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MASTER THESIS

Unleashing the potential of Business Intelligence & Analytics for SMEs in the Netherlands: A Comprehensive Analysis

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ABSTRACT

In recent years Business Intelligence & Analytics (BI&A) technologies have grown in popularity, because SMEs seek to acquire a competitive edge through data-driven decision making. However, the specific ways in which BI&A influences SME performance and the challenges faced by SMEs in realizing the benefits of BI&A are still not well understood. To research this gap, this study will examine how SMEs in the Netherlands can leverage BI&A to enhance organizational performance and overcome potential challenges. A survey was conducted among SMEs in the Netherlands with 38 respondents, utilizing validated measures to assess performance indicators and challenges associated with the use of BI&A with. The analysis reveals that both BI&A users and non-users perceive a generally positive impact on performance indicators, although users have a more positive opinion. Despite challenges not being perceived as major problems overall, differences in perspectives are true. As SMEs become more involved and actively utilize BI&A, their perception of its potential challenges tends to decrease and their perception of BI&A impact on performance indicators tends to increase. Moreover, contrary to previous literature, the customer perspective appears to be less important while the learning and growth indicator appears to be most important. Based on the analysis, the study suggests that SMEs should implement BI&A tools to enhance decision-making and operational efficiency, and non-users should explore its potential benefits. Recommendations include investing in training programs, promoting adoption, allocating sufficient budget and resources. To amplify this process, it is recommended to execute future research through case to gather real-world examples and insights into the usage of BI&A in SMEs, including in-depth, cross-sectional, and longitudinal studies, to optimize benefits, identify best practices, and assess sustainability and long-term effects.

Keywords: Business intelligence and analytics (BI&A), SMEs, Firm Performance, Challenges, Balanced Scorecard

1. INTRODUCTION

As organizations seek to acquire a competitive edge through data-driven decision making, Business Intelligence & Analytics (BI&A) technologies have grown in popularity in recent years (Wee et al., 2022). These are software programs that give organizations the tools they need to turn data into useful insights and make informed decisions. Key performance indicators (KPIs) and other essential data are effectively represented graphically by BI&A technologies, like dashboards, enabling users to swiftly and easily monitor their organization's performance (Sharma, 2019).

The usage of BI&A has been shown to have a positive impact on firm performance in a variety of organizations (Lopez-Nicolas, 2016). Firm performance can be defined as the ability of a firm to achieve its goals and objectives, as measured by various financial and non-financial indicators (e.g., return on investment, market share, customer satisfaction) (Taouab & Issor, 2019). However, there is still a lack of understanding of the specific ways in which BI&A influence firm performance and the factors that influence the realization of benefits from BI&A initiatives (Shields & Shelleman, 2020). This is particularly the case in small and medium-sized enterprises (SMEs), where the usage of BI&A tools may be limited by constraints such as limited resources and expertise (Al-Badi & Al-Lozi, 2016).

Given the importance of SMEs in the Dutch economy as they form 99% of all organizations in the Netherlands with comparable added value in euros as large firms (Chong et al., 2019), it is important to better understand the impact of BI&A on firm performance in these organizations and the challenges that come with the realization of BI&A initiatives. However, there is a lack of research on this topic (Popovič et al., 2019) and no research done in the Netherlands.

This study aims to address this gap in the literature by investigating the following research question:

How can small and medium-sized enterprises in the Netherlands leverage Business Intelligence & Analytics to enhance their organizational performance and overcome potential challenges that may arise from its usage?

The results of this study will provide valuable insights for organizations considering the usage of BI&A. Besides, this study will contribute to the broader understanding of the role of BI&A, its impact on firm performance and related challenges.

The execution of this study will begin with a thorough systematic review to investigate the existing literature and research on the usage of BI&A, its influence on firm performance and related challenges in SMEs. This will provide an understanding of the current state of knowledge on this topic and inform the direction of the research. Based on the findings of the systematic review, expectations will be developed about the potential outcomes of this study. Afterwards, a survey will be constructed using existing validated surveys, which will be adapted to align with the specific research objectives.

2. THEORETICAL FRAMEWORK

In this chapter, existing research will be reviewed to understand the concepts used in the study. The process of conducting a systematic literature review will be outlined first. Then, the concepts of BI&A, firm performance and challenges will be discussed. The application of these concepts in the SMEs will also be examined.

2.1 SYSTEMATIC LITERATURE REVIEW

This systematic literature review aims to investigate the important aspects of the definition of BI&A, its influence on firm performance and challenges in small and medium-sized enterprises (SMEs) in the Netherlands.

Systematic literature review is necessary as it allows for a thorough and structured examination of existing research on a topic, providing a comprehensive understanding of the current state of knowledge and identifying gaps for future research (Aveyard, 2010).

This paper uses a grounded-theory method for systematic review, which includes the steps of defining, searching, selecting, analyzing, and presenting (Wolfswinkel, Furtmueller, & Wilderom, 2013).

2.1.1 SEARCHING STRATEGY

The first phase involves defining the criteria for including and excluding certain articles, identifying relevant fields of study, selecting appropriate sources, and determining specific search terms. In this case, the criterion is using solely peer-reviewed articles to aim at a set of reliable articles. Moreover, articles before 2017 are excluded to prevent using irrelevant and outdated information. Finally, the articles were sorted by citation count from highest to lowest.

The second phase is to develop search terms that are relevant to the topic. The primary search terms for this study will be "BI&A" and "SMEs". Search terms, such as “adoption” were included to broaden the search scope. Synonyms were added or removed in between searches to find sufficient literature in the Scopus database to review. Moreover, the used keywords in relevant articles were also reviewed to possibly expand the search terms. An extraction from search process is illustrated in Table 1. The complete search matrix can be found in Appendix I.

Table 1. Extraction from search matrix

KEYWORDS	SORTED ON	YEAR FILTER	HITS	USED ARTICLES
“SME”, “Dashboard”, “Business Intelligence”, “Adoption”	Cited by (Highest)	2016-2022	59	5

The third phase will involve further selecting the articles from the literature search by modifying the sample. This process is visualized in figure 1. Duplicate articles are first removed from this process. Reading the articles' titles and abstracts further was done to refine the sample. Moreover, one article added to the sample through the snowball effect, which refers to the process of identifying additional relevant studies by examining the reference lists of already identified studies (Hiebl, 2021). The research subjects of articles that are relevant to and comparable to the research subjects of this study are retained in the sample, which contains 9 articles.

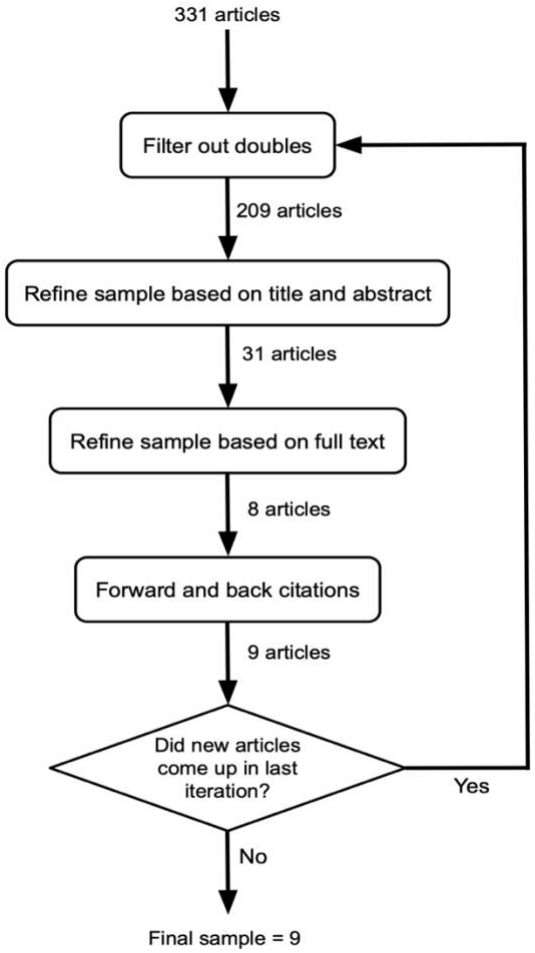

Figure 1. Flowchart of articles selection process

In the final phase of analysis, the selected articles were thoroughly reviewed to identify key findings and insights. Thematic analysis was then conducted on the articles by identifying and labeling themes within the papers using open coding with mutual exclusion. This process is illustrated in a concept matrix found in appendix II (Watson & Webster, 2020). Through this analysis, a set of categories were discovered which

provide a deeper understanding of the theoretical and methodological perspectives of the subject.

2.2 SYSTEMATIC REVIEW RESULTS

The results from the systematic review will be given starting with the meaning of SMEs. Subsequently, relevant findings about BI&A in organizations will be explained. Following that, the use of BI&A within SMEs will be addressed. This subchapter ends with a conclusion of the systematic review.

2.2.1 SMALL AND MEDIUM ENTERPRISES

In the Netherlands, small and medium-sized enterprises (SMEs) make up 99% of all organizations and are a vital part of the country's economy (SME definition, n.d.). Besides their huge presence, SMEs contribute to around 50% of the added value for the Dutch economy (Chong et al., 2019). These companies can be identified by their size, as defined by the European Union's criteria, which states that SMEs are enterprises that employ fewer than 250 people and have an annual turnover of less than 50 million euros (SME definition, n.d.).

SMEs in the Netherlands can be further divided into subcategories based on their characteristics. For example, micro-enterprises are businesses with fewer than 10 employees, while small enterprises have between 10 and 49 employees. Medium-sized enterprises have between 50 and 249 employees (SME definition, n.d.).

2.2.2 BUSINESS INTELLIGENCE & ANALYTICS

In general, Business Intelligence and Analytics (BI&A) tools have been increasingly used in recent years to make better decisions by analyzing and interpreting large amounts of data. BI&A tools allow users to access and analyze data from various sources in real-time, which enables businesses to identify patterns, trends, and insights that would otherwise go unnoticed (Popovič, Puklavec, and Oliveira, 2018). BI&A can be used for a wide range of purposes, such as financial analysis and risk management.

According to questioned data consultancy experts, the terms BI&A and dashboards are often confused with each other in the business world. Hence, it is relevant to explain the difference between these two.

Dashboards and BI&A are two vital components in the world of data analysis. Dashboards provide real-time snapshots of an organization's performance metrics, offering a quick and easy way for executives and managers to make informed decisions. These interactive displays offer a wide range of metrics, from financial data to customer satisfaction, and allow users to delve deeper into trends and insights (Ivanković, Barbazza, Bos, Brito Fernandes, et al., 2021).

BI&A, on the other hand, is a comprehensive process that uses data to identify opportunities for growth, optimize operations, and make data-driven decisions. This process involves collecting and analyzing vast amounts of data from multiple sources, both internal and external, and using innovative tools like data visualization and predictive modeling to uncover patterns and insights (Divatia et al., 2020).

In conclusion, while dashboards are an essential part of BI&A, they are just one aspect of this extensive process. BI&A is a robust methodology that enables organizations to gain insights and make informed decisions based on data, leading to better performance and success.

2.2.3 BI&A IN SMEs

In recent years, specifically Small and Medium Enterprises (SMEs) have been increasingly using Business Intelligence and Analytics (BI&A) tools trying to improve the overall business performance of the organization (Popovič, Puklavec, and Oliveira, 2018). According to a study Gauzelin and Bentz (2017), BI&A tools, such as dashboards can also help SMEs to improve their performance by providing real-time data and allowing managers to monitor key performance indicators (KPIs) on a regular basis.

Customer perspective

Seven studies concluded that the use of BI&A tools has a positive impact on the customer needs and satisfaction in SMEs (Popovič, 2018; Hackney, 2018; Rea Llave, 2017; Gauzelin, 2017; Shields, 2020; Pejić Bach, 2019; Rea Llave, 2018) and competitive advantage (Bhatiasevi, 2018; Rea Llave, 2018). On the other hand, one study showed a negative impact of BI&A usage on customer perspectives (Bhatiasevi, 2018). An example of how BI&A positively influences customer needs and satisfaction is that BI&A can analyze customer emails and chats to determine their characteristics and demands. This helps the company improve its operations and meet customer needs to stay competitive and achieve goals (Gauzelin, 2017).

Financial perspective

Another performance indicator which is found in these articles is the positive impact of BI&A tools on the financial perspectives of SMEs, such as return on investment (ROI) and sales (Hackney, 2018; Reallave, 2017; Gauzelin, 2017; Rea Llave, 2018; Pejić Bach, 2019). One way BI&A positively affects the financial perspective is by offering a cost-effective approach to obtain business information, which used to require significant spending on market research (Gauzelian, 2017). This approach saves both time and money, enabling businesses to focus their resources on other critical business aspects. Essentially, BI&A serves as a cost and time-saving solution for gathering information, freeing up money that would have been spent on market research for other purposes within the firm.

Internal processes

Bhatiasevi and Naglis (2018) conducted a study on the adoption and usage of business intelligence among SMEs in Thailand and found that the adoption of business intelligence had a positive effect on internal process in terms of organizational performance. The positive effect on internal processes is reconfirmed in three other articles (Popovič, 2018; Reallave, 2018; Gauzelin, 2017). A commonly found example within the internal processes of SMEs is the positive impact of marketing (Popovič, 2018, Gauzelin, 2017, Shields, 2020). Gauzelin (2017) provided an example of how BI&A can positively impact marketing by enabling an organization to quickly detect shifting market trends and potential threats based on changes in consumer behavior and preferences. This allows for the provision of timely and essential information necessary for making informed decisions related to marketing strategy.

Enhanced decision making

As explained before, one of the main goals with the use of BI&A is to improve decision-making, which is mentioned in four studies (Rea Llave, 2017; Rea Llave, 2018; Gauzelin, 2017; Shields, 2020). This decision-making can be related to different aspects of an organization such as finance, marketing and customers.

Competitive advantage

Lastly, only one study mentioned a positive impact with the use of BI&A on the learning and growth of an organization (Bhatiasevi and Naglis; 2018), because the use of BI&A may improve employee skills and know-how. Additionally, BI&A may facilitate knowledge sharing among employees.

Learning and growth

Merely one article (Bhatiasevi and Naglis; 2018) researched the relation between learning and growth and BI adoption. A positive relation was found, which could be explained by BI improving employee skills. Despite the limited mention, there are several reasons why the researcher chose to include the "learning and growth" performance indicator in the research model. Firstly, a comprehensive approach is necessary to fully understand the impact of BI&A on organizational performance and learning and growth is an important aspect to consider in this regard. Secondly, there is theoretical support for learning and growth, as it is emphasized in frameworks such as the Balanced Scorecard model, which is developed by Robert Kaplan and David Norton (1990) for measuring and

managing organizational performance. Finally, including learning and growth may be highly relevant to practitioners in the field, as it can provide valuable insights into how BI&A can impact employee development and contribute to overall organizational performance.

An overview of these performance indicators elaborated on by existing literature can be found in Table 2.

Table 2. Performance Indicators Matrix

AUTHORS	PERFORMANCE INDICATORS USING BI&A					
	CUSTOMER PERSPECTIVE	FINANCIAL PERSPECTIVE	INTERNAL PROCESS	ENHANCED DECISION MAKING	COMPETITIVE ADVANTAGE	LEARNING & GROWTH
(POPOVIČ, 2018)	✓		✓			
(HACKNEY, 2018)	✓	✓				
(REA LLAVE, 2017)	✓	✓		✓		
(BHATIASEVI,2018)	✓	✓	✓		✓	✓
(GAUZELIN, 2017)	✓	✓	✓	✓		
(SHIELDS, 2020)	✓		✓	✓		
(PEJIĆ BACH, 2019)	✓				✓	
(REA LLAVE, 2018)	✓	✓	✓	✓	✓	

High costs

However, next to all these positive impacts of using BI&A tools, according to a study by Gauzelin (2017), SMEs often face unique challenges when it comes to BI&A use, such as high costs. This finding is reconfirmed by three other studies (Bhatiasevi, 2018; Shields, 2020; Rea Llave, 2018). This is because SMEs usually have limited funds, and they think that investing in BI&A would use up a significant portion of their budget. Therefore, SMEs view investing in BI&A as putting too much pressure on their already limited resources, which could negatively affect their overall financial situation.

Lack of knowledge

Another common challenge when it comes to BI&A use, is the lack of knowledge (Gauzelin, 2017; Shields, 2020; Wee, 2022). This could be due to lack of IT skills of the employees, which will make the use of BI&A complex for an SME.

BI infrastructure

The lack of BI infrastructure is also a common challenge when it comes to using BI&A (Gauzelin, 2017; Real Llave, 2017; Wee, 2022). This is because building a robust BI-infrastructure requires significant investment in terms of time, money, and expertise which are usually constrained in SMEs.

Data privacy and security

Moreover, privacy and security of data concerns are mentioned as a challenge for using BI&A in a SME (Rea Llave, 2017; Gauzelin, 2017). With the use of BI&A comes large amounts of data from various sources, which can include sensitive or confidential information such as customer data or financial records (Rea Llave, 2017). This makes it crucial to ensure the privacy and security of the data to prevent unauthorized access, misuse, or theft.

Lack of resources

Finally, a lack of resources is a common challenge for SMEs to not be able to use BI&A (Gauzelin, 2017; Wee, 2022), which refers to time, money, expertise and BI&A-related hardware and software.

An overview of these potential challenges elaborated on by existing literature can be found in Table 3.

Table 3. Challenges Matrix

AUTHORS	CHALLENGES USING BI&A				
	COSTS	LACK OF KNOWLEDGE	BI INFRA-STRUCTURE	DATA PRIVACY & SECURITY	LACK OF RESOURCES
(POPOVIČ, 2018)					
(HACKNEY, 2018)					
(REA LLAVE, 2017)			✓	✓	
(BHATIASEVI,2018)	✓				
(GAUZELIN, 2017)	✓	✓	✓	✓	✓
(SHIELDS, 2020)	✓	✓			
(PEJIĆ BACH, 2019)					
(REA LLAVE, 2018)	✓				
(WEE, 2022)		✓	✓		✓

Lastly, it is important to mention that the traditional business intelligence and analytics (BI&A) models tailored for large firms might not be directly suitable for SMEs. This is due to the distinctive characteristics of SMEs, such as their organizational structures, scale and limited resources (Tasanen, 2018; Llave, 2018). SMEs need more adaptable and cost-effective solutions that align with their specific requirements and capabilities.

Furthermore, the decision-making process in SMEs heavily relies on the expertise and

judgments of their managers and owners, making it a critical factor for their overall success (Llave, 2018). By exploring how SMEs can effectively utilize BI&A to enhance decision-making, this research aims to provide practical insights and recommendations tailored to the unique context of SMEs (Raj et al., 2016).

2.2.4 CONCLUSION AND EXPECTATIONS

Overall, the studies reviewed in the systematic review demonstrate the importance of BI&A in SMEs and discuss both the impact BI&A has on SMEs (table 1) and the challenges that come with BI&A (table 2). According to seven studies BI&A usage has a positive impact on customer perspectives (Popovič, 2018; Hackney, 2018; Rea Llave, 2017; Gauzelin, 2017; Shields, 2020; Pejić Bach, 2019; Rea Llave, 2018) and competitive advantage (Bhatiasevi, 2018; Pejić Bach, 2019; Rea Llave, 2018). Moreover, five studies showed a positive impact of BI&A usage on financial perspectives, such as return on investment and profit (Hackney, 2018; Rea Llave, 2017; Gauzelin, 2017; Rea Llave, 2018). On the other hand, one study showed a negative impact of BI&A usage on both financial and customer perspectives (Bhatiasevi, 2018). Besides, according to four studies, the usage of BI&A leads to better and timelier decision making (Rea Llave, 2017; Gauzelin, 2017; Shields, 2020; Rea Llave, 2018). Five studies showed a positive impact of BI&A usage on the internal processes of SMEs (Popovič, 2018; Bhatiasevi, 2018; Gauzelin, 2017; Shields, 2020; Rea Llave, 2018) and specifically on marketing strategies (Popovič, 2018; Gauzelin, 2017; Shields, 2020). Lastly, one study found a positive impact on the learning and growth of the organization with the usage of BI&A (Bhatiasevi, 2018).

However, SMEs face unique challenges regarding the use of BI&A. The most occurring challenges are lack of knowledge and having a BI infrastructure, both mentioned by three studies respectively, (Gauzelin, 2017; Shields 2020; Wee, 2020) and (Rea Llave, 2017; Gauzelin, 2017; Wee, 2022). Besides, two studies showed using BI&A is a challenge due to high costs (Bhatiasevi, 2018; Gauzelin, 2017), while two studies stated that some BI&A tools, such as dashboards are relatively inexpensive due to unnecessity of a data warehouse (Shields, 2020; Rea Llave, 2018). Finally, a lack of resources and privacy and security of data concerns are seen as a challenge for using BI&A, both stated by two studies respectively, (Gauzelin, 2017; Wee, 2022) and (Rea Llave, 2017; Gauzelin, 2017).

Lastly, it is relevant to mention that only one out of the nine articles focused solely on the BI&A tool, dashboards, while the others focused on the broader picture, namely BI&A. This finding implicates that the use of dashboards in SMEs is little, despite being a commonly used tool in businesses to monitor KPIs and enhance decision making effectively (Shields, J. & Shelleman, J., 2017). Therefore, the systematic review's focus was shifted from dashboards to BI&A (tools) in general.

In summary, the systematic review shows that BI&A usage, except for two studies, has a positive impact on SMEs' customer perspectives, competitive advantage, financial perspectives, decision making, internal processes, marketing strategies, and organizational growth. However, SMEs face challenges in using BI&A, including a lack of knowledge and infrastructure, high costs, data privacy and security concerns, and lack of resources. The review implies that while dashboards are a commonly used BI&A tool, they are not widely adopted by SMEs. Therefore, the focus of the review is shifted to BI&A (tools) in general rather than just dashboards.

Based on the results from previous studies, expectations about the outcome of this study will be given. It is relevant to mention that this study differs from previous ones in two ways: it focuses solely on SMEs and is the first to be conducted in the Netherlands. To simplify the research process, certain factors from different literature sources that assess the same aspect have been merged into one indicator. The indicator

marketing has been added to the internal processes and the indicator competitive advantage has been added to the customer perspectives.

This leads to back to four performance indicators using BI&A, namely financial perspective, customer perspective, internal processes and learning and growth (figure 2). These four indicators can be recognized as the Balance Scorecard (BSC). Hence, The Performance indicators model resembles the BSC. The BSC, developed by Robert Kaplan and David Norton (1990), is a strategic management tool used to align an organization's actions and decision-making with its mission and vision by considering financial, customer, internal process, and learning and growth perspectives, and to track progress towards goals. Hence, this framework will be used as a foundation to measure the performance indicators in this study.

It is assumed that the usage of BI&A will have a positive impact on all the four performance indicators. As a logical consequence, the usage of BI&A will improve the overall decision-making in these four aspects of a SME.

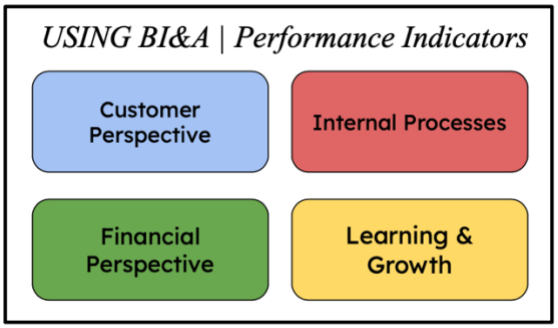

Figure 2. The Performance Indicators Model

Moreover, it is assumed that all the challenges found in the literature regarding the usage of BI&A will be perceived as challenges in SMEs in the Netherlands. These five challenges are developed into a similar framework (figure 3) as the BSC, which is used for the performance indicators.

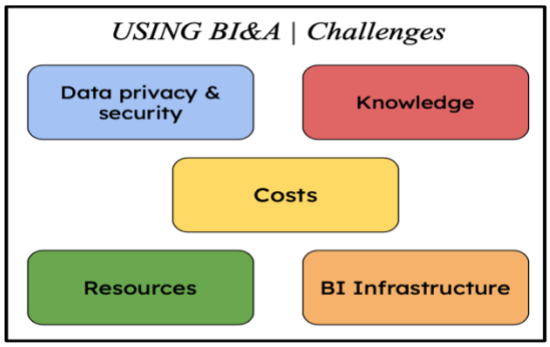

Figure 3. The Challenges Model

Conducting this study using these frameworks can offer valuable insights and contribute to the existing knowledge on the topic. The study aims to provide valuable insights on various performance indicators that affect the benefits of using BI&A tools, enhance the understanding of the impact of BI&A on SMEs, and shed light on the challenges associated with the usage of BI&A in SMEs.

In terms of practical contribution, this study will provide insights into both the usage of BI&A and its impact on firm performance and the challenges associated with the usage of BI&A in SMEs in the Netherlands. By examining this, the research could help SMEs in the Netherlands better understand the potential challenges and benefits of adopting and using BI&A and how they can impact firm performance. The results of the study could also inform decision-making by SME owners and managers considering the adoption of BI&A tools.

How this will be measured will be discussed in methodology.

3. METHODOLOGY

The research methodology chapter provides an overview of the methods and techniques used in the study. It outlines the strategies, procedures and processes followed to collect, analyze, and interpret data, and to answer the research question. Besides, it provides crucial information to understand the reliability and validity of the study results.

3.1 RESEARCH DESIGN

For the research question "*How can small and medium-sized enterprises in the Netherlands leverage Business Intelligence & Analytics to enhance their organizational performance and overcome potential challenges that may arise from its usage?*" a quantitative research design will be used. This type of research design allows for the collection of numerical data and the analysis of relationships between variables through statistical methods (Alan Bryman, 2016). A survey will be used to gather data on what challenges exist with the usage of BI&A and on the usage of BI&A tools and its influence on firm performance in SMEs in the Netherlands.

The reason for choosing to do a quantitative study instead of a qualitative one is to generate generalizable information about the underlying causes, concepts, and relationships, as well as to identify patterns (Watson, 2015). Lastly, it is relevant to mention this study is not an adoption study, which studies how to implement and adopt in this case a dashboard into a SME as effective and efficient possible. Instead, this study focusses on the usage of BI&A influences firm performance and what challenges exist with the usage of BI&A.

3.2 MEASUREMENT INSTRUMENT

The survey is developed with the help of two validated peer-reviewed studies, which had a similar study focus. These studies by Hou (2016) and by Nenzhelele and Pellissier (2014) have not been added to the systematic literature review, because the limit year of the literature review is 2017.

The first study by Hou (2016) analyzed how BI system usage impacted four performance measures of the BSC and looked for any significant causal relationships among the different perspectives of the BSC. Therefore, Hou (2016) used the BSC as the foundation for the survey development and identified items from prior research to operationalize the constructs under investigation.

To measure financial, customer, internal process, and learning and growth performance, multi-item scales were derived from previous research and a 5-point Likert-scale (from 1= "strongly disagree" to 5= "strongly agree") is used. Financial performance is assessed based on three dimensions: profitability, revenue growth, and cost structure. Customer performance is assessed based on three dimensions: product attribute, customer satisfaction, and firm image. Internal process performance is assessed based on three dimensions: operations management process, customer management process, and innovation process. Learning and growth is measured by evaluating human capital, information capital, and organizational capital.

Financial performance was assessed based on three dimensions: profitability, revenue growth, and cost structure. Customer performance was also assessed based on three dimensions: customer satisfaction and firm image. Internal process performance was as well assessed based on three dimensions: operations management process, customer management process, and innovation process. Lastly, learning and growth was also measured by evaluating human capital, information capital, and organizational capital.

Firm size was used as a control variable in the study, as prior literature has shown that it can affect organizational performance (Anwar & Hasnu, 2017; Mubeen et al., 2022; Yoon & Suh, 2019). To ensure data reliability, a pilot study was conducted, and Cronbach's alpha coefficient was used to measure the internal consistency of the multi-item scales. The final version of the survey was modified based on feedback from the pre-test and pilot study.

The second study by Nenzhelele and Pellissier (2014) focused partly on identifying the challenges SMEs face in implementing Competitive Intelligence, which involves the collection and analysis of data as Business Intelligence, but the focus of BI is on internal operations and

performance, while the focus of CI is on external competition and market trends.

From this study the section in survey about challenges is extracted. This section simply asked the respondent to mark the experienced challenges, found in the systematic review, with a cross. To stay consistent in the survey, the researcher decided to transform the questions into statements using the 5-point Likert-scale. The statements covered all the five challenges found in the systematic review of this study. Finally, the respondent is asked if he/she experiences other than those five challenges.

Vannette and Krosnick (2018, pp. 1-3) recommend adhering to established guidelines for survey design to minimize response errors. Since comprehending the concepts of business intelligence can be challenging without prior knowledge, it is crucial to implement effective strategies to promote understanding. Consequently, the following best practices are integrated: eliminating obscurities in questions, using short questions, employing simplified terminology for complex concepts, avoiding biased or suggestive wording, and ensuring consistent interpretation of all questions and terms. The primary objective was to develop a survey that could be completed within a ten-minute timeframe, thereby increasing the response rate and achieving the desired target of 50 respondents.

The survey questions are provided in Appendix IV, which are a combination of multiple-choice and Likert scale questions. It is important to mention that the Likert scale is an ordinal scale to depict the order of preferences. However, the distances between the responses do not represent equal intervals (Sullivan & Artino, 2013). This means for example that the difference between "Strongly Agree" and "Agree" is not the same as the difference between "Neutral" and "Disagree".

3.2 SAMPLE & DATA COLLECTION

Data for this quantitative study is collected through digitally distributed surveys due to the relatively large number of respondents required.

The sample for this survey is Dutch SMEs from various sectors, aiming for a sample size of 50 respondents. This is based on what De Veaux said (2015), "a survey that tries to find the proportion of the population falling into a category, you'll usually need several hundred respondents to say anything precise enough to be useful (p. 313)". However, even with lower number of respondents, reliable conclusion can be made. The researcher is aware of the risks of not obtaining enough respondents in the study, including the time constraints of the study and the limited availability of SMEs, who may not have the time to fill out the survey.

The SMEs were contacted by email, and through social media connections such as LinkedIn. A sample email was created for research purposes and contains a link to the Qualtrics research tool. Emails were sent directly to the SMEs manager or (co-)founder(s) to increase the response rate. If their contact information was not available, the email was sent to the SMEs general email. The emails that were sent to managers or the (co-)founders of small and medium-sized enterprises (SMEs) were tailored to each recipient with a personalized greeting. The emails also outlined the advantages that the SME would gain from participating in the study to increase response rates. In addition, a specific manager or (co-)founder(s) of the SME who was known by name but did not have contact information was contacted via LinkedIn.

Convenient sampling was also used to reach as many SMEs as possible due to time constraints. This means that the SMEs who received the survey were requested to distribute the survey to other SMEs with whom they work or have a relationship. The survey was sent in Dutch, as all the targeted SMEs are based in the Netherlands. SMEs are mainly found via the 'KVK Innovatie Top 100' 2018-2022, which is an annual ranking of the 100 most innovative SMEs in the

Netherlands. These companies show a greater inclination to embrace and implement new technologies, as supported by various reports, including one from Accenture (2019). A list of approached SMEs can be found in Appendix III.

3.3 DATA ANALYSIS

Descriptive analyses will be used to analyze the data to find valuable outcomes through calculations of means, frequencies, and trends. Based on these findings the research question will be answered. The software used to analyze the data will be SPSS.

4. RESULTS

In this chapter the collected data from the survey will be described with the aid of SPSS and Qualtrics. Firstly, the respondent characteristics will be analyzed and described. Afterwards the data related to the performance indicators and challenges with Business Intelligence & Analytics will be provided. Please refer to Appendix V to see the data analysis performed in SPSS.

4.1 RESPONDENTS

The survey received a number of 45 respondents. Before the data analysis, the dataset must be cleaned and prepared. Out of the 45 respondents 7 respondents did not complete the survey. Therefore, these respondents have been removed from the dataset. Considering the size of the SMEs of the respondents, of the 38 completed responses, 14 are micro-enterprises with a maximum of 10 employees (36.8% of responses), 11 are small enterprises with a size between 10 and 49 employees (28.9% of responses), and lastly 13 of the responses are from Medium-sized enterprises with an organization size between 50 and 249 employees (34.2% of responses). This distribution of company size of the respondents can be seen in figure 4.

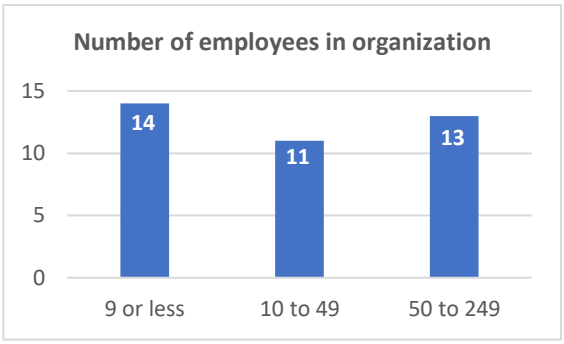

Figure 4. SME Size of the Respondents

In figure 5 the annual turnover of the respondents is shown. Seventeen respondents (44.7%) have an annual turnover of less than two million euros and only four (10.5%) respondents have an annual turnover of more than 50 million euros. Among the remaining respondents, eleven (28.9%) have an annual turnover between two and ten million euros, while six (15.8%) have an annual turnover between 10 and 50 million euros.

Figure 5. SME annual turnover of the Respondents

Besides, the distribution of the industrial sectors of the respondents is shown in figure 6. Since the 100 most innovative SME ranking from the last five years are used, it is not a surprise that the biggest sector is IT with 11 respondents (28.9%). Moreover, both the sectors 'Engineering, production and construction' and 'Other' count nine respondents (23.7%). However, of the nine respondents as 'Other', two respondents belong to the sector healthcare and wellness, two respondents belong to the trade and services sector and one respondent belongs to the IT sector. The

remaining four respondents work in the energy sector and the public sector. Figure five is changed accordingly. Finally, the sectors 'media and communication' and 'agriculture, nature and fishing' counted each one respondent.

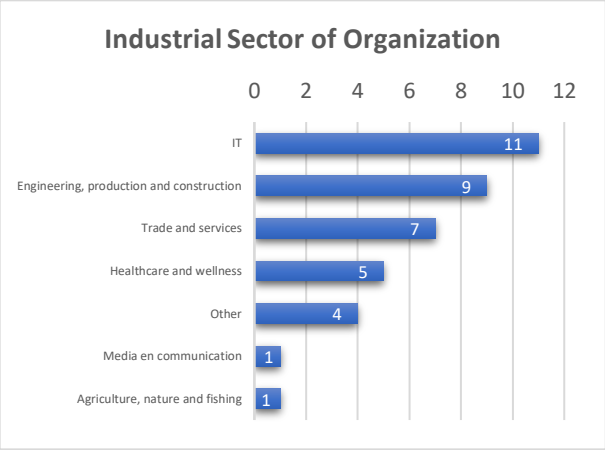

Figure 6. SME industrial sector of the Respondents

Finally, the distribution of the usage of BI&A among the respondents is shown in figures 7 and 8. The majority (N = 25, 65.8%) uses BI&A within the organization.

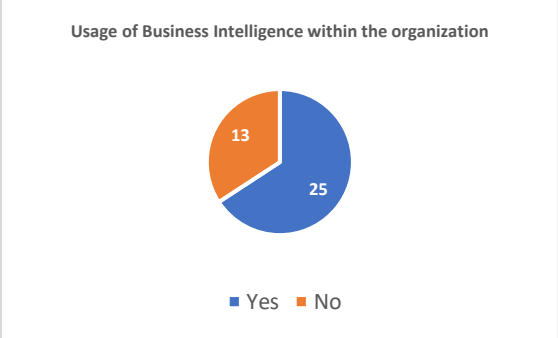

Figure 7. SME BI&A Usage of the Respondents

The usage of BI&A within this research is not merely defined as using BI&A, also known as the use phase. Three other phases (see figure 8) are also accepted as BI&A usage. Fortunately, the majority of this group are in the use phase of BI&A. This will give insights in the daily usage within organizations.

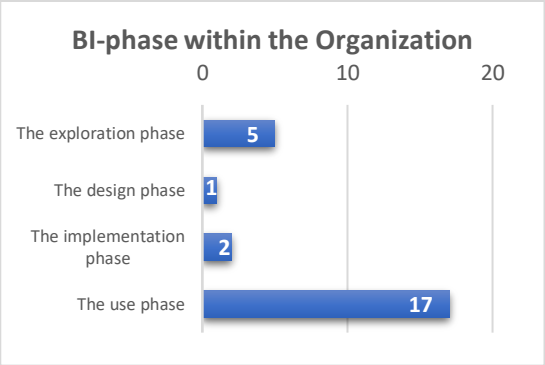

Figure 8. SME BI&A-Phase of the Respondents

4.2 PERFORMANCE INDICATORS OF BI&A

To assess the respondents' perceptions of the impact on the four performance indicators from figure 1, a five-point Likert scale was used. The results presented in Table 4, show that all performance indicators received scores slightly above three, indicating that the respondents acknowledge a modest positive impact on these indicators. The highest mean (M = 3.52, SD = 0.80) is the learning and growth indicator. This table and the following tables are shown in the same order as the systematic literature review.

N = 38. Table 4. Performance indicators descriptives

Performance indicator	Mean	Standard deviation
Customer perspective	3.21	0.82
Financial perspective	3.39	0.88
Internal processes	3.34	0.71
Learning & Growth	3.52	0.80

Moreover, figure 9 displays the distribution of the responses on the Likert scale questions. The numbers on the y-ax represent the performance indicators in the same order as displayed in Table 4. This figure shows that the majority of respondents leans towards the (strongly) agree side with the highest percentage for each indicator. Besides, around one-third of the respondents is neutral about the impact of BI&A on the performance indicators.

Only the most relevant Likert scale figures are kept in this chapter, while the others are put in the appendix to maintain overview and clarity.

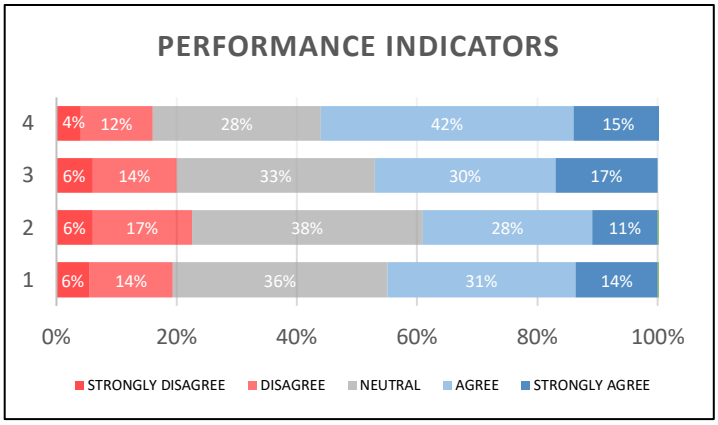

Figure 9. Likert Scale Distribution | Performance Indicators

To dive deeper into the analysis, differences among the respondents will be examined to determine whether these differences influence their perceptions of the impact of BI&A on the indicators.

Difference between BI-(non)user

Firstly, the difference between the respondents who use and don't use BI&A within the organization is examined. This is relevant because the respondents who use BI&A can tell from experience how they perceive the impact of BI&A and the respondents who don't use BI&A can merely express their expectations on the impact of BI&A. The results presented in Table 5 show that the BI&A-users show a modest positive impact, while the nonusers have an almost neutral perception regarding the impact of BI&A on the performance indicators. The highest mean of BI users (M = 3.75, SD = 0.68) is the learning and growth indicator and the highest mean (M = 3.11, SD = 0.84) of nonusers is the internal processes indicator.

N = 38. Table 5. Performance indicators | BI-Usage | Mean (STD)

Performance indicator / BI-Usage	YES (N = 25)	NO (N = 13)
Customer perspective	3.27 (0.77)	3.10 (0.94)
Financial perspective	3.55 (0.79)	3.09 (0.99)
Internal processes	3.45 (0.61)	3.11 (0.84)
Learning & Growth	3.75 (0.69)	3.06 (0.81)

Additionally, the related figures in appendix VI display the distribution of the responses on the Likert scale questions showing the difference of responses between BI-users and nonusers. These figures shows that the BI users have a clear perception regarding the impact of BI on the performance indicators compared to the nonusers. This is because almost half of the nonusers have a neutral standpoint, while the users have a more positive standpoint. The minority of responses, both for users as nonusers, do not see a positive impact of BI&A on the performance indicators.

Difference between firm size

Moreover, the difference in firm size regarding the impact of BI&A is analyzed. This is relevant as prior literature has shown that firm size can affect organizational performance (Anwar & Hasnu, 2017; Mubeen et al., 2022; Yoon & Suh, 2019). The results presented in Table 6 show that the firms with nine or less employees or firms with 50 to 249 employees show a positive perception, while firms with 10 to 49 employees have a neutral perception regarding the impact of BI&A on the performance indicators. The highest mean of firms with nine or less employees (M = 3.83, SD = 0.69) is the customer perspective, the highest mean (M = 3.11, SD = 0.84) is the learning and growth indicator and the highest mean of firms with 50 to 249 employees (M = 3.86 SD = 0.71) is again the learning and growth indicator.

N = 38. Table 6. Performance indicators | Firm size | Mean (STD)

Performance indicator / Firm size	≤ 9 Employees (N = 14)	10-49 Employees (N = 13)	50-249 Employees (N = 11)
Customer perspective	3.83 (0.69)	2.79 (0.95)	3.43 (0.75)
Internal processes	3.42 (0.83)	2.87 (0.83)	3.29 (0.79)
Financial perspective	3.55 (0.60)	2.90 (0.78)	3.48 (0.63)
Learning & Growth	3.46 (0.68)	3.18 (0.92)	3.86 (0.71)

These findings can be confirmed by the related figures in appendix VI. The majority of firms with nine or less employees and 50-249 employees have a positive perception. Although all firm sizes have approximately the same neutral positions, it stands out that firms within the 10 to 49 employees' range are relatively more negative towards the impact of BI&A on the performance indicators compared to the other firm sizes.

Moreover, figure 10 visually represents the various phases at which SMEs are in with BI&A usage, determines how they perceive the impact of BI&A on the performance indicators. The line graph demonstrates a gradual increase, indicating that as SMEs become more involved and actively utilize BI&A, their perception of its impact on performance indicators tends to increase. However, it is important to note the varying number of respondents across the different phase. The exploring phase has five users, the development phase has one user, the implementation phase has two users, and the usage phase has 17 users. This disproportionate representation of respondents per phase may affect the validity of these results.

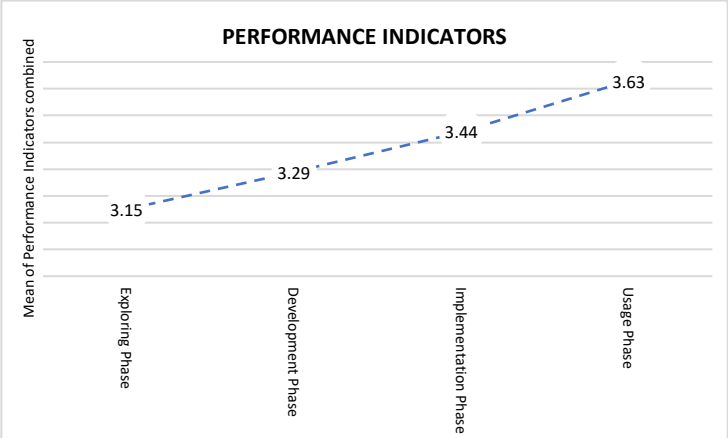

Figure 10. Phase of BI&A with Usage | Performance Indicators

Performance indicators from open question

At the end of this survey chapter one open question was formulated to ask BI&A-users if and how BI&A led to increased performance within the organization. The respondents stated both reasons why BI&A led to increased performance as reasons why BI&A didn't lead to increased performance.

The reasons provided why BI&A led to increased performance can be grouped into four main themes (see Table 7). The first theme focuses on the achievement of enhanced efficiency and cost savings through the BI&A. Multiple respondents (n = 5) emphasize that insights into data quality and subsequent actions derived from BI&A enable organizations to optimize their processes and reduce expenses. This suggests that BI&A plays a crucial role in driving operational efficiency and financial benefits.

The second theme highlights the recognition of BI&A as a valuable tool for project management. Several respondents (n = 4) note that BI&A provides insights into all facets of a project, ensuring clarity of roles and responsibilities among team members. This aspect emphasizes the importance of BI&A in facilitating effective coordination and collaboration within project teams, ultimately leading to improved project outcomes.

The third theme emphasizes the significance of data-driven decision-making and performance monitoring facilitated by BI&A. Three respondents acknowledge that BI&A enables organizations to make informed choices based on objective facts, shifting away from subjective expectations. By leveraging BI&A, organizations can monitor their performance in real-time and make data-driven decisions that contribute to improved outcomes.

Moreover, respondents emphasize the role of BI&A in facilitating the visualization of critical information. This includes aspects such as revenue generation and areas for improvement. The ability to visualize such information empowers organizations to steer their operations based on concrete insights, rather than relying on expectations or intuition.

Lastly, two respondents highlight the increased awareness and understanding achieved through the utilization of BI&A. This encompasses various aspects, including better knowledge of processes and performance, improved awareness of organizational functioning, and the ability to conduct tests with customers. These findings suggest that BI&A enhances organizations' overall awareness and enables them to gain deeper insights into their internal and external environments.

N = 18. Table 7. Performance indicators | Frequencies

Performance indicators of BI&A	Frequency
enhanced efficiency and cost savings	5
Valuable tool for project management	4
Data-driven decision-making and monitoring	3
Increased awareness and understanding	2

On the other hand, the reasons provided why BI&A didn't lead to increased performance can be grouped into three main themes.

Firstly, two respondents express limitations in information collection and the assessment of its impact. They note that their current focus on information gathering is relatively narrow, primarily discussed within small teams to understand its implications. Moreover, the incomplete structure of their data hinders proper interpretation, highlighting the need for a more robust framework.

Secondly, one respondent acknowledges the constraint of lacking relevant data due to the organization's relatively short existence. As a result, they currently do not possess data that directly applies to their specific work processes or customer behavior. This limitation emphasizes the importance of accumulating relevant data over time to enhance the organization's BI&A capabilities.

Lastly, another respondent recognizes the intrinsic value of data and its insights but express concerns regarding the organization and presentation of the acquired information. Although they acknowledge the significance of data, they face challenges in organizing and visualizing it in a comprehensive and understandable manner. This highlights the need for effective strategies and tools to ensure a clear and structured representation of the insights derived from BI&A.

4.3 CHALLENGES OF BI&A

To assess the respondents' perceptions on the potential challenges in figure 2 that may arise from the usage of BI&A, a five-point Likert scale was used. The results presented in Table 8, show that, with the exception of the challenge regarding knowledge, all the other challenges score slightly below three. This suggests that the respondents don't perceive these potential challenges as issues when it comes to the usage of BI&A. The challenge of knowledge (M = 3.34, SD = 1.15) is perceived as a potential challenge, but not of substantial magnitude. The challenge perceived as least troublesome is data privacy and security (M = 2.53, SD = 0.89). What stands out are the high standard deviations, which indicates a large variability in the perception of the challenges among the respondents.

N = 38. Table 8. Potential challenges descriptives

Potential challenges	Mean	Standard deviation
Costs	2.82	1.16
Knowledge	3.34	1.15
BI Infrastructure	2.76	1.28
Resources	2.82	1.09
Data privacy & security	2.53	0.89

Moreover, figure 10 displays the distribution of the responses on the Likert scale questions. The numbers on the y-ax represent the potential challenges in the same order as displayed in Table 6. In this subchapter, the coloring in the following Likert scale visualizations is reversed, because agreeing with these statements means to see the potential challenge as a difficulty. This figure shows that the majority of respondents leans towards the (strongly) disagree side with the highest percentage for each indicator, except for the challenge of knowledge. This again shows that the majority doesn't perceive these potential challenges as issues when it comes to the usage of BI&A.

To dive deeper into the analysis, differences among the respondents will be examined to determine whether these differences influence their perceptions on the potential challenges with the usage of BI&A.

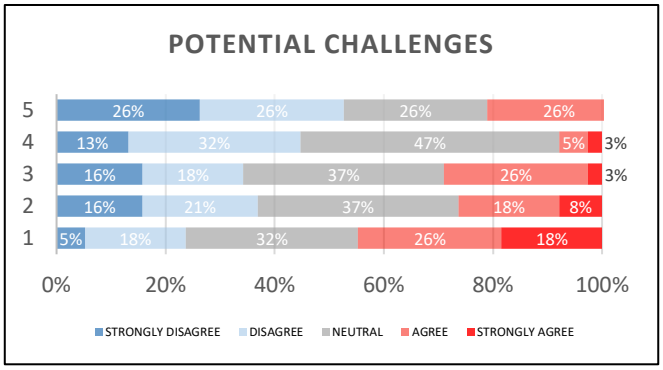

Figure 11. Likert Scale Distribution | Potential Challenges

Difference between BI-(non)user

Firstly, the difference between the respondents who use and don't use BI&A within the organization is examined. This is relevant because the respondents who use BI&A can tell from experience what challenges they experience with BI-usage and the respondents who don't use BI&A can merely assume what challenges may come with BI-usage. The results presented in Table 7, show that, with the exception of the challenges regarding knowledge and BI infrastructure, all the other challenges score the same as the overall group. Users find both the challenges of resources to be more problematic, while the nonusers are less inclined to see them as challenges. However, it is noteworthy that the high standard deviations indicate a large variability in the perceptions regarding the challenges among the respondents. The challenge perceived as least troublesome among BI users is data privacy and security (M = 2.48, SD = 1.00), while the most troublesome challenge perceived is the knowledge challenge (M = 3.32, SD = 1.22). The challenge perceived as least troublesome among nonusers is also data privacy and security (M = 2.62, SD = 0.65), while the most troublesome challenge perceived is also the knowledge challenge (M = 3.38, SD = 1.04).

N = 38. Table 9. Potential challenges | BI-Usage | Mean (STD)

Potential challenges / BI-Usage	YES	NO
Costs	2.76 (1.23)	2.92 (1.04)
Knowledge	3.32 (1.22)	3.38 (1.04)
BI Infrastructure	2.60 (1.32)	3.08 (1.19)
Resources	2.68 (1.15)	3.08 (0.95)
Data privacy & security	2.48 (1.00)	2.62 (0.65)

The related figures in Appendix VI show more relevant insights regarding the difference between users and nonusers. The most noticeable aspect is the neutral position of nonusers. While the majority of users don't perceive knowledge as a challenge, the majority of nonusers do.

Difference between firm size

Moreover, the difference in firm size regarding the potential challenges is analyzed. This is relevant as literature has shown that challenges differ based on firm size (Endris & Kassegn, 2022). The results presented in Table 8 show that the firms with less than nine employees don't perceive any of the challenges as potential for them. On the other hand, small and medium organizations both perceive knowledge as a challenge, and small organizations also perceive BI infrastructure as a challenge. The challenge perceived as least troublesome among firms with nine or less employees is BI infrastructure (M = 2.50, SD = 1.02), while the most troublesome challenge perceived is the cost challenge (M = 2.93, SD = 1.20). The challenge perceived as least troublesome among firms with 10-49 employees is data privacy and security (M = 2.55, SD = 0.69), while the most troublesome challenge perceived is the knowledge challenge (M = 3.91, SD = 1.04). The challenge perceived as least troublesome among firms with 50-249 employees is also data privacy and security (M = 2.62, SD = 0.97), while the most troublesome challenge perceived is the knowledge challenge (M = 3.38, SD = 1.33).

N = 38. Table 10. Potential challenges | Firm size | Mean (STD)

Potential challenges / Firm size	≤ 9 Employees (N = 14)	10-49 Employees (N = 13)	50-249 Employees (N = 11)
Costs	2.93 (1.20)	2.64 (1.21)	2.85 (1.14)
Knowledge	2.86 (0.86)	3.91 (1.04)	3.38 (1.33)
BI Infrastructure	2.50 (1.02)	3.45 (1.57)	3.08 (1.13)
Resources	2.57 (1.02)	3.09 (1.04)	2.85 (1.21)
Data privacy & security	2.57 (1.02)	2.55 (0.69)	2.62 (0.97)

The related figures in Appendix VI show that the respondents of firm size 50-249 have more diverse responses compared to the other firm sizes. Besides, the respondents of firm size 10-49 have strongly perceive the challenges knowledge and BI infrastructure as a difficulty. In general, a substantial percentage respondent of firm sizes with nine or less or 50-249 employees do not perceive the potential challenges as a threat compared to firms with 10-49 employees.

Additionally, figure 12 visually represents the various phases at which SMEs are in with BI&A usage, determines how they perceive the likelihood of the potential challenges arising with its usage. The line graph demonstrates a gradual decrease, indicating that as SMEs become more involved and actively utilize BI&A, their perception of its potential challenges tends to decrease. However, it is again important to note the varying number of respondents across the different phase.

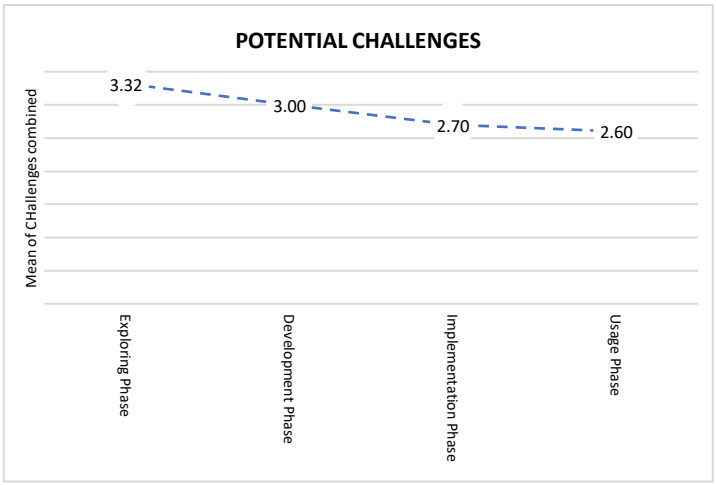

Figure 12. Phase of BI&A with Usage | Potential Challenges

Lastly, after each Likert scale question one open question was formulated to ask the respondents, who (strongly) agreed with the statement, to name either experienced or expected challenges related to the described challenge. The respondents stated insightful views which will be described in the next paragraphs.

Potential challenges from open questions

The potential challenges with the usage of BI&A from figure 2 can be grouped into subthemes. Firstly, Table 11 provides insights into the knowledge challenges associated with the usage of BI&A. The data, gathered from 14 respondents, reveals that the most prevalent challenge is a lack of knowledge about the profit of BI (n = 5). This indicates that certain individuals lack a comprehensive understanding of how to effectively leverage BI&A tools to drive profitability. The second most common challenge (n = 4) relates to problems regarding implementation and adoption, suggesting that organizations may encounter difficulties when integrating and adopting BI&A solutions. Moreover, some respondents (n = 3) expressed a lack of knowledge to gain relevant insights, underscoring the need for enhanced expertise in extracting valuable information from BI&A tools. Lastly, two respondents identified priority and change management as challenges, emphasizing the relevance of effectively managing priorities and change initiatives to implement BI&A.

N = 14. Table 11. Knowledge challenges | Frequencies

Knowledge challenges with the usage of BI&A	Frequency
Insufficient knowledge about the profit of BI	5
Problems regarding implementation and adoption	4
Lack of knowledge to gain relevant insights	3
Priority and change management	2

Secondly, Table 12 focuses on the challenges related to costs associated with BI&A usage. The dataset comprises responses from 9 participants, with the primary challenge being a lack of budget (n = 5). This finding implies that financial constraints hinder organizations from making optimal investments in and leveraging the full potential of BI&A tools. Another challenge raised by respondents

(n = 4) is seeing BI&A as unworthy investment, indicating that organizations may struggle to select the appropriate BI&A solution that offers satisfactory returns on investment. Lastly, three respondents cited licenses as a challenge, suggesting that the cost and management of licensing pose potential obstacles during the implementation of BI&A solutions.

N = 9. Table 12. Costs challenges | Frequencies

Costs challenges with the usage of BI&A	Frequency
No budget	5
Unworthy investment	4
Licenses	3

Furthermore, Table 13 sheds light on the resource challenges encountered in the context of BI&A usage. The dataset contains responses from 10 participants, and the most reported challenge is a lack of skill, (n = 3). This highlights that organizations may face a shortage of individuals possessing the necessary expertise and skills to effectively utilize BI&A tools. Similarly, three respondents emphasized a lack of employees, indicating insufficient personnel dedicated to BI&A tasks within organizations. Another challenge mentioned by three respondents is a lack of time, implying that time constraints may limit the comprehensive utilization of BI&A tools within organizations. Lastly, one respondent identified a lack of financial resources as a challenge, suggesting that organizations may encounter difficulties in allocating sufficient funds to support their BI&A initiatives.

N = 10. Table 13. Resources challenges | Frequencies

Resources challenges with the usage of BI&A	Frequency
Lack of skill	3
Lack of employees	3
Lack of time	3
Lack of financial resources	1

Moreover, the challenges regarding BI infrastructure and data privacy and security were also asked in the survey. The only challenge mentioned regarding data privacy and security (n = 2) is that the data used must meet the privacy and security requirements, which is expensive in maintenance. The only challenge mentioned regarding BI infrastructure (n = 6) is issues related to lack of knowledge about BI infrastructure. One respondent for example said: "We don't have an idea about the possibilities".

Finally, an open question was asked regarding any other challenges not mentioned in the survey. No new challenges were mentioned through this question. The challenges of lack of time (n = 5) and the lack of knowledge (n = 5) to use BI&A were recalled the most.

4.4 SUMMARY

In conclusion, the results provide important understandings of how SMEs view BI&A through either experiences or expectations.

A sample of 38 completed responses from SMEs within the Netherlands with operations in various sectors and of various sizes is analyzed. The respondents generally acknowledged a modestly positive influence on internal processes, customer perspective, financial perspective, and learning & growth in terms of the performance indicators of BI&A. While a substantial percentage of respondents maintained a neutral view, the majority of respondents tended to agree that BI&A had a positive impact on the performance indicators.

There are notable perceptional variations between BI&A users and non-users. Comparatively speaking, the users have a more positive opinion of how BI&A affects the performance indicators. The study also examined the impact of firm size on these perceptions and found that micro and medium businesses have a more positive opinion of the impact of BI&A on performance indicators compared to small firms.

Regarding the challenges in using BI&A, respondents in general did not consider

them to be major problems. However, the respondents' differing perspectives reveal a wide range of experiences and perspectives from the open questions.

Finally, as SMEs become more involved and actively utilize BI&A, their perception of its potential challenges tends to decrease and their perception of BI&A impact on performance indicators tends to increase.

5. ANALYSIS

In this chapter, the key results will be interpreted, compared to the expectations made and the existing literature.

5.1 PERFORMANCE INDICATORS OF BI&A

In line with the expectations made in this this study, the respondents agree that the impact of BI&A is positive on all the four performance indicators i.e., internal processes, customer perspective, financial perspective, and learning & growth. As a logical consequence, the usage of BI&A will improve the overall decision-making in these four aspects of a SME.

These results are also partly in line with the existing literature. Consistent with previous research, the results indicate that the usage of BI&A has a positive impact on the customer perspectives in SMEs (Popovič, 2018; Hackney, 2018; Rea Llave, 2017; Gauzelin, 2017; Shields, 2020; Pejić Bach, 2019; Rea Llave, 2018). Moreover, the findings support the existing literature by showing the positive impact of BI&A regarding the financial perspective (Hackney, 2018; Reallave, 2017; Gauzelin, 2017; Rea Llave, 2018; Pejić Bach, 2019). However, unlike these studies, this study reveals that nonusers often refrain from BI&A because they fear a negative ROI. Furthermore, the present study extends the existing literature (Bhatiasevi and Naglis, 2018; Popovič, 2018; Reallave, 2018; Gauzelin, 2017), by demonstrating the positive impact BI&A on the internal processes of SMEs, such as enhanced operational efficiency and decision making. Lastly, the results reveal that the usage of BI&A has a positive impact on the learning and growth in SMEs, which can be confirmed by existing literature (Bhatiasevi and Naglis, 2018). Ironically, it is worth noting that the mere inclination to employ BI&A itself causes a positive impact on the learning and growth processes within SMEs, as employees are obligated to obtain the necessary skills for effective and efficient use of BI&A.

5.2 POTENTIAL CHALLENGES OF BI&A

Contrary to the expectations made in this study, most respondents do not consider the challenges of figure 3 to be major problems, except for the challenge regarding lack of knowledge with a 44% response rate. However, if looking deeper into the results two observation can be made. Nonusers of BI&A have a high neutral response rate, which may be due to uncertainty regarding expectations about whether the challenge will be an issue or not. Moreover, when examining for example firms with 50 to 249 employees, the BI infrastructure is acknowledged as a challenge with a 54% response rate.

Consistent with previous research (Gauzelin, 2017; Shields, 2020; Wee, 2022), the results indicate that the lack of knowledge is a major challenge when it comes to BI&A-usage. Respondents mentioned several examples of reasons for the lack of knowledge, including insufficient knowledge about the benefits of BI (n = 5), difficulties in implementation and adoption (n = 4), and a lack of knowledge to gain relevant insights (n = 3).

Contradicting prior studies (Gauzelin, 2017; Bhatiasevi, 2018; Shields, 2020; Rea Llave, 2018), this study doesn't reveal the costs for BI&A to be a major challenge within SMEs. However, some valuable answers from the open questions showed that some respondents find the usage of BI&A impossible because of too little budget (n = 6) or perceive it as an unworthy investment (n = 4). On the contrary, according to literature the usage of BI&A helps to save in IT infrastructure costs and increase firm

profits (Rea Llave M.R., 2017; Gauzelin, 2017).

Furthermore, the results regarding the challenge of resources contradicts partly with existing literature (Gauzelin, 2017; Wee, 2022), because literature states that lack of resources is perceived as a challenge, while the overall mean of the data analysis in this study shows the majority of respondents do not see the challenge of resources as a problem. However, looking at the distinction of results between users and nonusers, the results reveal that users perceive lack of resources as a challenge while nonusers don't.

Moreover, privacy and security of data concerns are not perceived as a challenge for using BI&A in SMEs contrary to exising literature (Rea Llave, 2017; Gauzelin, 2017). This is eye-catching, considering the prevailing significance of privacy and data security in contemporary times, particularly within technologies like BI&A, which require the storage of vast amounts of confidential data. Given the legal obligations and the need to maintain organizational integrity, it becomes crucial to prioritize the implementation of robust security measures (Kagita, 2019). However, the reason for not being perceived as a challenge is unknown. This may be due to unawareness of the need for privacy and data security or because of the size of the firm and the collected data, which makes privacy and security easier to implement.

Additionally, contradicting prior studies (Gauzelin, 2017; Real Llave, 2017; Wee, 2022), the majority of respondents do not perceive BI infrastructure as a challenge, except for the firms with 50 to 249 employees with a 54% response rate. Consistent with these results is a study by Llave M.R. (2018), which states that BI&A tools are affordable because a data warehouse is unnecessary.

Finally, it is relevant to realize that the targeted SMEs for this study are from an annual ranking of the 100 most innovative SMEs in the Netherlands. These companies show a greater inclination to embrace and implement new technologies, as supported by various reports, including one from Accenture (2019). This may be a reason why the challenges above are not seen as major problems in this study compared to existing literature.

7. CONCLUSION & DISCUSSION

The objective of this study was to acquire new and valuable perspectives on the expectations and experiences of BI&A in SMEs in the Netherlands. To achieve this, the research question formulated was as follows:

How can small and medium-sized enterprises in the Netherlands leverage Business Intelligence & Analytics to enhance their organizational performance and overcome potential challenges that may arise from its usage?

To answer this research question, several conclusions and recommendations have been drawn.

SMEs in the Netherlands generally have a positive observation towards the impact of BI&A on their performance indicators, including internal processes, customer perspective, financial perspective, and learning & growth.

This is of relevance, because it is plausible a SME needs a positive perception towards BI&A in order to start leveraging BI&A.

Before continuing with discussing how to leverage BI&A within SMEs and how to overcome potential challenges with its usage, some important findings will be discussed.

To begin with, the impact of BI on customer perspective appears to be less important in this study compared to previous literature. This prevalent observation stems from the fact that all articles included in the systematic review of this study mentioned the importance of the customer perspective, while the findings of this study indicate a

slightly above-average mean of this performance indicator.

On the other hand, compared to previous literature, the impact of BI on learning and growth is important with the highest means among the performance indicators of this study. This prevalent observation stems from the fact that solely one article included in the systematic review of this study mentioned the importance of learning and growth, while the findings of this study indicate the highest average mean of this performance indicator compared to the other performance indicators of this study.

However, while BI has a positive impact on learning and growth, it can also work counterproductive. This study shows that mainly insufficient knowledge about the profit of BI and knowledge problems regarding implementation and adoption can be challenges to use BI&A. Therefore, it is of relevance to focus on the performance indicator of learning and growth, so that the impact of BI on this performance indicator will be positive, while overcoming the challenge related to knowledge.

To do this, SMEs should invest in training and development programs to enhance employees' skills in BI&A usage. This will facilitate better leverage of BI&A systems and maximize the positive impact on learning and growth processes.

Moreover, the impact of BI on the financial perspective in SMEs is shown in both previous literature and this study. While BI has a positive impact on the financial perspective, it can also work counterproductive. This study shows that mainly a lack of budget for BI and perceiving BI as an unworthy investment can be challenges to use BI&A. Therefore, SMEs should conduct a cost-benefit analysis to determine the value and potential returns of using BI&A in order to leverage BI&A. If the cost-benefit is positive, SMEs should allocate sufficient budget and resources for implementing and maintaining BI&A systems. This includes ensuring access to knowledgeable personnel or external consultants who can provide support and assistance in overcoming challenges related to implementation, adoption, and usage.

Regarding differences between groups, there were some variations in perception between BI&A users and non-users, with users having a more positive opinion overall. The challenges associated with BI&A usage were not considered major problems by most SMEs. However, there were varying perspectives and experiences related to these challenges, highlighting the diverse nature of SMEs' encounters with BI&A. These findings suggest that SMEs in the Netherlands have recognized the potential of BI&A in enhancing their organizational performance. This can be confirmed, because as SMEs become more involved and actively utilize BI&A, their perception of its potential challenges tends to decrease and their perception of BI&A impact on performance indicators tends to increase.

Based on the above conclusions, SMEs should consider implementing BI&A tools to leverage its positive impact on performance indicators, including customer perspectives, financial perspectives, and internal processes. This can lead to improved decision-making and operational efficiency.

Furthermore, this study shows that innovative SMEs, which use BI&A, perceive the positive impact of BI&A on organizational performance and do not perceive major challenges with its usage. This should encourage non-users of BI&A to explore its potential benefits and overcome their fears of negative return on investment (ROI). They can start with small-scale implementations and gradually expand based on the observed positive impact on performance indicators.

To do this, managers and decision-makers in SMEs can actively promote the adoption and usage of BI&A systems, emphasizing the potential benefits and addressing any misconceptions or concerns about costs and resources.

Limitations

To conduct a qualitative study, it is important to consider the limitations of the research. Four limitations of this study have been identified.

One limitation is the failure to achieve the intended response rate of 50 participants. SMEs' reluctance to complete surveys and the financial pressures and time constraints faced by SMEs may have contributed to this. Increasing the sample size would yield more representative results.

Another limitation is the presence of response bias, where participants tend to withhold negative information. This bias can impact the accuracy of data, potentially overrepresenting positive outcomes and underrepresenting challenges. Therefore, the findings may not fully capture the true extent of benefits and challenges related to BI&A usage in SMEs. Efforts were made to diminish this bias through confidential data collection, anonymous data collection and neutral language in survey questions. However, complete elimination of response bias is not possible.

Furthermore, as mentioned before an annual ranking of the 100 most innovative SMEs in the Netherlands is used to find respondents for the survey. This is sample bias, because these companies show a larger inclination to embrace and implement new technologies, as supported by various reports, including one from Accenture (2019). This means that the survey results may be skewed towards companies that are more proactive in adopting new technologies, potentially leading to an overrepresentation of positive outcomes related to the usage of BI&A. Hence, it may not be fully representative of all SMEs in the Netherlands. It is also expected that SMEs outside the top 100 use less frequently BI&A.

Lastly, bias may arise from participants' limited knowledge and subjective understanding of BI&A despite efforts to make the concepts as understandable and comprehensive as possible. A biased interest or inclination towards BI&A among respondents could also affect the objectivity of the findings.

Future research

It is recommended to conduct case studies for future research on BI&A usage in SMEs to gather useful knowledge and context. In-depth case studies for example can offer real-world examples of experiences, tactics, and results, assisting other SMEs in implementing BI&A. Besides, cross-sectional studies can provide a thorough understanding of the present usage across various SMEs. Moreover, longitudinal case studies can enable the assessment of BI&A's sustainability and long-term effects.

These research methods can help SMEs optimize the benefits of BI&A while considering their characteristics and challenges. They can also serve as a valuable means to identify and create best practices in the context of BI&A usage in SMEs.

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APPENDIX I. SYSTEMATIC REVIEW

KEYWORDS	SORTED ON	YEAR FILTER	HITS	USED ARTICLES	SEARCH KEY
“SME”, “Dashboard”, “Adoption	Cited by (Highest)	2016- 2022	12	0	TITLE-ABS-KEY((dashboard*) AND (adopt* OR accept*) AND ("Small and Medium sized Enterprise*" OR "Small and Medium sized Business*" OR "Small and Medium Enterprise*" OR "Small and Medium business*" OR SME*)) AND (LIMIT-TO (PUBYEAR,2023) OR LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016))
“Dashboard”, “SME”	Cited by (Highest)	2016- 2022	56	1	TITLE-ABS-KEY((dashboard*) AND ("Small and Medium sized Enterprise*" OR "Small and Medium sized Business*" OR "Small and Medium Enterprise*" OR "Small and Medium business*" OR SME*)) AND (LIMIT-TO (PUBYEAR,2023) OR LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016))
“SME”, “Dashboard”, “Business Intelligence”, “Adoption”	Cited by (Highest)	2016- 2022	59	5	TITLE-ABS-KEY((dashboard* OR "business intelligence" OR "BI&A tool*") AND (adopt* OR accept*) AND ("Small and Medium sized Enterprise*" OR "Small and Medium sized Business*" OR "Small and Medium Enterprise*" OR "Small and Medium business*" OR SME*)) AND (LIMIT-TO (PUBYEAR,2023) OR LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016))
“SME”, “Dashboard”, “Business Intelligence”	Cited by (Highest)	2016- 2022	204	3	TITLE-ABS-KEY((dashboard* OR "business intelligence" OR "BI&A tool*") AND ("Small and Medium sized Enterprise*" OR "Small and Medium sized Business*" OR "Small and Medium Enterprise*" OR "Small and Medium business*" OR SME*)) AND (LIMIT-TO (PUBYEAR,2023) OR LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016))

APPENDIX II. CONCEPT MATRIX

AUTHORS	CONCEPTS	
	BUSINESS INTELLIGENCE & ANALYTICS	SMES
(POPOVIČ, 2018)	✓	✓
(HACKNEY, 2018)	✓	
(REALLAVE, 2017)	✓	✓
(BHATIASEVI,2018)	✓	✓
(GAUZELIN, 2017)	✓	✓
(SHIELDS, 2020)	✓	✓
(PEJIĆ BACH, 2019)	✓	✓
(REA LLAVE, 2018)	✓	✓
(WEE, 2022)	✓	✓

APPENDIX III. LIST OF APPROACHED COMPANIES

List	Link
Top 100 innovative companies 2022	https://www.kvkinnovatietop100.nl/site/editie-2022
Top 100 innovative companies 2021	https://www.kvkinnovatietop100.nl/site/editie-2021
Top 100 innovative companies 2020	https://www.kvkinnovatietop100.nl/site/top-100-2020
Top 100 innovative companies 2019	https://www.kvkinnovatietop100.nl/site/top-100-2019
Top 100 innovative companies 2018	https://www.kvkinnovatietop100.nl/site/top-100-2018

APPENDIX IV. THE SURVEY

Master Thesis Vragenlijst | Business Intelligence in MKB'ers

INTRODUCTIE VRAGENLIJST

Bedankt en wat mooi dat u tijd vrijmaakt voor het invullen van deze vragenlijst. Als u over een MKB-onderneming beschikt of werkt in een MKB-onderneming, is uw ervaring/verwachting met Business Intelligence ontzettend van belang voor deze studie.

Onder Business Intelligence (BI) verstaan we het proces van het verzamelen, bruikbaar maken, analyseren en presenteren van gegevens uit verschillende bronnen met behulp van softwaretools zoals PowerBI. Deze bronnen kunnen onder andere verkoopgegevens, klantgegevens, financiële gegevens en andere belangrijke bedrijfsinformatie omvatten. Door gebruik te maken van BI-tools kunnen deze gegevens worden geanalyseerd en gepresenteerd om trends, patronen en inzichten te identificeren die organisaties helpen bij het oplossen van problemen, het nemen van beslissingen en het identificeren van nieuwe kansen.

Dit onderzoek gaat over de invloeden van het gebruik van Business Intelligence binnen MKB-ondernemingen in Nederland en de mogelijke uitdagingen die kunnen ontstaan bij het gebruik van Business Intelligence.

Deze vragenlijst bestaat uit zowel vragen waarbij u aan geeft in hoeverre u het eens bent met stellingen en een aantal open vragen en zal ongeveer 10 minuten in beslag nemen. Daarnaast is deze vragenlijst zowel voor organisaties die al op een of andere manier gebruik maken van BI, als voor organisaties die helemaal geen BI gebruiken. Zoals in de uitnodiging vermeld is, is het van belang de vragenlijst te laten invullen door een BI-(eind)verantwoordelijke binnen uw organisatie, als u natuurlijk BI al gebruikt. U zal na de afronding van dit onderzoek, als u daar geïnteresseerd in bent, een geanonimiseerd resultatenoverzicht ontvangen. Alle resultaten zullen worden geanonimiseerd.

Alvast bedankt voor het besteden van uw kostbare tijd aan het invullen van deze vragenlijst!

Als u problemen ondervindt bij het invullen van deze vragenlijst, aarzel dan niet om contact op te nemen met de onderzoeker per telefoon (06 81907658).

ONDERDEEL 1: INFORMATIE OVER UW ORGANISATIE

Vraag 1 Hoeveel jaar is uw organisatie actief?

_____

Vraag 2 In welke industrie opereert uw organisatie?

- ○ Gezondheidszorg en welzijn (1)
- ○ Handel en dienstverlening (2)
- ○ ICT (3)
- ○ Justitie, veiligheid en openbaar bestuur (4)
- ○ Landbouw, natuur en visserij (5)
- ○ Media en communicatie (6)
- ○ Onderwijs, cultuur en wetenschap (7)
- ○ Techniek, productie en bouw (8)
- ○ Toerisme, recreatie en horeca (9)
- ○ Transport en logistiek (10)
- ○ Anders: (11) _____

Vraag 3 Hoeveel werknemers heeft uw organisatie?

- ○ 9 of minder (1)
- ○ 10 tot 49 (2)
- ○ 50 tot 249 (3)
- ○ 250 of meer (4)

Vraag 4 Wat is de jaarlijkse omzet van uw organisatie?

- ○ Minder dan 2 miljoen euro (1)
- ○ Tussen 2 en 10 miljoen euro (2)
- ○ Tussen 10 en 50 miljoen euro (3)
- ○ Meer dan 50 miljoen euro (4)

Vraag 5 Maakt u gebruik van Business Intelligence?

- ○ Ja (1)
- ○ Nee (2)

Vraag 6 In welke fase met BI staan jullie als organisatie?

- ○ De verkenningsfase (1)
- ○ De ontwerpfase (2)
- ○ De implementatiefase (3)
- ○ De gebruiksfase (4)

Vraag 7 Waar ligt de eindverantwoordelijkheid van BI?

- ○ Bij de IT-afdeling (1)
- ○ Bij de BI-afdeling (2)
- ○ Bij de financieel directeur (3)
- ○ Bij de BI-controller (4)
- ○ Bij iedereen in de organisatie (5)
- ○ Anders, namelijk: (6) _____

Vraag 8 Hoeveel jaren wordt BI actief in uw organisatie gebruikt?

- ○ Minder dan 1 jaar (1)
- ○ 1 tot 3 jaar (2)
- ○ 3 tot 5 jaar (3)
- ○ Meer dan 5 jaar (4)

Vraag 9 In welke afdeling(en) maakt u gebruik van Business Intelligence? Meerdere antwoorden mogelijk. De stellingen hieronder over de desbetreffende afdeling(en) waar u nog geen BI gebruikt, kunt u beantwoorden op basis van uw verwachtingen.

- ☐ Interne processen (1)
- ☐ Financiën (2)
- ☐ Klanten (3)
- ☐ Leer & groei (4)

ONDERDEEL 2: DE INVLOED VAN BUSINESS INTELLIGENCE GEBRUIK BINNEN UW ORGANISATIE

Dit onderdeel zal de invloed van Business Intelligence (BI) op vier aspecten in uw organisatie

behandelen, namelijk de interne processen, de klanten, de financiën en het leren & groei van uw organisatie.

Elk aspect heeft een aantal stellingen die u kunt beantwoorden door aan te geven in hoeverre u het eens bent met de desbetreffende stelling.

Stellingen gerelateerd aan de interne processen van uw organisatie:

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
De verkregen BI-inzichten helpen ons de efficiëntie (doelmatigheid) van operationele processen te verbeteren (denk aan bv. logistieke processen). (1)	○	○	○	○	○
De verkregen BI-inzichten helpen ons de kwaliteit (consistentie en betrouwbaarheid) van operationele processen te verbeteren. (2)	○	○	○	○	○
De verkregen BI-inzichten helpen ons de effectiviteit (doeltreffend) van operationele processen te verbeteren. (3)	○	○	○	○	○
Met behulp van verkregen BI-inzichten (bv. klantbehoeften) kunnen we de beoogde klanten selecteren. (4)	○	○	○	○	○
Met behulp van verkregen BI-inzichten kunnen we gemakkelijker juiste klanten werven. (5)	○	○	○	○	○
Met behulp van verkregen BI-inzichten kunnen we onze huidige klanten gemakkelijker behouden. (6)	○	○	○	○	○
De verkregen BI-inzichten helpen ons te ontdekken welke kansen er zijn om nieuwe producten/diensten te ontwikkelen. (7)	○	○	○	○	○
De verkregen BI-inzichten helpen ons nieuwe producten/diensten effectiever te ontwikkelen. (8)	○	○	○	○	○
De verkregen BI-inzichten helpen ons de doorlooptijd van de ontwikkeling van nieuwe producten/diensten te verlagen. (9)	○	○	○	○	○
De verkregen BI-inzichten helpen ons onze product- of dienstassortiment uit te breiden (door bv. markt trends te identificeren). (10)	○	○	○	○	○
De verkregen BI-inzichten helpen de effectieve productie van nieuwe producten of diensten te verhogen (door bv. factoren voor succesvolle productie te identificeren). (11)	○	○	○	○	○

Stellingen gerelateerd aan de klanten van uw organisatie:

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
Met behulp van verkregen BI-inzichten kunnen we de kwaliteit van onze producten/diensten verbeteren (bv. website-ervaring verbeteren a.d.h.v. klantgedrag). (1)	○	○	○	○	○
Met behulp van verkregen BI-inzichten kunnen we de functionaliteit van onze producten/diensten verbeteren (bv. nieuwe functie toevoegen aan website voor betere klantervaring). (2)	○	○	○	○	○
Met behulp van verkregen BI-inzichten kunnen we beter inspelen op de veranderende behoeften en wensen van (toekomstige) klanten. (3)	○	○	○	○	○
De verkregen BI-inzichten helpen ons klachten van klanten te verminderen (door bv. veelvoorkomende klachten aan te pakken). (4)	○	○	○	○	○
De verkregen BI-inzichten helpen ons onze reactietijd van klantenservice te verkorten (door bv. op drukke momenten meer werknemers in te schakelen). (5)	○	○	○	○	○
De verkregen BI-inzichten helpen ons om het imago en de reputatie van onze organisatie op te bouwen (door bv. het verbeteren van onze prestaties met behulp van BI-inzichten). (6)	○	○	○	○	○
De verkregen BI-inzichten helpen ons het herkenningspercentage van ons bedrijfsmerk te verhogen (door bv. het succes van marketingcampagnes te analyseren). (7)	○	○	○	○	○

Stellingen gerelateerd aan de financiën van uw organisatie:

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
Met behulp van verkregen BI-inzichten kunnen we het rendement op investeringen verhogen (door bv. volgens BI-inzichten onsuccesvolle marketingcampagnes te beëindigen). (1)	○	○	○	○	○
De verkregen BI-inzichten helpen ons het rendement op onze activa (totaal vermogen) te verhogen. (2)	○	○	○	○	○
De verkregen BI-inzichten helpen ons onze winstmarges te verhogen (door bv. het gebruik van efficiëntere technologieën voor productie vanwege hoge huidige productiekosten). (3)	○	○	○	○	○
De verkregen BI-inzichten helpen ons onze omzet te verhogen. (4)	○	○	○	○	○
De verkregen BI-inzichten helpen ons ons marktaandeel te verhogen (door bv. te focussen op klantbehoeften met behulp van BI-inzichten). (5)	○	○	○	○	○
Met behulp van verkregen BI-inzichten kunnen we onze operationele kosten verminderen. (6)	○	○	○	○	○
Met behulp van verkregen BI-inzichten kunnen we de efficiëntie van het gebruik van materialen/middelen voor producten/diensten verhogen (en dus kosten verlagen). (7)	○	○	○	○	○

Stellingen gerelateerd aan het leren & groei binnen uw organisatie:

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
De verkregen BI-inzichten dragen bij aan de ontwikkeling van de vaardigheden van medewerkers (door bv. vanwege toenemende klachten van klanten, medewerkers klantgerichte training te geven). (1)	○	○	○	○	○
De verkregen BI-inzichten verbeteren de beschikbaarheid en toegankelijkheid van diverse informatie voor medewerkers (door bv. één centrale dashboard). (2)	○	○	○	○	○
Het gebruik van een BI-tool verbetert de algehele mogelijkheden van analyse en interpretatie van data. (3)	○	○	○	○	○
Het gebruik van een BI-tool verhoogt de communicatie door kennisdeling (van bv. een centrale dashboard). (4)	○	○	○	○	○
Het gebruik van een BI-tool kan het bewustzijn van medewerkers over gedeelde visie, doelstellingen en waarden vergroten. Bijvoorbeeld in een productiebedrijf dat duurzamer wil worden en waarbij de BI-inzichten helpen om het energieverbruik van afdelingen inzichtelijk te maken voor medewerkers. (5)	○	○	○	○	○

U heeft hierbij het einde van onderdeel 2 bereikt met nog 1 vraag. Als u nog geen gebruik maakt van BI, kunt u deze vraag overslaan.

Wat zijn de primaire redenen dat BI wel/niet heeft geleid tot betere prestaties binnen uw organisatie?

_____

ONDERDEEL 3: DE UITDAGINGEN DOOR BUSINESS INTELLIGENCE GEBRUIK

Dit laatste onderdeel zal de uitdagingen die kunnen ontstaan bij het gebruik van Business Intelligence (BI) behandelen.

Het bestaat uit een aantal stellingen die u kunt beantwoorden door aan te geven in hoeverre u het eens bent met de desbetreffende stelling. De vragenlijst eindigt met een open vraag.

KENNIS

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI. (1)	○	○	○	○	○

Indien (helemaal) mee eens, noem een aantal ervaren kennis-gerelateerde uitdagingen:

_____

KOSTEN

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie. (1)	○	○	○	○	○

Indien (helemaal) mee eens, noem een aantal ervaren kost-gerelateerde uitdagingen:

_____

MIDDELEN

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI. (1)	○	○	○	○	○

Indien (helemaal) mee eens, geef aan welke middelen gebrekkig waren/zijn:

_____

DATA PRIVACY & SECURITY

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI. (1)	○	○	○	○	○

Indien (helemaal) mee eens, benoem ervaren uitdagingen wat betreft gegevensprivacy en beveiliging:

_____

BI-INFRASTRUCTUUR

	HELEMAAL MEE ONEENS (1)	MEE ONEENS (2)	NEUTRAAL (3)	MEE EENS (4)	HELEMAAL MEE EENS (5)
Onze organisatie beschikt(e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken. (1)	○	○	○	○	○

Indien (helemaal) mee eens, benoem ervaren uitdagingen wat betreft BI-infrastructuur:

_____

Zijn er mogelijk daarnaast nog andere uitdagingen die jullie ervaren bij het gebruik van BI? Noem deze uitdagingen op:

_____

EINDE VRAGENLIJST Nogmaals hartelijk bedankt voor uw tijd!

Laat uw email-adres achter om een samenvatting van de resultaten van het onderzoek te ontvangen:

_____

APPENDIX V. DATA ANALYSIS SPSS

PERFORMANCE INDICATORS

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	38	1.00	5.00	3.3373	.70795
MeanCustomer	38	1.00	5.00	3.2143	.82149
MeanFinancial	38	1.00	5.00	3.3910	.87918
MeanLearningGrowth	38	1.00	5.00	3.5158	.79544
Valid N (listwise)	38				

Maakt u gebruik van Business Intelligence? = Ja

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	25	2.36	5.00	3.4545	.61490
MeanCustomer	25	1.57	5.00	3.2743	.76811
MeanFinancial	25	1.86	5.00	3.5486	.79184
MeanLearningGrowth	25	2.60	5.00	3.7520	.68867
Valid N (listwise)	25				

a. Maakt u gebruik van Business Intelligence? = Ja

Maakt u gebruik van Business Intelligence? = Nee

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	13	1.00	4.36	3.1119	.83991
MeanCustomer	13	1.00	4.71	3.0989	.93747
MeanFinancial	13	1.00	4.43	3.0879	.98895
MeanLearningGrowth	13	1.00	4.20	3.0615	.81398
Valid N (listwise)	13				

a. Maakt u gebruik van Business Intelligence? = Nee

Hoeveel werknemers heeft uw organisatie? = 9 of minder

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanCustomer	14	2.29	5.00	3.4184	.82820
MeanFinancial	14	2.43	5.00	3.8265	.68667
MeanInternal	14	3.00	5.00	3.5519	.59928
MeanLearningGrowth	14	2.20	5.00	3.4571	.68130
Valid N (listwise)	14				

a. Hoeveel werknemers heeft uw organisatie? = 9 of minder

Hoeveel werknemers heeft uw organisatie? = 10 tot 49

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanCustomer	11	1.00	4.00	2.8701	.82673
MeanFinancial	11	1.00	4.00	2.7922	.95482
MeanInternal	11	1.00	3.73	2.9008	.78251
MeanLearningGrowth	11	1.00	4.80	3.1818	.92284
Valid N (listwise)	11				

a. Hoeveel werknemers heeft uw organisatie? = 10 tot 49

Hoeveel werknemers heeft uw organisatie? = 50 tot 249

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanCustomer	13	1.57	4.29	3.2857	.77810
MeanFinancial	13	1.86	4.43	3.4286	.74915
MeanInternal	13	2.73	4.45	3.4755	.63000
MeanLearningGrowth	13	2.60	5.00	3.8615	.70892
Valid N (listwise)	13				

a. Hoeveel werknemers heeft uw organisatie? = 50 tot 249

In welke fase met BI staan jullie als organisatie? = De verkenningsfase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	5	2.91	3.82	3.4000	.38355
MeanCustomer	5	1.57	3.86	2.9429	.83666
MeanFinancial	5	1.86	4.29	3.1143	.99693
MeanLearningGrowth	5	2.60	3.60	3.1600	.38471
Valid N (listwise)	5				

a. In welke fase met BI staan jullie als organisatie? = De verkenningsfase

In welke fase met BI staan jullie als organisatie? = De ontwerpfase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	1	3.27	3.27	3.2727	.
MeanCustomer	1	3.00	3.00	3.0000	.
MeanFinancial	1	3.29	3.29	3.2857	.
MeanLearningGrowth	1	3.60	3.60	3.6000	.
Valid N (listwise)	1				

a. In welke fase met BI staan jullie als organisatie? = De ontwerpfase

In welke fase met BI staan jullie als organisatie? = De implementatiefase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	2	3.18	3.64	3.4091	.32141
MeanCustomer	2	3.00	3.29	3.1429	.20203
MeanFinancial	2	3.00	4.43	3.7143	1.01015
MeanLearningGrowth	2	3.00	4.00	3.5000	.70711
Valid N (listwise)	2				

a. In welke fase met BI staan jullie als organisatie? = De implementatiefase

In welke fase met BI staan jullie als organisatie? = De gebruiksfase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
MeanInternal	17	2.36	5.00	3.4866	.72081
MeanCustomer	17	2.14	5.00	3.4034	.80533
MeanFinancial	17	2.00	5.00	3.6723	.73846
MeanLearningGrowth	17	2.80	5.00	3.9647	.69006
Valid N (listwise)	17				

a. In welke fase met BI staan jullie als organisatie? = De gebruiksfase

POTENTIAL CHALLENGES

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	38	1	5	3.34	1.146
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	38	1	5	2.82	1.159
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	38	1	5	2.82	1.087
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	38	1	5	2.53	.893
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	38	1	5	2.76	1.283
Valid N (listwise)	38				

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS – Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	13	2	5	3.38	1.044
KOSTEN – De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	13	1	5	2.92	1.038
MIDDELEN – Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	13	1	5	3.08	.954
DATA PRIVACY & SECURITY – Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	13	1	3	2.62	.650
BI-INFRASTRUCTUUR – Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	13	1	5	3.08	1.188
Valid N (listwise)	13				

a. Maakt u gebruik van Business Intelligence? = Nee

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	25	1	5	3.32	1.215
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	25	1	5	2.76	1.234
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	25	1	4	2.68	1.145
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	25	1	5	2.48	1.005
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	25	1	5	2.60	1.323
Valid N (listwise)	25				

a. Maakt u gebruik van Business Intelligence? = Ja

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS – Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	14	1	4	2.86	.864
KOSTEN – De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	14	1	5	2.93	1.207
MIDDELEN – Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	14	1	4	2.57	1.016
DATA PRIVACY & SECURITY – Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	14	1	5	2.57	1.016
BI-INFRASTRUCTUUR – Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	14	1	4	2.50	1.019
Valid N (listwise)	14				

a. Hoeveel werknemers heeft uw organisatie? = 9 of minder

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS – Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	11	2	5	3.91	1.044
KOSTEN – De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	11	1	5	2.64	1.206
MIDDELEN – Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	11	1	5	3.09	1.044
DATA PRIVACY & SECURITY – Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	11	1	3	2.55	.688
BI-INFRASTRUCTUUR – Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	11	1	5	3.45	1.572
Valid N (listwise)	11				

a. Hoeveel werknemers heeft uw organisatie? = 10 tot 49

Hoeveel werknemers heeft uw organisatie? = 50 tot 249

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	13	1	5	3.38	1.325
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	13	1	5	2.85	1.144
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	13	1	4	2.85	1.214
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	13	1	4	2.46	.967
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	13	1	5	2.46	1.127
Valid N (listwise)	13				

a. Hoeveel werknemers heeft uw organisatie? = 50 tot 249

In welke fase met BI staan jullie als organisatie? = De verkenningsfase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	5	3	4	3.60	.548
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	5	3	5	3.60	.894
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	5	3	4	3.60	.548
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	5	1	3	2.60	.894
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	5	1	5	3.20	1.483
Valid N (listwise)	5				

a. In welke fase met BI staan jullie als organisatie? = De verkenningsfase

In welke fase met BI staan jullie als organisatie? = De ontwerpfase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	1	4	4	4.00	.
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	1	3	3	3.00	.
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	1	2	2	2.00	.
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	1	3	3	3.00	.
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	1	3	3	3.00	.
Valid N (listwise)	1				

a. In welke fase met BI staan jullie als organisatie? = De ontwerpfase

In welke fase met BI staan jullie als organisatie? = De implementatiefase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	2	3	4	3.50	.707
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	2	1	4	2.50	2.121
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	2	2	3	2.50	.707
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	2	2	3	2.50	.707
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	2	2	3	2.50	.707
Valid N (listwise)	2				

a. In welke fase met BI staan jullie als organisatie? = De implementatiefase

In welke fase met BI staan jullie als organisatie? = De gebruiksfase

Descriptive Statistics[a]

	N	Minimum	Maximum	Mean	Std. Deviation
KENNIS - Onze organisatie heeft last (gehad) van een gebrek aan kennis als het gaat om effectief gebruik van BI.	17	1	5	3.18	1.425
KOSTEN - De kosten die gepaard gaan met het implementeren en gebruiken van BI vormen/vormden een aanzienlijke barrière voor onze organisatie.	17	1	5	2.53	1.231
MIDDELEN - Onze organisatie staat/stond voor aanzienlijke uitdagingen wat betreft middelen bij het implementeren en gebruiken van BI.	17	1	4	2.47	1.231
DATA PRIVACY & SECURITY - Onze organisatie ervaart/ervaarde uitdagingen wat betreft gegevensprivacy en beveiliging bij het gebruik van BI.	17	1	5	2.41	1.121
BI-INFRASTRUCTUUR - Onze organisatie beschikt (e) niet over de noodzakelijke infrastructuur om BI effectief te implementeren en te gebruiken.	17	1	5	2.41	1.372
Valid N (listwise)	17				

a. In welke fase met BI staan jullie als organisatie? = De gebruiksfase

APPENDIX VI. REMAINING RESULT FIGURES

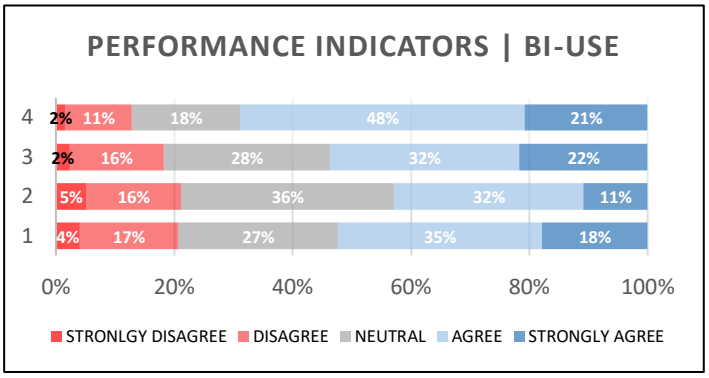

Figure 1. Likert Scale Distribution | BI-USE

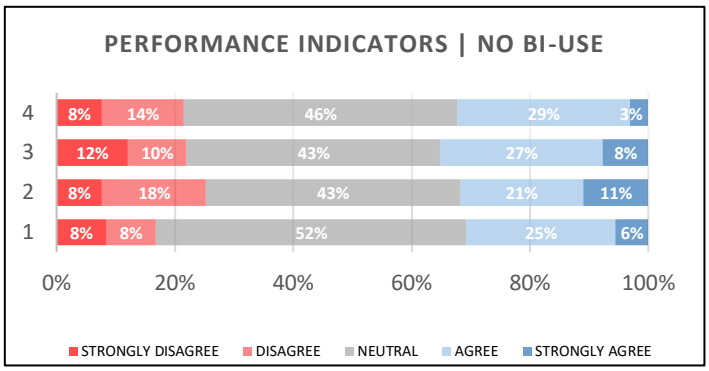

Figure 2. Likert Scale Distribution | NO BI-USE

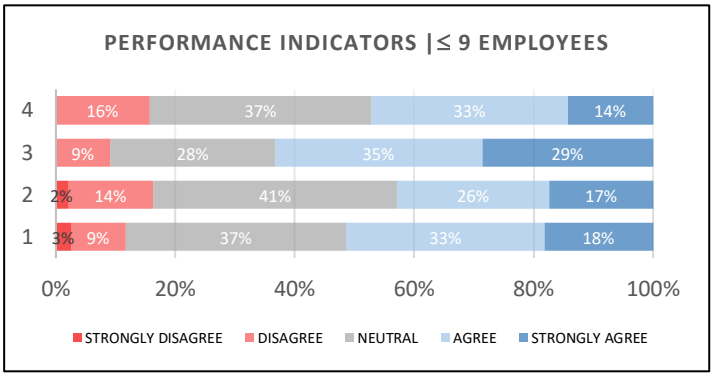

Figure 3. Likert Scale Distribution | 9 or less Employees

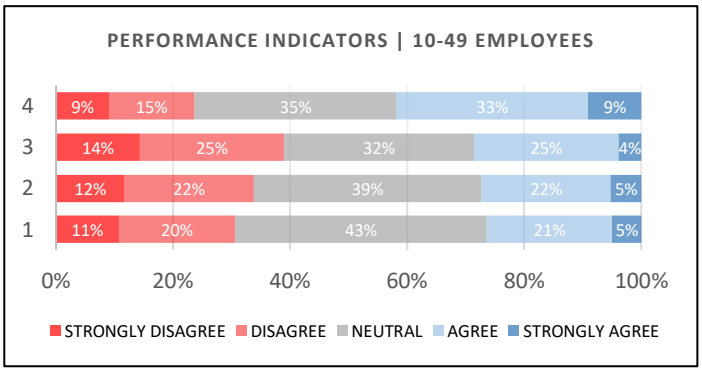

Figure 4. Likert Scale Distribution | 10 to 49 Employees

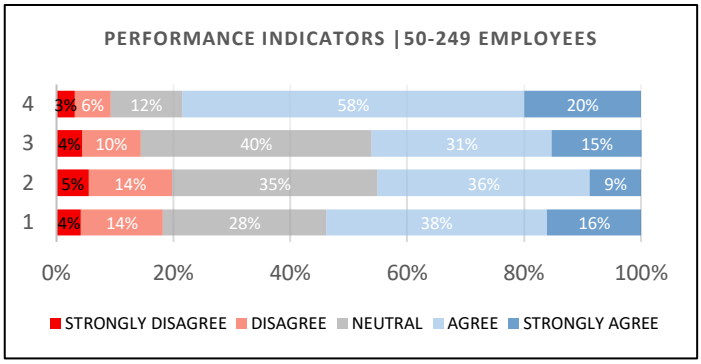

Figure 5. Likert Scale Distribution | 50 to 249 Employees

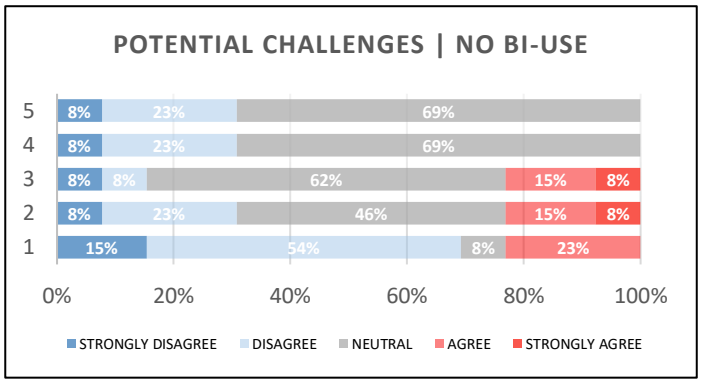

Figure 6. Likert Scale Distribution | No BI-USE

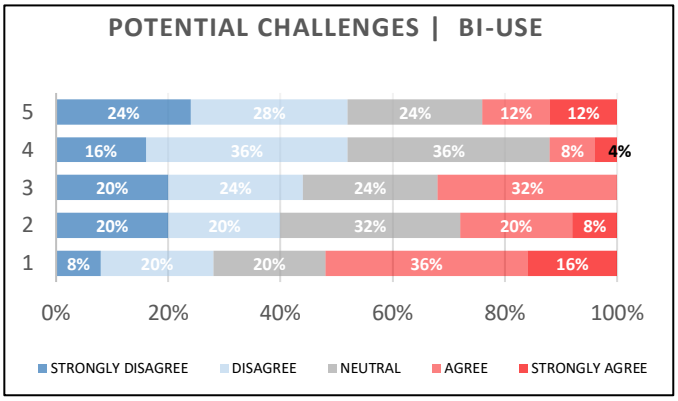

Figure 7. Likert Scale Distribution | BI-USE

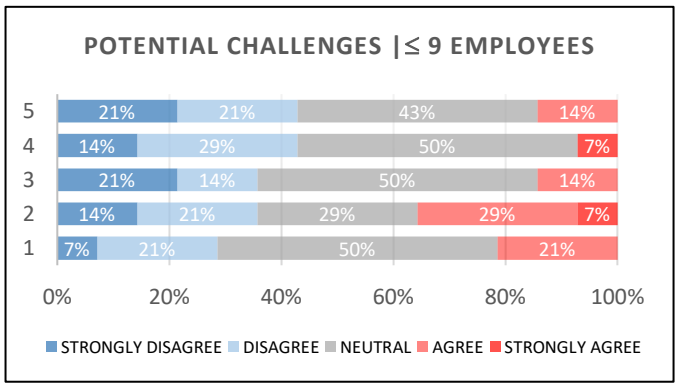

Figure 8. Likert Scale Distribution | 9 or less Employees

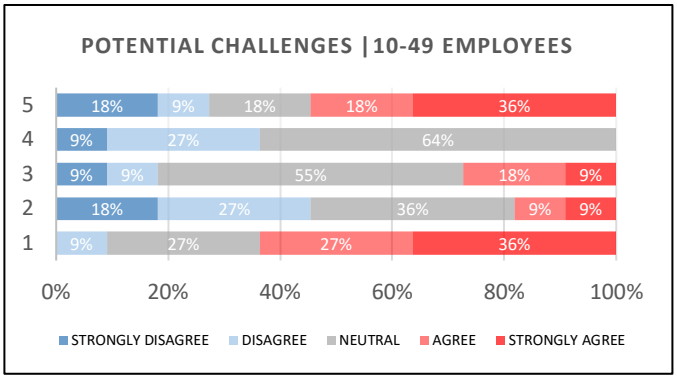

Figure 9. Likert Scale Distribution | 10 to 49 Employees

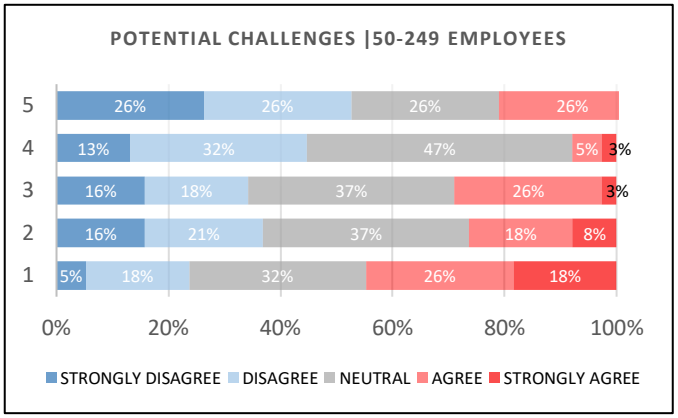

Figure 10. Likert Scale Distribution | 50 to 249 Employees