionalities of the system that might actually be mandatory or necessary for carrying out business processes, but for the deep structural use of BIS which in particular depends on an individual's efficacy and motivation to do so, in turn based on volitional control. This deep usage involves advanced analytics with the creation of competitive and innovative knowledge, that "takes managerial decision making to new levels of understanding and foresight" (Shanks et al., 2012) and represents the main added value of using BIS to lead to a better organizational performance.

### **6.6.3 Limitations and future research**

This study has some limitations that should encourage future research. The first limitation concerns the generalizability of the findings to other settings and information technologies. Since the objective of this study was to find antecedents to beliefs leading to the intention to use BIS, some of the significant determinants might only be context-specific. However, I

provided a broad framework of antecedents that should also be tested in other settings. Perhaps a different set of significant intention drivers will emerge. Second, this study tested the impact of the antecedents on behavioral and normative beliefs that drive internal motivations to use BIS. Actual use might also depend on some other determinants that can also influence the performance of a behavior, based on external and situational motives and mandates. System attributable characteristics and other infrastructural facilitators might come to fore. I encourage future research to test this framework of antecedents as a direct impact on use, preferably on different types of uses.

## **7 CONCLUDING REMARKS**

In order to improve business performance with BIS investments, these should become an integral part of organizational activity (Furneaux & Wade, 2011) by being embedded into the routines of workers, organizational processes, technology infrastructure and strategy (Shanks et al., 2012). Nevertheless, the numerous cases of underutilization of BIS show that “employees rarely use the implemented IS to its fullest potential, thus preventing organizations from realizing the promised benefits” (Li et al., 2013, p. 659). Understanding the structure of the determinants of effective acceptance and usage of BIS by employees, which was the purpose of the dissertation, is therefore crucial. This can provide leverage points to create favorable beliefs that encourage and motivate users to accept and effectively use BIS (Venkatesh, 2000). Effective deeply embedded usage involves advanced analytics with the creation of competitive and innovative knowledge that “takes managerial decision making to new levels of understanding and foresight” (Shanks et al., 2012, p. 114) and represents the main added value of using BIS leading to better organizational performance, realizing the outcomes promised by implementing BIS.

Throughout the dissertation research, the dissertation goals were successfully reached. A broad overview of the general determinants of user acceptance and use of IS was provided, identified, systemized, and categorized based on the extensive literature review. Specific differences and characteristics of BIS compared to operational IS related to the nature of their use were determined. Based on exploratory case studies and interviews with experts from the field, a BIS acceptance model and BIS extended use model were conceptualized. Embeddedness of BIS was defined and conceptualized by developing a measurement scale for this construct. Building on data gathered from the survey analysis, a model of drivers of the three dimensions of BIS use, including intensity, extent and embeddedness, was developed and tested. Finally, a model of the antecedent determinants of intention beliefs to accept and use BIS was developed and verified based on the survey data analysis.

The dissertation successfully confirmed the dissertation hypotheses found in the presented papers. The research findings revealed that a different but overlapping set of acceptance determinants than traditional models posit drive BIS use as a consequence of specific differences in the nature of BIS use (Hypothesis 1) and that a whole range of individual, technological, organizational, and social factors importantly shape motivations to accept and

use BIS (Hypothesis 2). The leading role of a broad range of organizational factors driving the acceptance and use of BIS was confirmed (Hypothesis 3). This organizational environment influence exposed the importance of an information culture along with the provision of quality information for the effective acceptance and use of BIS (Hypothesis 4). Determinants related to social aspects in an organizational environment were found to be major drivers of the acceptance and use of BIS (Hypothesis 5). Several dimensions encompassing the effective use of BIS leading to its embeddedness were established (Hypothesis 6). In addition, it was confirmed that a whole range of antecedent determinants, identified based on BIS specifics, explains the variance in the acceptance determinants of BIS, again pointing to the prominence of organizational factors in shaping these beliefs (Hypothesis 7). The research findings from each paper add to the confirmation of the dissertation hypotheses and are summarized below.

The second section provides a comprehensive literature review of theories and models dealing with psychological, technological, organizational, and environmental impacts on the acceptance of IS. Based on this overview, a comprehensive set of all identified determinants of IS acceptance was systemized into categories, including individual characteristics, technological characteristics, organizational factors, social characteristics, and environmental characteristics. Further, based on existing research in BIS settings, the preliminary specifics of BIS compared to operational IS were also outlined. The section concludes by pinpointing the initial determinants that are crucial for increasing the acceptance and use of BIS, as identified in the literature. These determinants include task-technology fit, management support and change management, organizational culture, and information culture. This section outlined the initial proof for the first hypothesis.

The third section used the literature review findings as a baseline and followed with an exploratory approach in order to conceptualize a business intelligence acceptance model. Findings from the literature review were reinforced with case studies including semi-structured interviews that allowed the specifics of BIS acceptance to emerge. Insights from the case studies and interviews helped identify the important determinants in the BIS acceptance framework. Building on these findings, a conceptual model was designed that distinguishes between object-based beliefs and behavioral beliefs impacting the acceptance of BIS. The findings revealed a significant emphasis on organizational factors in the BIS acceptance context, such as result demonstrability, social influence, and facilitating conditions with sufficient resources that help build an adequate information culture, all substantially influencing the effective acceptance of BIS. The findings from this section further confirm hypotheses one, two, three, and four.

The fourth section continued with an analysis of findings from the case studies, focusing on an investigation of diverse post-adoptive BIS use behaviors. In this section, three dimensions of effective BIS use, namely intensity, extent and embeddedness, were identified and theoretically elaborated and a business intelligence extended use model was conceptualized. The findings outlined the crucial determinants for effective BIS use. The analysis of the findings showed that personal innovativeness and readiness for change boost the transition to

the embeddedness of BIS into workers' routines. The relevance of the information provided by BIS is vital for the deep structural usage of BIS, which has not been highlighted in previous models of IT acceptance. The results also showed that there is a great emphasis on organizational factors classified as trans-implementation issues, taken into account before, during and after the implementation, that should be constantly evolving for effective BIS use. The findings from this section provided more confirmation of hypotheses one, two, three, four, and six.

The fifth section started with an empirical analysis of survey data. A survey questionnaire researching the determinants of the acceptance and use of BIS was constructed based on the findings and conceptualizations in the exploratory phase. This section theoretically conceptualized a model of drivers of the three dimensions of BIS use by developing several hypotheses. The results of the model estimation provided support for conceptualizing the three dimensions of use (intensity, extent and embeddedness) as different constructs. The findings of the empirical analysis revealed important insights in the BIS use context. They show that traditional determinants of effort and performance perceptions play no significant role in predicting intentions to use BIS. Intentions to use BIS are driven by the social mechanisms of result demonstrability and social influence. Direct drivers of different dimensions of use are intentions to use BIS (driven by social mechanisms) and facilitating conditions. Further, an organizational customer orientation directly impacts on the qualitative leap in use, namely the embeddedness of BIS into the routines of workers. The findings highlight the importance of organizational factors for the acceptance and effective use of BIS, the crucial role of customer orientation for embedding BIS into the routines of workers and enrich the understanding of the phenomena of post-adoption BIS use behavior. The findings from this section confirm hypotheses one and three, in most parts hypothesis two, and in particular provide proof for hypotheses five and six.

The sixth section continued with an analysis of the empirical data. It addressed the critical research question extensively called for in the IS literature of what drives intention beliefs so as to provide actionable guidance which acceptance models have been criticized for lacking. A comprehensive model of the antecedent determinants of intention beliefs to accept and use BIS was developed along with several hypotheses. The model captures a wide range of factors including individual, technological, and organizational factors that can impact the formation of favorable intention beliefs to use BIS, reflecting the specifics and nature of BIS use. The results of the study reveal the significant antecedent drivers of acceptance in the BIS context. They show that, besides the self-efficacy belief, representing individual characteristics, organizational factors either directly (user training and management support of BIS use) or indirectly through building of an open information culture impact the individual's internal schema of considerations that shape their intentions to use BIS. Drivers that help build higher levels of an information culture are management support of the BIS implementation, organizational implementation success factors and customer orientation. Contrary to expectations, BIS information and system quality (technology characteristics) do not have a direct impact on the creation of behavioral beliefs. Several theoretical and practical

implications were discussed, exposing organizational factors as antecedents for creating intentions that organizations can influence in order to increase individuals' motivations to use BIS. The findings of this section confirmed hypotheses two, three, four, and particularly seven.

All of the findings improve the understanding and provide a framework of what drives the individual's motivation to use BIS and how and why individuals form beliefs to engage in the use of BIS and further continue with their effective use, embedded into their routines. A big picture model of the acceptance and effective use of BIS can be drawn from the combined findings of the separate studies. Decisions to use BIS are formed by several layers of drivers. First, the formation of intention beliefs (consisting of social influence and result demonstrability in the BIS context) is driven by an interdependent mechanism of antecedent determinants. The significant antecedents include a self-efficacy belief, representing individual characteristics, and organizational factors that either directly (user training and management support of BIS use) or indirectly through the building of an open information culture (driven by management support for the BIS implementation, organizational implementation success factors and customer orientation) impact the individual's internal schema of considerations that shape their intentions to use BIS. Interestingly, BIS information and system quality (technology characteristics) do not have a direct impact on the creation of intention beliefs. The interim layer is made up of acceptance determinants that further drive BIS use. These encompass behavioral and normative beliefs impacting intentions to use BIS, and external organizational factors. In the BIS context, social influence and result demonstrability are predictors of intention beliefs, and not the traditional determinants of effort and performance perceptions (Davis, 1989; Venkatesh et al., 2003). The final layer includes the direct drivers of dimensions of effective BIS use, namely the intensity, extent and embeddedness of BIS, representing the ultimate desired outcome of BIS utilization. Direct drivers of different dimensions of use are intentions to use BIS (driven by social mechanisms) and facilitating conditions, while an organizational customer orientation only directly impacts the qualitative leap in use that is marked by the embeddedness of BIS into the routines of workers. The overall model reveals that organizational determinants can both shape the intentionality framework as antecedents to intention beliefs, or directly impact use dimensions. The creation of intention beliefs to perform a behavior is particularly important in volitional situations where intentions are core predictors of actual behavior (Ajzen & Fishbein, 2005). However, actual use also depends on some other determinants that can also influence the performance of a behavior based on external and situational motives and mandates. This is shown by the direct impact of facilitating conditions and a customer orientation on BIS use. The identified antecedent determinants can therefore also directly impact different dimensions of use as external factors not captured by the intentionality framework. System attribute characteristics and other infrastructural facilitators that form part of the antecedent framework could have a direct impact on use determinants, as exposed by the exploratory case study findings. The presented framework therefore also provides

opportunities for future research where, for example, the ways in which the antecedent determinants directly impact different dimensions of use should be tested.

Several theoretical and practical implications can be drawn from the findings discussed throughout the sections, also providing a stepping stone for future research. Based on these findings, organizations can proactively design interventions to improve the likelihood of their success with BIS implementations, leveraging benefits that such efforts provide, like increased competitive advantage, leading to a better organizational performance.

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## **APPENDICES**





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## **APPENDIX A: Semi-structured interview guide for researching acceptance and effective use of BIS (in Slovenian)**

### **OKVIRNA IZHODIŠČA POL-STRUKTURIRANIH INTERVJUJEV: DEJAVNIKI SPREJEMANJA IN UČINKOVITE UPORABE POSLOVNO INTELIGENČNIH SISTEMOV**

**Namen:** je ugotavljanje dejavnikov sprejemanja in učinkovite uporabe BI sistemov in uporabe informacij, ki jih ta zagotavlja pri različnih uporabnikih. Namen je pridobivanje informacij s strani ekspertov oz. strokovnjakov iz prakse, ki so takšen BI sistem uvedli v svoje poslovanje.

#### **Definicije:**

- Sprejemanje (acceptance) na ravni posameznika: dokazljiva pripravljenost posameznika, da uporablja določeno informacijsko tehnologijo za naloge, ki naj bi jih ta tehnologija podpirala.
- Vpetost (embeddedness): stopnja do katere je uporaba BIS sistema sestavni del organizacijske dejavnosti, kar vključuje vpetost v rutine odločevalcev in v organizacijske procese, tehnološko infrastrukturo in strategijo.

#### **Podjetje:**

**Ime in priimek intervjuvanca:**

**Delovno mesto:**

#### **IZHODIŠČNA VPRAŠANJA:**

1. **Kako je bila vaša BI rešitev sprejeta s strani uporabnikov?**
  - a. **Ali lahko identificirate različne skupine uporabnikov, ki so različno sprejeli BI sistem (npr. analitiki, srednji management, top management)?**
  - b. **V kolikšni meri so uporabniki potem dejansko uporabljali informacije, ki jih BI sistem zagotavlja v primerjavi s stanjem pred uvedbo sistema? (Ali so bile kakšne spremembe (ali sedaj bolj uporabljajo informacije)).**
  
2. **Kako je bila vaša BI rešitev sprejeta v različnih obdobjih po odločitvi o uvedbi BI sistema (različni uporabniki; npr. analitiki, srednji management, top management)?**
  - **Pričakovanja uporabnikov pred uvajanjem**
  - **Med uvajanjem**
  - **Po uvedbi (odziv uporabnikov in merjenje uporabe)**
  
3. **V teoriji kot osnovna dejavnika sprejemanja sistema ločimo zaznano uporabnost in zaznano enostavnost uporabe. Kje so bili večji problemi oz. ali je tukaj lahko vpliv na sprejemanje?**
  
4. **Kako bi opisali učinkovito uporabo BI sistemov? Na kakšne vidike uporabe je potrebno biti pozoren?**

5. Kaj so bili ali so po vaši oceni najpomembnejši dejavniki, da so uporabniki sprejeli BI rešitev (različni uporabniki; npr. analitiki, srednji management, top management)?
- Da so uporabniki sprejeli
  - Da uporabniki niso sprejeli
6. Kakšne so pri sprejemanju specifične BI sistemov v primerjavi z drugimi operativnimi informacijskimi sistemi
- Prosto:
  - Po sklopih:
    - Individualne značilnosti
    - Tehnološke značilnosti
    - Organizacijske značilnosti
    - Socialne značilnosti
    - Okoljske (makro) značilnosti
7. Na podlagi pregleda literature, smo identificirali in sistemizirali splošne dejavnike sprejemanja in uporabe IT. Kateri od navedenih, na podlagi vaših izkušenj, veljajo tudi za sprejemanje in uporabo BI sistemov?

		Velja za sprejemanje in učinkovito uporabo BIS (DA/NE)			
Spremenljivka	Opredelitev	Sprejemanje BIS	Intenzivnost uporabe	Obseg uporabe	Vpetost uporabe
<b>INDIVIDUALNE ZNAČILNOSTI</b>					
Spol	Moški ali ženski spol				
Starost	Starost uporabnika				
Računalniška pismenost	Znanje in sposobnost učinkovito uporabljati računalnike in povezano tehnologijo				
Stopnja izobrazbe	Stopnja dokončanih let izobrazbe				
Stališče (odnos)	Posameznikova pozitivna ali negativna čustva (evalvacijski afekt) o izvajanju ciljnega vedenja (Fishbein & Ajzen, 1975).				
Samoocena glede dela z računalnikom	Stopnja, do katere posameznik meni, da ima sposobnost opravljati specifične naloge in dela s pomočjo računalnika (Compeau & Higgins, 1995).				
Računalniška igrivost	Stopnja kognitivne spontanosti pri računalniški interakciji (Webster & Martocchio, 1992).				
Osebna inovativnost	Lastnost posameznika, ki odraža pripravljenost, da preizkusi katerokoli novo tehnologijo (Agarwal & Karahanna, 2000).				

Zazan užitak ob uporabi	Obseg v katerem je »aktivnost uporabe sistema zaznana kot prijetna sama po sebi, ne glede na zmogljivostne posledice, ki so rezultat uporabe sistema« (Venkatesh, 2000).				
Računalniška anksioznost	Stopnja posameznikove zaskrbljenosti ali strah v situaciji, ko je soočen z možnostjo uporabe računalnika (Venkatesh, 2000).				
Predhodne izkušnje	Trajanje ali stopnja posameznikove predhodne uporabe računalnikov ali kateregakoli informacijskega sistema na splošno (Sabherwal et al., 2006).				
Pozitivno razpoloženje	Pozitivno razpoloženje predstavlja notranji dejavnik, ki vpliva na kognicijo in vedenje in predstavlja posameznikovo čustveno stanje (ni reakcija ampak stališče). Biti v stanju pozitivnega razpoloženja vpliva na to, kako so naše misli organizirane (Djambasi, Strong & Dishaw, 2010).				
Vedenjsko pričakovanje	Posameznikova samo-napoved njegovega prihodnjega obnašanja, ki pomaga upoštevati pričakovane spremembe namena in pojasnjuje dejansko verjetnost vedenjskega dejanja (Warshaw & Davis).				
Pripravljenost na spremembe	Imeti ugodno percepcijo glede organizacijske spremembe in biti pripravljen nanjo. Predhodniki pripravljenosti na spremembe so zaznane osebne kompetence in organizacijska podpora (Kwahk & Lee, 2008).				
<b>TEHNOLOŠKE ZNAČILNOSTI</b>					
Relativna prednost	Stopnja, do katere je inovacija zaznana kot boljša od svojega predhodnika (Moore & Benbasat, 1991).				
Kompatibilnost	Stopnja, do katere je inovacija zaznana kot skladna z obstoječimi vrednotami, potrebami in predhodnimi izkušnjami potencialnih posvojiteljev (Moore & Benbasat, 1991).				
Kompleksnost	Stopnja, do katere je inovacija zaznana kot težka za razumevanje in uporabo (Rogers, 1983).				
Vidnost	Stopnja, do katere so rezultati inovacije vidni drugim v organizaciji (Rogers, 1983).				
Predstavljaljivost rezultatov	Stopnja oprijemljivosti, vidnosti in komunikativnosti rezultatov sprejemanja in uporabe inovacije IS (Moore & Benbasat, 1991).				

Preizkusljivost rezultatov	Stopnja, do katere je mogoče preizkusiti nov sistem pred odločitvijo o sprejetju ali zavrnitvi (Rogers, 1983).				
Objektivna uporabnost	Konstrukt, ki omogoča primerjavo sistemov na dejanski ravni (in ne na zaznavi) zahtevanega napora za dokončanje specifičnih nalog (Venkatesh, 2000).				
Ustreznost delu	Stopnja, do katere posameznik verjame, da je ciljni sistem primeren in lahko izboljša učinkovitost opravljanja njegovega dela (Venkatesh & Davis, 2000).				
Učinkovitost sistema	Stopnja, do katere posameznik meni, da sistem dobro opravlja njegove delovne naloge (Venkatesh & Davis, 2000).				
Dostopnost	Fizična dostopnost: Obseg, v katerem ima posameznik fizični dostop do strojne opreme, potrebne za uporabo sistema. Informacijska dostopnost: Možnost, pridobiti želene podatke iz določenega sistema (Karahanna & Straub, 1999).				
Kakovost sistema	Mera tehničnih značilnosti samega informacijskega sistema, ki vključuje zanesljivost, fleksibilnost, dostopnost, integracijo, pravočasnost, prenosljivost, kakovost podatkov in enostavnost uporabe (DeLone & McLean, 2003; Wixom & Todd, 2005).				
Kakovost informacij	Mera kakovosti izhodnih rezultatov informacijskega sistema, ki vključuje natančnost, pravočasnost, popolnost, ustreznost, doslednost in veljavnost (DeLone & McLean, 1992; DeLone & McLean, 2003).				
Uporabniški vmesnik	Način prikaza podatkov uporabnikom (Wixom & Watson, 2010).				
Prileganje tehnologije opravilom	Ujemanje med potrebami in zahtevami uporabnikovih delovnih nalog ter razpoložljivo funkcionalnostjo in zmožnostmi IT ali IS (Dishaw & Strong, 1999).				
<b>ORGANIZACIJSKE ZNAČILNOSTI</b>					
Podporne okoliščine	Stopnja, do katere posameznik verjame, da obstajajo organizacijska in tehnična sredstva za podporo uporabe sistema (Venkatesh et al., 2003).				

Podpora managementa	Stopnja podpore managementa, ki zagotavlja zadostno alokacijo sredstev in deluje kot agent sprememb za ustvarjanje bolj prevodnega okolja za uspeh IS (Igbaria, Zinatelli, Cragg & Cavaye, 1997).				
Skupna prepričanja	Oblikovanje skupnih prepričanj med organizacijskimi udeleženci preko komunikacije, ki zajema zagotavljanje in pridobivanje informacij ter ustvarjanje razumevanja med organizacijskimi udeleženci (Amoako-Gyampah & Salam, 2004).				
Vključenost in sodelovanje uporabnikov pri implementaciji	Vključenost in sodelovanje uporabnikov pri načrtovanju in razvoju IS, ki vodi do boljše komunikacije njihovih potreb (Yeoh & Koronios, 2010).				
Iterativni razvojni pristop	Postopen razvoj IS, ki omogoča sprotno spremljanje uporabe in rezultatov IS, prostor za spremembe in izboljšave in vključuje zaposlene, ki postanejo bolj dovezetni in pripravljeni sprejeti in uresničiti potencial novega IS (Yeoh & Koronios, 2010).				
Usposabljanje uporabnikov	Obseg, v katerem se je posameznik usposabljal za uporabo določenega IS preko formalnih izobraževanj, zunanjih tečajev, tečajev znotraj podjetja in samostojnega učenja (Sabherwal et al., 2006).				
Organizacijska kultura	Ujemanje med organizacijsko kulturo in kulturnimi predpostavkami, vgrajenimi v določen IS. Organizacijska kultura je zapleten sistem norm in vrednot, ki se oblikuje skozi čas in predstavlja sklop skupnih predpostavk in razumevanj zaposlenih o delovanju organizacije (Ke & Wei, 2008).				
Informacijska kultura	Informacijska kultura predstavlja vrednote in odnose do informacij in kaj narediti ali ne storiti v zvezi z obdelavo, objavo in komunikacijo informacij (Davenport, 1997). Informacijsko obnašanje in vrednote (IBV) vključujejo integriteto, formalnost, kontrolo, transparentnost, deljenje in proaktivnost. IBV tabela, na koncu vprašalnika.				

Management sprememb	Management sprememb obsega upravljanje človeških virov in družbene spremembe pri uvajanju novega IS, z namenom pripraviti zaposlene, da sprejmejo spremembe in zmanjšati nenaklonjenost do sprememb (Žabjek et al., 2009).				
Organizacijska sredstva	Razpoložljivost organizacijskih sredstev kot so denar, ljudje in čas, ki so potrebni za uspešno uvedbo novega IS (Wixom & Watson, 2001).				
Velikost podjetja	Velikost podjetja				
<b>SOCIALNE ZNAČILNOSTI</b>					
Prostovoljnost	Obseg, v katerem posamezniki dojemajo sprejemanje inovacije kot prostovoljno (neobvezno) (Venkatesh & Davis, 2000).				
Podoba	Stopnja, do katere posameznik zaznava, da bo uporaba inovacije izboljšala njegovo podobo ali status v njegovem socialnem sistemu (Moore & Benbasat, 1991).				
Subjektivna norma	Stopnja, do katere posameznik verjame, da večina ljudi, ki so mu pomembni, meni, da bi moral ali ne bi smel uporabljati sistem (Venkatesh & Davis, 2000).				
Zaupanje	Zaupanje določa pričakovano korist poslovne transakcije, pri čemer je posameznik, ki zaupa, odvisen od drugih, vendar nima nadzora nad njimi (Gefen, 2004).				
Tveganje	Zaznano tveganje pri uporabi sistema okoljska in vedenjska negotovost, (Pavlou, 2003).				
Nacionalna kultura	Stopnja vpliva nacionalne in etnične kulture na sprejemanje IS (Straub, Keil & Brenner, 1997).				
<b>OKOLJSKE (MAKRO) ZNAČILNOSTI</b>					
Dejavnost podjetja	Dejavnost, v katerem posluje podjetje				
Okolje	Konkurenčnost okolja, v katerem podjetje posluje (Wade & Hulland, 2004).				

**8. Ali bi lahko izpostavili še kakšen dejavnik, ki pomembno vpliva na sprejemanje in učinkovito uporabo BI sistemov in bi lahko bil specifičen v kontekstu BIS in ni bil naštet med navedenimi?**

ZA VAŠ ČAS, TRUD IN SODELOVANJE SE VAM NAJLEPŠE ZAHVALJUJEMO!



## APPENDIX B: Questionnaire Acceptance and use of Business intelligence systems (in Slovenian)

### RAZISKAVA SPREJEMANJE IN UPORABA POSLOVNO INTELIGENČNIH SISTEMOV

*Sistem poslovne inteligence oz. poslovnega obveščanja* je informacijski sistem, ki pretvarja neobdelane podatke v smiselne in koristne informacije, ki omogočajo *učinkovitejši strateški, taktični in operativni vpogled v poslovanje in analitično odločanje*. Vključuje različne tehnologije, kot so integracija podatkov, zagotavljanje kakovosti podatkov, podatkovno skladiščenje, upravljanje matičnih podatkov, analitičnih orodij, on-line poročila, preglednice, opozorila, nadzorne plošče, analize besedil in mnoge druge.

INDIVIDUALNE ZNAČILNOSTI		
DEMOGRAFSKE ZNAČILNOSTI		
<b>Spol</b>	<input type="checkbox"/> Moški <input type="checkbox"/> Ženski	
<b>Starost</b>	Kakšna je vaša starost v letih?	
<b>Izobrazba</b>	Kakšna je stopnja vaše izobrazbe?	<input type="checkbox"/> Osnovna šola <input type="checkbox"/> Srednja šola <input type="checkbox"/> Višješolski strokovni program <input type="checkbox"/> Visokošolski strokovni program <input type="checkbox"/> Univerzitetna izobrazba <input type="checkbox"/> Magisterij <input type="checkbox"/> Doktor znanosti
IZKUŠNJE		
<b>Izkušnje z uporabo poslovno inteligenčnega sistema</b>	Kako dolgo uporabljate poslovno inteligenčni sistem (v mesecih)?	
BOJAZEN V ZVEZI Z UPORABO IT		
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede bojazni v zvezi z uporabo informacijske tehnologije.		1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Informacijske tehnologije se sploh ne bojim.	1 2 3 4 5 6 7 X	
Delo z informacijsko tehnologijo me dela nervoznega.	1 2 3 4 5 6 7 X	
Ob informacijski tehnologiji se počutim neprijetno.	1 2 3 4 5 6 7 X	
OSEBNA INOVATIVNOST V ZVEZI Z UPORABO IT		
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede osebne inovativnosti v zvezi z uporabo informacijske tehnologije.		1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Če bi slišal(a) za novo informacijsko tehnologijo, bi iskal(a) načine za eksperimentiranje z njo.	1 2 3 4 5 6 7 X	
V splošnem oklevam pri preizkušanju novih tehnologij.	1 2 3 4 5 6 7 X	
Všeč mi je eksperimentiranje z novimi informacijskimi tehnologijami.	1 2 3 4 5 6 7 X	
PRIPRAVLJENOST NA SPREMEMBE		
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede pripravljenosti na spremembe.		1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Nagibam se k preizkušanju novih pobud.	1 2 3 4 5 6 7 X	
Po navadi podpiram nove ideje.	1 2 3 4 5 6 7 X	
Pogosto predlagam nove pristope k zadevam.	1 2 3 4 5 6 7 X	

<b>SAMOOCENA GLEDE DELA Z RAČUNALNIKOM</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede samoocene glede dela z računalnikom.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Lahko opravljam delo z uporabo programske opreme, čeprav ni nikogar, ki bi mi povedal kaj naj naredim.	1 2 3 4 5 6 7 X
Lahko bi opravljal(a) delo z uporabo programske opreme, tudi če bi imel(a) na voljo <i>samo</i> v programsko opremo vgrajeno pomoč.	1 2 3 4 5 6 7 X
Lahko bi opravljal(a) delo z uporabo programske opreme, če bi predhodno uporabljal(a) podobno programsko opremo za opravljanje istega dela.	1 2 3 4 5 6 7 X

<b>KAKOVOST POSLOVNO INTELIGENČNEGA SISTEMA</b>	
<b>SKLADNOST: Prileganje tehnologije opretilom</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede skladnosti poslovno inteligenčnega sistema z vašim delom.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Uporaba poslovno inteligenčnega sistema je skladna z vsemi vidiki mojega dela.	1 2 3 4 5 6 7 X
Mislím, da se uporaba poslovno inteligenčnega sistema dobro ujema z mojim načinom dela.	1 2 3 4 5 6 7 X
Uporaba poslovno inteligenčnega sistema se sklada z mojim delovnim slogom.	1 2 3 4 5 6 7 X
<b>KAKOVOST INFORMACIJ: Kakovost informacij, ki jih zagotavlja poslovno inteligenčni sistem</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede kakovosti informacij, ki jih zagotavlja poslovno inteligenčni sistem v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
<b>Popolnost informacij</b>	
Poslovno inteligenčni sistem mi ponuja popoln nabor informacij.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem proizvaja celovite (izčrpne) informacije.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem mi nudi vse informacije, ki jih potrebujem.	1 2 3 4 5 6 7 X
<b>Oblika informacij</b>	
Informacije, ki jih zagotavlja poslovno inteligenčni sistem, so dobro oblikovane.	1 2 3 4 5 6 7 X
Informacije, ki jih zagotavlja poslovno inteligenčni sistem, so prikazane v berljivi in razumljivi obliki.	1 2 3 4 5 6 7 X
Informacije, ki jih zagotavlja poslovno inteligenčni sistem, so jasno predstavljene na zaslonu za ciljne uporabnike.	1 2 3 4 5 6 7 X
<b>Natančnost informacij</b>	
Poslovno inteligenčni sistem zagotavlja pravilne informacije.	1 2 3 4 5 6 7 X
V informacijah, ki jih dobim iz poslovno inteligenčnega sistema, je malo napak.	1 2 3 4 5 6 7 X
Informacije pridobljene iz poslovno inteligenčnega sistema so točne.	1 2 3 4 5 6 7 X
<b>Aktualnost informacij</b>	
Poslovno inteligenčni sistem mi omogoča dostop do najbolj svežih informacij.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem zagotavlja najnovejše informacije.	1 2 3 4 5 6 7 X
Informacije, pridobljene iz poslovno inteligenčnega sistema, so vedno ažurne.	1 2 3 4 5 6 7 X

<b>Relevantnost informacij</b>	
Informacije, ki jih zagotavlja poslovno inteligenčni sistem, so neposredno uporabne za reševanje problemov.	1 2 3 4 5 6 7 X
Informacije, ki jih zagotavlja poslovno inteligenčni sistem, so jedrnate, brez nepotrebnih elementov.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem zagotavlja dovolj podrobne podatke.	1 2 3 4 5 6 7 X
<b>Pomen informacij</b>	
Natančen pomen podatkov, ki jih uporabljam pri svojem delu, lahko ugotovim brez težav.	1 2 3 4 5 6 7 X
Meta podatki v poslovno inteligenčnem sistemu so lahko dostopni ali dosegljivi.	1 2 3 4 5 6 7 X
Podatke v poslovno inteligenčnem sistemu je enostavno razumeti.	1 2 3 4 5 6 7 X
Pomen podatkovnih polj znotraj poslovno inteligenčnega sistema je enostavno ugotoviti.	1 2 3 4 5 6 7 X
<b>Združljivost informacij</b>	
Ko je potrebno primerjati ali zbrati podatke iz dveh ali več različnih podatkovnih virov, lahko pride do nepričakovanih ali velikih neskladij.	1 2 3 4 5 6 7 X
Obstajajo primeri, ko so domnevno enakovredni podatki iz dveh različnih virov v neskladju.	1 2 3 4 5 6 7 X
Včasih je težko ali nemogoče primerjati ali združiti podatke iz dveh različnih virov, saj so podatki različno opredeljeni (imajo različen pomen).	1 2 3 4 5 6 7 X
<b>Kakovost informacij, ki jih zagotavlja poslovno inteligenčni sistem</b>	
V celoti bi kakovost informacij, ki jih zagotavlja poslovno inteligenčni sistem, ocenil(a) visoko.	1 2 3 4 5 6 7 X
Na splošno bi informacijam, ki jih zagotavlja poslovno inteligenčni sistem, dal(a) visoko oceno kakovosti.	1 2 3 4 5 6 7 X
Na splošno so informacije, ki jih zagotavlja poslovno inteligenčni sistem, visoke kakovosti.	1 2 3 4 5 6 7 X
<b>KAKOVOST SISTEMA: Kakovost poslovno inteligenčnega sistema</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede kakovosti poslovno inteligenčnega sistema v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
<b>Zanesljivost</b>	
Poslovno inteligenčni sistem deluje zanesljivo.	1 2 3 4 5 6 7 X
Lahko računam, da poslovno inteligenčni sistem deluje in je na voljo, ko ga potrebujem.	1 2 3 4 5 6 7 X
Delovanje poslovno inteligenčnega sistema je stabilno.	1 2 3 4 5 6 7 X
<b>Dostopnost</b>	
Poslovno inteligenčni sistem omogoča, da so mi informacije na voljo brez težav.	1 2 3 4 5 6 7 X
Podatke lahko dobim hitro in enostavno, ko jih potrebujem.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem zagotavlja enostavno dostopnost informacij.	1 2 3 4 5 6 7 X
<b>Prilagodljivost</b>	
Poslovno inteligenčni sistem je mogoče prilagoditi različnim potrebam.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem se lahko prilagodi na nove zahteve in pogoje.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem je vsestranski pri odgovarjanju na potrebe, ko se pojavijo.	1 2 3 4 5 6 7 X
<b>Integracija podatkov</b>	
Poslovno inteligenčni sistem učinkovito združuje podatke iz	1 2 3 4 5 6 7 X

različnih področij v organizaciji.	
Poslovno inteligenčni sistem pridobiva podatke, ki prihajajo iz različnih področij v organizaciji.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem učinkovito kombinira podatke z različnih področij delovanja organizacije.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem je dobro integriran z drugimi informacijskimi sistemi znotraj organizacije.	1 2 3 4 5 6 7 X
<b>Pravočasnost</b>	
Predolgo traja, da se poslovno inteligenčni sistem odzove na moje zahteve.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem informacije zagotavlja pravočasno.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem hitro vrne odgovore na moje zahteve.	1 2 3 4 5 6 7 X
<b>Kompleksnost</b>	
Uporaba poslovno inteligenčnega sistema zahteva preveč časa.	1 2 3 4 5 6 7 X
Delo s poslovno inteligenčnim sistemom je tako zapleteno, da je težko razumeti, kaj se dogaja.	1 2 3 4 5 6 7 X
Učenje uporabe poslovno inteligenčnega sistema traja predolgo, da bi bilo vredno truda.	1 2 3 4 5 6 7 X
<b>Zazan užitek</b>	
Uživam pri uporabi poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Uporaba poslovno inteligenčnega sistema je prijetna.	1 2 3 4 5 6 7 X
Zabavam se ob uporabi poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
<b>Kakovost poslovno inteligenčnega sistema</b>	
V celoti bi kakovost poslovno inteligenčnega sistema ocenil(a) visoko.	1 2 3 4 5 6 7 X
Na splošno je poslovno inteligenčni sistem visoke kakovosti.	1 2 3 4 5 6 7 X
Na splošno bi poslovno inteligenčnemu sistemu dal(a) visoko oceno kakovosti.	1 2 3 4 5 6 7 X

<b>ORGANIZACIJSKI DEJAVNIKI</b>	
<b>OSREDOTOČENOST NA STRANKO</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede osredotočenosti na stranke v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Naši poslovni cilji so odvisni predvsem od zadovoljstva strank.	1 2 3 4 5 6 7 X
Nenehno nadzorujemo našo stopnjo zavezanosti in usmeritve na potrebe strank.	1 2 3 4 5 6 7 X
Neovirano si izmenjujemo informacije o naših uspešnih in neuspešnih izkušnjah s strankami med vsemi poslovnimi funkcijami.	1 2 3 4 5 6 7 X
Naša strategija za doseganje konkurenčne prednosti temelji na razumevanju potreb strank.	1 2 3 4 5 6 7 X
Zadovoljstvo strank merimo sistematično in pogosto.	1 2 3 4 5 6 7 X
Bolj smo osredotočeni na stranke kot naši konkurenti.	1 2 3 4 5 6 7 X
<b>PODPORA MANAGEMENTA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede podpore managementa poslovno inteligenčnemu sistemu v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
<i>Podpora pri uvajanju poslovno inteligenčnega sistema:</i>	
Management podpira uvedbo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Management zagotavlja ustrezna sredstva za uvedbo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Management sodeluje pri uvajanju poslovno inteligenčnega	1 2 3 4 5 6 7 X

sistema.	
<i>Podpora pri uporabi poslovno inteligenčnega sistema:</i>	
Management spodbuja uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Management je zgled pri uporabi poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Management podpira odločanje na podlagi informacij, ki jih zagotavlja poslovno inteligenčni sistem.	1 2 3 4 5 6 7 X
<b>SODELOVANJE UPORABNIKOV PRI UVEDBI</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede sodelovanja uporabnikov pri uvedbi poslovno inteligenčnega sistema v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Oddelek za informatiko in uporabniki so sodelovali kot skupina na projektu uvedbe poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Uporabnikom je bil določen del delovnega časa za sodelovanje na projektu uvedbe poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Uporabniki so izvajali konkretne aktivnosti (npr. modeliranje podatkov, oblikovanje poročil) v okviru projekta uvedbe poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
<b>ORGANIZACIJSKA SREDSTVA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede organizacijskih sredstev v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Projekt uvedbe poslovno inteligenčnega sistema je bil ustrezno financiran.	1 2 3 4 5 6 7 X
Projektna skupina za uvedbo poslovno inteligenčnega sistema je imela ustrezno število članov, da je delo potekalo nemoteno.	1 2 3 4 5 6 7 X
Za projekt uvedbe poslovno inteligenčnega sistema je bilo dovolj časa za izvedbo.	1 2 3 4 5 6 7 X
<b>ORGANIZACIJSKI DEJAVNIKI USPEHA UVEDBE POSLOVNO INTELIGENČNEGA SISTEMA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede organizacijskih dejavnikov uspeha uvedbe poslovno inteligenčnega sistema.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Vsak odpor zaposlenih do uvedbe poslovno inteligenčnega sistema je bil učinkovito odpravljen.	1 2 3 4 5 6 7 X
Management sprememb, povezanih z uvedbo poslovno inteligenčnega sistema, je bil učinkovit.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem ima podporo zaposlenih v celotni organizaciji.	1 2 3 4 5 6 7 X
<b>USPOSABLJANJE UPORABNIKOV</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede usposabljanja uporabnikov v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Usposabljanje za uporabo poslovno inteligenčnega sistema je bilo celovito.	1 2 3 4 5 6 7 X
Moja stopnja razumevanja se je bistveno izboljšala po udeležbi na usposabljanju.	1 2 3 4 5 6 7 X
Usposabljanje mi je dalo zaupanje v poslovno inteligenčni sistem.	1 2 3 4 5 6 7 X
<b>INFORMACIJSKA KULTURA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede informacijske kulture v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
<b>Integriteta</b>	
Med sodelavci, s katerimi redno sodelujem, je normalno, da uporabljajo informacije kot vzvod za doseganje osebne koristi.	1 2 3 4 5 6 7 X

<b>Transparentnost</b>								
Med sodelavci, s katerimi redno sodelujem, se odprto delijo informacije o napakah in neuspehih.	1	2	3	4	5	6	7	X
<b>Deljenje informacij – notranje</b>								
Pogosto si pri sodelovanju izmenjujem podatke z drugimi sodelavci v organizaciji.	1	2	3	4	5	6	7	X
<b>Deljenje informacij – zunanje</b>								
Pogosto si izmenjujem podatke z odjemalci, strankami ali kupci zunaj moje organizacije.	1	2	3	4	5	6	7	X
<b>Proaktivnost</b>								
Aktivno uporabljам informacije pri razvoju ali izboljševanju izdelkov, storitev in procesov v moji organizaciji.	1	2	3	4	5	6	7	X
<b>Neformalnost</b>								
Neuradnim virom informacij (npr. sodelavcem) zaupam bolj kot uradnim virom informacij (npr. zapiskom, poročilom).	1	2	3	4	5	6	7	X
<b>Nadzor</b>								
Moje vedenje o uspešnosti moje organizacije vpliva na moje delo.	1	2	3	4	5	6	7	X

<b>ZAZNAVANJE USPEŠNOSTI IN UČINKOVITOSTI PRI UPORABI POSLOVNO INTELIGENČNEGA SISTEMA</b>								
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede zaznavanja uspešnosti in učinkovitosti zaradi uporabe poslovno inteligenčnega sistema.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem							
Poslovno inteligenčni sistem je koristen pri mojem delu.	1	2	3	4	5	6	7	X
Uporaba poslovno inteligenčnega sistema izboljšuje mojo delovno uspešnost.	1	2	3	4	5	6	7	X
Uporaba poslovno inteligenčnega sistema olajšuje opravljanje mojega dela.	1	2	3	4	5	6	7	X
Če uporabljам poslovno inteligenčni sistem, se čas opravljanja rutinskih delovnih nalog skrajša.	1	2	3	4	5	6	7	X
Če uporabljам poslovno inteligenčni sistem, se poveča kakovost rezultatov mojega dela.	1	2	3	4	5	6	7	X
Če uporabljам poslovno inteligenčni sistem, se povečajo moje možnosti za napredovanje.	1	2	3	4	5	6	7	X
<b>PREDSTAVLJIVOST REZULTATOV</b>								
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede predstavljenosti rezultatov.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem							
Nimam težav pri razlaganju drugim o rezultatih uporabe poslovno inteligenčnega sistema.	1	2	3	4	5	6	7	X
Mislím, da bi lahko razložil(a) drugim posledice uporabe poslovno inteligenčnega sistema.	1	2	3	4	5	6	7	X
Rezultati uporabe poslovno inteligenčnega sistema so meni očitni.	1	2	3	4	5	6	7	X
Težko bi pojasnil(a), zakaj uporaba poslovno inteligenčnega sistema je ali ni koristna.	1	2	3	4	5	6	7	X
<b>ZAZNAVANJE NAPORA</b>								
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede zaznavanje napora uporabe.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem							
Moje delo s poslovno inteligenčnim sistemom je jasno in razumljivo.	1	2	3	4	5	6	7	X
Brez težav sem postal(a) spreten(na) pri uporabi poslovno inteligenčnega sistema.	1	2	3	4	5	6	7	X

Poslovno inteligenčni sistem je enostaven za uporabo.	1 2 3 4 5 6 7 X
Učenje uporabe poslovno inteligenčnega sistema je enostavno.	1 2 3 4 5 6 7 X
<b>DRUŽBENI VPLIV</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede družbenega vpliva.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Ljudje, ki vplivajo na moje vedenje, menijo, da bi moral(a) uporabljati poslovno inteligenčni sistem.	1 2 3 4 5 6 7 X
Ljudje, ki so mi pomembni, menijo, da bi moral(a) uporabljati poslovno inteligenčni sistem.	1 2 3 4 5 6 7 X
Višje vodstvo našega podjetja vzpodbuja uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Na splošno organizacija podpira uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
<b>PODPORNE OKOLIŠČINE</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede podpornih okoliščin v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Imam sredstva, potrebna za uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Imam znanje, potrebno za uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem ni skladen z ostalimi sistemi, ki jih uporabljam (npr. podoben način uporabe).	1 2 3 4 5 6 7 X
Določena oseba (ali skupina) je na voljo za pomoč pri težavah z uporabo sistema.	1 2 3 4 5 6 7 X
Na voljo je pomoč, ki jo potrebujem pri dostopu in razumevanju podatkov.	1 2 3 4 5 6 7 X
Mehanizmi za upravljanje nadgradenj in sprememb poslovno inteligenčnega sistema so dobro opredeljeni in se redno uporabljajo.	1 2 3 4 5 6 7 X

<b>NAMEN VEDENJA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede namena uporabe poslovno inteligenčnega sistema.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
Če bi bilo odvisno od mene, bi v naslednjem letu rutinsko (npr. vsakodnevno) uporabljal(a) poslovno inteligenčni sistem za izvajanje svojih delovnih nalog.	1 2 3 4 5 6 7 X
Če bi bilo odvisno od mene, bi v naslednjem letu poslovno inteligenčni sistem uporabljal(a) ob vsaki priložnosti.	1 2 3 4 5 6 7 X
Če bi bilo odvisno od mene, bi v naslednjem letu povečal(a) uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
<b>UPORABA POSLOVNO INTELIGENČNEGA SISTEMA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede uporabe poslovno inteligenčnega sistema v vaši organizaciji.	1 = sploh se ne strinjam; 7 = popolnoma se strinjam; X = ne vem
<b>1. INTENZIVNOST UPORABE POSLOVNO INTELIGENČNEGA SISTEMA</b>	
Poslovno inteligenčni sistem uporabljam rutinsko za izvajanje svojih delovnih nalog.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam ob vsaki priložnosti.	1 2 3 4 5 6 7 X
Povečujem uporabo poslovno inteligenčnega sistema.	1 2 3 4 5 6 7 X
<b>2. VPETOST POSLOVNO INTELIGENČNEGA SISTEMA</b>	
Moja uporaba poslovno inteligenčnega sistema je integrirana v	1 2 3 4 5 6 7 X

izvajanje poslovnih procesov. Poslovni procesi, v katerih je potreba po informacijah za analitično odločanje, se izvajajo brez prekinitve, ki bi jih povzročila uporaba poslovno inteligenčnega sistema.	
Poslovno inteligenčni sistem je vpet v moje postopke sprejemanja odločitev.	1 2 3 4 5 6 7 X
Zaznavam, da je pomen in uporaba spoznanj iz poslovno inteligenčnega sistema vpeta v proces oblikovanja poslovne strategije, kar vodi do skladnosti poslovno inteligenčnega sistema s poslovno strategijo.	1 2 3 4 5 6 7 X
<b>3. OBSEG UPORABE POSLOVNO INTELIGENČNEGA SISTEMA</b>	
Označite, do katere mere se strinjate/se ne strinjate z naslednjimi trditvami glede obsega uporabe poslovno inteligenčnega sistema v vaši organizaciji.	1 = sploh ne; 7 = zelo veliko; X = ne vem
<b>PODPORA ODLOČANJU</b>	
<i>Reševanje problemov</i>	
Poslovno inteligenčni sistem uporabljam kot pomoč pri reševanju problemov.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam, da se prepričam, da podatki podpirajo mojo analizo problema.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam, da preverim usklajenost svojega razmišljanja s podatki.	1 2 3 4 5 6 7 X
<i>Racionalizacija odločitev:</i>	
Pojasnjevanje odločitev	
Poslovno inteligenčni sistem uporabljam kot pomoč pri upravičevanju svojih odločitev.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam kot pomoč pri jasnemu navajanju razlogov za moje odločitve.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za racionaliziranje svojih odločitev.	1 2 3 4 5 6 7 X
Izboljševanje odločitev	
Poslovno inteligenčni sistem uporabljam za nadzor ali oblikovanje postopka odločanja.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za izboljšanje uspešnosti in učinkovitosti postopka odločanja.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam zato, da je proces odločanja bolj racionalen.	1 2 3 4 5 6 7 X
<b>INTEGRACIJA DELA</b>	
<i>Horizontalna integracija</i>	
Moja delovna skupina in jaz uporabljamo poslovno inteligenčni sistem za usklajevanje svojih dejavnosti.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za usklajevanje aktivnosti z drugimi v svoji delovni skupini.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za izmenjavo informacij z ljudmi v svoji delovni skupini.	1 2 3 4 5 6 7 X
<i>Vertikalna integracija:</i>	
Načrtovanje dela	
Poslovno inteligenčni sistem uporabljam kot pomoč pri upravljanju svojega dela.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za spremljanje svoje uspešnosti.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam, da bi dobil(a) povratne informacije o uspešnosti dela.	1 2 3 4 5 6 7 X
<i>Vertikalna komunikacija</i>	
Poslovno inteligenčni sistem uporabljam za komunikacijo z ljudmi,	1 2 3 4 5 6 7 X



ki mi poročajo.	
Poslovno inteligenčni sistem uporabljam za komunikacijo z ljudmi, ki jim jaz poročam.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za poročanje mojim nadrejenim.	1 2 3 4 5 6 7 X
<b>STORITVE ZA STRANKE</b>	
Poslovno inteligenčni sistem uporabljam pri izvajanju storitev za notranje in/ ali zunanje stranke.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za izboljševanje kakovosti storitev za stranke.	1 2 3 4 5 6 7 X
Poslovno inteligenčni sistem uporabljam za bolj ustvarjalno izvajanje storitev za stranke.	1 2 3 4 5 6 7 X

<b>ZNAČILNOSTI OKOLJA</b>	
<b>VELIKOST PODJETJA</b>	
Kolikšno je število zaposlenih v vaši organizaciji?	<input type="checkbox"/> manj kot 50 <input type="checkbox"/> 50-249 zaposlenih <input type="checkbox"/> 250-1000 zaposlenih <input type="checkbox"/> nad 1000 zaposlenih <input type="checkbox"/> brez odgovora
Kolikšen je bil obseg letnega prometa (čisti prihodki od prodaje) v letu 2012 [v milijon €]?	<input type="checkbox"/> do vključno 10 M € <input type="checkbox"/> več kot 10 in do vključno 50 M € <input type="checkbox"/> več kot 50 M € <input type="checkbox"/> brez odgovora
<b>DEJAVNOST ORGANIZACIJE</b>	
Katera je statistična klasifikacija ekonomske aktivnosti organizacije (dejavnost organizacije)?	<input type="checkbox"/> A – Kmetijstvo in lov, gozdarstvo, ribištvo <input type="checkbox"/> B – Rudarstvo <input type="checkbox"/> C – Predelovalne dejavnosti <input type="checkbox"/> D – Oskrba z električno energijo, plinom in paro <input type="checkbox"/> E – Oskrba z vodo; ravnanje z odpadki in odpadki; saniranje okolja <input type="checkbox"/> F – Gradbeništvo <input type="checkbox"/> G – Trgovina; vzdrževanje in popravila motornih vozil <input type="checkbox"/> H – Promet in skladiščenje <input type="checkbox"/> I – Gostinstvo <input type="checkbox"/> J – Informacijske in komunikacijske dejavnosti <input type="checkbox"/> K – Finančne in zavarovalniške dejavnosti <input type="checkbox"/> L – Poslovanje z nepremičninami <input type="checkbox"/> M – Strokovne, znanstvene in tehnične dejavnosti <input type="checkbox"/> N – Druge raznovrstne poslovne dejavnosti <input type="checkbox"/> O – Dejavnost javne uprave in obrambe; dejavnost obvezne socialne varnosti <input type="checkbox"/> P – Izobraževanje <input type="checkbox"/> Q – Zdravstvo in socialno varstvo <input type="checkbox"/> R – Kulturne, razvedrilne in rekreacijske dejavnosti <input type="checkbox"/> S – Druge dejavnosti <input type="checkbox"/> T – Dejavnost gospodinjstev z zaposlenim hišnim osebjem; proizvodnja za lastno rabo <input type="checkbox"/> U – Dejavnost eksteritorialnih organizacij in teles
<b>KONKURENČNOST OKOLJA</b>	
Prosimo označite ali deluje vaša organizacija v izjemno tekmovalnem okolju (1) ali deluje v nekonkurenčnem okolju (7).	
Organizacija deluje v izjemno tekmovalnem okolju (dejavnosti).	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> ne vem
	Organizacija deluje v nekonkurenčnem okolju (dejavnosti).

**ZA SODELOVANJE V RAZISKAVI SE VAM NAJLEPŠE ZAHVALJUJEMO!**

**APPENDIX C: Indicators of the measurement model for the embeddedness of business intelligence systems model**

Construct	Label	Indicator
		Indicate to what extent you agree/disagree with the following statements (1 = totally disagree; 7 = totally agree; X = don't know)
Effort Perceptions	EP1 EP2 EP3 EP4	My interaction with BIS would be clear and understandable. It would be easy for me to become skillful at using BIS. I would find BIS easy to use. Learning to operate BIS is easy for me.
Performance Perceptions	PP1 PP2 PP3 PP4 PP5 PP6	I would find BIS to be useful in my job. Using BIS would improve my job performance. Using BIS would make it easier to do my job. If I use BIS, I spend less time on routine job tasks. If I use BIS, I increase the quality of output of my job. If I use BIS, my chances of obtaining a promotion are increased.
Social Influence	SI1 SI2 SI3 SI4	People who influence my behavior think that I should use BIS. People who are important to me think that I should use BIS. The senior management of this business has been helpful in the use of BIS. In general, the organization has supported the use of BIS.
Result Demonstrability	RD1 RD2 RD3 RD4	I have no difficulty telling others about the results of using BIS. I believe I could communicate to others the consequences of using BIS. The results of using BIS are apparent to me. **I would have difficulty explaining why using BIS may or may not be beneficial.
Facilitating Conditions	FC1 FC2 FC3 FC4 FC5 FC6	I have the resources necessary to use BIS. I have the knowledge necessary to use BIS. **BIS is not compatible with other systems I use. A specific person (or group) is available for assistance with system difficulties. I am getting the help I need in accessing and understanding data. Governance mechanisms for BIS renewal are well defined and routinely used.
Customer Orientation	CO1 CO2 CO3 CO4 CO5 CO6	Our business objectives are driven primarily by customer satisfaction. We constantly monitor our level of commitment and orientation to serving customer needs. We freely communicate information about our successful and unsuccessful customer experiences across all business functions. Our strategy for competitive advantage is based on our understanding of customers' needs. We measure customer satisfaction systematically and frequently. We are more customer-focused than our competitors.
Behavioral Intention	BI1 BI2 BI3	If it depended on me, I would intend to use BIS as a routine part of my job. If it depended on me, I would intend to use BIS at every opportunity. If it depended on me, I would plan to increase my use of BIS.
<b>Use of BIS</b>		

<b>INTENSITY OF BIS USE</b>	IU1 IU2 IU3	I use BIS as a routine part of my job. I use BIS at every opportunity. I have been increasingly using BIS.
<b>EXTENT OF BIS USE</b>		
<b>DECISION SUPPORT:</b>		
<i>Problem solving</i>	PS1 PS2 PS3	I use BIS to help me think through problems. I use BIS to make sure the data matches my analysis of problems. I use BIS to check my thinking against the data.
<i>Decision rationalization:</i>		
Explaining decisions	ED1 ED2 ED3	I use BIS to help me justify my decisions. I use BIS to help me make explicit the reasons for my decisions. I use BIS to rationalize my decisions.
Improving decisions	ID1 ID2 ID3	I use BIS to control or shape the decision process. I use BIS to improve the effectiveness and efficiency of the decision process. I use BIS to make the decision process more rational.
<b>WORK INTEGRATION:</b>		
Horizontal integration	HI1 HI2 HI3	My work group and I use BIS to coordinate our activities. I use BIS to coordinate activities with others in my work group. I use BIS to exchange information with people in my work group.
<i>Vertical integration:</i>		
<i>Work planning</i>	WP1 WP2 WP3	I use BIS to help me manage my work. I use BIS to monitor my own performance. I use BIS to get feedback on job performance.
<i>Vertical communication</i>	VC1 VC2 VC3	I use BIS to communicate with people who report to me. I use BIS to communicate with people I report to. I use BIS to keep my supervisor informed.
<b>CUSTOMER SERVICE</b>	CS1 CS2 CS3	I use BIS to serve internal and/or external customers. I use BIS to improve the quality of customer service. I use BIS to more creatively serve customers.
<b>BIS EMBEDDEDNESS</b>	EMB1 EMB2 EMB3	When I use BIS it is seamlessly integrated with business process execution. BIS is embedded into my decision-making routines. I perceive the importance and use of insights from BIS are embedded within the business strategy formulation process, leading to the alignment of BIS and the business strategy.

## APPENDIX D: Comparison of the item cross-loadings for the embeddedness of business intelligence systems model

	Indicator	Effort Perceptions	Performance Perceptions	Social Influence	Result Demonstrability	Facilitating Conditions	Customer Orientation	Behavioral Intention	Intensity of BIS use	Extent of BIS use	BIS Embeddedness
<b>Effort Perceptions</b>	EP1	<b>0.8752</b>	0.5156	0.3679	0.7753	0.5634	0.1977	0.4008	0.5543	0.465	0.3621
	EP2	<b>0.8901</b>	0.3874	0.3067	0.6573	0.4830	0.1255	0.3667	0.4418	0.3594	0.224
	EP3	<b>0.7819</b>	0.3839	0.2293	0.4948	0.4344	0.1137	0.2785	0.3451	0.2491	0.2121
	EP4	<b>0.7623</b>	0.3188	0.3029	0.4334	0.4504	0.1475	0.2324	0.3900	0.3712	0.2581
<b>Performance Perceptions</b>	PP1	0.4517	<b>0.8827</b>	0.4366	0.5289	0.4024	0.2272	0.3623	0.4836	0.4670	0.425
	PP2	0.4395	<b>0.8634</b>	0.3512	0.5322	0.4249	0.1683	0.3220	0.4078	0.3695	0.3199
	PP3	0.4770	<b>0.9373</b>	0.4619	0.5317	0.4495	0.1917	0.4117	0.4700	0.4372	0.3704
	PP4	0.4384	<b>0.8916</b>	0.3374	0.4974	0.3654	0.2728	0.3895	0.4573	0.4230	0.3102
	PP5	0.3657	<b>0.8307</b>	0.3250	0.4290	0.3464	0.2261	0.3274	0.3564	0.3673	0.2831
<b>Social Influence</b>	SI1	0.2237	0.2717	<b>0.7849</b>	0.2241	0.2182	0.0727	0.2671	0.3044	0.3438	0.2132
	SI2	0.2302	0.2809	<b>0.7995</b>	0.2376	0.2298	0.0433	0.3243	0.3204	0.3287	0.2056
	SI3	0.3421	0.3673	<b>0.8220</b>	0.3013	0.4205	0.2552	0.3610	0.4079	0.4006	0.4463
	SI4	0.3568	0.4545	<b>0.7647</b>	0.3817	0.4674	0.2463	0.3124	0.4521	0.4300	0.4269
<b>Result Demonstrability</b>	RD1	0.6613	0.4744	0.3264	<b>0.8979</b>	0.4630	0.2409	0.4332	0.4353	0.3622	0.3604
	RD2	0.6357	0.4850	0.2794	<b>0.9019</b>	0.4018	0.1937	0.3980	0.4127	0.3485	0.2722
	RD3	0.6531	0.5600	0.3579	<b>0.8422</b>	0.4619	0.1341	0.3670	0.4553	0.3919	0.2950
<b>Facilitating Conditions</b>	FC1	0.4224	0.3263	0.4881	0.4169	<b>0.6768</b>	0.1072	0.2541	0.4174	0.3350	0.3312
	FC2	0.6407	0.3672	0.3028	0.5225	<b>0.6892</b>	0.1597	0.3492	0.5386	0.4284	0.3110
	FC4	0.3486	0.3409	0.2653	0.3373	<b>0.8429</b>	0.2231	0.4042	0.4308	0.3666	0.3979
	FC5	0.4154	0.3810	0.3189	0.3449	<b>0.8725</b>	0.1967	0.3924	0.5666	0.4394	0.4707
	FC6	0.4218	0.3118	0.2955	0.3133	<b>0.7430</b>	0.2256	0.3223	0.4453	0.3418	0.4589
	<b>Customer Orientation</b>	CO1	0.1170	0.1437	0.0257	0.1922	0.1341	<b>0.6187</b>	0.0310	0.0449	0.1246
CO2		0.1106	0.1890	0.1094	0.2015	0.2162	<b>0.8207</b>	0.1082	0.1567	0.1774	0.2630
CO3		0.1550	0.1730	0.1548	0.1419	0.2068	<b>0.8046</b>	0.1569	0.1250	0.1830	0.2860
CO4		0.1271	0.2318	0.2452	0.2017	0.2370	<b>0.8188</b>	0.2394	0.1523	0.2327	0.3498
CO5		0.1627	0.1954	0.1755	0.1724	0.1696	<b>0.7884</b>	0.2332	0.2013	0.1874	0.2668
CO6		0.1646	0.2087	0.1634	0.1380	0.1468	<b>0.8227</b>	0.0776	0.1906	0.2303	0.2746
<b>Behavioral Intention</b>	BI1	0.3738	0.4043	0.4190	0.4397	0.4623	0.1779	<b>0.9663</b>	0.5890	0.4523	0.4654
	BI2	0.4051	0.4053	0.3979	0.4652	0.4470	0.2133	<b>0.9734</b>	0.5797	0.4285	0.4247
	BI3	0.3729	0.3876	0.3445	0.4099	0.3958	0.1675	<b>0.9552</b>	0.5276	0.4213	0.3963
<b>Intensity of BIS use</b>	IU1	0.4759	0.4232	0.4476	0.4291	0.5848	0.1112	0.4627	<b>0.8970</b>	0.7154	0.6587
	IU2	0.5381	0.4890	0.4105	0.4987	0.6214	0.2421	0.5876	<b>0.9302</b>	0.6945	0.6626
	IU3	0.4219	0.4276	0.4243	0.3984	0.4959	0.1665	0.5355	<b>0.8836</b>	0.6650	0.6460
<b>Extent of BIS use</b>	PS1	0.4167	0.4907	0.3740	0.4184	0.4367	0.1645	0.4015	0.6586	<b>0.7564</b>	0.6089
	PS2	0.3877	0.3475	0.3615	0.3724	0.4513	0.1054	0.4373	0.6861	<b>0.8433</b>	0.5959
	PS3	0.4490	0.3474	0.3738	0.4257	0.4458	0.0798	0.4268	0.6923	<b>0.8472</b>	0.5725
	ED1	0.3846	0.3592	0.3086	0.3735	0.4218	0.1628	0.3779	0.6673	<b>0.8259</b>	0.5509

	ED2	0.4267	0.3979	0.3769	0.3889	0.4527	0.1329	0.4109	0.7277	<b>0.8763</b>	0.6103
	ED3	0.4009	0.3555	0.3676	0.3668	0.4340	0.1569	0.4307	0.7385	<b>0.8711</b>	0.6189
	ID1	0.3731	0.3921	0.3703	0.3409	0.4576	0.1611	0.4275	0.7035	<b>0.8778</b>	0.5946
	ID2	0.3796	0.4070	0.3887	0.3401	0.4487	0.1582	0.4276	0.7208	<b>0.8757</b>	0.6050
	ID3	0.4370	0.4064	0.4239	0.3838	0.4622	0.2058	0.4546	0.7006	<b>0.8852</b>	0.6101
	HI1	0.3332	0.4205	0.4496	0.3458	0.4172	0.2677	0.3660	0.6222	<b>0.8205</b>	0.5280
	HI2	0.3143	0.3977	0.4169	0.3361	0.4074	0.3034	0.3421	0.6066	<b>0.8213</b>	0.5269
	HI3	0.3259	0.379	0.3992	0.3115	0.3767	0.2659	0.3018	0.5711	<b>0.8213</b>	0.5081
	WP1	0.2866	0.3805	0.4477	0.2656	0.3715	0.2090	0.2921	0.5349	<b>0.7751</b>	0.5016
	WP2	0.2956	0.2719	0.3766	0.2508	0.3233	0.2826	0.2496	0.4867	<b>0.7397</b>	0.4666
	WP3	0.2981	0.2859	0.3802	0.2680	0.3076	0.2230	0.2392	0.4975	<b>0.7387</b>	0.4480
	VC1	0.2872	0.3728	0.3872	0.2482	0.2887	0.2004	0.2976	0.4891	<b>0.7321</b>	0.4346
	VC2	0.2598	0.3300	0.3865	0.2310	0.2639	0.1518	0.2515	0.4808	<b>0.7492</b>	0.4155
	VC3	0.3005	0.3530	0.3241	0.2669	0.2986	0.0605	0.2567	0.5180	<b>0.7623</b>	0.4290
	CS1	0.3841	0.4356	0.4503	0.3407	0.4678	0.2772	0.3680	0.5828	<b>0.7800</b>	0.5771
	CS2	0.3442	0.4045	0.3683	0.3484	0.4235	0.3105	0.3665	0.5740	<b>0.8043</b>	0.5550
	CS3	0.3401	0.4149	0.3839	0.3418	0.4276	0.3371	0.3767	0.5990	<b>0.7955</b>	0.5726
<b>BIS Embeddedness</b>	EMB1	0.3366	0.3579	0.3607	0.3475	0.5133	0.2774	0.4065	0.7209	0.6459	<b>0.8888</b>
	EMB2	0.2862	0.3776	0.3981	0.3137	0.4468	0.3448	0.4240	0.6636	0.6243	<b>0.9514</b>
	EMB3	0.2706	0.3397	0.3929	0.3142	0.4689	0.3426	0.4021	0.6208	0.5931	<b>0.9269</b>

Note. \*\* - reverse scored.

## APPENDIX E: Indicators of the measurement model for the antecedents of business intelligence systems use model

Construct	Label	Indicator
		Indicate to what extent you agree/disagree with the following statements (1 = totally disagree; 7 = totally agree; X = don't know)
IT Anxiety	IT ANX1 IT ANX2 IT ANX3	IT does not scare me at all. **Working with IT makes me nervous. **IT makes me feel uncomfortable.
Computer self-efficacy	CSE1 CSE2 CSE3	I could complete the job using a software system if there was no one around to tell me what to do as I go. I could complete the job using a software system if I had just the built-in help facility for assistance. I could complete the job using a software system if I had used similar packages before this one to do the same job.
Information quality	IQ1 IQ2 IQ3	Overall, I would give the information from BIS high marks. Overall, I would give the information provided by BIS a high rating in terms of quality. In general, BIS provides me with high-quality information.
System quality	SQ1 SQ2 SQ3	In terms of system quality, I would rate BIS highly. Overall, BIS is of high quality. Overall, I would give the quality of BIS a high rating.
Management support of the BIS implementation	MNGM-IMPL1 MNGM-IMPL2 MNGM-IMPL3	Management supports BIS implementation. Management provides adequate resources to BIS implementation. Management participates in BIS implementation.
Management support of the BIS use	MNGM-USE1 MNGM-USE2 MNGM-USE3	Overall, management has encouraged the use of BIS. Management leads by example in using BIS. Management supports decision making based on the information provided by BIS.
Organizational resources	OR1 OR2 OR3	The BIS project was adequately funded. The BIS project had enough team members to get the work done. The BIS project was given enough time for completion.
User training	UT1 UT2 UT3	The kind of training provided to me was complete. My level of understanding was substantially improved after going through the training program. The training gave me confidence in BIS.
Organizational implementation success factors	OISF1 OISF2 OISF3	Any political resistance to BIS in the organization was dealt with effectively. Change in the organization created by BIS was managed effectively. The BIS has support from people throughout the organization.
Information culture	IC1 IC2 IC3 IC4 IC5 IC6 IC7	<b>Information integrity:</b> **Among the people I work with regularly, it is normal to leverage information for personal advantage. <b>Information transparency:</b> The people I work with regularly share information on errors or failures openly. <b>Information sharing – internal:</b> I often exchange information with other people within my organization. <b>Information sharing – external:</b> I often exchange information with citizens, customers, or clients outside my organization. <b>Information proactiveness:</b> I actively use information to create or enhance my organization's products, services, and processes. <b>Information informality:</b> **I trust informal information sources (e.g. colleagues) more than I trust formal sources (e.g. memos, reports). <b>Information control:</b> My knowledge of organizational

		performance influences my work.
Customer Orientation	CO1 CO2 CO3 CO4 CO5 CO6	Our business objectives are driven primarily by customer satisfaction. We constantly monitor our level of commitment and orientation to serving customer needs. We freely communicate information about our successful and unsuccessful customer experiences across all business functions. Our strategy for competitive advantage is based on our understanding of customers' needs. We measure customer satisfaction systematically and frequently. We are more customer-focused than our competitors.
Facilitating Conditions	FC1 FC2 FC3 FC4 FC5 FC6	I have the resources necessary to use BIS. I have the knowledge necessary to use BIS. **BIS is not compatible with other systems I use. A specific person (or group) is available for assistance with system difficulties. I am getting the help I need in accessing and understanding data. Governance mechanisms for BIS renewal are well defined and routinely used.
Result Demonstrability	RD1 RD2 RD3 RD4	I have no difficulty telling others about the results of using BIS. I believe I could communicate to others the consequences of using BIS. The results of using BIS are apparent to me. **I would have difficulty explaining why using BIS may or may not be beneficial.
Social Influence	SI1 SI2 SI3 SI4	People who influence my behavior think that I should use BIS. People who are important to me think that I should use BIS. The senior management of this business has been helpful in the use of BIS. In general, the organization has supported the use of BIS.

Note. \*\* - reverse scored.

**APPENDIX F: Comparison of the item cross-loadings for the antecedents of business intelligence systems use model**

Construct	Label	IT Anxiety	Computer self-efficacy	System quality	Information quality	Management support of the BIS implementation	Management support of the BIS use	Organizational resources	User training	Organizational implementation success factors	Information culture	Customer orientation	Result Demonstrability	Social Influence	Facilitating Conditions
IT Anxiety	IT ANX1	0.8177	0.3191	0.0645	0.1836	0.1934	0.0976	0.0839	0.0951	0.1420	0.2535	0.0865	0.2766	0.0354	0.1817
	IT ANX2	0.6910	0.2458	0.0122	0.1061	0.1213	0.0940	0.1605	0.1198	0.1211	0.1128	0.1302	0.1611	0.0085	0.1172
	IT ANX3	0.6397	0.1607	-0.0431	-0.0151	0.0595	0.0542	0.1410	0.1341	0.0992	-0.0019	0.0209	0.1516	0.0600	0.0074
Computer self-efficacy	CSE1	0.3504	0.9466	0.0846	0.0796	0.0769	0.0112	0.1150	0.0655	0.1382	0.1753	0.0534	0.3709	-0.0385	0.1501
	CSE2	0.3007	0.9226	0.0396	0.1100	0.0427	-0.0586	0.1298	0.0441	0.1133	0.2365	0.1274	0.3099	-0.0944	0.1783
System quality	SQ1	0.0430	0.1047	0.9483	0.0430	0.3890	0.3351	0.2137	0.3634	0.3197	0.2950	0.2613	0.3776	0.2716	0.4304
	SQ2	0.0039	0.0309	0.9669	0.0039	0.3430	0.2941	0.2381	0.3900	0.3454	0.3311	0.2738	0.3501	0.2724	0.4535
	SQ3	0.0417	0.0603	0.9497	0.0417	0.3211	0.2328	0.2361	0.3776	0.3510	0.3065	0.2530	0.3254	0.2349	0.4101
Information quality	IQ1	0.1462	0.0856	0.6449	0.9494	0.3147	0.2286	0.2293	0.3127	0.2681	0.2399	0.2021	0.2820	0.1445	0.3380
	IQ2	0.1190	0.1073	0.6723	0.9715	0.3550	0.2438	0.2429	0.2796	0.3105	0.2707	0.2059	0.3286	0.1544	0.3562
	IQ3	0.1728	0.0939	0.6613	0.9642	0.3482	0.2493	0.2091	0.2860	0.2874	0.2559	0.2181	0.2975	0.1617	0.3457
Management support of the BIS implementation	MNGM-IMPL1	0.2283	0.0997	0.2665	0.2283	0.8686	0.7673	0.4259	0.3949	0.5122	0.3798	0.3020	0.3523	0.5006	0.2770
	MNGM-IMPL2	0.1682	0.0971	0.3890	0.1682	0.8983	0.6787	0.5179	0.4556	0.5458	0.3669	0.3937	0.3280	0.4453	0.4164
	MNGM-IMPL3	0.1091	-0.0200	0.3139	0.1091	0.8796	0.7592	0.5066	0.4643	0.5558	0.3673	0.4668	0.2226	0.4608	0.3167
Management support of the BIS use	MNGM-USE1	0.0537	-0.0888	0.3055	0.0537	0.7851	0.9167	0.4691	0.5067	0.4974	0.3038	0.3471	0.3076	0.5283	0.3459
	MNGM-USE2	0.1045	-0.0152	0.2889	0.1045	0.6877	0.8675	0.4376	0.4218	0.4961	0.2456	0.3262	0.1598	0.4036	0.2795
	MNGM-USE3	0.1551	0.0465	0.2250	0.1551	0.7558	0.9058	0.4608	0.3997	0.5468	0.2664	0.2756	0.2552	0.5221	0.3074
Organizational resources	OR1	0.1501	0.0692	0.2447	0.1501	0.5439	0.4722	0.9068	0.5741	0.5917	0.2644	0.3241	0.2786	0.3945	0.4856
	OR2	0.1285	0.1208	0.1727	0.1285	0.5076	0.5008	0.9169	0.6013	0.6692	0.2509	0.3335	0.2299	0.3284	0.4297
	OR3	0.1633	0.1747	0.2331	0.1633	0.4293	0.4001	0.8900	0.5410	0.6214	0.1727	0.3170	0.2938	0.2471	0.3989
User training	UT1	0.1824	0.1496	0.4055	0.1824	0.5256	0.5040	0.6724	0.8633	0.6947	0.2620	0.3755	0.3844	0.3126	0.4591
	UT2	0.1184	-0.0109	0.3044	0.1184	0.4122	0.4468	0.5119	0.9272	0.4675	0.2623	0.2467	0.3635	0.3290	0.3669
	UT3	0.1155	0.0240	0.3656	0.1155	0.4250	0.4063	0.5474	0.9411	0.5191	0.2655	0.2608	0.4273	0.3264	0.3851
Organizational implementation success factors	OISF1	0.2264	0.1796	0.2211	0.2264	0.5206	0.4863	0.5862	0.5626	0.8635	0.3488	0.2962	0.3071	0.3129	0.3298
	OISF2	0.1276	0.1427	0.3234	0.1276	0.5576	0.5281	0.6467	0.5291	0.8726	0.2690	0.3126	0.2839	0.2982	0.3607
	OISF3	0.0885	0.0411	0.3847	0.0885	0.5274	0.4928	0.5913	0.5192	0.8844	0.3599	0.2984	0.3352	0.3659	0.4118
Information culture	IC2	0.1033	0.1099	0.2975	0.1033	0.3716	0.2857	0.2830	0.2448	0.3765	0.7926	0.3726	0.3290	0.3093	0.3754
	IC3	0.1792	0.1594	0.2308	0.1792	0.3008	0.1968	0.1886	0.2369	0.2219	0.8014	0.1804	0.3397	0.3544	0.3071
	IC5	0.1848	0.2305	0.2100	0.1848	0.2819	0.2076	0.1074	0.1762	0.2562	0.6865	0.2111	0.3803	0.2811	0.3488
Customer orientation	CO1	0.1196	0.1336	0.1637	0.1196	0.1843	0.1824	0.2036	0.2020	0.1204	0.1946	0.6449	0.1909	0.0292	0.1283
	CO2	0.0761	0.0271	0.2104	0.0761	0.2887	0.2281	0.2303	0.2294	0.2044	0.2469	0.8311	0.1988	0.1333	0.2178
	CO3	0.0628	0.0183	0.2671	0.0628	0.4017	0.3245	0.2715	0.2282	0.2794	0.3851	0.8258	0.1376	0.1896	0.2202
	CO4	0.0578	0.0615	0.2101	0.0578	0.3794	0.2833	0.3547	0.3116	0.3356	0.2997	0.8256	0.1999	0.2735	0.2389
	CO5	0.1054	0.1172	0.2135	0.1054	0.3533	0.2670	0.2809	0.2805	0.2599	0.2073	0.7599	0.1723	0.1938	0.1725
	CO6	0.1325	0.1255	0.2139	0.1325	0.4239	0.3417	0.3244	0.2545	0.3799	0.2091	0.7929	0.1367	0.2008	0.1451
Result Demonstrability	RD1	0.2373	0.3179	0.3117	0.2373	0.3410	0.2815	0.2892	0.4005	0.3179	0.4037	0.2462	0.8870	0.3347	0.4511
	RD2	0.2448	0.3406	0.3262	0.2448	0.2889	0.2226	0.2562	0.4013	0.3242	0.4410	0.1958	0.9069	0.2892	0.3856



	RD3	0.2833	0.3102	0.3368	0.2833	0.2673	0.2256	0.2334	0.3378	0.2986	0.3661	0.1314	0.8488	0.3670	0.4496
<b>Social Influence</b>	SI1	-0.0560	-0.0643	0.2531	-0.0560	0.2045	0.2350	0.1287	0.1963	0.1198	0.2074	0.0719	0.2226	0.6587	0.2099
	SI2	-0.0369	-0.0772	0.3155	-0.0369	0.2267	0.2062	0.1459	0.2070	0.0990	0.2207	0.0418	0.2376	0.6683	0.2230
	SI3	0.0835	-0.0529	0.1786	0.0835	0.5829	0.6150	0.3833	0.3515	0.4317	0.4130	0.2514	0.3006	0.9043	0.4154
	SI4	0.0676	-0.0429	0.2110	0.0676	0.4593	0.4571	0.3463	0.2953	0.3472	0.3633	0.2399	0.3822	0.8486	0.4659
<b>Facilitating Conditions</b>	FC1	0.1649	0.1499	0.1870	0.1649	0.3129	0.2851	0.3960	0.2748	0.2743	0.2637	0.1047	0.4180	0.5207	0.6602
	FC2	0.2849	0.3004	0.2955	0.2849	0.3119	0.2387	0.2899	0.3606	0.3282	0.4108	0.1577	0.5224	0.3212	0.6482
	FC4	0.0630	0.0827	0.3633	0.0630	0.2673	0.2551	0.4152	0.3694	0.3420	0.4176	0.2322	0.3367	0.2940	0.8582
	FC5	0.1476	0.0803	0.4329	0.1476	0.3161	0.2959	0.3647	0.3461	0.3196	0.4005	0.2007	0.3432	0.3282	0.8791
	FC6	0.0211	0.1092	0.4162	0.0211	0.2878	0.2726	0.4050	0.3534	0.3572	0.2632	0.2273	0.3105	0.3282	0.7698

## **Appendix G: Summary in Slovenian language/Daljši povzetek disertacije v slovenskem jeziku**

### **POVZETEK V SLOVENSKEM JEZIKU**

#### **1 OPIS ZNANSTVENEGA PODROČJA**

Sprejemanje informacijskih sistemov (IS) in njihova uporaba v delovnem okolju predstavlja eno od prednostnih problematik pri raziskovanju informacijskih sistemov in v poslovni praksi (Venkatesh & Davis, 2000). Informacijska tehnologija (IT) postaja vedno bolj kompleksna in ključna v poslovanju podjetij kot tudi pri vodstvenem odločanju, s tem pa postaja vprašanje sprejemanja in uporabe še bolj resno. Kljub pomembnemu napredku na področju razvoja programskih rešitev, pa je problem neizkoriščenosti IS še vedno prisoten. Obstajajo številni primeri neuspešnih uvedb IS znotraj organizacij (Venkatesh & Bala, 2008), ki so povezani s prenizko ravno sprejemanja in uporabe (Venkatesh, Morris, Davis & Davis, 2003). Medtem ko je začetno sprejetje s strani uporabnikov pomembno v začetnih fazah uvedbe IS, ki sledi iniciaciji, organizacijskemu privzemu in adaptaciji; pa je dolgoročna učinkovita uporaba IS, vključno z rutinizacijo in vpetostjo, kot predlagata Cooper in Zmud (1990) ter Saga in Zmud (1994), v stopnjskem modelu uvedbe IS; ključno merilo dejanskega uspeha IS (DeLone & McLean, 2003; Venkatesh & Bala, 2008).

Izvedenih je bilo že mnogo raziskav, ki so proučevale in skušale razumeti uporabniško sprejemanje IT (Taylor & Todd, 1995; Venkatesh & Davis, 2000), katerih rezultat je večje število modelov, ki vključujejo različne vedenjske, socialne in druge kontrolne dejavnike za pojasnjevanje sprejemanja IT (npr. Davis, 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008). Eden od ciljev takšnih modelov je »napovedovanje sprejemanja IS in načrtovanje sprememb pred uporabnikovo izkušnjo z novim sistemom« (Taylor & Todd, 1995, str. 561).

Raziskovanje, ki se ukvarja s preučevanjem in pojasnjevanjem privzemanja in sprejemanja, je eno izmed najbolj zrelih in bogatih raziskovalnih tokov na področju IS (npr. Davis, 1989, Venkatesh & Davis, 2000; Venkatesh et al, 2003; Venkatesh & Bala, 2008). Toda, na drugi strani, pa je uporabniško vedenje po sprejetju še vedno premalo raziskano, pogosto razumljeno kot naraščajoča intenzivnost uporabe ali večja pogostost uporabe (Jasperson, Carter & Zmud, 2005). Nekaj raziskovalnih prizadevanj je že prikazalo, da se uporaba po sprejetju lahko sčasoma s pridobljenimi izkušnjami tudi zmanjšuje (Bhattacharjee, 2001) ali pa postane vpeta v navade in rutinsko delo zaposlenih (Jasperson et al., 2005). Nedvomno lahko raziskave o sprejemanju tehnologije in začetne uporabe obogatijo naše razumevanje uporabniškega vedenja po sprejetju in lahko gradimo na ugotovitvah in prepoznanih dejavnikih, ki vplivajo na sprejemanje in uporabo novega IS, vendar pa so dejavniki, ki lahko vplivajo na sprejemanje IS in uporabo po sprejetju različni. Razlike med prepričanji in vedenjem pred sprejetjem in uporabniškim vedenjem po sprejetju so že bile opažene (Agarwal & Karahanna, 2000; Karahanna, Straub & Chervany, 1999).

Kljub temu, da obstoječe raziskave ponujajo dragocena spoznanja za razumevanje dejavnikov sprejemanja in uporabe IT (npr. Davis, 1989; Venkatesh et al., 2003, Venkatesh & Bala,

2008), pa prepoznavanje predhodnih dejavnikov, ki vplivajo na oblikovanje teh prepričanj še vedno primanjkuje (Venkatesh & Bala, 2008). Najpogostejša kritika modelov sprejemanja je pomanjkanje smernic za povečevanje ravni sprejemanja (Lee, Kozar & Larsen, 2003; Venkatesh et al., 2003; Benbasat & Barki, 2007; Venkatesh & Bala, 2008). Prepoznavanje predhodnih dejavnikov, ki vplivajo na sprejemanje in uporabo IS, ponuja pomembno vrednost organizacijam, saj lahko na njihovi podlagi proaktivno načrtujejo ukrepe (Jasperson et al., 2005, Venkatesh & Bala, 2008), s katerimi lahko ublažijo odpor do sprejemanja novih IS in izboljšajo verjetnost uspeha in poslovne vrednosti novih IS za organizacije.

Napredek na področju razumevanja dejavnikov sprejemanja in uporabe IT je sicer viden (Venkatesh et al., 2003), vseeno pa strokovne raziskave kažejo, da nizka raven sprejemanja in uporabe IT s strani zaposlenih "vodi v nezmožnost izkoriščanja pričakovanih koristi tovrstnih uvedb in ogroža dolgoročno upravičenost takšnih sistemov" (Venkatesh, Brown, Maruping & Bala, 2008, str. 284). Razumevanje ključnih dejavnikov uporabniškega sprejemanja tehnologije in njihove uporabe je torej ključnega pomena, saj omogoča ustvarjanje ugodnih zaznav ter s tem spodbuja uporabniško sprejemanje in uporabo (Venkatesh, 2000).

Splošni nabor dejavnikov sprejemanja in uporabe, ki obsega širok razpon IS, zagotavlja širok okvir in dobro izhodišče za razumevanje uporabniškega sprejemanja in uporabe IS (Venkatesh et al., 2003). Vendar pa ima prepoznavanje kontekstno specifičnih dejavnikov »izjemno vrednost za bogato teoretiziranje o specifičnem IT artefaktu, s prepoznavanjem dejavnikov, ki so značilni, za uporabo dotične vrste tehnologije (Venkatesh & Bala, 2008, str. 275). Venkatesh, Thong, Chan, Hu & Brown (2011, str. 545) izpostavljajo "potrebo po upoštevanju kontekstno pomembnih spremenljivk pri načrtovanju raziskav za študij sprejemanja in uporabe tehnologije".

Naložbe v poslovno inteligenčne sisteme (angl. Business Intelligence Systems, v nadaljevanju BIS) so postale »prepoznaven znak organizacijske strategije in konkurenčne prednosti« (Venkatesh et al., 2008, str. 484; Wixom & Watson, 2010). V literaturi IS je posebej poudarjen pozitiven vpliv informacij, ki jih ponujajo BIS za poslovno odločanje, še posebej, ko organizacije poslujejo v zelo konkurenčnih okoljih (Popovič, Hackney, Coelho, & Jaklič, 2012). Tehnološke inovacije, kot so BIS, so eden od glavnih virov konkurenčne prednosti za dolgoročno preživetje organizacij (Jourdan, Rainer & Marshall, 2008; Wixom, Watson, Reynolds & Hoffer, 2008). Ključno vprašanje je torej, ali uporabniki po uvedbi BIS dejansko sprejmejo in uporabljajo ter polno izkoriščajo vse njihove zmožnosti.

## **2 PROBLEMATIKA TEME DISERTACIJE**

Kljub temu, da literatura ponuja dragocen vpogled za razumevanje splošno veljavnih dejavnikov sprejemanja in uporabe IS s strani uporabnikov v številnih okoljih, pa lahko na motivacijo in odločitve o uporabi BIS vpliva specifičen nabor dejavnikov, ki odraža njihovo posebno naravo uporabe v primerjavi s splošnimi ali operativnimi IS. Razumevanje, kaj vpliva na motivacijo posameznikov, da uporabljajo BIS, in kako in zakaj posamezniki tvorijo

prepričanja, da pričnejo z uporabo BIS in nadaljujejo z njihovo učinkovito uporabo, je torej ključnega pomena.

Pomen poslovne inteligence (angl. Business Intelligence, v nadaljevanju BI) in analiziranja masivnih podatkov (angl. Big data analytics), je razviden iz dejstva, da vse več zasebnih in javnih (vključno z vladnimi) organizacij izkazuje interes za uvedbo poslovno inteligenčnih sistemov (Gartner Research, 2013; Wixom & Watson, 2010). Po raziskavi Gartner Research (2013) sta analitika in poslovna inteligenca uvrščeni na prvo mesto poslovnih in tehnoloških prednostnih nalog v letu 2013 mnogih vodij služb za informatiko, kar kaže na njihov vedno večji strateški pomen in poudarja potrebo po večji pozornosti v raziskovanju.

BIS so najpogosteje opredeljene kot rešitve, ki ponujajo kakovostne informacije v dobro oblikovanih podatkovnih skladiščih in so povezane z uporabniško prijaznimi orodji. Njihov cilj je ponuditi deležnikom na različnih ravneh v organizaciji pravočasen dostop, učinkovite analize in predstavitev informacij, ki nastajajo v poslovnih aplikacijah, ki jim omogočajo sprejemanje pravilnih odločitev ali sprejemanje ustreznih ukrepov za celo vrsto poslovnih dejavnosti (Popovič, Coelho, & Jaklič, 2009). Bistveni elementi uvedbe BIS niso le programska oprema ali tehnološke komponente, temveč tudi pomen človeških dejavnikov v organizaciji in njenem poslovnem okolju. V skladu s tem English (2005) širše opredeljuje BI kot »sposobnost podjetja, da učinkovito deluje z izkoriščanjem človeških in informacijskih virov«. BI tako ne more obstajati brez ljudi, ki tolmačijo pomen in pomembnost informacij in ki delujejo na podlagi pridobljenega znanja (English, 2005).

Dejanska in učinkovita uporaba BIS velja za izredno pomembno, saj predstavlja povezavo med, na eni strani, uporabo in sprejemanjem tehnologije ali sistema, in na drugi strani, dolgoročno rutinsko (Bhattacharjee, 2001) uporabo informacij, ki jih ponuja BIS, to je, ko postane uporaba BIS vpeta v proces ustvarjanja poslovne vrednosti (Popovič et al., 2012). Sama uvedba in obstoj BIS v podjetju torej ni dovolj, da bi se dodana vrednost izkazovala v uspešnosti poslovanja. Dolgoročna vzdržnost BIS in njihov uspeh je odvisen od sposobnosti, da postanejo vpeti v rutine delavcev, procese in strategijo organizacije (Shanks, Bekmamedova, Adam & Daly, 2012). Da bi dosegli to raven vpetosti, pa je potrebno razumeti, kaj motivira in oblikuje odločitve zaposlenih, da uporabljajo BIS.

Za preučevanje dejavnikov, ki vplivajo na sprejemanje in različne dimenzije uporabe BIS, je pomembno opredeliti specifične značilnosti BIS v primerjavi s tradicionalnimi oz. operativnimi IS. Najbolj opazne posebnosti BIS, povezane z naravo njihove uporabe, so prostovoljnost uporabe (Venkatesh & Davis, 2000; Venkatesh et al, 2003; Venkatesh & Bala, 2008), drugačna struktura uporabnikov (predvsem managerji), kar je pogosto povezano z manj strukturiranimi informacijskimi potrebami, zbrane informacije so veliko bolj agregirane in integrirane in veliko je deljenja informacij na ravni organizacije (Negash & Gray, 2008), povezano s potrebo po izboljšavah na področju informacijske kulture (Marchand, Kettinger, Rollins, 2001) in poudarek je na relevantnosti informacij, ki jih zagotavlja BIS (DeLone & McLean, 2003; Eppler 2006; Popovič et al, 2009). Opredelitev posebnih značilnosti uporabniškega okolja BIS lahko pomaga razkriti, da lahko drugačni vplivi oblikujejo

motivacijo in odločitve glede njihovega sprejemanja in uporabe. Razumevanje, kako in zakaj posamezniki tvorijo odločitve, da uporabljajo BIS, lahko potencialno poveča njihovo učinkovito uporabo, vpetost v rutine delavcev, organizacijske procese, tehnološko infrastrukturo in strategijo (Shanks et al., 2012). Ta poglobljena uporaba vključuje napredno analitiko z ustvarjanjem konkurenčnega in inovativnega znanja, za ustvarjanje »odločitvenih aktivnosti, ki temeljijo na uporabi BIS in s strani BI omogočenih organizacijskih procesov, ki vodijo vodstveno odločanje na nove ravni razumevanja in predvidevanja« (Shanks et al., 2012, str. 114).

### **3 NAMEN IN CILJI**

Namen doktorske disertacije je izboljšati razumevanje in ponuditi obširno razlago o tem, kaj vpliva na motivacijo posameznika, da uporablja BIS in kako in zakaj posamezniki tvorijo prepričanja, da pričnejo uporabljati BIS in nadaljujejo z njihovo učinkovito uporabo, vpeto v njihove rutine. Po mojem najboljši vedenju, v literaturi še ne obstaja tako obširna raziskava, ki bi ponudila celovit okvir dejavnikov sprejemanja in različnih dimenzij uporabe BIS, skupaj s prehodnimi dejavniki, ki vplivajo na oblikovanje teh prepričanj in vedenj.

Za uresničitev namena, ima disertacija naslednje cilje:

- Ponuditi širok pregled splošnih dejavnikov sprejemanja in uporabe s strani uporabnikov, opredeljenih, sistemiziranih in kategoriziranih na podlagi obsežnega pregleda literature;
- Opredeliti značilnosti BIS in razlike v primerjavi z operativnimi IS, vezane na naravo njihove uporabe, določene na podlagi pregleda literature in ugotovitev iz intervjujev s strokovnjaki in ključnimi uporabniki iz prakse;
- Predlagati konceptualni model sprejemanja BIS, zasnovan na podlagi raziskovalnih študij primerov in intervjujev s strokovnjaki in ključnimi uporabniki s tega področja;
- Predlagati konceptualni model razširjene uporabe BIS, zasnovan na podlagi raziskovalnih študij primerov in intervjujev s strokovnjaki in ključnimi uporabniki s tega področja;
- Zasnovati in opredeliti vpetost BIS, razviti mersko lestvico za ta konstrukt na podlagi pregleda literature in mnenj ter predlogov strokovnjakov;
- Razviti model vplivnih dejavnikov na tri dimenzije uporabe, ki vključuje intenzivnost, obseg in vpetost uporabe BIS, zasnovan na podlagi podatkov, pridobljenih z anketnim vprašalnikom; in
- Razviti model predhodnih dejavnikov, ki vplivajo na namen sprejemanja in uporabe BIS, zasnovan na podlagi podatkov zbranih z analizo ankete.

### **4 HIPOTEZE DISERTACIJE**

Osnovno raziskovalno vprašanje doktorske disertacije je, kaj so dejavniki sprejemanja in učinkovite uporabe BIS s strani posameznikov, ki vodijo v vpetost BIS in njegove uporabe. Navedeno vprašanje je preučevano z več pod-vprašanji, skozi različne povezane članke, iz katerih so izpeljane hipoteze disertacije.

Pregled modelov in teorij sprejemanja, je pokazal, da ti večinoma vključujejo dejavnike individualnih značilnosti ali zaznav posameznikov, povezanih z lastnostmi sistema

(Venkatesh et al., 2003). Raziskava in analiza posebnosti BIS v primerjavi s splošnimi ali tradicionalnimi operativnimi IS glede narave njihove uporabe, je pokazala, da bi lahko te posebnosti vodile k prepoznavanju drugačnega sklopa dejavnikov sprejemanja in uporabe, kot jih predlagajo tradicionalni modeli, kar vodi v prvo hipotezo:

H1: Različen sklop dejavnikov sprejemanja, kot posledica značilnosti v naravi uporabe BIS, vpliva na uporabo BIS, ki pa se tudi delno prekriva s tradicionalnimi dejavniki.

Širši pregled različnih raziskovalnih tokov na področju IS (npr. privzemanje IS, uvedba in uspeh IS, sprejemanje IS, in teorije človeškega družbenega vedenja) je vodil v identifikacijo in sistemizacijo številnih dejavnikov, vključno z individualnimi, tehnološkimi, organizacijskimi in okoljskimi značilnostmi, ki lahko vplivajo na sprejemanje IS. Iz tega sledi naslednja hipoteza:

H2: Širok razpon individualnih, tehnoloških, organizacijskih in družbenih dejavnikov lahko oblikuje motivacijo za sprejem in uporabo BIS.

Obstoječa literatura o uvajanju in uspehu BIS razkriva poudarek na organizacijski podpori in zavezanosti za uspeh BIS (npr. Wixom & Watson, 2001; Yeoh & Koronios, 2010). Na podlagi tega, je mogoče sklepati, da so lahko ti dejavniki pomembni tudi za oblikovanje prepričanj posameznikov, ki vodijo v sprejemanje in uporabo BIS, kar ni vključeno v tradicionalne modele sprejemanja (npr. Davis et al., 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008). Naslednja hipoteza se tako glasi:

H3: Pretežno širok nabor organizacijskih dejavnikov vpliva na sprejemanje in uporabo BIS.

Uvedba in delo z BIS pretežno prinaša spremembe na področju informacijske kulture skozi celotno organizacijo, zlasti na področjih preglednosti informacij, deljenja informacij in proaktivnim delovanjem na podlagi informacij (Marchand et al., 2001). Informacije, ki izhajajo iz BIS, so bolj agregirane in integrirane na ravni organizacije, veliko je deljenja informacij in želen rezultat je proaktivna uporaba informacij iz BIS za boljše odločanje. V povezavi s tem je obstoječa literatura že pokazala pomen relevantnosti informacij, ki izhajajo iz BIS, tako da uporabniki lahko ustvarjajo visoko kakovostne rezultate z njihovo uporabo (Popovič et al., 2012). Informacijska kultura organizacije se kaže v treh informacijskih zmogljivostih organizacije (Marchand et al., 2001): organizacijske tehnološke prakse (ki se odražajo v kakovosti BIS in posledično kakovosti informacij, ki izhajajo iz BIS), organizacijske prakse za upravljanje informacij (ki se odražajo v podpori upravljanja BIS) ter informacijske vrednote (ki se odražajo v učinkoviti uporabi BIS s strani zaposlenih). Visoka stopnja odprte (Pijpers, 2002) informacijske kulture v organizaciji, lahko prispeva k višji kakovosti informacij, ki izhajajo iz BIS, kar bi moralo v sinergiji prispevati k večjemu sprejemanju in uporabi BIS, to pa vodi v naslednjo hipotezo:

H4: Informacijska kultura skupaj z zagotavljanjem kakovostnih informacij pomembno prispeva (pozitivno ali negativno) k sprejemanju in uporabi BIS.

Uporabniško okolje uporabe BIS, vključno s preglednostjo, deljenjem in proaktivnim delovanjem na podlagi informacij, vpliva na to, da uporabniki ustvarjajo sodbe glede sprejemanja in uporabe BIS v organizacijskem družbenem okolju, ki izkazuje organizacijsko kolektivno naklonjenost do uporabe BIS. Pozitivno dojetje organizacijske podpore in spodbude sodelavcev in nadrejenih, skupaj s komunikacijo rezultatov njihove uporabe bi moral predstavljal velik delež presoje uporabnikov glede sprejemanja in uporabe BIS. Na osnovi tega je postavljena naslednja hipoteza:

H5: Dejavniki, povezani z družbenimi vidiki v organizacijskem okolju, pomembno vplivajo na sprejemanje in uporabo BIS.

Predhodne raziskave sprejemanja IS so raziskovale uporabo predvsem kot naraščajočo intenzivnost, pogostost in trajanje uporabe po sprejetju (Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008). Predmet raziskave so bili večinoma tradicionalni operativni IS, kjer je uporaba integrirana z izvedbo poslovnih procesov. Vendar narava uporabe BIS, ki zajema tudi nestrukturirane procese ter bolj raziskovalno in inovativno uporabo, nakazuje, da samo merjenje, koliko se BIS uporablja, ni dovolj, da bi zajeli njihovo učinkovito uporabo. Zato je v kontekstu uporabe BIS pomembno zajeti, koliko in kako se BIS uporablja, ter posledično doseči stopnjo vpetosti, kjer uporaba BIS postane sestavni del organizacijske dejavnosti (Furneaux & Wade, 2011). Na podlagi tega se postavlja naslednja hipoteza:

H6: Več dimenzij (intenzivnost, obseg in vpetost) obsega učinkovito uporabo BIS, ki vodi v njihovo vpetost.

Pogosta kritika modelov sprejemanja je, da ponujajo premalo smernic za vplivanje na ugotovljene dejavnike sprejemanja (Venkatesh et al., 2003; Jaspersen et al., 2005; Venkatesh & Bala, 2008). Dejavniki sprejemanja, ki obsegajo vedenjska, normativna in kontrolna prepričanja, se lahko razlikujejo v odvisnosti od številnih predhodnih dejavnikov vključno z individualnimi in socialnimi vidiki ter na podlagi različnih informacij (npr. znanje, intervencije) (Ajzen & Fishbein, 2005). Ob upoštevanju narave uporabe BIS, je v doktorski disertaciji naveden širok nabor predhodnih dejavnikov, ki vplivajo na prepričanja o sprejemanju. Na nastanek prepričanj o sprejemanju vplivajo različni kulturni, osebni in organizacijski dejavniki (Ajzen & Fishbein, 2005). Na podlagi tega je oblikovana naslednja hipoteza:

H7: Številni predhodni dejavniki, identificirani na podlagi značilnosti BIS, pojasnjujejo neposredne dejavnike sprejemanja BIS.

Prepoznavanje dejavnikov sprejemanja BIS, skupaj s predhodnimi dejavniki in identifikacija dejavnikov, ki vplivajo na različne dimenzije učinkovite uporabe BIS, bi moralo zagotoviti smernice za povečanje možnosti, da BIS postanejo globoko vpeti v poslovanje.

## 5 OPIS ZNANSTVENE METODE

Pred izvedbo raziskave disertacije je bil izdelan načrt raziskave, kjer je bilo opredeljeno, kateri podatki so potrebni, katere metode bodo uporabljene za zbiranje in analizo podatkov in kako bodo odgovorjena raziskovalna vprašanja. Znanstvene raziskovalne metode, ki so bile uporabljene v disertaciji, so sledile zasnovi študije identificiranega problema oz. pojava. Raziskovanje se je pričelo s širokim pregledom obstoječe literature, z namenom pregleda in identifikacije dejavnikov, ki bi bili lahko pomembni za raziskavo. Temu je sledila raziskovalna študija primerov in v tem okviru izvedba intervjujev v opredeljenem kontekstu z namenom boljšega razumevanja preučevanega problema, kar je omogočilo nadgradnjo pregleda literature s kontekstno značilnimi dejavniki in zagotovilo podlago za oblikovanje konceptualnega modela raziskave. Po oblikovanju konceptualnega okvirja, je bila izvedena kvantitativna empirična analiza na podlagi podatkov, zbranih z anketno raziskavo, kjer so bile preverjene postavljene hipoteze. Vse faze raziskovanja so pomagale odgovoriti na različna raziskovalna vprašanja in pripomogle k doseganju ciljev disertacije.

Najprej je bil opravljen obsežen pregled znanstvene in strokovne literature, ki je vključeval pregled obstoječih teorij in modelov na temo sprejemanja, privzemanja, uvedbe in uspešnosti IS. Na podlagi tega, so bili identificirani in sistemizirani dejavniki sprejemanja s strani uporabnikov, ki so predstavljali izhodišče in podlago za nadalje raziskovanje specifičnega konteksta. Zbrane so bile tudi specifične značilnosti BIS v primerjavi z operativnimi IS, povezane z naravo njihove uporabe, identificirane na podlagi obstoječe literature.

Nadalje je bila opravljena raziskovalna študija primerov. V tej fazi so bili pridobljeni podatki in informacije na podlagi dveh študij primerov, kar je vključevalo zbiranje spoznanj skozi uvajanje projekta (pregled dokumentacije in opazovanje) in opravljanje pol-strukturiranih intervjujev s strokovnjaki iz prakse na področju uvedbe in uporabe BIS projektov v organizacijah. Pol-strukturirani intervjuji so omogočili poglobljeno raziskovanje raziskovalnih vprašanj in razviti globlje razumevanje pomembnih vprašanj z vidika neodvisnih ekspertov iz prakse (Blumberg, Cooper & Schindler, 2008). Okvirna izhodišča pol-strukturiranih intervjujev so bila namensko postavljena tako, da so omogočila celovito raziskovanje dejavnikov sprejemanja in uporabe BIS, kjer so eksperti svobodno izražali svoja mnenja in opazovanja, obenem pa so bila pripravljena izhodišča vodilo za pridobivanje želenih informacij (Saunders, Lewis & Thornhill, 2009). Izhodiščna vprašanja so predstavljena v Prilogi A. Na podlagi informacij, pridobljenih skozi raziskovalno študijo primerov skupaj s pregledom literature, je bil zasnovan konceptualni model sprejemanja in različnih dimenzij uporabe BIS, kar je predstavljeno v poglavjih 3 in 4.

Sledila je empirična raziskava, opravljena na podlagi analize anketne raziskave. Vprašalnik je bil izdelan na podlagi konceptualnega modela, razvitega v predhodni fazi raziskovanja. Pretežno so bili uporabljeni merski indikatorji iz obstoječih raziskav, kar zagotavlja višjo raven veljavnosti, vprašalnik je bil tudi predhodno testiran na ciljni skupini (Cooper & Schindler, 2003). Manjše spremembe so bila narejene na podlagi njihovih predlogov, kar je večinoma vključevalo prilagajanje postavk specifičnemu kontekstu uporabe BIS, npr.



integriranje prostovoljnosti uporabe in usklajevanje ter operacionalizacija indikatorjev za merjenje zaznav. Uporabljena je bila sedem stopenjska Likertove lestvica, z lestvico odgovor od sploh se ne strinjam (1) do se popolnoma strinjam (7). Vprašalnik, ki je bil poslan anketirancem v slovenskem jeziku, je prikazan v Prilogi B.

Podatki so bili zbrani na podlagi ankete, poslane 2173 srednje velikim in velikim organizacijam v Sloveniji, ki imajo več kot 50 zaposlenih. Te organizacije predstavljajo celotno populacijo po omenjenem merilu registriranih organizacij v uradni bazi podatkov Poslovnega informatorja Republike Slovenije (PIRS) marca 2013. Udeležencem je bilo poslano uvodno pismo, kjer so bili pojasnjeni cilji in postopki raziskave. Podana je bila razlaga in opredelitev pojma poslovno inteligenčnih sistemov, s čimer je bilo razloženo, kdo naj bi bili ciljni anketiranci, saj je predvideno, da vsa podjetja, katerim je bil poslan vprašalnik, ne uporabljajo BIS. Vprašalnik je bil naslovljen na kontaktne osebe v bazi, s prošnjo, po posredovanju vprašalnika različnim uporabnikom BIS, npr. top management, vodje oddelkov, vodje služb za informatiko in ostale uporabnike. Skupno je bilo zbranih 195 izpolnjenih anket.

Analizo podatkov sem izvedla z uporabo strukturnih modelov (SEM). Te tehnike raziskovalcem omogočajo, da ocenjujejo in modificirajo teoretične modele in so postale vedno bolj priljubljene pri raziskavah IS, saj ponujajo velik potencial za nadaljnji razvoj teorij (Gefen, Straub & Boudreau, 2000). To je pogosto izbrana metodologija analiziranja podatkov na področju raziskovanja IS, saj je primerna za napovedovanje in razvoj teorij, ker proučuje pomen odnosov med raziskovalnimi konstrukti in napovedno moč odvisne spremenljivke (Chin, 1998). PLS (angl. Partial Least Squares, kratica PLS) pristop k SEM je bil uporabljen za izvedbo analize podatkov. PLS je primeren za kompleksne modele (z velikim številom latentnih in manifestnih spremenljivk), relativno majhne vzorce, raziskovalne modele v zgodnji fazi razvoja in testiranja ter nima distribucijskih zahtev po normalni razporeditvi (Henseler et al., 2009). Dva empirična modela s številnimi hipotezami, sta bila preverjena, kar je predstavljeno v Poglavjih 5 in 6.

Vse uporabljene metodologije, njihov podroben opis in analiza zbranih podatkov so opisani v posameznih poglavjih disertacije.

## **6 STRUKTURA DISERTACIJE**

Doktorska disertacija je strukturirana kot zbirka petih člankov, ki smiselno sledijo raziskovalnemu načrtu za razvoj okvirja determinant vpetosti BIS, ki je tema doktorske disertacije. Vsak članek posebej je samostojen prispevek, vseeno pa je jasno razvidna rdeča nit, ki jih povezuje, ter razvoj in nadgradnja skupnih ugotovitev, na podlagi omenjenih faz raziskovanja, od široke konceptualizacije raziskovalnega okvirja do izpopolnitev predlaganih modelov. Vsako poglavje ima zato svoj uvod, teoretično ozadje, opredelitev problematike, ugotovitve in zaključek s posameznimi omejitvami.

Po uvodu je v drugem poglavju podan širok pregled teorij in modelov, ki se ukvarjajo s psihološkimi, tehnološkimi, organizacijskimi in okoljskimi vplivi na sprejemanje IS. Na podlagi tega je sistemiziran celovit nabor vseh ugotovljenih dejavnikov sprejemanja, razdeljen v kategorije osebnih, tehnoloških, organizacijskih socialnih in okoljskih značilnosti. Poleg tega so navedene identificirane razlike BIS v primerjavi z operativnimi IS in izpostavljeni izhodiščni ugotovljeni dejavniki, ki bi bili lahko bolj pomembni v kontekstu sprejemanja in uporabe BIS.

Tretje poglavje se opira na predstavljena teoretična izhodišča in sledi z raziskovalnimi študijami primerov. Ugotovitve na podlagi pregleda literature so okrepljene s podatki, zbranimi na podlagi študij primerov, vključno s pol-strukturiranimi intervjuji, ki so omogočili bolj poglobljeno razumevanje poudarka in pomembnosti dejavnikov, ki so bolj izraziti v specifičnem raziskovanem okolju. Predlagan in opisan je konceptualni model sprejemanja BIS.

Četrto poglavje nadaljuje z analizo ugotovitev na podlagi raziskovalnih študij primerov, s poudarkom na preiskovanju različnih dimenzij uporabe BIS, ki sledi začetnemu sprejetju. Opredeljene in teoretično podprte so tri dimenzije uporabe BIS, in sicer intenzivnost uporabe, obseg uporabe in vpetost BIS. Ugotovitve opisujejo ključne dejavnike učinkovite uporabe BIS in predlagan je konceptualni model razširjene uporabe BIS.

Peto poglavje prične z empirično analizo na podlagi anketnih podatkov. Predlagan in podkrepjen s teoretičnimi dognanji je model vplivnih dejavnikov na tri dimenzije uporabe, ki vključuje intenzivnost, obseg in vpetost uporabe BIS. Ugotovitve empirične analize podprejo razvoj treh dimenzij uporabe BIS in razkrijejo pomembne poudarke v kontekstu uporabe BIS, ki se v veliki meri razlikujejo od obstoječih teorij in modelov.

Šesto poglavje nadaljuje z analizo empiričnih podatkov. Obravnava pomembno raziskovalno vprašanje, izpostavljeno v literaturi kot pereče in premalo raziskano, in sicer, kaj so predhodni dejavniki sprejemanja in uporabe. Razvit je celovit model predhodnih dejavnikov, ki vplivajo na namen sprejemanja in uporabe BIS. Postavljene in preverjene so številne hipoteze. Model zajema širok spekter dejavnikov, vključno z individualnimi, tehnološkimi in organizacijskimi značilnostmi, ki lahko vplivajo na nastanek ugodnih zaznav in prepričanj za povečanje uporabe BIS, identificiranih na podlagi specifične narave uporabe BIS.

Sedmo poglavje vsebuje povzetek glavnih in skupnih ugotovitev doktorske disertacije. Poudarjena so skupna dognanja posameznih študij s celovitim pogledom nad celotnim raziskovalnim problemom. Temu sledi literatura (Poglavje 8) in priloge (Poglavje 9).

## **7 REZULTATI DISERTACIJE**

Skozi celotno raziskavo doktorske disertacije so bili uspešno doseženi postavljeni cilji disertacije in preverjene hipoteze.

V drugem poglavju sem identificirala, sistemizirala in kategorizirala širok nabor dejavnikov sprejemanja IS na podlagi obsežnega pregleda literature, ki vključuje individualne, tehnološke, organizacijske, socialne in okoljske značilnosti. Na podlagi obstoječe literature sem identificirala specifične značilnosti BIS v primerjavi z operativnimi IS, ki se navezujejo na njihovo posebno naravo uporabe. Na koncu poglavja sem izpostavila izhodiščne dejavnike, ki bi lahko bili ključnega pomena za učinkovito uporabo BIS, ki so prileganje tehnologije opravičilo, podpora managementa in management sprememb, organizacijska kultura in informacijska kultura. V tem poglavju je bila v delu potrjena prva hipoteza.

V tretjem poglavju sem s pomočjo ugotovitev pregleda literature in nadgraditvijo z ugotovitvami iz raziskovalnih študij primerov, predlagala konceptualni model sprejemanja BIS, ki razlikuje med objektivnimi prepričanji in vedenjskimi prepričanji, ki vplivajo na učinkovito sprejemanje. Ugotovitve so pokazale, da je v kontekstu sprejemanja BIS, pomemben poudarek na organizacijskih dejavnikih, kot so predstavljenost rezultatov, družbeni vpliv in podporne okoliščine z zagotavljanjem zadostnih sredstev, vzporedno z ustvarjanjem ustrezne informacijske kulture. Ugotovitve tega poglavja dodajo k potrditvi hipotez ena, dva, tri in štiri.

V četrtem poglavju sem nadaljevala z analizo ugotovitev iz študij primerov z osredotočenjem na preiskavo različnih načinov uporabniškega vedenja, ki sledi začetnemu sprejemanju BIS. Opredelila sem tri dimenzije učinkovite uporabe BIS, in sicer intenzivnost uporabe, obseg uporabe in vpetost uporabe BIS in predlagala konceptualni model razširjene uporabe BIS. Rezultati so pokazali, da osebna inovativnost in pripravljenost na spremembe spodbujata prehod v vpetost BIS v rutine delavcev. Relevantnost informacij, ki jih zagotavlja BIS, so ključnega pomena za globoko vpeto uporabo BIS, kar še ni bilo poudarjeno v obstoječih tradicionalnih modelih sprejemanja IS. Izpostavljen je bil velik pomen organizacijskih dejavnikov, poimenovanih trans-implementacijski dejavniki, ki bi morali biti izvajani pred, med in po uvedbi BIS in se nenehno razvijati za učinkovito uporabo BIS. Ugotovitve tega poglavja prispevajo k potrditvi hipotez ena, dva, tri, štiri in šest.

V petem poglavju sem začela z empirično analizo anketnih podatkov. Teoretično sem zasnovala model vplivnih dejavnikov na tri dimenzije uporabe BIS, ki vključuje intenzivnost, obseg in vpetost uporabe BIS in preverila različne postavljene hipoteze. Rezultati empirične analize so zagotovili podporo opredelitvi treh razsežnosti uporabe BIS. Pokazali so, da tradicionalni dejavniki zaznavanja navora ter učinkovitosti in uspešnosti ne igrajo pomembne vloge pri napovedovanju namere uporabe BIS. Na namero uporabe BIS vplivajo družbeni mehanizmi, kot so predstavljenost rezultatov in družbeni vpliv. Neposredni dejavniki, ki vplivajo na različne dimenzije uporabe BIS, so namera uporabe (na katero vplivajo družbeni mehanizmi) in podporne okoliščine, medtem ko organizacijska usmerjenost k strankam neposredno vpliva le na kvalitativni preskok v uporabi od intenzivnosti in razširjenosti uporabe do vpetosti uporabe BIS v rutine delavcev. Ugotovitve ponovno izpostavljajo pomen organizacijskih dejavnikov za sprejemanje in učinkovito uporabo BIS, odločilno vlogo organizacijske usmerjenosti k strankam za vpetost BIS v rutine delavcev in bogatijo

razumevanje uporabniškega vedenja, ki sledi začetnemu sprejemanju BIS. Ugotovitve tega poglavja potrjujejo hipoteze ena, tri, v večji meri hipotezo dva, in zlasti potrjujejo hipotezi pet in šest.

V šestem poglavju sem nadaljevala z analizo empiričnih podatkov. Obravnavala sem pomembno raziskovalno vprašanje, izpostavljeno v literaturi kot pereče in premalo raziskano, in sicer, kaj so predhodni dejavniki sprejemanja in uporabe, s ponujanjem vodilnih smernic na podlagi katerih lahko organizacije proaktivno načrtujejo ukrepe. Razvila sem obsežen model predhodnih dejavnikov, ki vplivajo na namen sprejemanja in uporabe BIS. Model zajema širok spekter dejavnikov, vključno z individualnimi, tehnološkimi in organizacijskimi značilnostmi, ki lahko vplivajo na oblikovanje ugodnih zaznav glede uporabe BIS, ki odražajo specifične v naravi uporabe BIS. Rezultati raziskave so pokazali značilne predhodne dejavnike sprejemanja v kontekstu BIS. Razkrivajo pomen samo-učinkovitosti, ki predstavlja individualno značilnost, in organizacijskih dejavnikov, ki bodisi neposredno (usposabljanje uporabnikov in podpora managementa za uporabo BIS) ali posredno preko izboljševanja informacijske kulture (vplivni dejavniki so podpora managementa pri uvajanju BIS, organizacijski dejavniki uspeha uvedbe BIS in organizacijska usmerjenost k strankam) vplivajo na notranjo shemo odločitev, ki oblikujejo tvorjenje namena uporabe BIS. Kakovost informacij in kakovost sistema BIS (lastnosti same tehnologije) nimajo neposrednega vpliva na ustvarjanje vedenjskih prepričanj. Ponovno je bil izpostavljen prevladujoč pomen organizacijskih dejavnikov tudi kot predhodnih dejavnikov, ki vplivajo na povečanje namena uporabe BIS. Ugotovitve tega poglavja potrjujejo hipoteze dva, tri, štiri in posebej sedem.

## **8 OCENA PRISPEVKA K ZNANOSTI**

Ugotovitve doktorske disertacije ponujajo številne teoretične in praktične prispevke. Najobsežnejši prispevek je razvoj celovite strukture dejavnikov sprejemanja in različnih razsežnosti uporabe BIS na ravni posameznika, skupaj s predhodnimi dejavniki, ki oblikujejo ta prepričanja in vedenje. Okvir vključuje in opredeljuje ključna kontekstualna zaznavanja in prepričanja in razkrivajo, kako ta delujejo v okviru uporabe BIS za doseganje učinkovite uporabe, vpete v rutine delavcev. Številni posamezni prispevki, povezani z obsežnim, so navedeni v nadaljevanju.

Pregled in sistemizacija identificiranih dejavnikov sprejemanja IS predstavlja nadgradnjo in bolj izčrpen povzetek od tistega v obstoječi literaturi (npr. Legris, Ingham & Colletette, 2003; Lee et al., 2003; Chuttur, 2009, Sharp, 2007; Bilandžić et al., 2008). Ta pregled lahko služi kot izhodišče za druge študije tega pojava v drugih okoljih uporabe.

Identifikacija specifičnih razlik in značilnosti BIS v primerjavi z operativnimi IS, povezanih s posebno naravo njihove uporabe, predstavlja razširitev nabora razlik, ki so jih identificirali Popovič et al. (2012).

Celovita in obsežna študija sprejemanja in uporabe BIS na individualni ravni predstavlja prispevek k obstoječim študijam v kontekstu BIS. Predhodne raziskave v tem okolju so se

predvsem osredotočale na izboljšanje kakovosti sistema, razvojne značilnosti ter na uspešno uvedbo in kritične dejavnike uspeha BIS (npr. Wixom & Watson, 2001; Yeoh & Koronios, 2010; Popovič et al., 2012). Vsi ti vidiki so pomembni in bistveni za uspeh sistema v organizacijah, vseeno pa je na koncu za uresničitev pričakovanih koristi uvedbe BIS, pomembno, da zaposleni sprejmejo in učinkovito uporabljajo BIS.

Predhodne raziskave o sprejemanju in uporabi IS so predvsem raziskovale uporabo kot naraščajočo intenzivnost uporabe, ki sledi sprejemanju, in s tem zanemarjale, kako se sistem uporablja (npr. Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh & Bala, 2008). Ta raziskava torej ponuja nove vpoglede z raziskovanjem in merjenjem treh različnih razsežnosti uporabe BIS, in sicer intenzivnost uporabe, obseg uporabe in vpetost uporabe BIS. Konceptualizacija in merjenje konstrukta vpetosti BIS na individualni ravni predstavlja prilagoditev raziskovalnih ugotovitev Shanks et al. (2012), kjer so bile identificirane dimenzije vpetosti na različnih ravneh v organizaciji.

Študija doktorske disertacije ponuja pomembne razširitve in prilagoditve tradicionalnih teorij sprejemanja in uporabe za BIS kontekst. Tradicionalni modeli sprejemanja se pretežno osredotočajo na individualne zaznave napora in uporabnosti IS ali na zaznavanje lastnosti in značilnosti samih sistemov oz. tehnologije (npr. Davis, 1989; Venkatesh & Bala, 2008). Rezultati te raziskave kažejo, da v BIS kontekstu zaznave napora in uporabnosti nimajo neposrednega vpliva na namen uporabe BIS (ki nadalje vpliva na uporabo), ampak se namen uporabe gradi preko družbenih mehanizmov, z vplivom predstavljenosti rezultatov in družbenega vpliva.

Nadalje raziskava razkriva ključno vlogo cele vrste organizacijskih dejavnikov pri oblikovanju bodisi namena uporabe BIS ali različnih dimenzij uporabe BIS. Ti organizacijski, okoljski (ali zunanji) dejavniki so v obstoječih modelih večinoma zajeti le s podpornimi okoliščinami (Venkatesh et al., 2008). Poleg tega študija ponuja celovit okvir predhodnih dejavnikov, ki vplivajo na sprejemanj BIS, ki vključujejo individualne, tehnološke in organizacijske dejavnike. Skupna kritika modelov sprejemanja je pomanjkanje smernic za povečanje sprejemanja IS (npr. Lee et al, 2003; Benbasat & Barki, 2007; Venkatesh & Bala, 2008). Analiza vpliva predhodnih dejavnikov pokaže, da pretežno organizacijski dejavniki, bodisi neposredno ali posredno, preko izboljševanja informacijske kulture, vplivajo na notranjo shemo odločitev, ki oblikujejo tvorjenje namena uporabe BIS. Predlogi za vključitev teh širših organizacijskih in okoljskih vplivov za spodbujanje uporabe IS so že bili podani v literaturi (Benbasat & Zmud, 2003).

Vse ugotovitve razkrivajo pomen dejavnikov v pomembnem specifičnem okolju uporabe BIS, lahko pa so tudi uporabni v drugih okoljih uporabe. Na primer, dejavniki, ki so bili izpostavljeni kot pomembni, lahko veljajo tudi za uporabo drugih organizacijskih sistemov na ravni celotne organizacije, sistemov podpore odločanju in v domenah izmenjave znanja ali celo širše, v kateri koli situaciji prostovoljne uporabe, kot so preučevanje uporabe z vidika potrošnikov ali uporabo družbenih medijev. Poudarek na družbenih mehanizmih in vplivih širših dejavnikov kulturnega okolja za spodbujanje sprejemanja in uporabe, bi se lahko

prilagodilo na katerokoli skupinsko okolje, tako da bi bili te vplivi operacionalizirani, na primer kot podpora in spodbuda s strani prijateljev in vodje skupine, izmenjava in deljenje rezultatov uporabe, proaktivna uporaba podatkov in informacij za ustvarjanje znanja z zagotavljanjem ustreznih sredstev in podporo za pomoč pri težavah s sistemom.

Pomemben prispevek k praksi je ponujanje smernic organizacijam. Glede na to, da so glavni dejavniki, ki vplivajo na oblikovanje notranje motivacije in spodbujanje učinkovite uporabe BIS predvsem organizacijski, te ugotovitve ponujajo smernice organizacijam, saj so to dejavniki na katere organizacije lahko vplivajo in proaktivno načrtujejo ukrepe za izboljšanje verjetnosti uspeha in poslovne vrednosti BIS za organizacije.

## **9 SKLEP**

Za doseganje povečanja poslovne uspešnosti z uvedbo BIS, bi le ti morali postati sestavni del organizacijske dejavnosti (Furneaux & Wade, 2011), tako da bi postali vpeti v rutine delavcev, tehnološko infrastrukturo, organizacijske procese in strategijo (Shanks et al., 2012). Vseeno pa številni primeri razkrivajo, da zaposleni premalo izkoriščajo možnosti, ki jih ponujajo BIS (Li et al., 2013), zato je razumevanje dejavnikov sprejemanja in učinkovite uporabe BIS, kar je bil namen doktorske disertacije, ključnega pomena. To omogoča ustvarjanje ugodnih zaznav ter s tem spodbuja uporabniško sprejemanje in učinkovito uporabo BIS (Venkatesh, 2000), vpeto v rutine delavcev.

Vse ugotovitve doktorske disertacije izboljšujejo razumevanje in ponujajo okvirno shemo glede tega, kaj vpliva na motivacijo posameznikov, da uporabljajo BIS in kako in zakaj posamezniki oblikujejo zaznave, da pričnejo uporabljati BIS in nadaljujejo z njihovo učinkovito uporabo. Na podlagi ugotovitev posameznih raziskav je razviden celovit model sprejemanja in učinkovite uporabe BIS.

Odločitve o uporabi BIS se oblikujejo skozi več plasti. Kot prvo, se namen uporabe BIS (ki ga tvorita družbeni vpliv in predstavljaljivost rezultatov) oblikuje preko soodvisnega mehanizma vpliva predhodnih dejavnikov. Značilni predhodni dejavniki vključujejo samo-učinkovitost, ki predstavlja individualno značilnost, in organizacijske dejavnike, ki bodisi neposredno (usposabljanje uporabnikov in podpora managementa za uporabo BIS) ali posredno preko izboljševanja informacijske kulture (vplivni dejavniki so podpora managementa pri uvajanju BIS, organizacijski dejavniki uspeha uvedbe BIS in organizacijska usmerjenost k strankam) vplivajo na notranjo shemo odločitev, ki oblikujejo tvorjenje namena uporabe BIS. Zanimivo je, da kakovost informacij in kakovost sistema BIS (lastnosti same tehnologije) nimata neposrednega vpliva na ustvarjanje vedenjskih prepričanj. Vmesna plast predstavljajo dejavniki sprejemanja BIS, ki nadalje vplivajo na uporabo. Ti zajemajo vedenjska in normativna prepričanja, ki vplivajo na namen uporabe BIS in zunanje organizacijske dejavnike. V kontekstu BIS, družbeni vpliv in predstavljaljivost rezultatov vplivata na tvorjenje namena uporabe BIS in ne tradicionalni dejavniki zaznave napora in uporabnosti (Davis, 1989, Venkatesh et al., 2003). Zadnja plast vključuje dejavnike, ki neposredno vplivajo na različne dimenzije učinkovite uporabe BIS, in sicer intenzivnost, obseg in vpetost uporabe, ki

predstavlja končni želeni rezultat uporabe BIS. Neposredna dejavnika, ki vplivata na različne dimenzije uporabe BIS, sta namen uporabe in podporne okoliščine, medtem ko organizacijska usmerjenost na stranke vpliva le na kvalitativen preskok v uporabi, ki je vpetost BIS v rutine delavcev. Skupni splošni model kaže, da lahko organizacijski dejavniki kot predhodni dejavniki oblikujejo tako namen uporabe, kot tudi neposredno vplivajo na dejansko uporabo. Oblikovanje namena vedenja je še posebno poudarjeno v okoljih prostovoljne uporabe, kjer je namen uporabe ključni in osrednji napovedovalec dejanske uporabe (Ajzen & Fishbein, 2005). Vseeno pa je dejanska uporaba lahko odvisna še od nekaterih drugih dejavnikov, ki lahko vplivajo na dejansko vedenje in temeljijo na zunanjih in situacijskih motivih. To je tudi razvidno iz neposrednega vpliva podpornih okoliščin in organizacijske osredotočenosti na stranke na dejansko uporabo BIS. Identificirani predhodni dejavniki lahko torej tudi neposredno vplivajo na različne dimenzije uporabe kot zunanji dejavniki, ki niso zajeti v okviru intencionalnosti. Kakovost informacij in sistema kot tudi drugi infrastrukturni dejavniki, ki so del predhodnih dejavnikov, bi lahko tudi neposredno vplivali na samo uporabo, kar je bilo tudi izpostavljeno z ugotovitvami iz študij primerov.

Predstavljen okvir sprejemanja in uporabe torej ponuja tudi veliko možnosti za nadaljnje raziskave, na primer načina neposrednega vpliva predhodnih dejavnikov na različne dimenzije uporabe BIS in kako se različna prepričanja in zaznave spreminjajo skozi čas in s pridobljenimi izkušnjami. Prihodnje raziskave bi lahko vključile različne moderatorje in testirale razlike skupin, na primer iskanje razlik v različnih dejavnostih, vpliv konkurenčnosti okolja ali katerih koli demografskih značilnosti posameznika (npr. starost, spol, izobrazba). Raziskava bi lahko bila opravljena še v drugih državah.

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