Business Intelligence Success Factors

A Literature Review

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BUSINESS INTELLIGENCE SUCCESS FACTORS: A LITERATURE REVIEW

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ABSTRACT

Business intelligence (BI) is a strategically important practice in many organizations. Several studies have investigated the factors that contribute to BI success; however, an overview of the critical success factors (CSFs) involved is lacking in the extant literature. We have integrated the findings of 43 studies after conducting a building block search strategy, reference and citation search, and critical assessment of the identified papers. A framework of information system success was used to identify the CSFs and analyze how researchers identify information system success. We discovered 34 CSFs related to BI success. The distinct CSFs identified in the extant literature relate to project management skills (13 papers), management support (20 papers), and user involvement (11 papers). In the articles with operationalized BI success, we found several distinct factors: system quality (32 papers), net benefits (20 papers), information quality (19 papers), use (14 papers), and user satisfaction (9 papers). We extend the framework of information system success with four additional factors: vision and strategy, organizational structure, competency development, and organizational culture. In addition, we contribute to the extant research by extending the framework of information system success and identifying gaps in the extant literature. Furthermore, we contribute to practical implementation through an enhanced understanding of the CSFs related to BI success.

Keywords: Business intelligence system, critical success factor, BI success, information system success.

INTRODUCTION

Business intelligence (BI) is an umbrella term for the technologies, applications, and processes associated with collecting, storing, using, disclosing and analyzing data to facilitate decision making [82]. Chief information officers (CIOs) rank BI first when asked to prioritize technology investments [21], which indicates BI's strategic importance. In today's highly competitive world, BI quality and accuracy are critical factors in the generation of profits and losses [22]. Moreover, public organizations are increasingly interested in implementing BI [75]. According to Hartley and Seymour [27], BI plays a vital role in addressing service delivery needs in the public sector.

Several researchers have emphasized the benefits of using BI. Organizations can improve their business practices and thus their performance, by making decisions based on business analytics [6, 58]. The ultimate aim of BI is building shareholder value [11]. However, the success of BI varies across industries and organizations. BI implementations are complex, and this high complexity

carries a cost [78]. The cost of BI technologies is high because implementation requires software, infrastructure, licenses, training and wages [73]. Moreover, a significant number of organizations fail to realize the expected benefits of BI [8, 11, 29, 51, 62, 77].

Between 2008 and 2017, numerous studies addressed the critical success factors (CSFs) for BI [2, 11, 22, 25, 29, 48, 49, 51, 52, 78]. There are various definitions of CSFs. The concept was initially introduced by Daniel [10] and further developed by Rochart [63] and others. One of the most commonly used definitions refers to CSFs as: 'the limited number of areas in which results if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where "things must go right" for the business to flourish' [63]. Although many organizations view BI as a purely technological investment, several internal and external factors affect its business value [51]. CSFs are used to identify and prioritize both business needs and technical systems [15].

Several studies have investigated the CSFs regarding the challenges that ensure BI success. Although numerous studies have been published on this subject, the existing literature reviews either build upon industry presentations [29] or analyze research papers published before the time window investigated in the current review [42]. This article aims to synthesize the extant research by examining recent knowledge on CSFs for BI. We find, classify and analyze papers using Petter, DeLone and McLean's [56] theoretical framework for information system (IS) success. Throughout our analysis, we identify distinct CSFs and point to the areas of BI that require further research. This study is an extension of our paper accepted for the ECIS 2017 conference [18].

In the next section, we present the theoretical framework developed by Petter et al. [56]. In the third section, we describe the methods we used to search, select and analyze the literature in our review. The fourth section is divided into two parts: a classification of the papers included in the review and a CSF analysis. In the fifth section, we discuss our results. The final section presents our conclusions, outlines the study's limitations and raises further research scenarios.

THEORETICAL FRAMEWORK

The search for dependent variables in IS

At the first International Conference on Information Systems in 1980, Peter Keen posed six questions. One of these questions was, 'What is the dependent variable?' [32]. To address this question, DeLone and McLean [12] proposed a model based on Shannon and Weaver's [67] three levels of communication and Mason's [45] information influence theory. DeLone and McLean's [12] IS Success Model (D&M IS Success Model) has its roots in communication theory. Therefore, the model is both integrated and comprehensive.

IS success is based on several interrelated factors. The D&M IS Success Model initially comprised six dimensions: system quality, information quality, use, user satisfaction, individual impact and organizational impact. All of these dimensions are treated as dependent variables. An IS is characterized by system quality and information quality. Users operate the system with different levels of satisfaction and various types of individual impact that engender effects at the organizational level. In the original theory, system quality is classified as occurring at the technical level, whereas information quality is a semantic concept. The remaining categories assess the effectiveness of a system [12, 13].

Several scholars have suggested improvements to the D&M IS Success Model, primarily aiming to resolve confusion with respect to dependent and independent variables. For example, clarification was necessary for certain factors, i.e., user involvement and management support. While these variables are correlated with success, they are not elements of success itself [13]. In 2003, DeLone and McLean [13] revised their work and presented an updated model. The revised model includes service quality and combines individual and organizational impact to form a net benefit construct. This net benefit construct also extends to other types of effects. Moreover, in the updated model, the construct 'use' is divided into 'use' and 'intention to use'.

The search for independent variables in IS

DeLone and McLean did not pinpoint the related factors included in the updated D&M IS Success Model until 2013 [56]. To categorize the independent variables in their updated version of the model, they used Leavitt's [41] Diamond of Organizational Change, which includes Leavitt's four independent constructs: tasks, people, structure, and technology. In the model, tasks and people are individual constructs, structure represents an organization, and technology denotes a system. The model explains sociotechnical IS and the interrelationships between IS and other aspects of the environment [5]. In the first version of the 'IS Success Model', the technology dimension representing IS success is the dependent variable. In this context, IS success is equivalent to BI

success. As discussed in the previous section, the independent variables are causes of but not elements of IS success. As illustrated in Table 1 below, the antecedent categories are sub-categorizations of each construct. We apply this framework for the analysis below as it entails a single, original model. Moreover, the high number of modified models within the technology acceptance approach makes it suitable for mapping review papers.

Table 1: Mapping between Leavitt's Diamond constructs and antecedent categories [56]

Leavitt's constructs [41]	Antecedent categories [56]	Related variables (CSFs) [56]
Task	Task characteristics	Task compatibility, task difficulty, task independence, task significance, task variability, task specificity
People	User characteristics	Attitudes toward technology, attitudes toward change, enjoyment, trust, computer anxiety, self-efficacy, user expectations, technology experience, organizational role, education, age, gender, organizational tenure
	Social characteristics	Subjective norms, image, visibility, peer support
Structure	Project characteristics	User involvement, relationships with developers, third-party interactions, developer skill, development approach, IT planning, project management skills, domain expert knowledge, type of IS, time since implementation, voluntariness
	Organizational characteristics	Management support, extrinsic motivation, management processes, organizational competence, IT infrastructure, IT investments, external environment, IS governance, organizational size
Technology	IS success	System quality, information quality, service quality, intention to use, use, user satisfaction, individual impact, organisational impact

METHOD

We identified the BI success factors covered in the literature by conducting a systematic literature review. In this section, we first outline our search criteria. We then explain our method of classifying papers and describe our content analysis and mapping procedure.

Identification of relevant papers

We conducted a structured search for research papers to be included in the present literature review. The search included databases, reference lists and citations [54]. A proper search process requires a combination of systematization and creativity [80]. For the paper search, we used the Web of Science (ISI), Scopus (Elsevier), the ACM Digital Library, EBSCOhost and ABI/INFORM Complete (ProQuest) due to their academic content, advanced search interfaces and relevant subject coverage.

To focus the review, only peer-reviewed papers published in English between 2008 and 2017 are included. This 10-year time window was chosen to ensure the recency of the reviewed papers. A building block search strategy was applied [44], consisting of two facets: one for the CSFs and one for the technology. The CSF facet was based on the following search terms: 'success factor,' 'success factors,' 'IS success,' 'information system success' and 'information systems success.' The technology facet included the following search terms: 'data warehouse,' 'data warehouses' and 'business intelligence.' The technology search terms were adapted from Gaardboe, Svarre, and Kanstrup [19]. According to Wixom and Watson [75], data warehouses are elements of BI. This explains the inclusion of 'data warehouse' and 'data warehouses' as synonyms in the technology facet. Overall, the queries considered the following search facets and filters: subject ('CSF' AND 'technology'), language, document type and publication year.

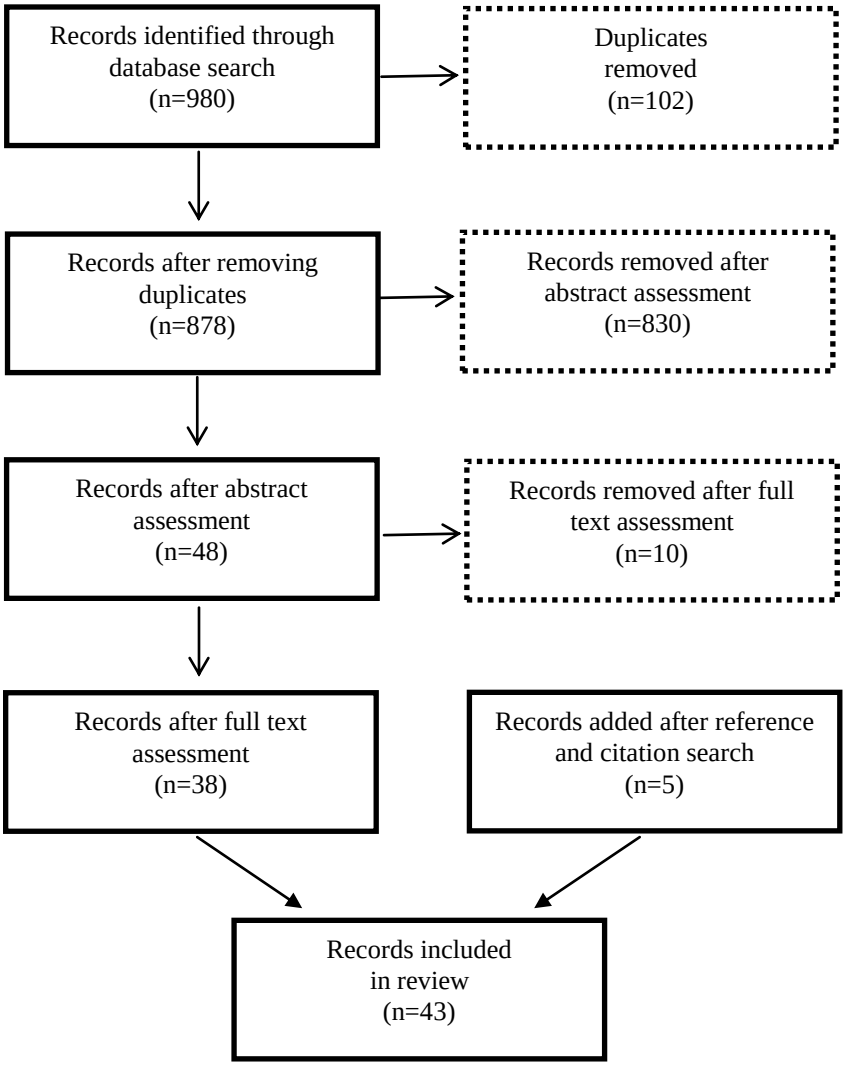

Figure 1: Flow diagram of the identification of relevant papers

Querying the selected databases resulted in 980 records, and 102 duplicates were removed. If researchers published findings from the same study in greater than one publication, the most extensive paper was chosen. After reading the abstracts, 830 papers unrelatd to BI Success and CSFs were eliminated. After reading the full text of the remaining 48 papers, 10 papers were excluded based on the following exclusion criteria: they are not based on empirical evidence, disseminate ongoing research, or are not published in peer-reviewed publications. In addition, the 48 papers underwent a quality assessment, i.e., 'the process of assessing and interpreting evidence by systematically considering its validity, results and relevance' [55]. We used the BestBET Survey Worksheet [83] and BestBET Qualitative Worksheet [84] to assess the quantitative and qualitative studies, respectively. Each author reviewed the 48 papers according to the selected guidelines and discussed them. Based on this review, both authors independently agreed that 10 papers did not meet the criteria; thus, they were excluded from the present study.

Next, the 1,941 references in the 38 remaining papers, including duplicates, were examined to identify papers that were missing from the searched databases. Furthermore, to ensure the inclusion of the most recently published papers, a citation search of the 43 papers was

also performed in the Web of Science (113 citations), Scopus (279 citations), and Google Scholar (1048 citations).This resulted in a total of 445 citations and duplicates. All the additional papers uncovered in this step were reviewed. If a paper fit the selection criteria, it was included in the literature pool. In this manner, 5 papers were added to the literature review. Ultimately, 43 papers are included in the review. The entire selection process is depicted in Figure 1.

Classification of papers

Nvivo was used for the analysis and coding of the papers. The papers were mapped according to the methods applied, focal areas, types of respondents, and type and year of publication. The method classification follows the framework developed by Schlichter and Kræmmergaard [65] in their review of research in enterprise resource planning and includes case studies, archival studies, theoretical studies, surveys, experiments, descriptive studies and design science studies, as well as various combinations of methods. To map the types of respondents in the studies, all the types explicitly expressed in the articles were categorized and subsequently classified into the categories listed in Table 2.

We used content analysis to map the CSFs [38] and perform two stages of analysis. This procedure allowed us to identify the manifest variables (for which authors had concluded that CSFs existed). In the first iteration, the CSFs were mapped using Petter et al.'s [56] theoretical framework. In the second round, relationships among the CSFs were identified. For the quantitative studies, only CSFs that were significant at 0.05 were included. In the cases where studies investigated CSFs for several respondent groups, significant CSFs were included, regardless of their group membership. For the qualitative studies, CSFs were included if they were reported by the authors as findings in the analysis or conclusion sections. Two raters participated at every iteration to ensure the interrater reliability of the categorizations. The iterations identified distinct CSFs, defined as factors occurring in greater than 20% of the selected papers (i.e., at least nine papers).

FINDINGS

This section is divided into two sections. First, we present the general characteristics of the selected papers. Second, we present the CSFs for BI categorized according to Petter et al.'s [56] framework. We review the task characteristics first, followed by the structure, user and technology constructs. Finally, we summarize the CSFs, suggest additions and modifications to the framework and highlight gaps in the literature.

General characteristics of the review papers

We analyzed 43 papers for the present review based on the criteria presented in section 2.2. The papers represent almost the entirety of the selected time period, although the number of papers varies from year to year. Just under half of the papers were published in the period from 2016 to 2017. There are a greater number of journal papers (30) than conference papers (13). The majority of the papers are based on survey research (30), but several papers focus on case studies, combined methods, and descriptive studies. The most common target groups for investigation are employees (33) and managers (29), although some papers focus on consultants (6) and vendors (4). In the early years of critical success factor research, there was a tendency to include consultants and suppliers in studies. But as the research area matured, employees and managers were included in the studies. An overview of bibliometric characteristics is given in Table 2.

Table 2: Bibliometric distribution of review papers

Publication year	2008 (2), 2010 (1), 2011 (5), 2012 (7), 2013 (4), 2014 (3), 2015 (8), 2016 (7), 2017 (6)
Publication channel	Conference papers (13), journal papers (30)
Applied research method	Descriptive (2), theoretical (1), combined (3), case study (7), survey (30)
Target group	Consultants (6), employees (33), managers (29), vendors (4)

Identified critical success factors

In this section, our findings are presented regarding the four constructs identified in Petter et al.'s [56] framework: tasks, people, structure, and technology. More precisely, we present the distinct CSFs identified in the extant research and highlight the areas in which further research is required. Additionally, we discuss possible modifications to the framework and determine novel CSFs within the framework that are not covered in the existing BI literature. The findings of the task characteristics are presented below.

The task construct

Tasks can be understood as activities supporting an organization that are introduced to increase the completion of assignments [41]. BI is used to automate or inform such tasks [81]. In this regard, BI relates to a system's ability to provide better information.

Table 3: Identified CSFs for the task construct (number of papers in parentheses)

Variable (CSF)	Papers
Task compatibility (5)	[2, 16, 35, 52, 60]

Our analysis reveals that task compatibility is a CSF for BI [2, 16, 35, 52, 60]. This supports the relevance of task-technology fit (TTF), which suggests that efficiency is high when a technology is compatible with a user's tasks [23]. Grublješič and Jaklič [25] include TTF in their research, but dismiss it as a distinct factor related to BI success. The other task characteristics, i.e., task difficulty, task independence, task significance, task variability, and task specificity, are not addressed in the extant literature on BI critical success factors.

The people construct

BI can be a resource for any organization, but users and information use can affect the success of IS. The people construct encompasses two categories: user characteristics and social characteristics. User characteristics are the most frequently studied category. The most distinct variable in this regard is users' technology experience. As Grublješič and Jaklič [25] note, achieving success with even the best BI system is difficult if employees are unskilled with the technology. Thus, users' technology experience is an important factor because it can alter perceptions of usefulness and ease of use [25]. Kfouri and Skyrius [33] address technology experience and skills as key factors of BI. User expectations represent a distinct variable that is narrowly related to users' technology experience. It is difficult to conform a BI system to user expectations if there is no knowledge of these expectations [52]. If users have unrealistic or implausible expectations of a BI system, or if the implementation of a BI system fails, they will resist using it [60].

Regarding social characteristics, two papers include subjective norms in their studies. The level of perceived social pressure related to IS use was found to affect its use if users perceived the data quality to be high [36, 37].

Table 4: Identified CSFs for the people construct (number of papers in parentheses)

Variable (CSF)	Papers
Technology experience (5)	[11, 25, 33, 49, 51]
Attitude toward change (2)	[25, 60]
Trust (1)	[4]
User expectations (1)	[52]
Subjective norms (2)	[36, 37]
Image (1)	[25]
Peer support (1)	[4]
Visibility (1)	[25]

The structure construct

The structure category is composed of two antecedent classifications: project and organizational types. In total, 32 papers include this characteristic in their study. Organizational characteristics are elements of the structural elements of an organization [41] that directly and indirectly affect the technology employed [5].

Table 5: Identified CSFs for the structure construct (number of papers in parentheses). A * indicates a new variable added to the framework.

Variable (CSF)	Papers
Management support (20)	[2, 3, 11, 20, 24, 25, 28, 29, 30, 34, 36, 40, 49, 51, 52, 57, 58, 59, 69, 78]
Vision and strategy* (8)	[1, 4, 28, 34, 39, 60, 69, 79]
External environment (7)	[2, 11, 22, 25, 29, 40, 49]
Management processes (8)	[3. 11, 22, 25, 28, 29, 33, 51]
IT infrastructure (5)	[2, 25, 29, 51, 76]
IS governance (6)	[2, 22, 33, 60, 64, 76]
Organizational structure* (3)	[3, 28, 78]
Organizational competence (3)	[37, 40, 74]
Organizational size (1)	[30, 78]
Organizational culture* (4)	[3, 20, 33, 59]
Project management (13)	[1, 2, 11, 22, 25, 29, 49, 51, 52, 60, 74, 76, 78]
User involvement (11)	[4, 11, 14, 25, 28, 29, 39, 49, 51, 52, 60]
Competency development* (6)	[22, 25, 30, 36, 60, 76]
Third-party interactions (6)	[28, 29, 30, 49, 52, 60]
Developer skills (6)	[34, 39, 51, 57, 60, 79]
Development approach (4)	[2, 29, 49, 60]
Expert domain knowledge (1)	[14]
Voluntariness (1)	[25]

Management support is the most studied CSF in this stream of literature. This variable reflects the degree to which management supports IS as a champion, sponsor or promoter, as well as management's willingness to allocate resources for IS use [56]. Olszak and Ziemba [52] discuss the importance of anchoring BI in top management to ensure the allocation of necessary resources. Similarly, Olbrich, Pöppelbuß, and Niehaves [51] note that strong management support is the most critical factor in BI success and that it is practicable. However, management support can vary widely over time. Furthermore, top management can transform BI into organizational strategies [52].

Petter et al.'s [56] theoretical framework excludes strategy and vision as variables. However, our content analysis found that seven papers identify strategy or vision as a CSF. Many of the variables in the 'organizational' antecedent category are consistent with the variables typically found in contingency theory, which often references strategy and vision [53, 61]. Organizations that achieve BI success have a well-defined BI vision and strategy [1]. A clear strategy ensures the alignment of business and technology [60]. If a BI system meets operational requirements, then it will be used and have an impact. In relation to vision and strategy, it is also essential to address the issue of IS governance, which may be critical of absent guidelines for BI [33].

'Management processes' refers to strategy implementation, which can be defined as the politics and procedure management processes (e.g., culture, change processes, bureaucracy) used in an organization to support BI users [56]. Organizational culture, which is preferably used as an independent variable, includes analytical culture. Hence, an organizational culture in which decisions are based on analysis is a distinct factor in BI success [1, 11, 25, 29].

Regarding independent variables, the extant research focuses primarily on the internal factors of organizations. However, similar to research showing that investments in BI can lead to higher competitiveness, several studies view the external environment as a distinct independent variable and focus on market dynamics [2, 22] and competitors [11, 29]. Lautenbach et al. [40] argue that BI is no longer a 'nice-to-have' but rather a 'need-to-have' technology due an increasingly globally competitive market. However, since two studies found that they were not distinct variables [25, 51], we cannot conclude that they are unrelated.

Project management determinants relate to processes established to identify, develop and implement BI [56]. Therefore, this category includes ongoing opera-

tions and maintenance. The project management variable is added as a distinct factor in 13 studies. Project management is more operational than management support and includes coordinating, scheduling, scope and monitoring activities, as well as resources related to project objectives [76]. Project management is essential because many projects fail to adequately account for the organizational elements, resources, time, and funding needed to support a project and ensure BI success [52, 76]. Furthermore, project management helps ensure user involvement in the process [52].

Of the papers in this category, 11 conclude that user involvement is a distinct factor in BI success. The primary purpose of involving the user is to ensure alignment between business processes and BI development [49].

Developer skills and competency development are closely related variables. Five papers focus on technical capabilities, i.e., the use of in-house knowledge for the implementation and maintenance of BI systems [51]. Kulkarni and Robles-Flores [39] point out that BI capabilities are developed and improved through user involvement and use. Five papers emphasize training and competency development. Training serves two purposes: first, it strengthens a manager's belief in the system, creating and maintaining management support [60]; second, it helps users become familiar with the system, thus increasing system use [25].

The technology (BI) construct

Certain articles operationalize BI success regarding updated D&M IS Success Model variables, while others use BI success categories. Thirty-two articles focus on system quality as a CSF. Applying DeLone and McLean's [12] definitions of data quality, infrastructure, and usability, Grublješič and Jaklič [25] conclude that, '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' [25]. Yeoh and Koronios [78] emphasize that a BI system's technical framework should be scalable with respect to additional data sources, attributes, and dimensions. In addition, a BI system should accommodate data from both industry and the public sector. The aim is to create a long-term solution capable of meeting the changing needs of an organization.

Table 6: Identified CSFs for the technology construct.
A * indicates a variable added to the framework

Variable (CSF)	Papers
System quality (32)	[1, 2, 4, 11, 14, 16, 17, 22, 25, 26, 28, 29, 31, 35–37, 39, 49–52, 57, 58, 60, 66, 68–70, 74, 76, 78, 79]
Information quality (19)	[1, 4, 9, 14, 17, 22, 25, 26, 29, 36, 43, 46, 52, 58, 68–70, 72, 78]
Net benefits* (20)	[9, 11, 14, 17, 22, 25, 29-31, 33, 37, 39, 46, 50, 59, 69, 70, 74, 76, 79]
Use (14)	[4, 14, 17, 22, 33, 36, 40, 46, 50, 58, 69, 70, 74, 78]
Service quality (8)	[4, 29, 46, 49, 50, 52, 60, 68]
User satisfaction (9)	[17, 22, 26, 39, 46, 47, 70, 72, 74]
Intention to use (2)	[36, 50]

Olszak and Ziemba [52] find that 'integration between BI system and other systems,' 'data quality' and 'BI flexibility' have the highest impact on small- and medium-sized companies. These factors relate to BI's objective of consolidating data from multiple sources and providing information to support decision-making [75]. Grublješič and Jaklič [25] emphasize that proper infrastructure is a prerequisite for efficient BI functioning. A lack of integration produces poor data quality, inconsistent data definitions and formats, incoherent business information and limited access to information due to a variety of user interface design issues. It also prevents procedural business improvements and effective decision making [29]. Moreover, complex source infrastructure in a system with limited technical compatibility can involve high costs, and out-of-date legacy systems are often difficult to connect to innovative BI systems [51]. Data quality issues relating to source systems are a variable in the CSF infrastructure [29]. According to Hawking and Sellitto [29], there may be a relationship between infrastructure and data quality, and BI systems that suffer from problems with data quality have limited credibility. Arnott [2] suggests that sound data quality can be ensured through efficient data management and access to data sources. Extract, transform and load (ETL) processes ensure cur-

rency, consistency, and accuracy. Furthermore, the data model employed must be flexible and expandable.

Similar to system quality, information quality is also a widely applied construct. Gonzales, Wareham and Serida [22] focus on information quality and suggest that information should be up-to-date. Grublješič and Jaklič [25] define information quality in line with DeLone and McLean [12]. Although they exclude up-to-date information as a separate factor, they include it in 'information quality.' Their article also refers to output quality, which they define as 'the degree to which an individual believes that the system performs his or her job tasks well' [71]. Grublješič and Jaklič [25] conclude that two essential factors contribute to information quality: output quality and the relevance of the available information. If a company's business processes are unstructured, these two factors can present a challenge.

Use is a relatively popular construct; however, it is only explored in approximately one third of the articles. Although DeLone and McLean added the construct 'intention to use' to their revised model [13], only 2 articles use this construct.

In Petter et al.'s [56] framework, IS impact is partitioned into individual and organizational impact. DeLone and McLean [13] combine these two variables into net benefits, which can be positively or negatively influenced by BI. Greater than half of the reviewed articles discuss net benefits. Grublješič and Jaklič [25] discuss both financial and non-financial net benefits, while the remaining authors address one or the other. Notably, non-financial BI indicators are related to tasks and how they support process automation, with only one indicator focusing on knowledge. Moreover, non-financial net benefits are not specified as success criteria. The researchers conclude that they represent a CSF but do not explain how it should be measured. Several papers operationalize non-BI success, while others use logic to demonstrate that use leads to individual impact and, in turn, organizational impact. A final set of articles uses only a single success factor (e.g., use or net benefit).

Summary of CSFs

In the previous section, we focused on the CSFs identified in the literature. The table below presents an overview of these CSFs. Distinct CSFs are factors that we identified in at least nine papers, while non-distinct CSFs are factors that we identified in fewer than nine papers. The third group of CSFs consists of factors that add to Petter et al.'s [56] framework. The last column shows the CSFs in Peter et al.'s [56] framework that are not investigated in the 43 selected papers.

DISCUSSION

This study aims to identify critical success factors for BI success. Upon reviewing the literature, no precise measure of BI success was identified within the technology category, which is consistent with DeLone and McLean's findings (28). Certain papers refer to BI success measures based on quality, user satisfaction, use, and/or net benefit. Others refer to BI success as an antecedent category. Furthermore, there is no consensus on whether BI success should be measured at the individual or organizational level. Several factors have been consistently found to enhance BI success, i.e., user involvement, management support, and project management. Other types of success factors have been less frequently studied, and these represent gaps in our knowledge. There is a lack of research on several factors within the task category in particular.

In this literature review, the individual level of analysis is represented by two categories; people and task. We identified CSFs in both categories; however, none of them were distinct. Very little was found in the literature with respect to CSFs in the task category. Within the task category, only task compatibility was studied and identified as a CSF. This finding contradicts Petter et al.'s [56] general study of IS success wherein they identify all the CSFs in the four constructs. One explanation for this discrepancy could be that Petter et al. examined 140 studies involving different technologies over a 15-year period. There is insufficient research on the factor of task significance for drawing any firm conclusions about it as a clear CSF. However, the importance of a task most likely influences IS success, notably because the argument for investing in IS technology is that business analytics can improve business and decision processes and thus enhance business performance [21, 22]. Chen et al. [7] argue that BI supplements the existing IT portfolio of an organization. Therefore, a particularly interesting study area concerns differentiating between tasks that are best resolved with BI versus those that require a different type of IS. Although several studies include the user as a factor, few examine the user as an independent variable. Rather, the user is included as a control variable in the majority of cases [56]. User differences can affect IS success [32], yet no articles in the study investigate whether CSF is dependent on different user types. Alternatively, CSFs can be considered generic across several types of users and various types of organizations.

Table 7: CSFs. Parentheses show the number of papers addressing each specific CSF

Leavitt's constructs [41]	Distinct CSFs in BI	Non-distinct CSFs in BI	BI CSFs adding to Petter et al.'s framework [56]	CSFs not covered in BI
Task		Task compatibility (5)		Task difficulty, task independence, task significance, task variability, task specificity
People		Technology experience (5), subjective norms (2), attitudes toward change (2), image (1), peer support (1), visibility (1), trust (1), user expectations (1)		Attitudes toward technology, enjoyment, computer anxiety, self-efficacy, organizational role, education, age, gender, organizational tenure
Structure	Project management skills (13), management support (20), user involvement (11)	IT infrastructure (5), third-party interaction (6), IS governance (6), developer skill (6), development approach (4), organizational competence (3), organizational size (2), organizational culture(4), expert domain knowledge (1), voluntariness (1), management processes (8), external environment (7)	Vision and strategy (8), development of competences (7), organizational structure (3), organizational culture(4)	Relationships with developers, IT planning, type of IS, time since implantation, extrinsic motivation, IT investment
Technology	System quality (32), net benefit (20), information quality (19), use (14), service quality (8), user satisfaction (9)	Intention to use (2)		

The newly identified distinct CSFs belong to the structure and technology constructs. With respect to the structure category, it is interesting that management support plays a significant role in BI success. Management support is the most frequently studied determinant and a significant predictor of IS success. This is because management is responsible for allocating resources, designating time and encouraging employees to use IS [56]. Project management skills and user involvement are also distinct factors related to success. This corroborates Petter et al.'s [56] findings on IS in general. Since a combination of project management skills and user involvement creates user satisfaction, user satisfaction is one measure of success.

We initially drew attention to the fact that the present article is an extension of the literature review presented at ECIS 2017 by Gaardboe and Svarre [18]. Since then, new articles have been included in the study, primarily from 2016 and 2017. Therefore, our 20% requirement for distinct CSFs was increased from 6 to 9 articles. Therefore, the following CSFs are no longer considered to be distinct: external environment, management process, and service quality. These CSFs remain relevant; it merely signifies that the research found on them is outdated, whereas the criterion is that they have been included and found to be significant.

Over the past 10 years, several studies have investigated the factors that lead to BI success. However, many unanswered questions remain. Researchers have primarily focused on the relationship between CSFs in the structure and technology categories, but additional research is needed to explore the task and people categories and their relationship to BI success. The studies included here examine the relationships between independent and

dependent variables. Further research would support an understanding of the interactions between the many critical and control factors that determine the effectiveness of specific system designs. An understanding of the interrelationships among multiple independent variables may lead to a better framework for the analysis of CSF determinants. The sociotechnical perspective is another area for augmenting the constructs mentioned by Petter et al. [56]. Regarding IS success, we add four new CSFs to Petter et al.'s [56] framework: strategy and vision, development of competencies, organizational culture and organizational structure. Additional studies are required to develop a full picture of these CSFs.

CONCLUSION

In this literature review, we have confirmed and identified the independent variables that affect BI success. In other words, we have explored the determinants related to actual BI measurements. By integrating 43 BI success studies conducted between 2008 and 2017, we have identified 34 variables as determinants of BI success. We have expanded the original 43 variables in Petter et al.'s [56] framework to 47 variables, necessitating the creation of four new CSF's: Vision and strategy, development of competences, organizational structure, and organizational culture. Of the 47 variables indicated in the framework, 34 were studied and compared to BI success. The most frequently used construct was technology, followed by the structure, people, and task constructs. Moreover, we identified several CSFs requiring further research. In addition, we discussed the factors and their roles as dependent or independent variables. An investigation of the interactions among variables would be fruitful for increasing our knowledge of the factors that affect BI success to support organizations in achieving success and reaching their goals through BI.

This literature review incorporated a wide selection of previous research on business intelligence and success. Our study focuses on the term 'business intelligence' without synonyms. Therefore, we may have missed some relevant papers. This same limitation applies to the keywords we used to signify IS success. Moreover, since we considered both qualitative and quantitative studies, we are unable to comment in depth regarding cause and effect. The purpose of this study was not to test cause and effect, but rather to identify the CSFs related to BI success.

This literature review not only contributes to the academic literature but also benefits organizations interested in implementing or maintaining BI. Organizations require an improved understanding of BI CSFs to prioritize their use of limited resources and achieve greater value. The present study also uncovered additional CSFs and describes various indicators to measure them.

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