THE CURRENT STATUS OF BUSINESS INTELLIGENCE: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Business intelligence has gained much attention the last few years and corporations has invested a lot of money in its operation to better prepare for the future. Studies show improvements in organizations performance both when it comes to better insight but also better decision making. Business intelligence software has made it possible for easier transformation of data. This article presents a systematic literature review on business intelligence and address the challenges and benefits of BI, along with its critical success factors.

Keywords: Business intelligence, BI success factors, Critical success factors, CSFs, Delphi method, BI implementation.

INTRODUCTION

Traditionally, business intelligence has been used as an umbrella term that refers to the tools, applications and best practices to improve business decision making (Panian, 2012). According to Chaudhuri et al. (2011), "*Today, it is difficult to find a successful enterprise that has not leveraged BI technology for their business*". Business intelligence has played a major role in businesses in the last few years (Riabacke, Larsson, & Danielson, 2014). Applications of business intelligence have remarkably addressed the challenges of complex business decisions, some authors defined BI, as a process, a product, and as a set of technologies, or a combination of these, which involves data, information, knowledge, decision making and technologies that support them (Shollo & Kautz, 2010). Common functions of business intelligence technologies are reporting, online analytical processing, analytics, data mining, process mining, complex event processing, business performance management, benchmarking, text mining, predictive analytics and prescriptive analytics (Arora & Chakrabarti, 2013; Farooq, 2013). According to Gurda et al. (2016), strategic Bl is a key source for a successful business, that requires an awareness of the surrounding environment of the organizations both internal and external. García et al. (2017) states that "*it is required to know what the strategy of the business is, weaknesses and strengths to know where it is oriented*". However, strategic intelligence suggests, the creation

and transformation of information can be used in high-level decision-making and without this information, it is difficult for employees to make the correct decisions to achieve and maintain market leadership (Pellissier & Kruger, 2011).

RESEARCH METHODOLOGY

This research entails of a systematic literature review (SLR), where the recommendations by Kowalczyk (2017) is followed in order to characterize the scope the literature review. The focus of the research is mainly on the research outcomes and methods of the analyzed publications.

The study begins with collecting information from publications, journals and reports. The results are organized conceptually according to the different stages of business intelligence. Through summarizing and creating findings, we aim at an unbiassed perspective for representing the findings. This research concentrates specifically on its critical success factors for the implementation of BI and information from several articles that we believe are relevant to this area. BI systems are used almost in all the sectors of the industry for different purposes like reporting, analysis and decision making. We tried to achieve complete reporting of the literature with respect to our research goal by performing searches in five scientific databases, but at the same time we were limited to the sources available in the chosen databases. The results might also be interesting for practitioners who want to gain insight into the effectiveness of such technologies.

Search Terms

At the beginning of a literature review it is recommended to start with a definition of key terms in order to originate meaningful search terms (Kowalczyk, 2017). We investigated existing reviews on business intelligence and critical success factors. We discussed those topics in order to extract the relevant terms and their relationships. Using those terms, we searched through a set of databases with different combinations of search queries in order to verify their usefulness and to improve the search queries iteratively. Thus, we enhanced the queries by adding synonyms, abbreviations and symbols, which account for different spellings. We created the final search query, which addresses the two main topics by combining search terms through logical operators. The final search query is presented below

business intelligence systems OR BI: critical success factor
OR success OR implementation OR benefits
OR challenges OR SMEs OR platforms OR CSFs

Inclusion and Exclusion Criteria

In order to guide our evaluation procedures during the literature search process, we derived at a set of explicit inclusion and exclusion criteria in accordance with

our research goal. Those criteria provide additional view, not only on the search procedure but also on the follow up literature evaluation procedures (i.e. title, abstract and full text study). Publications were eligible for inclusion if they provided practical results related to our research goal and we included suitable qualitative and quantitative research studies. We based our study using the review of Yeoh and Koronios (2010) as it provides an overview on critical success factors. Thus, we focused on research performed after 2009 and furthermore publications had to be peer-reviewed, written in English and available in full text. Due to the diversity of BI research topics we also defined several explicit exclusion criteria. Additionally, publications that focused on the effects of user characteristics like satisfaction and learning techniques were not in our scope. Finally, we excluded publications that could not be determined (technical report, conference, journal, keynote).

Data Sources and Search Process

For finding relevant data sources we queried scientific databases, which contained journals and publications from relevant conferences. We decided to query the scientific databases by title and without further restricting the searches to specific journals or conference proceedings in order to be exhaustive and address the interdisciplinary nature of the topic. We performed searches in the following databases: Elsevier (ScienceDirect), Wiley Online Library, ACM digital library, IEEE Digital Library and Google Scholar.

Figure 1 gives an overview of our literature search process. Having the initial set of publications, we read through titles and abstracts of those publications and excluded those that did not match our defined inclusion and exclusion criteria. These publications were entered into a Zotero database for better handling and documentation of the process phases. In uncertain cases we kept the publications for subsequent full text analysis. This resulted in a set of 210 publications for which we intensively investigated the full text and again applied our inclusion and exclusion criteria as part of the evaluation. Additionally, we excluded similar publications by the same author groups and in such cases, we kept results from the highest quality source or if those were similar, we kept the newest one.

FIGURE 1
Search Process

As recommended by (Kowalczyk, 2017), we additionally conducted a forward and backward search on the set of relevant publications. We searched backward by

analyzing the references of the publications. We searched forward by utilizing respective functions of Google Scholar for identifying citing publications. During forward and backward search, we followed the same procedure as before by identifying potentially relevant research through their title and abstract and further investigating them with a full text analysis. At the end we obtained a final set of 106 publications from which we extracted data for the analysis.

SYSTEMATIC LITERATURE REVIEW RESULTS

From the final set of 106 publications, data was extracted using a predefined extraction form. We recorded basic bibliographic information (date, author, source, item type). For analyzing the extracted information, we applied the research framework. In our analysis we distinguish contributions that explicitly examine different business intelligence implementation phases. In this context we used the information about the investigated BI systems types and performed tasks for identifying critical success factors. With respect to the actual effects on BI implementation phases, we analyzed the variables that were investigated within the publications and assigned the evidence on their effects to the respective categories of the research framework. Table 1 summarizes the search.

TABLE 1
Search Result

Source	Retrieved	Selected	Year
Wiley Online Library	14	3	2010-2018
IEEE Digital Library	53	20	2010-2018
ACM Digital Library	21	10	2010-2018
Elsevier (ScienceDirect)	18	5	2010-2018
Google Scholar	81	50	2010-2018
Google	23	18	2010-2018
Total	210	106	

The chart below presents the results from the literature review. In the set of 106 publications the majority has been published in proceedings (43 publications) and in journals (41 publications). Research related to the effects of business intelligence systems has been performed mainly on critical success factors CSFs are 12. Most prevalent other research methods are model, frameworks and guidelines are 63 in total, followed by surveys at 11 and case studies at 10.

Studies on Business Intelligence

Within the set of publications, we identified five survey studies that were performed in industrial contexts dealing with perceived business intelligence systems (Table 2). In these studies, the subjects were directly asked about their

level of support for the different process phases. These studies report positive effects with respect to the perceived implementation of the investigated factors.
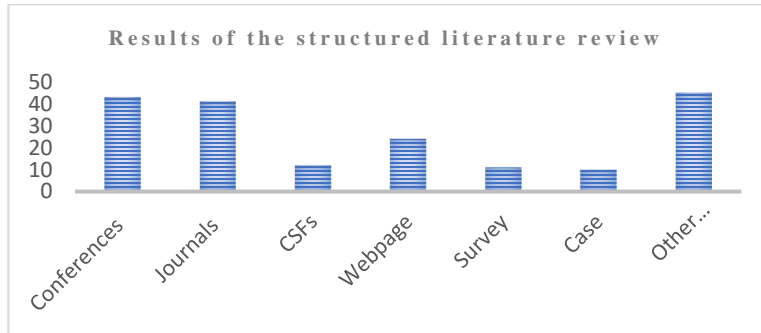
FIGURE 2
Results of SLR

TABLE 2
Overview of Survey Studies on Business Intelligence Success Factors

Nr.	Year	Research method	System type	Reference
1	2011	Survey	BI	(Adamala & Cidrin, 2011)
2	2011	Survey	ERP & BI	(Dezdar & Ainin, 2011)
3	2016	Survey	BI tools	(Gounder et al., 2016)
4	2014	Survey	BI & IS	(Riabacke et al., 2014)
5	2013	Survey	DSS	(Işık et al., 2013)

Studies in table (2 & 3) reveals that, the significance of CSFs through the business orientation approach. Notably, all five studies seemed successful and appeared to be a mixture of factors. The surveys (S3, S5) were more focused towards technology instead of organizational or process-oriented factors. The other three studies shifted their focus from the technological view and adopted an organizational approach and process approach. Although, it is important to define a CSFs in a clear manner, but it is even more critical to address the CSFs from the right approach (Yeoh & Koronios, 2010). These five successful studies clearly verified that addressing the CSFs from a business perspective was the foundation of success that were based on implementation of their BI systems. In order to better address the CSFs, it is essential for an organization to highlight the business implementation factors, and in so doing it will gain an advantage over competitors (Yeoh & Koronios, 2010).

Challenges of BI

The successful implementation of information technology (IT) innovations remains both a theoretical and a managerial challenge (El Bousty et al., 2018).

Despite the bright side of BI systems, it is also facing some challenges (El Bousty et al., 2018). The success of BI systems depends on the effective planning, implementation and adoption (Clavier, 2014). If organizations do not identify its CSFs, it can affect them in a negative way, since the firm will not be able to offer the customer what they actual value (Cöster, Engdahl, & Svensson, 2014).

TABLE 3
Implementation Success of Five Surveys

Success measure	S1	S2	S3	S4	S5
System quality				X	X
Funding /cost	X	X	X		
Training & education		X			
Communication/ tools		X			
Strategic BI capabilities				X	
Integration/tools			X		X

TABLE 4
Evaluation of CSFs in Different Organizations

CSFs	S1	S2	S3	S4	S5
Management support and sponsorship	X	X			
Clear business vision and well-established business case	X			X	
Business-driven methodology and project management	X	X			
Business-driven and iterative development approach					
Team skills and composition		X			
Sustainable data quality and integrity			X	X	X
Business-driven, scalable and flexible technical framework			X		X

These are some challenges faced by the organizations, when implementing a new business intelligence systems and they are: data quality, lack of expertise of users, limiting funding, user training and acceptance (Clavier et al., 2014; El Bousty et al., 2018; Rahman et al., 2016). Among these challenges, training and user acceptance should be given more focus by implementers (Rahman et al., 2016). Although, there are a wide range of BI solutions available, Bl organizations often lack of knowledge to select the most appropriate solution for addressing the business's needs (Raj, Wong, & Beaumont, 2016).

In Němec et al. (2011) they viewed fear and threat factors of business intelligence that are faced by organizations: low security, source code openness, low quality and lack of functions, low performance, low vendor support, low quality of documentation, acquisition risks, low community activity or size, low open-source

integration skills, IT or enterprise-wide opensource aversion, technology environment integration problems, and lack of- or low user references.
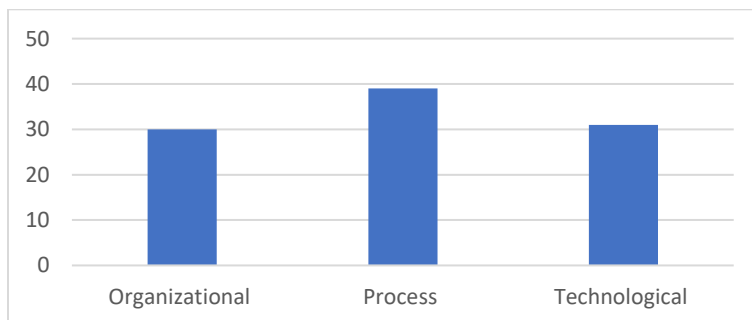
Critical Success Factors

The success of the BI initiatives undertaken by companies depends on various factors and one factor is IT resources (Adamala & Cidrin, 2011). However, Yeoh et al. (2010) discuss, how organizations implement CSFs when struggling for success in the long-term. Findings from the literature review, the authors Sangar and Iahad (2013), Yeoh and Popovič (2015) argue that CSFs are vital components for organizations to include in their business to keep growing and being successful on a competitive market. CSFs is a concept that have big influences on organization's and if they are managed correctly it can increase an organization's competitiveness with the objectives and goals (Somya, Manongga, & Pakereng, 2018). Consequently, Cöster et al. (2014) argue that when organization's CSFs are to be identified they need careful attention, as it is vital for the organizations operating activities and its future success.

The term CSFs refers to a set of factors influencing the implementation of BI systems and those few critical areas where the company has to succeed in order to achieve their goals (Hirsimäki, 2017; Olbrich, Poppelbuss, & Niehaves, 2012; Sangar & Iahad, 2013). According to Olszak (2016), CSFs are those factors that determine whether business objectives are achieved, and it gives a solid basis for the stated criteria to be followed during the implementation of the BI applications.

The literature has defined several frameworks for categorizing and recognizing CSFs. Olszak, & Ziemba (2012) suggests that, the success of BI systems implementation requires a solid methodical foundation and proven scientific theories. According to authors the Delphi method is more appropriate to identify the set of CSFs in a business intelligence study (Olszak & Ziemba, 2012; Olbrich, Poppelbuss, & Niehaves, 2012). In Figure 3 we revealed which CSFs are more involved in the business intelligence implementation phase.

FIGURE 3
Critical Success Factors

We can see above, that the process related factors are more discussed and influential than organizational and technological factors. Adamala and Cidrin (2011) reveals that management sponsorship and the presence of a clear vision for business intelligence is important when implementing business intelligence. Although, the implementation of BI systems is not a simple activity, it operates as a cycle that evolves over time (Olszak & Ziemba, 2012). A common mistake that are made while implementing BI systems are not providing satisfactory resources and funding for supporting efforts needed for a successful BI initiative (Yeoh & Popovič, 2015). Below, we briefly explain each factor for better understanding.

1. Organizational factors

***Management support and sponsorship*:** According to the Nasab et al. (2017) top management support and sponsorship is essential for the BI project to succeed. All levels of management from both technical and business side must be involved in the BI implementation (Hirsimäki, 2017). As stated firmly by Yeoh and Koronios, (2010) "*Project sponsorship has been shown to be the single most important determinant of IT project success or failure. A BI project is no different to any other IT project in this respect maintaining the commitment and support of the projects sponsor throughout the project because circumstances can change over the life of the project*".

Support from management pushed the project ahead and provide the resources including financial and human for the success of BI implementation (Nasab et al., 2017). Typically, a committee of a BI systems implementation included CIO, general managers, functional managers, IT/IS managers, and project managers (Hirsimäki, 2017). Yeoh and Popovič (2015) claimed that organizations management support was detected in the form of business executives direct involvement in the project and providing overall direction and support to the BI initiative.

Likewise, Dezdar, and Ainin (2011) affirmed that implementing BI does not only involve changes in software systems usage, it also involves in company transformation and all business practices. Therefore, top management should sincerely show their support to emphasize the implementation of BI. Also, evidence shows how top management support is essential during the entire BI implementation process and how it remained critical in order to earn the benefits. Also, without dedicated support from top management, the BI project may not receive the proper recognition.

***Clear business vision and well-established business case*:** It is known that well-established business case reveals all the benefit of the project for organization success, so it is important that, in the beginning of BI the vision of the project should be set, and each phase the project should follow a vision in order to reach

its goals (Nasab et al., 2017; Ask, 2018). Magaireah et al. (2017) state that, a clear strategic vision and plan is important for BI project and towards achieving a goal with the arrangement of objectives and needs of the organization. They also argue that having a clear vision and a well-defined plan is among the CSFs for BI implementation, would affect the adoption and outcome of the BI initiatives (Magaireah et al., 2017). Two authors explained the situation this way "*In order for the leadership to support, they must understand; when they understand and can easily explain and provide the support needed. Of course, the business case is an extremely important tool for both leadership and the implementation team*" (Yeoh & Koronios, 2010). According to Dezdar and Ainin (2011), the key aspect is, from the start of the project communication it should be consistent and continuous, the reason for implementing it, and a vision on how the business will change and how the system will support these changes.

2. Process factors

***Business-driven methodology and project management*:** Generally, any changes to the business processes must be managed, and continued support from top management is necessary. So, effective project management is important to achieve BI systems success (Mungree, Rudra, & Morien, 2013). As mentioned by Nasab et al. (2017), business managers should make an attractive environment for the project team members, beside they use the power to influence team member to work under his supervision. Although, during BI implementation, participants feel stressed especially in the requirement collection phase. Based on the research, some of the business users are reluctant to accept BI tools, so project manager tries to guide all members according to their knowledge and experience, not only technically but professionally and personally. Project managers must also be, in charge of the communication among the parties involved, both internally and externally, dealing with problems and situations derivative from the development and execution of the project (García & Pinzon, 2017).

Business-driven and iterative development approach: The BI systems should be developed iteratively with strong user involvement, evolving towards an effective application set (Mungree, Rudra, & Morien, 2013). Worthwhile, solution start with small changes and developments and then to adopt an incremental delivery. Moreover, these days modern businesses are changing very quickly, and they always try to identify the immediate impacts of those changes, so an incremental delivery approach is more thoughtful (Yeoh & Koronios, 2010).

A proper software development approach and methodology leads to the success of BI project and plays a key part to determine when, who and how it is involved in the project, such as project team member and business users. Thus, iterative and incremental method increase the speed of BI implementation project and saves time and money. Some requirements need to be added during the project as sometimes they miss due to the different reasons, the iterative and incremental

method assists the project team to work over the determined scope by adding new or ignoring unnecessary requirements (Nasab et al., 2017).

Team skills and composition: Staff in the client organization and external suppliers should have the appropriate knowledge, skills and experience (Mungree, Rudra, & Morien, 2013; Nasab et al., 2017). Not surprisingly, the composition and skills of a BI team have a major influence on the success of the systems implementation. However, BI projects are primarily different from other system implementation projects. The project team must design the architecture in such a way that can accommodate the emerging requirements, and this work require highly competent team members (Yeoh & Koronios, 2010). Both technical and non-technical skills are important in the business intelligence field and learning process generate a specialized knowledge within a BI project. According to García and Pinzon (2017) "*people's skills in all levels are very heterogeneous*" and likewise "*they will depend on the role that individuals have within the project*".

Nasab et al., (2017) indicates that, when a new BI system is deployed at an organization some employees have no flexibility in terms of customizing the solution. This because they might have no prior experience working with the solution and therefore the organization must support them with training courses or workshops. BI is a complex system thus, for to use effectively and efficiently, satisfactory training and education must be required. Dezdar and Ainin (2011) states that enough training can increase the probability of BI systems implementation success, while the lack of suitable training can hinder the implementation. In addition, training increases ease of use and reduces resistance, which increase the success of BI.

3. Technological factors

Sustainable data quality and integrity**:** Data quality and integrity are also key determinants of BI systems success. Wrong data input will affect the functionality of the whole system; so, data must be cleansed to ensure that there will be no disruption to the BI systems performance. Business data should be fully integrated, for greater business value (Sangar & Iahad, 2013; Mungree, Rudra, & Morien, 2013; Nasab et al., 2017). The Yeoh et al. (2010) exclaimed that, "*Without quality data the BI is not intelligence!*". They reveal that, many Delphi participants believed, commonly data quality scopes address the representational consistency, interpretability and ease of understanding. Quality totally depend on the accuracy of data. Poor quality data also affect the decision-making process in a negative way. It is essential to check data quality from the beginning of the project not only for the BI systems but also for the other information systems. Also, the required data for decision-making, usually come from different sources as they are connected to other organizations, therefore data integrity is a main key, which data quality analyses through the ETL (Nasab et al., 2017).

Business-driven, scalable and flexible technical framework: There should be a main organizational goal that the BI hardware and software and the system are able to adapt the emerging and ever-changing business requirements (Mungree et al., 2013; Nasab et al., 2017). Although, the initial BI solution is always time consuming but flexible and scalable infrastructure design which allows easy expansion of the system to align it with upcoming information needs (Yeoh & Koronios, 2010). Requirement changes is important for every project; therefore, the data warehouse should support the increases of data. For this reason, a BI system should be compatible with existing systems, and organizations need to select a BI tool carefully, otherwise it is a waste of resources. One point related to requirement is BI system access to data. BI tool authorizes access to users by providing relevant information according to specific user roles and responsibilities and it depends on the organization policy (Nasab et al., 2017).

BI systems are similar to other information systems in that user training and education is an important factor of a BI systems success, many projects fail in the end due to a lack of proper training for their users (Sangar & Iahad, 2013). Nasab et al. (2017) discussed, new dimension of critical success factor of BI implementation, where culture is divided it in to four sub sections: learning and development, participative decision-making, power sharing, and support and collaboration culture. In their research they found that collaboration and support within organizations helped the BI project team during the implementation, they can get any information which they need from different departments. This collaboration will not happen unless organizations have a real support and a collaboration culture. The previous study results show that there is a combination of multi-dimensional CSFs for the BI systems implementation to be successful.

More importantly, the study has pointed the research focus through the identification of a set of CSFs as presented. In addition to the encouraging trend of BI use among users, the project leaders of organizations confirmed that their implementation projects were completed on time and within budget. However, the successful case was experiencing uncontrollable external factors in its BI systems implementation. On the other hand, who had not clearly defined BI needs and requirements at the early phase of its implementation process, they faced BI failure at the end (Yeoh & Koronios, 2010). Mungree et al. (2013) proves that organizational and project related factors are more important and influential than technological factors and those organizations address these CSFs are in a better position. Summary of critical success factors those are discussed in previous studies are presented in Table 5.

Summary of BI benefits that are mentioned in previous literature.

Nowadays, many organizations are implementing BI systems but not all of them succeed to realize the real benefits of these systems (Anjariny & Zeki, 2011). An often-mentioned benefit of BI is the support of decision making (Siemen et al.,

2018). Traditionally, enterprise only use internal data for activities, these days organizations need to deal with huge amount of external data that gathered from different sources (Jesus & Bernardino, 2014).

TABLE 5
Critical Success Factors

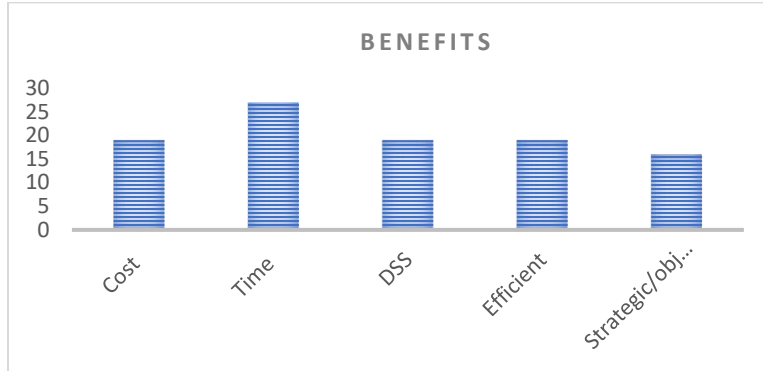| Critical success factors	Papers
Management support and sponsorship	(Adamala et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Olszak, 2016); (Olbrich et al., 2012); (Sangar et al., 2013); (Yeoh et al., 2010); (Yeoh et al., 2015)
Clear business vision and well-established case	(Adamala et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Olszak, 2016); (Sangar et al., 2013); (Yeoh et al., 2010); (Yeoh et al., 2010)
Business-driven methodology and project management	(Adamala et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Sangar et al., 2013); (Yeoh et al., 2010); (Yeoh et al., 2015)
Business-driven and iterative development approach	(Adamala, et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Sangar et al., 2013); (Yeoh et al., 2010); (Yeoh et al., 2015)
Team skills and composition	(Adamala et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Sangar et al., 2013); (Olbrich et al., 2012); (Olszak, 2016); (Yeoh et al., 2010); (Yeoh et al., 2015)
Sustainable data quality and integrity	(Adamala et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Sangar et al., 2013); (Olbrich et al., 2012); (Olszak, 2016); (Yeoh et al., 2010); (Yeoh et al., 2015)
Business-driven, scalable and flexible technical framework	(Adamala et al., 2011); (Hirsimäki, 2017); (Nasab et al., 2017); (Sangar et al., 2013); (Olszak, 2016); (Yeoh et al., 2010); (Yeoh et al., 2015)

Many authors consider that the BI systems usage is not only beneficial for business decisions but also for profit making (Jesus et al., 2014; Ratia et al., 2017; Sayedi et al., 2017). BI systems help end users to answer questions like "What has happened?", "Why has this happened?", and even "What will happen?" (Hirsimäki, 2017).

However, BI systems have many benefits, here we are mentioning some benefits and their percentage that were categorized based on a comparative study of previous works and publications. Summary of BI benefits that are mentioned in previous literature are also presented in Figure 4.

According to Yeoh and Popovič (2015) the success of BI systems lies on the quality of end user training and support. Although it is true that, a companywide business intelligence system is complex, costly and time-consuming to establish,

when implemented and used correctly, its benefits can be significant (Strain, 2018).

FIGURE 4
Benefits from Implementation of BI

Guarda et al. (2013) highlighted more BI benefits: the reduction of the dispersion of information, greater scope for interaction between users, ease of access to information, the information is available in real time, versatility and flexibility in adapting to the reality of the company, useful in the process of decision making.

Some other main advantages of BI systems are defined by Pavkov et al. (2016) as the unique structure of reporting process, data analysis, provide an information on time that leads to better communication and, value of information as a resource.

TABLE 6
BI Benefits

Benefits	Papers
Cost Saving	(Balachandran et al., 2017); (El Bousty 2018); (Hirsimäki, 2017); (Panorama, n.d.); (Yusof et al., 2015)
Time Saving	(Balachandran et al., 2017); (El Bousty, 2018); (Hočevar & Jaklič, 2010); (Panorama, n.d.); (Pellissier & Kruger, 2011); (Somya et al., 2018); (Yusof et al., 2015)
Better decisions	(El Bousty, 2018); (Hočevar & Jaklič, 2010); (Panorama, n.d.); (Somya et al., 2018); (Yusof et al., 2015)
Improvement of better processes	(Balachandran et al., 2017); (Hočevar & Jaklič, 2010); (Panorama, n.d.); (Somya et al., 2018); (Yusof et al., 2015)
Support of Strategic business objectives	(Panorama, n.d.); (Pellissier & Kruger, 2011); (Somya et al., 2018); (Yusof et al., 2015)

Hirsimäki (2017) divided the BI implementation cost into four parts: hardware, software, implementation and personnel costs. First one related to data warehouses and possible installations of data transmission. Software costs are actual BI

software and data services. Main BI expense is user training that are core related to implementation. Last one, personnel costs include salary, space and computing equipment and other infrastructure.

Summary of Previous Studies on CSFs for BI Systems Implementation Driven by Authors.

This section contains the literature considered most relevant in the support of understanding business intelligence systems and their most common CSFs. We draw on existing literature from the fields of BI and critical success factors (CSFs) in order to provide the readers of research with a primary list of relevant CSFs. Identifying CSFs is one of the important stages in BI implementation lifecycle which should be done before the start of the high-level project plan (Nasab et al., 2017).

This section contains the references considered most relevant in the support of the understanding of business intelligence, their most common success factors and how each of the factors are used in the BI implementation. The following section related work contains 8 entries; each entry includes authors names, a summarization, an assessment of reliability and a reflection on how each reference is used in support of this study. All references listed in this section are mentioned based on the detailed data analysis for to extract the relevant information used in this literature review. See Appendix.

Yeoh and Koronios (2010) presented a qualitative study and provided a framework of critical success factors for implementing BI systems, in which the authors performed a Delphi study, where they categorized CSFs in three main dimensions namely: organizational, process and technology. This research seeks to bridge the gap that exists between academia and practitioners by investigating the CSFs influencing BI systems success. In research authors also reveals that those organizations which address the CSFs from a business orientation approach will be more likely to achieve better results (Yeoh & Koronios, 2010). This article is relevant to the purpose of a business intelligence and how to measure the success of BI.

Sangar and Iahad (2013), provide an example, where the issue of BI can be analyzed from many different angles. The authors take a purely BI project life cycle viewpoint and classify BI systems project implementation in three stages which include a pre-implementation stage, an implementation stage and a post-implementation stage.

Anjariny et al. (2011) discussed the organization readiness issue and proposes a model for a successful BI system. They believe the readiness factor and CSFs are the same in essence. Likewise, Isık et al. (2011) discussed the decision-making process (flexibility and risk management support) where they conduct a survey.

According to Isik et al. (2011) success factor such as data quality, data reliability, user access and the integration of BI with other systems are essential for BI success.

Isik et al. (2011) seems more focused on the quality of the data. They indicate that respondents were more satisfied with quantitative data quality and internal data reliability. Also, users with BI experience were more satisfied by using BI systems as compare to less experienced users. One reason may be experiencing the users may have gained using BI over a longer time period and therefore more aware of the BI capabilities.

Dawson and Van Belle (2013) investigate a new concept critical contextual success factors that influence business intelligence (BI) system success and design in organizations regarding their relevance, variability, and controllability. The author performed a Delphi study and identify six distinct clusters of factors with similar attributes and in total, they found 27 CCSF in the end.

Hawking and Sellitto (2010) identified two newly business intelligence critical success factors, process maturity and knowledge transfer and discussed the business intelligence critical success factors that were identified from the content analysis and interviews. These included; security, business content, interaction with vendor (SAP), reporting strategy, testing, identification of KPIs, process maturity, knowledge transfer, governance, training, and technical. Finally, we would like to mention the research from Yeoh and Popovič (2015), they proposed a CSFs model and mentioned that the organizational CSFs is the cornerstone for the successful implementation of the BI systems.

Review and comparison of previous researches on CSFs for BI implementation revealed that the CSF framework proposed by Yeoh and Koronios (2010) is the most comprehensive source for this study as it covers majority of factors which is mentioned by other researchers. According Nasab et al. (2017), user's involvement is important in BI projects to prevent missing business requirement. All of the above arguments suggest that the theory available for explaining business intelligence success factors is still underdeveloped and there is a lot of room for research in this area.

SUMMARY

This study provides a comprehensive systematic literature review on business intelligence. This article highlights articles related to business intelligence, its benefits, challenges and critical success factors. Knowing the organizations critical success factors are important to ensure a successful BI implementation process. This article could be of interest for researchers as well as organizations planning to implement or currently using BI systems as technology keeps changing.

A continuation of this article will investigate the current situation in Norwegian organizations related to BI, particular SME´s. This to find out the current status in Norway and how Norwegian businesses compare to the rest of the world. The same type of study can be conducted in other parts of the world if wanting to learn more about a particular market in detail. There is still room for more studies looking at small and medium sized enterprises investing in BI and their current state.

It is also interesting to conduct a case study to look at a particular successful organization to learn from their success. Conducting a comparison on the various software platforms could also be of interest. There are currently many tools available on the market some with more sophisticated features than others.

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APPENDIX
Summary of Prior CFS Studies.

Authors	Brief Description
Sangar and Iahad (2013)	Top management support, clear vision and mission, effective project management, organizational culture, user education and training, stakeholder's active involvement, data and information accuracy and integrity, enterprise it infrastructure and legacy system, suitability of hardware and software, system reliability and flexibility and learnability, system perceived usefulness, change management, perceived contribution made by the BI to organizational performance.
Anjariny et al. (2011)	Clear vision and strategy, strong committed sponsorship, the support of managers, the appropriate scale and scope, team skills and sufficient resources, a culture of measurement, configuration between business and IT, quality of data, strong technical infrastructure.
Işık et al. (2011)	Data quality, data source quality, data reliability, interaction with other systems, user access, flexibility, risk management support.
Yeoh and Popovič (2015)	Process performance and infrastructure performance.
Yeoh and Koronios (2010)	Committed management support and sponsorship, clear vision and well-established business case business-centric, championship and balanced team composition, business-driven and iterative development approach, user-oriented change management sustainable data quality and integrity, infrastructure related factors.
Olbrich et al. (2012)	Top management support, financial, corporate strategy, product range, market dynamics, IT budge.
Hawking and Sellitto (2010)	Management support, champion resources, user participation, team skills, source systems, development technology, performance, methodology, business content, governance, reporting strategy, interaction with sap, testing, data quality, involvement of business and technical, implementation partners, identification of KPIs, technical.
Dawson and Van Belle (2013)	Management support, champion, resources, user participation, data quality.