Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technology

Master's Thesis

The Impact of Business Intelligence on Employee Productivity

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Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Senator Obinwanne Owuala

Informatics

Thesis title

The impact of business intelligence on employee productivity

Objectives of thesis

The main objective of this thesis is to analyze the impact of business intelligence on employee productivity. This includes identifying factors influencing BI usage, examining the relationship between BI and job satisfaction, and assessing the state of BI in selected companies. These objectives collectively contribute to understanding the influence of BI on productivity and exploring potential contextual factors that shape this relationship in a selected company.

Methodology

This study will use combined methods of research design. The first phase of the study will involve a survey of employees from a selected company to gather quantitative data on the use of business intelligence and its impact on productivity. The survey will be administered through online platforms, and data will be analyzed using descriptive and inferential statistics. The collected data will be subjected to rigorous quantitative analysis procedures using statistical software. The specific techniques employed will be contingent upon the nature of the research questions and the type of data collected. linear regression analysis will also be utilized to look into how well BI utilization predicts staff productivity.

The proposed extent of the thesis
60 – 80 pages

Keywords Business Intelligence, Big Data, Competitive Edge, Information Systems, Knowledge-Based Theory, Organizational Learning Theory, Data Warehousing, Data, Mining, Analysis, Performance Management, IS Capability Theory, Employee Productivity, Analytical A pplications

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Recommended information sources

Amit, J., & Aggawal, A.K. Business Intelligence. Himalaya Publishing House, 2011. ISBN 9789250244777

Arefin M., et al. "The Impact of Business Intelligence on Organization'S Effectiveness: An Empirical Study." Journal of Systems and Information Technology, vol. 17, no. 3, 2015, p. 263– 285 , https://doi.org/10.1108/jsit-09-2014-0067.

Buhasho E., et al. "Business Intelligence, Organisational Capability, Complementary Resources and Firm Performance." International Journal of Economics, Commerce and Management., vol. 6, no. 12 , 2018, http://ijecm.co.uk/wp-content/uploads/2018/12/61240.pdf.

Chen H., et al. "Business Intelligence and Analytics: From Big Data to Big Impact Firm Performance." Management Information Systems Quarterly, vol. 36, no. 4, 2012, p. 1165 , https://doi.org/10.2307/41703503.

Olszak C. Towards an Understanding Business Intelligence. A Dynamic Capability-Based Framework for Business Intelligence. Computer Science and Information Systems (FedCSIS), 2019 Federated Conference on . Polskie Towarzystwo Informatyczne, 2014, https://doi.org/10.15439/2014f68. Shollo, Arisa and Kautz, Karlheinz, "Towards an Understanding of Business Intelligence" (2010). ACIS 2010 Proceedings. https://aisel.aisnet.org/acis2010/86 Shollo, A. The Role of Business Intelligence in Organizational Decision-making, PhD Series, No. 10. 2013 ,

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Declaration

I declare that I have worked on my Master's thesis titled" The impact of Business intelligence on employee productivity" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on the 29th of March 2024

Owuala Senator Obinwanne

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Most of all my sincere gratitude goes to God almighty for his unfailing love and strength in the midst of chaos around the time of this project work. At the end of it all God did!

Dedication

This work is dedicated to the all the hardworking individuals who strive tirelessly to unlock the potential of data-driven potentials, this thesis is a testament to their relentless pursuit of excellence. May their commitment inspire future generations to take advantage of the power of business intelligence in enhancing employee productivity, driving innovation, and fostering success in the dynamic landscape of modern organizations.

The Impact of Business Intelligence on Employee Productivity

Abstract

This study looks into the relationship between Business Intelligence (BI) utilization and employee productivity in organizational settings. Through quantitative analysis of data collected from employees of Company X and other organizations implementing BI, a positive correlation between BI usage and productivity was identified. The regression analysis revealed that BI utilization can account for approximately 40.6% of the variance in employee productivity. Descriptive statistics indicated a mean employee productivity score of 3.8529 with a standard deviation of 0.47450, while the mean BI utilization score was 3.6588 with a standard deviation of 0.64813. These findings emphasizes the strategic importance of BI in optimizing workforce performance and highlight the potential for organizations to leverage BI tools comprehensively. While the study acknowledges limitations in the subjectivity of self-reported data and the constraints of correlation analysis, it provides valuable perception for organizations seeking to enhance employee efficiency through effective BI implementation.

Keywords: Business Intelligence, Employee Productivity, Regression Analysis, Descriptive Statistics

Vliv Business Intelligence na produktivitu zaměstnanců

Abstrakt

Tato studie zkoumá vztah mezi využitím Business Intelligence (BI) a produktivitou zaměstnanců v organizačním prostředí. Prostřednictvím kvantitativní analýzy dat shromážděných od zaměstnanců Společnosti X a dalších organizací implementujících BI byla identifikována pozitivní korelace mezi využitím BI a produktivitou. Regresní analýza odhalila, že využití BI může představovat přibližně 40,6 % rozptylu v produktivitě zaměstnanců. Popisné statistiky uváděly průměrné skóre produktivity zaměstnanců 3,8529 se směrodatnou odchylkou 0,47450, zatímco průměrné skóre využití BI bylo 3,6588 se směrodatnou odchylkou 0,64813. Tato zjištění podtrhuje strategický význam BI při optimalizaci výkonu pracovní síly a zdůrazňuje potenciál organizací využívat nástroje BI komplexně. Přestože studie uznává omezení v subjektivitě sebevykazovaných dat a omezení korelační analýzy, poskytuje cenné poznatky pro organizace, které chtějí zvýšit efektivitu zaměstnanců prostřednictvím efektivní implementace BI.

Klíčová slova: Business Intelligence, Produktivita zaměstnanců, Regresní analýza, Popisná statistika

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1.0 Introduction

There is a rapid change in the corporate environment. This is influenced by various factors including the complexity, and vast amounts of data coming via social networks and mobile communications (Buhasho et al, 2018). As a result, fast access to accurate and sufficient information is important for any company to gain a competitive edge and improve their performance (Shollo, 2013). Unfortunately, existing technologies and programming paradigms are unable to handle the large amount of data generated (Sirin & Karacan, 2017; Baars & Kemper, 2008). But in the last ten years, technology has advanced so quickly that data processing has become easier, enabling companies to handle enormous amounts of data at a high rate and in a range of formats, such as emails, web pages, sales force reports, and images (referred to as "big data"). (Sirin & Karacan, 2017).

A popular idea in the globalization period, business intelligence (BI) is thought to be critical to an organization's success (Sebanescu, 2012; Işk, Jones, & Sidorova, 2013). Business intelligence's (BI) primary objective is to transform raw data into useful, practical knowledge. According to LaValle, Lesser, Shockley, Hopkins, and Kruschwitz (2011), newly gained knowledge helps stakeholders make better decisions and take the necessary steps, which benefits a company.

Applications of business intelligence have a huge positive impact on business performance (Anderson-Lehman, Watson, Wixom & Hoffer, 2004; Fink, Yogev & Even, 2017; Brynjolfsson, Hitt & Kim, 2011). According to a report by Durcevic (2018), Michigan State University saved $34,434 annually and saw a 55% return on investment when they invested in business intelligence (BI). This allowed staff members to focus on value-adding work by eliminating the need for manual data analysis. BI is one of the most crucial investments for enterprises, according to a different study that involved over 400 information and communication technology (ICT) specialists from 93 different countries (Arefin, Hoque, & Bao, 2015; Yiu, Yeung, & Cheng, 2021). Globally, as at 2017, BI investment stood at $18.3 billion. At the end of 2020, the market was values at $22.8 billion (Moore, 2017) and it is projected to reach $ 29.48 billion in 2022 (Sanyal, 2021). According to Elbashir, Collier, and Davern (2008), the amount of money spent on BI demonstrates its strategic importance and highlights the necessity for additional academic study in this field. There is a lack of a broad paradigm to incorporate findings on moderating and mediating variables (Trieu, 2017; Eybers,

2015) and fragmentation in the BI research about how BI impacts performance (Audzeyeva & Hudson, 2016). The technology platforms, methods, and capabilities that can be used to create business intelligence systems for a range of applications in fields like performance management, supply chain analytics, risk analysis and mitigation, and revenue and profit improvement are provided by business intelligence (BI) tools (Agarwal and Amit, 2011).

The Information Systems (IS) Capability Theory by Peppard & Ward (2004), Knowledge Based theory by Grant (1996), and Organizational Learning theory by Fiol and Lyles (1985) provide the theoretical framework for this investigation. The idea of BI capacity is developed by IS capability theory. Understanding how data from BI facilitates learning and creates new knowledge that leads to better decision making is made possible by the application of knowledge-based theory and organizational learning theory. Although organizational capabilities are influenced by BI capability, greater company performance is a predicate of these capabilities (Kohli & Grover, 2008). Nonetheless, according to Buhasho et al. (2018), complementary resources mediate the relationship between BI and performance.

Information has greater value to a firm when it is easier for it to access. Technology platforms, methodologies, and capabilities that can be used to develop business intelligence systems for a range of applications, including supply chain analytics, performance management, risk analysis and mitigation, and revenue and profit improvement, are provided by business intelligence (BI) tools (Amit & Aggarwal, 2011). When the marketing department is well informed about the installed base of goods and services, it can develop more focused and successful promotions. When customers, on the other hand, can easily verify that a product is in stock, they are considerably more likely to purchase it.

One of the two IT revolutions happening right now is the explosive emergence of new forms of intelligence (AI) produced by computers. The second, as most people are aware, is the Internet. The two revolutions are meant to reinforce and intensify one another. The combination of the two will cause company to be drastically reinvented (Amit and Aggarwal, 2011). Modern infrastructure, which includes a federated architecture—also referred to as modular—that can accommodate all of the components of a contemporary business intelligence system, is the foundation of today's BI systems. Among these systems are:

1. Data marts, data warehousing, and data warehouse systems
2. Applications for analysis

3. Tools for data mining and data mining
4. OLAP data processing analytical tools
5. Tools for queries and data reporting
6. Manufacturing instruments personalized reports
7. ELT, data loading, translation, and removal tools
8. Tools for systems management
9. Portals for corporate information
10. Database programs
11. Systems for managing knowledge

Business Intelligence (BI) is the capacity to quickly and accurately gather, compile, and evaluate data in order to identify opportunities and improve business decisions. A definition that is in line with modern business demands that it withstand pressure from an increasingly competitive environment in order to fulfill its dual obligations of survival and profitability. Therefore, any firm wishing to thrive in today's tremendously volatile market must invest in business intelligence (BI) and the many analytics solutions that enable demand management, revenue modeling, predictive analytics, and role-based intelligence within organizations. Since every Web-based program generates electronic user data, tracking decisions and actions done online is another benefit of the Internet in general and digital marketing in particular. The application of BI in marketing, sales, and service businesses worldwide has significantly increased as a result of this alone. In order to speed up decision-making, it is also changing the roles of analytics, reporting, and the enterprise-wide use of data intelligence and insight.

2.0 Objectives

2.1 Statement of the problem

The increasing complexity and volume of data in the current corporate landscape present a challenge for organizations seeking to gain a competitive advantage through informed decision-making. Despite the advancements in technology, existing systems often struggle to handle the vast amounts of data generated via social networks and mobile communications (Buhasho et al., 2018). This limitation impedes organizations from achieving the fast access to accurate and sufficient information crucial for success in today's dynamic business environment (Shollo, 2013).

While Business Intelligence (BI) has emerged as a solution to this challenge, the literature on BI's impact on organizational performance remains fragmented and lacks a unified framework (Audzeyeva & Hudson, 2016). Additionally, the significant financial investments in BI technologies underscore its strategic importance, necessitating a deeper understanding of how BI influences employee productivity and overall organizational outcomes (Elbashir et al., 2008).

2.2 Research Questions

In light of the aforementioned challenges and gaps in the literature, this study seeks to address the following research questions:

RQ1: To what extent does business intelligence impact employee productivity?

RQ2: What is the impact of business intelligence on employee productivity in organizations?

RQ3: What is the relationship between the use of business intelligence and employee job performance?

RQ4: How does the use of business intelligence affect employee job satisfaction?

2.3 Objective of Study

The above questions will pursue the primary objective of this study, which is to examine the impact of business intelligence on employee productivity. Specifically, the study aims to achieve the following objectives:

1. To identify the factors that influence the use of business intelligence in the workplace.
2. To explore the impact of business intelligence on employee productivity.
3. To analyze the impact of BI on employee productivity in these companies.
4. To examine the relationship between business intelligence and employee job satisfaction.
5. To investigate the moderating effect of organizational culture on the relationship between business intelligence and employee productivity.

2.4 Significance of the Study

This research holds significance both conceptually and practically. Theoretically, it adds to the body of existing knowledge by providing a comprehensive understanding of the relationships between worker productivity, corporate culture, and business intelligence. Through the integration of Organisational Learning Theory, Knowledge-Based Theory, and Information Systems (IS) Capability Theory, the study aims to establish a robust framework that elucidates the ways in which BI impacts organisational outcomes.

Practically speaking, the study's conclusions can help firms optimise the use of BI tools to raise worker productivity and job happiness. Comprehending the moderating function of organisational culture can additionally aid in customising business intelligence techniques to the unique circumstances of every organisation, thus optimising the favourable influence on overall efficacy. The results of this study should be especially helpful for corporate executives, legislators, and academics who are trying to understand how business intelligence is changing and how it changes affect worker productivity in the modern business world.

2.5 Scope of the Study

The purpose of this study is to find out how worker productivity is impacted by business intelligence in the context of contemporary multinational corporations. In particular, the study will examine the factors that impact the use of business information, the ways in which business

intelligence impacts employee productivity, and the connections between business intelligence and job satisfaction. Businesses who have adopted business intelligence methodologies and technology will be covered by the study, which spans a variety of industries and sectors. However, rather than diving into the technical details of individual BI systems, the study will concentrate on the more general organizational and human components of BI deployment.

2.6 Limitations of the Study

Despite the efforts to conduct a thorough investigation, it is critical to recognise the particular limitations of this research. Firstly, the study is vulnerable to the limitations that come with survey-based approaches, including restricted generalizability and possible response bias. Furthermore, the dynamic nature of organizational contexts and technology may have an impact on the study's findings, which could have an impact on the conclusions' long-term validity. Moreover, the study does not include a comprehensive examination of every BI tool currently in use and how each one affects worker productivity in particular. Rather, it offers a broad picture based on the more general trends and patterns that have been noticed in a variety of companies. The limitations of the investigation are also influenced by time and budgetary restrictions. These variables may have an effect on the sample size and the level of analysis in particular areas.

2.7 Operational Definition of Terms

To ensure clarity and consistency in the interpretation of key concepts, the following terms are operationally defined within the context of this study:

- **Business Intelligence (BI):** In this study, BI refers to the use of technology platforms, techniques, and capabilities to collect, analyze, and transform data into valuable knowledge for organizational decision-making (Amit & Aggarwal, 2011).

- **Employee Productivity:** Employee productivity is defined as the efficiency and effectiveness with which employees contribute to achieving organizational goals, measured by output quantity and quality within a given timeframe.

- **Organizational Culture:** Organizational culture is the shared values, beliefs, and practices within an organization that shape its members' behavior and influence the overall work environment.

- **Information Systems (IS) Capability Theory:** The theoretical framework posits that BI capability influences the development of organizational capabilities, which, in turn, are antecedents of superior firm performance (Peppard & Ward, 2004; Kohli & Grover, 2008).

- **Knowledge-Based Theory:** This theory, put out by Grant (1996), highlights how data from BI may support organisational learning, which in turn can provide new knowledge and enhance decision-making.

- **Organizational Learning Theory:** The Fiol and Lyles' (1985) highlights the significance of organisational learning in improving decision-making procedures and overall performance.

3.0 Literature Review

This chapter will address the components, tools, methods, and benefits of business intelligence (BI) in organisations in addition to reviewing the literature that will be used to support this study. Due to the rapid expansion in data, an increasing number of firms are utilising business intelligence (BI) solutions to collect and extract relevant data that can be used for decisionmaking (Buhasho et al., 2018).

3.1 The Business Intelligence Concept

When looking back in time, Buhasho et al. (2018) claim that the idea of business intelligence is not new. Although the term "business intelligence" (BI) dates back to the 1800s, its widespread use did not occur until Dresner utilized it to promote the idea that individual businesses might use data in IT systems (Shollo, 2013). From several previous decisionmaking tools, BI is a logical next step (Ida & Graeme, 2015; Yogev, et al., 2013; Nagesh, 2004). As a result, different definitions of BI have been put out by academics and practitioners alike (Işk, et al., 2013).

Chen (2012) discovered that the term "business intelligence" is broad and includes a variety of technological aspects. Kumari (2013) defines business intelligence (BI) as an organization's ability to gather all of its skills and processes, turn them into knowledge, and then continuously deliver the right information to stakeholders through the right channel at the right time. Zeng et al. (2006) assert that business intelligence (BI) is a powerful set of tools and approaches that may improve business operations, corporate decision-making, and an organization's value.

Jourdan et al. (2008) and Olszak (2014) claim that organisational and technical components make up business intelligence. Business intelligence (BI) is the technology term for a collection of tools, software, and programmes used in data gathering, data analysis, and public information sharing from many sources (Olszak & Ziemba, 2006). Chen et al. (2012) state that the BI technical perspective evolved through three stages: 1.0, 2.0, and 3.0. Applications concentrate on extraction, transformation, and loading (ETL) procedures early in the development phase in order to find relevant data from transaction processing systems and arrange it in a format that is suitable for analysis. The primary analytical approaches employed at this period were statistical methods (Eggert & Alberts, 2020). Consequently, methods for handling the structured data that companies collected using antiquated systems were developed (Chen et al.,

2012). During the BI 1.0 period, three noteworthy technologies emerged: OLAP, data mining, and data warehousing (Olszak, 2014).

Olszak (2014) claims that modern technologies including opinion mining, web mining, semantic refining, and mobile mining approaches are characteristics of BI 2.0. They specialize in analyzing unstructured or semi-structured data, primarily from the internet and social media. According to Chen et al. (2012), a variety of text and web mining techniques can be used to gather vast amounts of online data on customers or products in order to make strategic decisions. Web analytics programs such as Google Analytics, for instance, can highlight users' browsing and purchasing habits by presenting a history of user activity through consumer click stream data logs. The gathering and analysis of data from various mobile devices and sensors is what defines business intelligence 3.0 (Olszak, 2014; Eggert & Alberts, 2020). BI 3.0 are concerned with the analysis of huge quantities of sensor data. The education and healthcare industries are two examples of how mobile technologies, like as smartphones and their whole downloadable ecosystems, are changing various aspects of society (Chen et al. 2012).

3.2 Key Components of BI Methodologies and Tools

Methodologies Business intelligence are commonly used for following business purposes to improve organizational performance:

1. Measurement processes to produce performance indicators that tell management of how well their company is doing in terms of achieving its objectives. The Corporate Performance Management technique, which comprises a number of tools including scorecards, dashboards, and portals, incorporates these activities. For some commercial objectives, a particular set of these instruments may serve as the metric. For instance, a balanced scorecard that shows measures for productivity, organizational learning, and growth together with portlets for financial indicators.

2. Analytics tasks to carry out Business Knowledge Discovery and to create quantitative procedures for the best possible decision-making. Data mining, statistical analytical methods that forecast or offer certainty measurements on facts, forecasting, predictive analytics, predictive modeling, and business process modeling are some of the instruments used in these operations.

3. Reporting initiatives to provide a framework especially for strategic reporting to support a company's strategic decision-making process. These tasks need the use of tools like OLAP and data visualization.

4. Actions that facilitate collaboration between various parties through electronic data interchange and data exchange. With the use of such an infrastructure, measurements might be distributed in real time via email, chat services, and/or interactive displays.

5. Through methods and techniques to identify, generate, represent, share, and facilitate adoption of experiences that are actual business knowledge, knowledge management activities can make company data driven.

Both simple and complex processes can be used by BI systems to collect data and turn it into valuable information. (Vitt et al, 2002). Due to this, it is crucial for businesses to comprehend the characteristics of BI systems that turn data from information into knowledge for choices. (Lloyd, 2011). Various writers have described the various parts that make up BI systems (Llyod, 2011; Vitt Luckevicher & Minser, 2002). Because different businesses have varied aims, BI providers are forced to constantly develop new components to help clients achieve their goals, which accounts for the variety of BI components (Al-ma'aitah, 2013). All BI applications require a minimum of four components, while the number of components stated by the authors may vary depending on the business goals and the complexity of the BI system (Llyod, 2011; Mustafa & Ziyad 2013; Sharda et al, 2014.).

Data storage, business analytics, business performance management, and user interface were the four key components that Sharda, and his colleagues determined to be necessary (Sharda, Delen, Turdan 2014). Two other authors highlighted four essential components: data warehouses, online analytics processing (OLAP) techniques, extraction, transformation, and load (ETL) tools, and data mining (Lloyd 2011; Olszak & Ziemba 2006).

3.2.1 Data Warehouse

Olzak and Ziemba (2006) defined a data warehouse as a centralized location designed to integrate data and enable a heterogeneous decision-making environment. A data warehouse can be more simply defined as a data store that provides input to many data marts, or subjectspecific

stores (Vitt, Luckevich & Minser, 2002). Generally, a range of other operational support systems, including corporate planning systems (ERP), customer management systems (CRM), and human resource systems, provide the data that is kept in a data warehouse (Vitt, Luckevich & Minser, 2002). Data warehouses are cited as the primary function of BI because they readily combine various dimensions from various business processes into one report, adding value to reporting (Ashrafi et al, 2015).

As a consequence, analysis across business processes is more powerful (Vitt, Luckevich & Minser, 2002). The data is extracted, transformed, and loaded from the working systems into the data repository with the aid of the ETL tool. Business people are typically not made aware of the ETL feature, but they do play a part in defining the business rules that decide the degree of data integration for business analytical purposes (Vitt, Luckevich & Minser, 2002).

Data sources include operational databases, historical data, external data from sources like the internet or market research companies, and data from the pre-existing data warehouse environment. Relational databases or any other type of data structure that is compatible with the line of business applications can serve as the data sources. Additionally, they can be found on a variety of platforms and contain both structured and unstructured data, including plaintext files, images, and other multimedia content, as well as organized data like spreadsheets and tables (Ranjan, 2009). Figure 2.1 below displays an architecture diagram for a data warehouse.

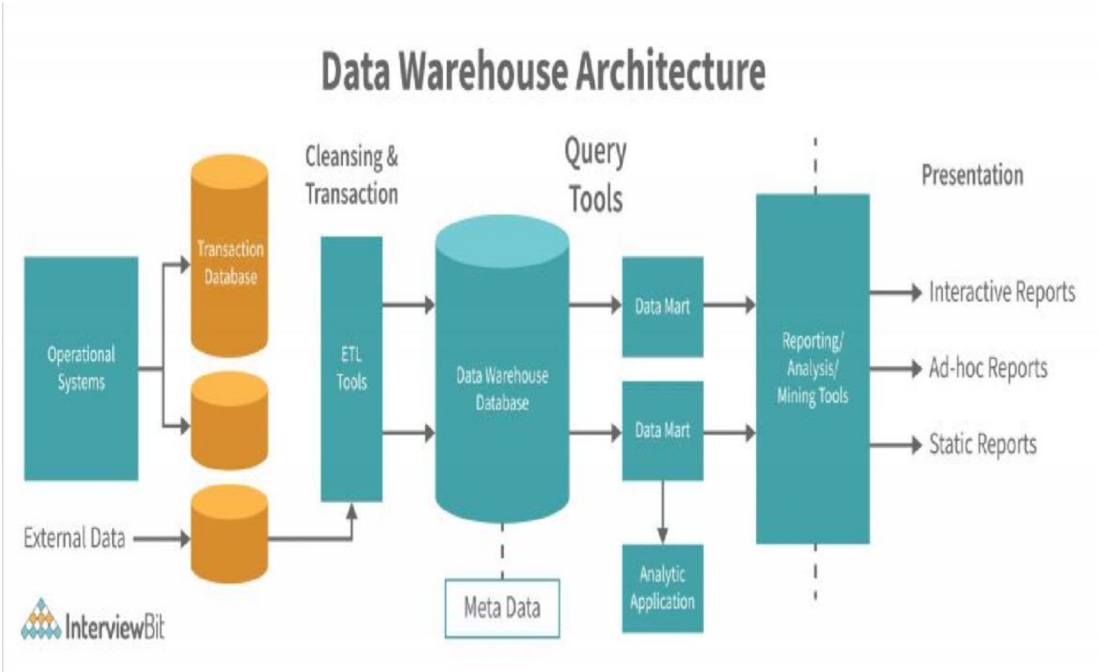

Figure 1: Data warehouse architecture (Source: Interview Bit, 2023)

3.2.2 Data Mining

Large-scale data sets can be explored and analyzed using data mining techniques to find relevant patterns and rules using automatic or semi-automated methods. Within the context of business intelligence, data mining is used to find and retrieve relevant information from corporate data warehouses that might help with decision-making. It is a tool that is used in conjunction with spreadsheets, OLAP, statistics, and basic data access in data analysis. Enumerated as the first stage of knowledge discovery in databases, data mining finds hidden patterns and relationships among data. The process of finding knowledge in databases involves using the database and any necessary selection, preprocessing, subsampling, selecting the best method for data transformation or representation, using data mining techniques to extract patterns from it, and assessing the data mining results to determine which subset of the extracted patterns can be considered knowledge (Fayyad et al, 1996).

When employing data mining tools, it is still important to understand the business, the data, or generic statistical procedures. Furthermore, data mining should still be utilized to validate the information it unearths; hence, it assists business analysts in formulating hypotheses but does not itself validate them (Rygielski et al., 2002). patterns mentioned that fall within the category of knowledge.

To manage enormous amounts of data, data mining makes use of a variety of techniques, including as statistics, neural networks, decision trees, genetic algorithms, and data visualization. The four main types of data mining outputs are associative, clustering, classification, and prediction. Finding association rules that demonstrate attribute-value conditions that frequently coexist in a dataset is the process of association. During the clustering process, a dataset is split up into several groups in order to maximize intra-class similarity and minimize inter-class similarity. By using properties to determine an object's categorization class, classification develops a function or model. A prediction model, according to Chen & Chen (2008), predicts continuous values or future patterns in data.

3.2.3 Data Mart

Data Marts are made to make it easier for users to analyze data. Usually, it supports one analytical application that is utilized by a business unit or department. According to Inmon (1999), a data mart is an assortment of topic areas arranged for decision support according to the requirements of a certain department. It can assist with a certain business unit, process, or function. Every department has a data mart that is optimized for access and tailored to meet its unique requirements. The data marts of one department and another are only somewhat comparable. Perhaps the most important is that every department controls the applications, data, hardware, and software that comprise the data mart (Inmon, 1999). Similar to data warehouses, data marts are collections of operational data that, through analysis of past trends and experiences, assist business professionals in their strategic planning. The primary distinction is that the building of a data mart is predicated on a specific necessity for a certain arrangement and categorization of specific data. A single organization may have multiple data marts.

3.2.4 Extraction-Transformation-Load (ETL)

A collection of tools for extracting, transforming, and loading data into business intelligence systems are referred to by this concept. These tools are principally in charge of moving data from transaction systems and the Internet to data warehouses. They comprise obtaining information from outside sources, converting it to satisfy useful specifications, like as quality standards, and then putting it into the desired locations, like databases or data warehouses.

3.2.5 Online Analytical Processing (OLAP)

In contrast to query and reporting tools, which prioritize data access for monitoring, OLAP is a capability that concentrates on data analysis and exploration. By examining "why" something is happening instead of just "what" is happening, OLAP shifts the focus. Users might drill down and explore a data collection to find specific features and trends in order to understand the "why" rather than knowing exactly what information they are looking for as stated by Amit (2011).

OLAP (year, quarter, month) provides interactive analysis by different dimensions (e.g., location, product, and time) and levels of detail. When discussing OLAP, "pivot" and "drill down" have become interchangeable concepts for a lot of people. Still, a lot of business intelligence solutions come with drill-down and pivot features that don't require an OLAP database or full-fledged OLAP engine running in the background. The lines between OLAP and reporting have become hazier as both the technology and the users have developed and grown. Report users want to dive right in when they see a problem with a particular statistic in an OLAP report; they want well-prepared reports based on multi-dimensional data. They don't want to have to start a new tool as they move from reporting to analysis and exploration. The following characteristics of OLAP tools keep them different from business query and reporting tools (Amit, 2011).

Multidimensional: Users examine numerical values from several dimensions, including time, location, and product. Conversely, a report could only contain one dimension, such a list of product prices as of a certain date.

Relentlessly rapid: OLAP refers to fast, or the speed of cognition, as users move between several dimensions and layers within a dimension. Waiting twenty-four hours, twenty-four minutes, or even twenty-four seconds for a response is not acceptable if a user double-clicks to drill-down from Year to Quarter. Although it goes without saying that report users do not desire slow reports, some reports require scheduling because they take so long to run.

Interactive: Users only interact with OLAP data in one way when drilling. Users can examine information from various angles, such as location or product, by pivoting. Users can apply filters to the data within these dimensions by selecting, for example, sales data for Baroda and Ahmedabad separately, or crime statistics for Mumbai and Surat separately. A non-OLAP report may contain this type of interaction, which is either nonexistent or has only recently become possible.

Different degrees of Aggregation: OLAP tools pre-aggregate data in various ways to guarantee consistent query times. On the other hand, reporting may have the least amount of information possible. For example, instead of breaking down sales by product, you may have individual line items for a specific order number.

Cross dimensional calculations: Complex computations increase with the number of dimensions. You may choose to examine market share or percentage contribution in OLAP. Subtotaling sales for a given state is necessary for these assessments, after which the percentage contribution for the entire region, nation, or planet must be determined. This percentage market share can be examined from a variety of angles by users, including real versus budget, this year versus previous year, and for a certain product category. These computations frequently require input numbers that customers would never see and must be completed in a specific order. On the other hand, simple subtotals or calculations of numbers that are shown on the report itself are frequently used in detailed reports.

3.2.6 Business Analytics

Business reporting and analysis processes can be carried out after the data has been loaded onto the data warehouse by compiling the data into formats that are conducive to business (for instance, excel sheets, graphs, charts, etc.) and distributing this information to business users (Vitt, Luckevich, & Minser, 2002). The term "business analytics" refers to the combined use of statistics, prediction, and optimization in business intelligence (BI) to help organizations identify and communicate significant trends in data (Kumar, 2013). Once more, this feature is supported by a variety of essential components, such as distributed systems, online analytical processing (OLAP), and relational databases (Kumar, 2013). Relationship databases work as the data warehouse's back end, whereas OLAP offers functions like pivoting, filtering, and aggregation (Vitt, Luckevich, & Minser, 2002). Based on these powerful functions BI is able to retrieve meaningful insights that can be susceptible for data interpretation.

3.2.7 Business Performance Management (BPM)

Researchers have come up with two definitions for the acronym BPM. In the first, the acronym's meaning was given as follows: business process management is a discipline that aids practitioners in identifying, designing, executing, documenting, measuring, monitoring, and controlling processes in order to achieve the intended outcomes that are in line with the enterprise's strategic goal (E. Fleacă & B. Fleacă, 2016). According to Dingli (2016), BPM is

described as Business Performance Management in the second definition, which is an expanding set of applications within the BI framework that gives businesses the tools they need to better manage their operations. For this reason, the company's total performance is tracked and managed using key performance indicators (KPI) (Kumar, 2013). These KPIs include things like revenue, sales, return on investment, overhead, and operating costs. In the past, business intelligence and performance management were handled differently, with finance controlling the latter and IT or specific business units managing the former. Because the information demands and goals of both sets of tools are closely related, it has become more common for a single vendor to offer both business intelligence and performance management capabilities. BI offers improved data access in basic implementations. Better data access is made possible by PM in more targeted projects, enabling individuals or the entire business to perform better (Amit and Aggarwal, 2011).

Through the provision of the following crucial elements, budgeting and planning skills, financial consolidation, and strategic or balanced scorecards—performance management tools assist in the optimization, management, and measurement of that performance. When performance is optimized in accordance with the objectives of the business, BI frequently serves as the foundation for performance management because (1) these applications require access to data for planning and measurement purposes and (2) what may initially appear to be a straightforward BI initiative for "better data access" becomes more purpose-driven. It is also simpler to balance the frequently disparate priorities of various business divisions and users when these requirements are measured against these objectives.

3.2.8 User Interface

The user interface (UI) provides a comprehensive graphical/pictorial view of corporate performance measurements trends and exceptions (Dingli, 2016). Along with the area performance and strategy, which is primarily consistent with the BPM elements, the user interface is a recent addition to the BI framework (Turban, 2010). The purpose of including these features was to give a more comprehensive summary of the BI components and how they work together.

Users can retrieve and access information, create visualized graphs based on their reporting choices, and more using the UI. The role of data visualization in the UI is crucial in supporting

and summarizing data analyses, into easily understandable forms, allowing analytics to become more focused (Elias, 2012). The UI offers features to users to search for information of a specific product, sold at a specific time and geographical area with limitless combinations, to identify new patterns (Pietrobon, Ogunmakinwa, 2011). The user interface consists of features such as; browers, portals, dashboard, charts, tables, reports, statistics etcetera.

3.3 The Role of BI in Enterprise Product

BI systems were formerly believed to be purely strategic decision-making support tools. Businesses have just begun to realize that these technologies may be able to handle largerscale operations. These days, companies employ business intelligence (BI) solutions to improve operational and tactical processes in supply chain, manufacturing, and customer service. The availability of current information, such as daily updates on customers and products, has enabled line managers to make more informed decisions more quickly

(Elbashir et al., 2008).

In the current economic climate, business intelligence (BI) is not only a luxury for global conglomerates but also a competitive edge for companies of all sizes, including small and medium-sized enterprises (SMEs). SMEs or businesses with a weak organizational culture may recognize the need based on certain metrics. The following are indicators that can be used to assess whether BI implementation throughout the company is necessary:

1. If a company generates vast amounts of data, only a small portion of that data is really utilized.
2. If locating past business records becomes crucial.
3. If the organization's information technology staff lacks the time necessary to generate reports.
4. If it turns out that improving corporate procedures would result in greater financial success.
5. If data organization is difficult.
6. If using true data instead of the current information system helps decision makers make better decisions.
7. If the creation of reports needs to be more intelligently organized.

8. In the event that the time spent gathering and evaluating data is deemed inefficient (Gangadharan & Swamy, 2004).

3.3.1 Application of BI Techniques in Business Functions

Since the majority of business functions rely on one another, so do the BI applications that are related to them. In addition to being utilized in strategic decision making, business intelligence (BI) solutions are frequently employed in the following areas;

- Customer analytics include customer happiness, customer lifetime value, personalized marketing, personalization, collaborative filtering, and customer profiling and loyalty.
- Analytics for Human Capital Productivity: Production efficiency, call center use and optimization.
- Business productivity analytics includes, but is not limited to, asset management, just-intime, financial reporting, capacity planning and optimization, defect analysis, risk management, and resource planning.
- Marketing, sales performance, and pipeline are all part of sales channel analytics.
- Supply chain analytics includes distribution analysis, inventory control, shipping, and supplier and vendor management.
- Behavior analysis includes social network analysis, fraud and abuse detection, online activity, purchasing trends, and customer attrition (Loshin, 2003).

Numerous studies about applying data mining methods to particular business situations have been published in the literature. The three primary components of business process intelligence tools are the Process Data Warehouse Loader, which gathers information from process logs; the Process Mining Engine, which builds complex models using data mining techniques to help users predict the occurrence of interesting behaviors in running processes and identify their causes; and the Cockpit, a graphical user interface for reporting to users (Grigoria et al., 2004).

Customer Relationship Management is another common application area for data extraction. (CRM). Data mining can be used in CRM apps to forecast prospects' profitability as active customers, the length of time they will remain active customers, and their likelihood of leaving. Furthermore, campaigns or other CRM technologies can be used to sustain the activity of customers from targeted customer groups by using data mining over time to foresee certain changes in customer data and lifecycle events. The two cornerstones of this marketing data intelligence approach to data mining for CRM are customer data transformation and customer knowledge discovery (Rygielski and Wang and Yen, 2002).

The hiring procedures used by businesses that depend mostly on human resources are the subject of another study. This method aims to improve hiring process accuracy by extracting actionable rules from the relationships between employee profile data and job behaviors. The outcomes of the data mining will also be used to inform decisions about how to improve HRM responsibilities including work redesign, job rotation, mentoring, and career path development. In order to forecast work performance and retention, the data is obtained from candidate demographics, including age, gender, length of service, marital status, and educational attainment (Chien and Chen, 2008).

Data mining is being used in another study to increase productivity in manufacturing settings. Many factors influence productivity in manufacturing settings, and sometimes these aspects depend on one another. This method is based on creating a knowledge base from which rules are derived using customized association rule mining techniques, updating all previously extracted dependent rules.

The last study I'll discuss examines how information technology investments affect productivity. Actually, it may be broadly defined as the examination of how some noteworthy investments affect an organization's productivity. This strategy is focused on comparing long-term productivity growth that is dependent on the growth accounting framework and employing data mining to identify organizational practices that either support or impede productivity growth. An expansion of association rule mining, this data mining method is known as association rule networking (Poon et al., 2009).

3.4 Key Determinant of Success with BI Systems

The most crucial factor among the many that influence BI system success is having a firm grasp of cooperation and communication at the process level. Then, there is constant improvement in the use of data analytics reporting tools that connect various databases. The Fortune 1,000's adoption of performance management and BI is shown in Figure 2.2, which

shows the shift in interest in these areas between 2008 and 2009. The analytical infrastructure ranks third, indicating how important a DSS platform is to long-term performance. The dependence on Search to provide immediate access to data in addition to dashboards and process score carding is further illustrated in Figure 2.2. But what ties the entire collection of adoption points together is the focus on a collaborative workflow or process that needs to be maintained in line with several KPIs (Rahman, 2015). Business intelligence (BI) systems that track their performance and create the foundation for sustained gains in productivity and profitability are the most effective means of automating the highly collaborative processes of demand, supply chain, revenue, and customer relationship management (CRM) (Rahman, 2015).

Finding tasks that heavily rely on massive amounts of data and are highly collaborative in nature is the most important factor in a BI implementation's success, as shown by Figure 2.2, Fortune 1,000 adoption of BI and Performance Management efforts. The quote-to-order process used by manufacturing firms is a great illustration of this kind of informationintensive procedure where the value of BI can be demonstrated, as will be explored later in this study.

A crucial element of a successful BI implementation is the utilization of balanced scorecards to assess cooperation and facilitate increased information sharing and interchange. It is essential for scorecards since resistance to change is the biggest barrier to the success of BI strategy.

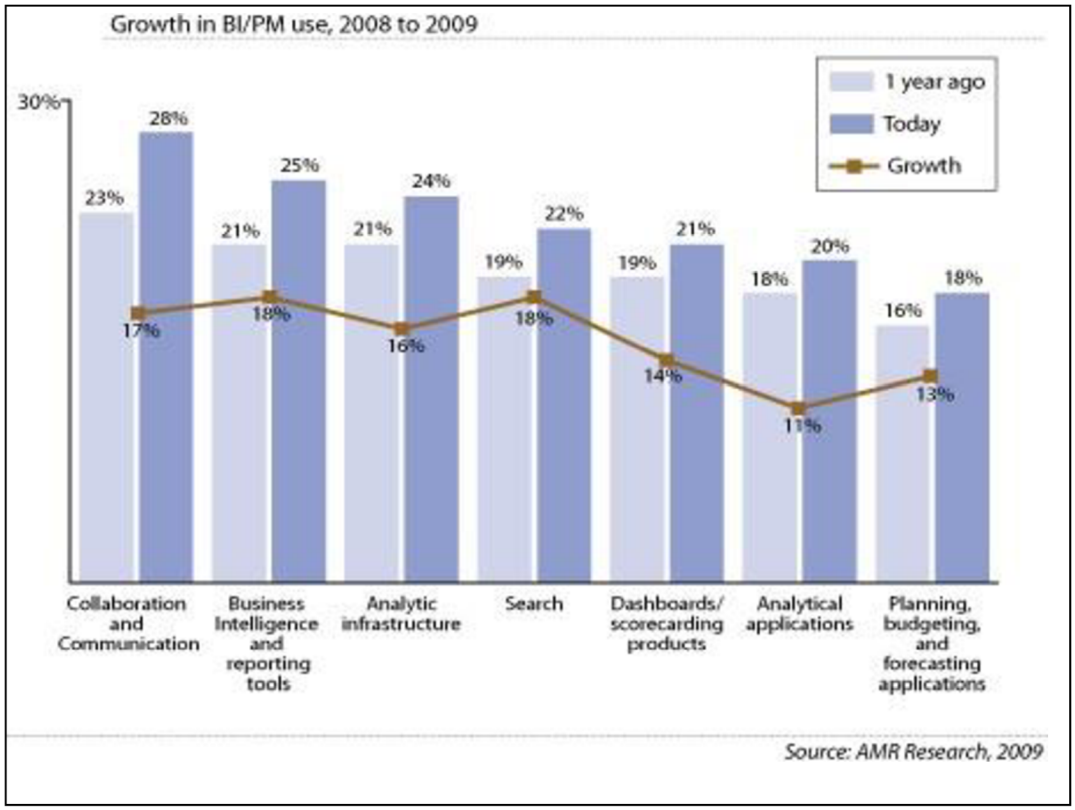

Figure 2: Fortune 1,000 Adoption of BI and Performance Management

(Source: Lamont, 2008)

Any BI project must identify activities that are highly collaborative and dependent on significant amounts of data in order to be successful, as shown by Figure 2.2, which shows how Fortune 1,000 companies have adopted BI and Performance Management initiatives. As will be covered later in this analysis, the quote-to-order process used by manufacturing companies is an excellent illustration of the kind of information-intensive operation where the advantages of business intelligence may be proven.

3.5 Factors to Ensure Successful BI System that led to Competitive Advantage

Before depending on BI systems and procedures to provide competitive results, it is often required to combine heterogeneous databases, data marts, and data warehouses in order to meet strategic plans and ambitions. The field of data warehousing is responsible for several advancements in cross-process collaboration and legacy system management. The process of gathering the information required for strategic plans, initiatives, and assessing the subsequent success of enterprises is known as data warehousing. In businesses, it is

commonly employed to provide a single, cohesive version of the truth. Utilizing BI as a data warehousing solution might provide you a significant competitive edge.

Mission-critical business processes must be automated for any BI application to be successful. Choosing which business process to automate is one of the most important lessons learned from using BI and DSS technologies to enable enhanced competitive performance. Many organizations are discovering after completing a significant amount of research that the workflows, strategies, and procedures related to NPDI have the most potential to gain from BI and DSS platform assistance. Rahman (2015) stated that producers can have a better understanding of the critical success factors in developing new goods by employing the concepts of business intelligence (BI) tools, such as data mining. This result is in line with what AMR Research has discovered on the application of BI to the creation and launch of new goods in manufacturing firms that depend on distribution networks. The capacity to establish a real-time analytics link between demand management, channel management, production planning, and production operations is a crucial element of a successful BI implementation.

In order for manufacturing to respond swiftly and precisely to customer demand, it is imperative that real-time sales operations data and sales forecasts be reliably captured (Rahman, 2015). This is another crucial success factor for BI installations. Supply chains can better align with the demands of channel partners and resellers by using the S&OP strategy. To assess continuous performance by process area, Key Performance Indicators (KPIs) and performance metrics are required for every process that links these components of a company's value chain. The data from the BI and DSS systems is what allows businesses to expand their S&OP procedures in order to increase productivity and adapt to changes in customer demand.

In order to describe the state of each strategy and the processes that are relied upon, BI systems are used first to integrate consumer demand data into the S&OP process and then to analyze the various aspects and generate dashboards and scorecards.

3.6 Business Intelligence, Organizational Capability and Firm Performance

Information management competency (IMC), which is enabled by IT, improves business abilities and boosts corporate performance, according to a previous study by Kohli and Grover

(2008). IT investment accelerates the development of targeted business capabilities. To bridge the gap between performance and BI, Modell (2005) created a two-stage strategy that leverages organization capabilities as the fundamental construct. Higher-order capabilities (process management, performance management, and customer management capabilities) make up organization capabilities. The specialists made use of previous data from a collaboration including roughly 80 organizations. The results validated the hypothesis (Buhasho et al., 2018) that the relationship between information capacity and business performance is influenced by organizational capability. The IMC has a greater effect on performance management capability, followed by process management, and lastly customer management capability, according to their study. The results of this study, however, cannot be applied to businesses worldwide. Since the data collection was restricted to businesses in the group, the researchers were able to control the influence of other factors, like culture.

Empirical evidence from research conducted in North America by Ray, Muhanna, and Barney (2005) indicates that the shared information enabled by IT has a major impact on a company's capacity to obtain more consumer intelligence and the associated business processes, which subsequently impacts business performance. The study used a crosssectional methodology to collect data from 104 firms. The study's generalizability was restricted due to the research environment's focus on a particular insurance sector area and strong emphasis on the customer experience. Companies use a variety of tactics to accomplish their objectives, which creates a number of chances for IT integration to improve operations (Melville et al., 2004). The ability of businesses to create analytical tools that enable real-time visibility into business processes, streamline process integration, and alert users of performance reductions is a major benefit of BI capacity. Robinson and Kalakota (2003). In their survey-based study, Elbashir et al. (2008) discovered that business intelligence (BI) helps companies by enhancing company processes (client insight benefits, inner procedure proficiency, and business partner interactions).

According to a survey study conducted in South Korea by Kim et al. (2011), IT capability affects process-oriented dynamic capability, which in turn affects company performance. In terms of optimizing operations and reducing expenses, it provides management with the capacity to enhance, adjust, or restructure corporate processes more successfully than other competing businesses. Nevertheless, other aspects (customer and performance management capability) were not considered in the investigation. Empirical research by Oliveira and

Maçada (2017) shows how IT competence improves process performance, which in turn affects firm performance. A representative sample of 150 major Brazilian firms was included in the study. As IT capabilities, infrastructure, human, management, and reconfiguration skills were operationalized.

3.6.1 Business Intelligence, Organizational Capability, Complementary Resources and Firm Performance

Based on empirical research on a conglomerate group, Mithas et al. (2011) created a conceptual model that connected organizational skills with IS supported capacity. A total of 160 observations were gathered from 77 businesses in the hospitality, banking, and manufacturing industries. The results of the study showed that the growth of organizational capacities is significantly influenced by IS competence (Buhasho et al., 2018). As a result, these abilities have a beneficial effect on business success. The other elements that affect how BI and performance interact were not included in the study.

Elbashir et al. conducted an empirical study on 1873 managers from 612 Australian firms in 2008. Buhasho et al. (2018) state that the only companies whose data was gathered were conglomerate businesses that actively utilized BI software offered by a single BI software vendor and had adopted BI systems. The study's findings demonstrated that business intelligence (BI) has an indirect impact on organizational level performance and a direct impact on supplier relationships, internal efficiency, and customer intelligence at the operational level (Buhasho et al., 2018). Although external validity was compromised due to the fact that the data originated from users of BI software from a single vendor, internal validity was guaranteed. Different vendors provide different BI solution capabilities. Furthermore, the study used subjective, perception-based metrics to evaluate the impact at the organizational and process levels. Lastly, the influence of culture and other variables that mitigate the impact of BI on performance was overlooked by the researchers.

Chen (2012) claims that there isn’t enough empirical BI-related research that particularly look at BI's effects and how other assets work in tandem with BI to provide higher returns. Elbashir et al. (2008) state that more research is required to look into potential mediating elements between BI capabilities and performance, such as culture. The Arefin Group (2015)

3.7 Important Perspectives for Establishing an Effective BI System

As BI technologies get more expensive, it becomes increasingly crucial to use them effectively. In order to do that, it is necessary to thoroughly analyze and identify the business system and to define business objectives in accordance with trustworthy success indicators. Important accomplishment A key component of an organization's overall performance are indicators. BI Systems can track these indicators for operational, tactical, and strategic goals as long as a thorough and efficient information system is set up inside the organization.

To create a successful BI system, a corporation must first assess its own business system and surroundings. Furthermore, regardless of how operational or strategic a process is, it should outline the methods for each one in its business system. Last but not least, the company needs a flexible approach for adapting to various decisions. The following categorizes the crucial viewpoints for creating a successful BI system:

1. Strategic Alignment: Senior management needs to acknowledge the value of the BI system. It is important to first comprehend the strategic drivers of the competitive environment. The next step is to resolve any doubts regarding the planning, budgeting, controlling, monitoring, measuring, evaluating, and performanceenhancing activities in connection to the strategic goals. Ultimately, technological procedures for locating, obtaining, integrating, staging, and distributing the data and information required by managers should be defined, along with tools and methodologies to support critical business operations.
2. Process engineering: To assess and track the effectiveness of operational, tactical, and strategic business functions, a structured framework must be established.
3. Change Management: Using the above-mentioned organized framework, processes can be altered as Process Engineering suggests (Williams and Williams 2006).

The aforementioned viewpoints are essential for institutionalizing the business and implementing the BI system. Other than these, the most common technological challenges businesses face while implementing business intelligence are as follows:

1. Granting large-scale resource access from devices with constrained storage.

2. Deciding on realistic performance goals and useful benchmarking templates.
3. Establishing a new information architecture to facilitate the creation and implementation of numerous applications.
4. Integrating with current company legacy systems and having several network connections.
5. Developing and maintaining solutions that function both inside and outside of network coverage.
6. Implementing role-based access control and security measures for the data warehouse (Gangadharan and Swamy, 2004).

3.7.1 The Role of Business Intelligence Systems in Organizations

Since they may be used to assess an organization's performance, business intelligence systems are a vital component. According to the definition of business intelligence

(Sabanovic & Sàilen, 2012: Popovič et al., 2012), it is evident that they improve decisionmaking. Popovič et al. (2012) state that business intelligence provides companies with superior information that is essential for making decisions. This is due to the fact that it enables knowledge workers to obtain information fast, assess it effectively, and provide the relevant information in an understandable way. Such an opportunity allows a corporation to make the right decision and take the right action. As a result, business intelligence can be defined as an organization's capacity for innovative problem-solving, planning, prediction, and thought (Popovič et al., 2012). Creative problem-solving and abstract thought are highly valued in corporate intelligence since it guarantees that the appropriate actions are taken to accomplish company goals and avert any potential business disruptions. This is only possible if the right business systems are implemented.

Business intelligence offers advantages beyond only assisting a company in making wise judgments about its operations. According to Sabanovic et al. (2012), business intelligence systems (BIS) have an effect on the entire company and enhance return on investment, draw in new business and suppliers, draw in top talent, and raise employee happiness. Business intelligence technologies improve visibility in the workplace by giving leaders a comprehensive understanding of the company and the environment it operates in (Sabanovic & Silen, 2012). This is made feasible by the fact that BIS facilitated the information gathering process for strategic planning.

These tactics aid in improving consumer targeting, hiring top people, securing the best suppliers, and ultimately generating a return on investment for a company. These tools are essential for assisting companies in making strategic choices. Organizations can avoid misinterpreting their goals by implementing BIS. Ensuring that all employees behave uniformly and in accordance with the organization's objectives is crucial (Sabanovic & Silen, 2012). Business intelligence can be used to gather competitive intelligence, which is crucial for formulating a company's strategy. Jenster & Silen (2013) define competitive intelligence as the processes of identifying, acquiring, evaluating, and sharing information that is used for making decisions. As a result, the process of strategic planning within a company is aided by the competitive intelligence obtained. As a result, a BIS leads to the collection of competition intelligence, which is subsequently applied to guide strategic decisions for a particular company.

Additionally, BIS plays a part in giving companies information for marketing-related tasks. Trade exhibitions are one venue for a company's marketing. Soilen (2010) asserts that trade shows have long been mainly disregarded in the domains of marketing research. Marketing's strong focus on customers over competitors and other market factors has made them less important. However, these days, trade exhibitions are becoming increasingly important for selling and promoting corporate gifts. business and verifying the business's market presence (Søilen, 2010). A company meets a range of clients at trade shows who provide important marketing information. Despite becoming common, face-to-face interaction is the primary means of information transfer at trade shows. During these trade shows, BIS could be utilized to collect marketing information. This is an example of intelligent data collection that may be used for integrated marketing initiatives. As a result, Søilen (2010) confirms that BIS is useful for obtaining data for marketing and associated purposes.

Lastly, the performance of a corporation is impacted by BIS. Enhancing a company's overall performance is the primary objective of business intelligence use. However, it might be difficult to ascertain the true outcome of these business procedures. While measuring the exact impact of any intelligent system a company deploys is difficult, the overall outcome can be used to gauge the system's effectiveness (Amara, Silen, & Vriens, 2012). According to Jenster & Silen (2013), BIS makes it easier to obtain competitive intelligence for use in making strategic decisions. This affects how a company does business. Furthermore, Jenster & Silen (2013) assert that the performance of businesses is impacted by strategic planning.

Therefore, BIS have a crucial role in determining the overall success of a firm.

3.7.2 Business Intelligence Systems and Small and Medium Enterprises

SMEs have not been as quick to adopt clever business solutions. They think that these approaches are effective primarily for large companies with substantial IT expenditures. Big businesses have the resources needed to launch, run, and hire highly skilled personnel to work on the BIS. This is similar to SMEs in that they are resource-constrained. Because these technologies are costly, small enterprises cannot afford to use them (Lueg & Lu 2013).

SMEs, however, might adopt BIS that need no technical expertise and are easy to maintain. One of the BIS for SMEs that is financially feasible is spreadsheets for basic data. Spreadsheets are useful tools for SMEs to store data and perform financial analysis, claim Lueg & Lu (2013). Spreadsheets can be used for applications like cell and holistic spreadsheet modeling, which are useful for obtaining crucial data.

For SMEs' customer management strategy, BIS are essential tools. Soilen (2012) found that SMEs use BIS to quickly and easily integrate information and manage clients. The subject of Silen's research was Swedish small companies. As a result, BIS are essential tools for SMEs because they facilitate client management. Since customers are one of the main sources of support for SMEs, the BIS can help businesses maintain strong relationships with their clients. Furthermore, according to Søilen (2012), how these organizations address information demands determines how they feel about BIS. The choice of intelligence systems to be used is also influenced by an individual's prior work experience. There is a study gap in this area when it comes to comparing the results of SMEs located outside of Sweden.

BIS can help small businesses be more effective with their budgeting. In a small firm, the budget is crucial since it shows how to balance several objectives while making the most of the limited resources at hand. The lack of understanding of the budgeting process, its simplicity, and user-friendly IT solutions are the main causes of budgeting issues among SMEs. Errors in the final budget are also caused by a lack of processes to verify the data utilized in budgeting. This results in the waste of corporate resources. According to (Lueg & Lu, 2013), budgeting efficiency may be increased by using business intelligence. This is due to business intelligence's increased user friendliness, openness, and simplicity, all of which are crucial for improving data validation and thus boosting budgeting effectiveness.

Further, business intelligence may also assist small enterprises in fending off rivalry. Businesses now operate in a dynamic atmosphere where competition appears to be the driving force behind all of the company's strategic initiatives. SMEs deal with this difficulty on a regular basis. Therefore, a SME should learn how to handle and overcome these problems posed by competition. This may be done by transforming a small firm to be proactive and quick to make decisions.

According to Ponis & Christou (2013), adopting competitive intelligence is one strategy small company firms may use to successfully handle competition. This is due to the process of competitive intelligence, which entails gathering information about rivals and using it to inform planning and decision-making processes in order to enhance performance. Competitive intelligence is part of business intelligence, and therefore it can be of help for a small-scale business enterprise (Ponis & Christou, 2013). Therefore, business intelligence can help SMEs to achieve a competitive advantage. This is supported by Guarda et al. (2013), who claim that small businesses who have adopted business intelligence have an advantage in the market since they can compete more successfully. This is due to the fact that they have more knowledge about both their clients and their rivals. Business intelligence data may be utilized by SMEs for strategic planning in the future, which can assist them avoid impending competition (Guarda et al., 2013).

Lastly, those who assert that SMEs cannot use BIS should rethink their position. This is because small organizations must cope with growing data quantities, and business intelligence may assist them in making sense of the data. The sole consideration for SMEs should be selecting the greatest business information that is consistent with their plan. The SMEs will benefit from having a competitive edge as a result.

Users of business intelligence systems benefit from enhanced knowledge of complicated information, which enables them to make quicker and better business choices and successfully accomplish company objectives (Dukić et al., 2016). The establishment of a foundation for boosting the performance and efficiency of the organization is one of the key benefits of business intelligence systems. Utilizing business information systems with an aggressive and timely approach results in the reengineering of current business processes, their modifications, and prospects (Lokken, 2001).

Users of business intelligence, including analysts, emphasize that companies using these kinds of technologies have benefits and advantages that are sometimes hard to pin down exactly. Businesses can gain a great deal of benefits from business intelligence because of its broad application in both internal and external contexts. The following is a definition of business intelligence benefits (Thompson 2006):

1. Measurement is a program that builds a hierarchy of benchmarking and performance indicators to tell business executives how their company is doing in terms of achieving its objectives.
2. Analytics is a program that develops quantitative procedures to help businesses learn and discover business knowledge while making the best judgments possible.
3. Reporting/Enterprise Reporting is a program that develops the foundation for Strategic Reporting, NOT Operational Reporting, to support a company's Strategic Management.
4. Collaboration/Collaboration platform: an application that encourages cooperation across many departments within and outside the company.
5. Knowledge management is a program designed to make the business data-driven by identifying, creating, representing, disseminating, and facilitating the adoption of experiences and ideas that are authentic business knowledge.

3.7.3 Use of Business Intelligence to Create Learning Organizations

Developing organizational capacities to take in information and generate organizational learning is essential to having an impact on the market and achieving corporate objectives.

According to Dukić et al. (2016), organizational learning originates from the process of altering human behavior, which then influences organizational behavior. activities must be taken in order to learn, and the results of these activities will teach us. As a result, timing and manner of information delivery regarding consequences are crucial. Businesses presently employ business intelligence (BI) to give the correct information at the right time and so facilitate analysis of the organization's activities in today's competitive market (Dukić et al., 2016). Traditionally, business intelligence has been used to plan and manage productivity and efficiency. However, in the modern day, its primary uses are for operational assistance and strategic goals such as improving results. Learning must be produced in order to impact the market and provide commercial results. Because of this, there ought

to be a chance to make the most of the data in business intelligence and develop a learning process using the information that has been evaluated (Dukić et al., 2016).

Learning is mostly formed through positive reinforcement, and in order for it to be effective, delivery methods must be taken into account. Therefore, in order for the information in business intelligence to contribute to the learning process, it must satisfy the same requirements as positive reinforcers. Thus, organizations should be able to alter their behavior and take action if the information complies with the following criteria: it should be immediate, particular, personal, certain, sincere, and frequent (Daniels, 1989; Braksick, 2007; Johnson et al, 2008; Olofsson, 2010). After then, information regarding the actions will be included into business intelligence to serve as the foundation for fresh research. Nowadays, companies are under a lot of pressure in the current economy to meet their objectives and compete in the tough markets. As such, it is critical to make wise decisions at the right time using reliable, accurate, and up-to-date information. relationships with customers, who now communicate with businesses through every imaginable medium—such as social media, telephones, and other devices—and who expect timely responses from them in reaction to the company's prudent business decisions. Decisions about business must be founded on reliable, up-to-date information. To ensure consistency across the entire organization, a knowledge-based continuous learning strategy must be established.

4.0 Methodology

This chapter outlines the methodological framework employed in this research investigation, which seeks to comprehensively examine the intricate relationship between business intelligence (BI) and employee productivity. To achieve this objective, a quantitative method of data collection and analysis techniques will be utilized. This chapter begins by providing the research design. Then it goes ahead to provide a rationale for the chosen research design, followed by a detailed description of the quantitative components of the study, including the study population, sampling technique, research instruments, method of data presentation and analysis, and reliability and validation test.

The collected data will be subjected to rigorous quantitative analysis procedures using statistical software. The specific techniques employed will be contingent upon the nature of the research questions and the type of data collected. Here's an overview of the anticipated analyses:

The features of the sample will be summed up and a basic knowledge of the data will be provided through the use of descriptive statistics. For important variables, this covers the central tendency (mean, median) and dispersion (standard deviation) metrics. To evaluate the direction and strength of the linear link between employee productivity and BI utilization, Pearson correlation analysis will be utilized. This study aims to investigate the degree to which changes in employee productivity levels are correlated with variations in BI utilization.

Equation:

The Pearson correlation coefficient (r) is calculated using the following formula:

$$r = \Sigma(xy) / \sqrt{(\Sigma x^2 * \Sigma y^2)}$$

where:

- $\Sigma (xy)$ represents the sum of the products of the deviations from the means of X and Y variables.
- Σx^2 represents the sum of the squared deviations from the mean for the X variable.
- Σy^2 represents the sum of the squared deviations from the mean for the Y variable.

A correlation coefficient between -1 and +1 will be present. A favorable correlation can be established between greater staff productivity scores and higher BI utilization scores. Conversely, an inverse relationship is shown by a negative correlation. A correlation coefficient that is close to zero indicates that there is little or no association between the variables.

Regression Analysis: We will use linear regression analysis to look into how well BI utilization predicts staff productivity. This approach will be used to generate a regression model that determines the linear relationship that best fits the data, with staff productivity as the dependent variable and BI use as the independent variable.

The analysis will clarify the extent to which changes in BI use can statistically account for variances in worker productivity. Moreover, the regression model will identify the precise contribution of BI consumption to worker productivity after correcting for other potential variables.

These data analysis techniques will provide a comprehensive understanding of the relationship between employee productivity and business intelligence (BI). The study aims to identify areas that require additional investigation in this emerging field and offer insight on the potential impacts of BI on worker performance through the use of regression analysis, correlation analysis, and descriptive statistics.

4.1 Research Design

Due to the complexity of the research question, this study used a descriptive correlational design with quantitative methods (Creswell & Plano Clark, 2018). There are several benefits when comparing this strategy to a single-method approach. Firstly, it allows for a deeper understanding of the subject matter by looking at it from multiple perspectives (Johnson & Onwuegbuzie, 2004). increases our understanding of the relationship between worker productivity and corporate intelligence (Creswell & Plano Clark, 2018).

The descriptive component of the design provided a comprehensive examination of the factors involved, elucidating the current state of business intelligence (BI) utilization and its potential impacts on employee productivity. This enabled us to identify trends, patterns, and correlations in the dataset, which enhanced our comprehension of the study topic overall.

4.2 Rationale for the Method chosen

The study's use of a quantitative method research design resulted from the decision to make use of the methodology's inherent advantages. As Creswell and Plano Clark (2018) confirm, this kind of approach offers a prism through which to view the complex relationship between business information (BI) and worker productivity.

The use of quantitative techniques in the study process allows for a detailed investigation of the variables at play as well as a sophisticated analysis of BI consumption habits and their potential effects on worker productivity. The ability to identify patterns, correlations, and trends in the dataset is made possible by this statistical analysis, which significantly advances our comprehension of the study as a whole. Additionally, the strategy aligns with the study's objective, which is to provide a comprehensive explanation of the link being studied.

4.3 Study Sample

The study group for the quantitative phase will consist of workers from Company X and other companies who have successfully incorporated BI into their operations. Due to their importance to the study's focus on employee productivity and business intelligence, these organizations were picked on purpose. A diverse mix of people from many departments will convey a wide range of perspectives and experiences.

It is critical to represent a range of experiences, perspectives, and corporate cultures, which is why this choice was made. Examining the similarities and differences in the ways that BI influences worker productivity in different circumstances is made simpler by incorporating a range of firms. This diversity enhances the generalizability of the study's findings and ensures a more nuanced understanding of the factors influencing BI utilization.

4.4 Sampling Technique and Sample Size

Determining the appropriate sample size and selecting the appropriate sampling procedure are crucial stages in ensuring the external validity and generalizability of study findings (Bryman, 2016). For the quantitative phase, which involves employees from Company X and other companies, purposeful sampling is employed. This method allows for the careful selection of participants based on how well they match the study's focus on employee productivity and

business intelligence (BI). Saunders, Lewis, and Thornhill (2019) state that purposeful sampling is particularly useful when attempting to capture distinctive characteristics or experiences within a community.

This selection technique is justified by the study issue's specificity, which centers on the usage of BI technologies in the organizational setting. The fact that participants were chosen who have firsthand knowledge of BI tools ensures that the information acquired is highly pertinent to the study's objectives. Moreover, a diverse representation of Company X employees from a number of departments is included in an effort to capture a diversity of perspectives, bringing a range of experiences and insights to the dataset (Creswell & Creswell, 2017).

When selecting the sample size, statistical power and representativeness are important considerations to make (Creswell & Creswell, 2017). Taking into account the objectives and scope of the research, a sample size that preserves practicality and allows for meaningful statistical analyses will be sought after. Comparing findings from past studies on worker productivity and business intelligence (e.g., Anderson-Lehman et al., 2004; Fink, Yogev, & Even, 2017) can help determine an optimal sample size. Furthermore, it is possible to ensure that the sample size chosen is sufficient for finding significant connections in the data by employing power analysis approaches (Creswell & Creswell, 2017).

This study will employ a medium effect size of 0.5, an alpha level of 0.05, and a power of 0.8 due to its exploratory character. These characteristics indicate that the minimal sample size needed for the quantitative phase is about 120. Formula:

$$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES} \right)^2$$

4.5 Research Instrument

The exploration of the intricate relationship between business intelligence (BI) and worker productivity required the use of a precisely constructed research tool. The instrument of choice for this inquiry was a standardized questionnaire that was strategically administered via the internet. The use of a questionnaire fits with the quantitative nature of the research, which aims to gather numerical data in an orderly fashion for statistical examination.

The questionnaire offers several advantages as a research instrument for analyzing the intricate facets of business intelligence and how they impact employee productivity. To begin with, employing questionnaires provides a standardized approach to gathering information from respondents, ensuring uniformity in the data obtained (Creswell & Creswell, 2017). This standardization is crucial when working with large sample sizes since it facilitates the efficient comparison of responses from a range of respondents.

Furthermore, because the questionnaire is structured, quantitative data can be gathered, offering quantified insights into participants' attitudes, experiences, and opinions about BI use and productivity-boosting effects. According to Dillman, Smyth, and Christian (2014), questionnaires are useful for obtaining explicit, self-reported data, which makes them suitable for studies looking into people's attitudes and behavior.

The decision to make the questionnaire available online is in line with recent advancements in data gathering methods. Respondent accessibility is enhanced and data collection is accelerated by online surveys, perhaps leading to higher response rates (Couper, 2008). In the digital age, when remote engagement is more common, accessibility is especially important.

Numerous scholarly investigations highlight the effectiveness of surveys in assessing characteristics like to those investigated in this study. In Chen, Preston, and Xia's (2010) study, for example, questionnaires were used to examine how business intelligence (BI) affected organizational performance. The study emphasized the value of quantitative tools for gathering a variety of viewpoints inside a predetermined framework.

4.6 Methods of Data Presentation and Analysis

For this study to yield useful insights and make reliable conclusions, the quantitative data analysis is essential. The way the data is presented and analyzed will be customized to the unique properties of each type of data.

Statistical analysis software will be utilized for the analysis of quantitative data obtained from the employee survey conducted by Company X. The organization's BI use patterns and staff productivity levels will be described using descriptive statistics, such as measures of central tendency and dispersion. We'll use inferential statistics, such regression and correlation analysis, to investigate the connections between BI factors and worker productivity. To help

with a clear and succinct representation of the findings, the data will be presented utilizing tables and charts. Information will be easier to acquire and analyze with the use of visual aids for statistical trends. The use of graphics is consistent with Tufte's (2001) guidelines for good data presentation.

4.7 Reliability and Validity Tests

It is crucial to confirm that the study's conclusions are reliable and credible (Lincoln & Guba, 1985). Tests for validity and reliability will be performed to evaluate the accuracy of the quantitative and qualitative data.

The reliability of the survey instrument will be evaluated using internal consistency metrics like Cronbach's alpha. In order to ensure the validity of the quantitative data, this will assess the degree to which the survey items consistently measure the target variables (Nunnally & Bernstein, 1994).

Construct validity, criterion-related validity, and content validity will all be used to guarantee validity. The alignment of survey items with accepted theories and frameworks about business intelligence and worker productivity will ensure content validity. Factor analysis will be used to evaluate construct validity, guaranteeing that the survey measures the underlying constructs correctly. By comparing the survey's capacity to forecast employee productivity results to predetermined criteria, criterion-related validity will be ascertained

(Campbell & Fiske, 1959).

5.0 Results

5.1 History and Environment of Selected Company

To successfully carry out this research for the purpose of confidentiality and data proctection, the original name of the selected company has been withheld and replaced with a fictional name "**Company X**". Company X Based in Oakbroo Terrace, Illinois is a privately held holding company in the moving industry that was formed when Allied Van Lines and North American Van Lines merged. The Latin phrase Servire, which meaning "to serve," was used to create the company name. When the private equity firm Clayton, Dubilier and Rice combined its Allied and North American businesses, the company was established in 1999. With the ticker code "SIR," it was traded on the New York Stock Exchange in 2002 under the new Company X name. The business has been privately held since 2002.

5.1.2 Brief History of Company X

In order to purchase North American Van Lines, Inc., one of the biggest U.S. moving services companies based on shipments, from Norfolk Southern Corporation in 1998, Clayton, Dubilier & Rice established Company X. After purchasing the Allied and Pickfords companies from NFC plc in 1999, the new company changed its name to Allied Worldwide. In 2002 and 2003, there were a number of additional purchases. The company noticed a trend where corporate clients were hiring relocation service providers to handle every part of an employee's move, including the relocation of household possessions. As a result, the business acquired the relocation services part of Cooperative Resource Services (CRS) in May 2002. In addition to acquiring PRS Europe of Belgium, another provider of relocation services, the company established an office in Hong Kong in 2003. Being the only company in the industry to have both moving and relocation companies under its umbrella, Company X's primary rivals are either one of them.

Allied Worldwide was renamed as Company X on February 11, 2002. Following the announcement of the company's first public offering, its common shares were listed under the symbol "SIR" on the New York Stock Exchange. In 2003, the year it went public, the company announced that it employed approximately 7,700 people and operated in 40 countries. Its service provider network operated in 175 nations. Its assets totaled $1.55 billion, while its revenue was $2.35 billion. Among its 2,500 business clients globally, 38% of

Fortune 500 corporations benefited from its services. It employed 760 moving agents, with a fleet of 7,800 automobiles.The business filed for bankruptcy in February 2008, underwent a reorganization, and became a private firm in May of that same year.

The business bought Peninsular Properties, a real estate firm offering a comprehensive range of destination services, in Hong Kong during 2011. In 2012, it bought Concept Mobility Services, a relocation and move management company based in São Paulo, Brazil. Under the Allied Pickfords name, it established an office in Doha, Qatar in 2013.

The process of turning gathered data into meaningful knowledge involves extensive research efforts, which are completed by data analysis, presentation, and discussion. This chapter dives into the core of the study, where unprocessed data is carefully examined, molded into interesting stories, and participated in productive discussions. With great aptness, Creswell and Plano Clark (2018) say that "data analysis and interpretation breathe life into research allowing researchers to move beyond simply describing what they found to making sense of it all." As a result, the real conclusions drawn from the information gathered—including data analysis, presentation, and discussion—are the main subject of this chapter.

The quantitative and qualitative empirical data will be coherently examined, presented, and debated. The chapter begins with a thorough examination of the quantitative data gathered from the Company X employee survey. This study sheds insight on the ways in which business intelligence (BI) is used and how it affects worker productivity.

5.2 Descriptive Analysis

The descriptive analysis of the quantitative data collected through the survey offers a preliminary snapshot of the relationship between business intelligence (BI) and employee

productivity (EP). Examining the means and standard deviations for both variables reveal some initial insights.

Table 1: Descriptive Statistics of employee productivity and business intelligence (Selfgenerated from SPSS)

Descriptive Statistics			
	Mean	Std. Deviation	N
EP	3.8529	.47450	162
BI	3.6588	.64813	162

As shown in the descriptive statistic above, the average employee productivity (EP) score is 3.85, with a standard deviation of 0.47. This suggests that the majority of respondents fall within a relatively narrow range around the mean, indicating a good level of homogeneity in self-reported productivity levels. The average score for BI use (BI) is 3.66, with a standard deviation of 0.65. This slightly lower mean, coupled with a marginally larger standard deviation, suggests that while most employees utilize BI tools to some extent, the frequency and intensity of use likely vary more significantly across the sample. Furthermore, figure 5.1 and 5.2, show the age range of the respondents and how long they have worked in their current workplace, respectively.

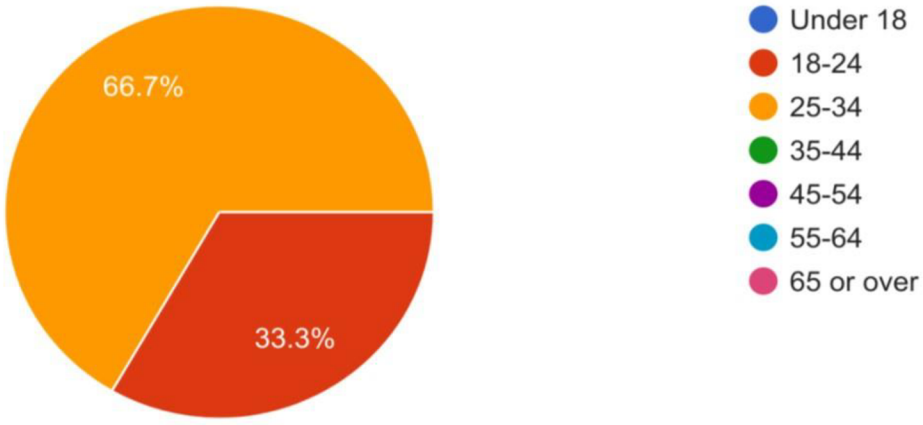

Figure 3: Age range of the respondents

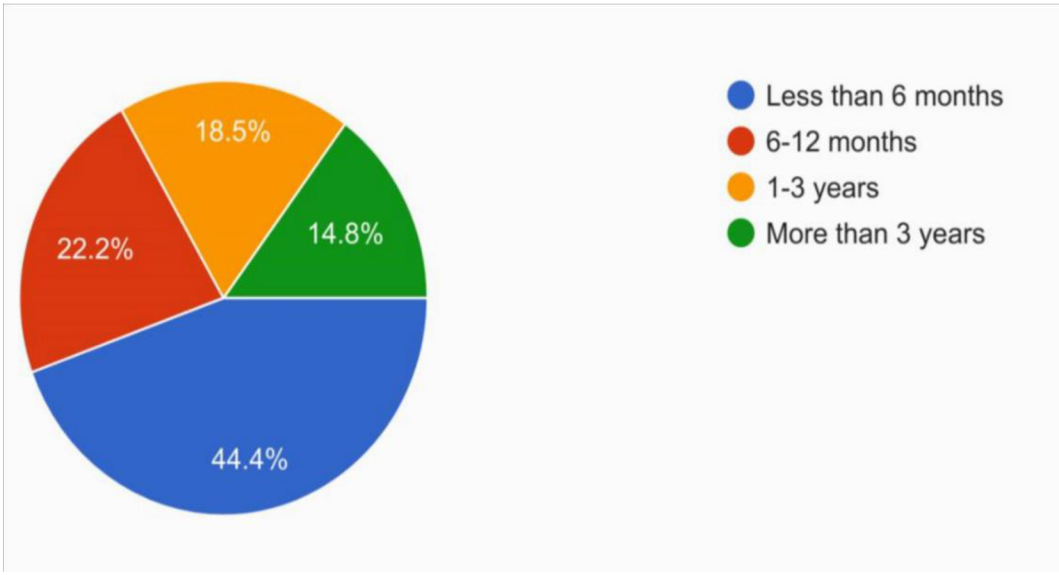

Figure 4: How long respondents have worked in their current workplace

5.3 Correlation Analysis

In the dataset, the correlation analysis looks at the relationship between business intelligence (BI) and employee productivity (EP). The Pearson correlation coefficient, represented by the Symbol "r," offers information on the direction and strength of the linear relationship between these two variables.

Subjectivity:

a) **Correlation coefficient interpretation:** Correlation coefficient interpretation is subject to interpretation. A significant correlation is indicated by a coefficient near +1 or -1, although the interpretation of the correlation's strength varies based on the particular variables under investigation and the context.

b) **Contextual knowledge:** Interpreting correlations necessitates knowing the relevant variables in their context. It's important to take into account additional factors that can affect the relationship between variables because correlations do not necessarily imply causality.

c) **Data quality:** Correlation analysis's outcomes may be impacted by the caliber of the data it uses. Measurement mistakes, outliers, and missing data can all have an impact on correlations, which can result in biased or untrustworthy results**.**

Limitations:

a) **Non-linear relationships:** The linear link between variables is assumed by correlation analysis. Correlations, however, might not fully represent non-linear relationships, which could result in incorrect interpretations.

b) **Narrow focus:** Correlation analysis can only assess the relationship between two variables at once. It may overlook more complex relationships involving multiple variables or interactions among them.

c) **Spurious correlations:** Sometimes, variables may appear to be correlated by chance alone. Without a theoretical basis or further analysis, it can be challenging to determine whether observed correlations are meaningful or simply coincidental.

d) **Directionality:** Correlation coefficients indicate the direction of the relationship (positive or negative), but they do not provide information about the direction of causality. Determining the directionality of causality often requires additional research or experimental design.

Table 2: Correlation between EP and BI (self-generated from SPSS)

Correlations			
		EP	BI
Pearson Correlation (r)	EP	1.000	.638
	BI	.638	1.000

Sig. (1-tailed)	EP	.	.003
	BI	.003	.
N	EP	162	162
	BI	162	162

Following the SPSS data shown above, the correlation coefficient between EP and BI is 0.638, indicating a moderately strong positive correlation. This suggests that as perceptions of business intelligence utilization increase, there is a tendency for employee productivity perceptions to also increase. The positive sign of the correlation coefficient signifies a direct relationship—higher BI perceptions align with higher employee productivity perceptions.

The p-value associated with the correlation coefficient is significant at the 0.05 level, with a value of .003 for both variables. This suggests that the observed correlation is unlikely to have occurred by chance, supporting the validity of the relationship identified. The significant p-value lends statistical support to the assertion that there is a meaningful association between BI and employee productivity.

5.4 Regression Analysis

The regression analysis delves deeper into the relationship between business intelligence (BI) use and employee productivity (EP), aiming to quantify the extent to which BI can predict employee performance. The model summary reveals a substantial relationship, with an Rsquared value of 0.406. This indicates that approximately 40.6% of the variance in employee productivity can be explained by the variance in BI use.

Table 3: Model summary of the regression analysis of EP and BI

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.638[a]	.406	.367	.37755

The ANOVA results further support the model's significance, with an F-statistic of 10.272 and a p-value of 0.006. This suggests that the model is unlikely to have occurred by chance, providing evidence for a genuine predictive relationship between BI and EP.

Table 4: ANOVA Result

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.464	1	1.464	10.272	.006[b]
	Residual	2.138	15	.143		
	Total	3.602	16			

Examining the regression coefficients sheds light on the specific nature of this relationship. The unstandardized coefficient for BI (B = 0.467) reveals that for every one-unit increase in BI use, there is an estimated 0.467-unit increase in employee productivity, holding other variables constant.

Table 5: Regression Coefficients

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
	1 (Constant)	2.145	.541		3.968	.001	.993	3.298
	BI	.467	.146	.638	3.205	.006	.156	.777

The standardized coefficient (Beta = 0.638) reinforces the strength of this association, indicating a moderately strong positive relationship between the two variables. The model's intercept (2.145) suggests that even when BI use is at its minimum, there is a baseline level of employee productivity present.

The residuals analysis provides additional insights into the model's accuracy and assumptions. The histogram of residuals confirms normality, supporting the validity of the regression

analysis. The relatively small standard error of the estimate (0.37755) suggests that the model fits the data reasonably well.

Table 6: Residuals Statistics (Self-generated from SPSS)

Residuals Statistics[a]					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.9853	4.2456	3.8529	.30251	17
Residual	-.69877	.61465	.00000	.36556	17
Std. Predicted Value	-2.868	1.298	.000	1.000	17
Std. Residual	-1.851	1.628	.000	.968	17

The regression analysis provides compelling evidence for the predictive power of business intelligence in relation to employee productivity. The model suggests that BI use can explain a significant proportion of the variance in employee performance, with a positive relationship between the two variables. As seen inf figure 4.3 below, the normality of the histogram chart further strengthens the reliability of the regression analysis, offering a valuable foundation for further exploration of the mechanisms and contexts that influence the impact of BI on employee productivity. The positive skew of the histogram, while subtle, provides a hint towards a potential ceiling effect, where extremely high levels of BI usage may not translate into proportional productivity gains. However, overall, the normality and positive skew align with our findings, suggesting a stable and positive relationship between BI use and employee productivity within the observed range.

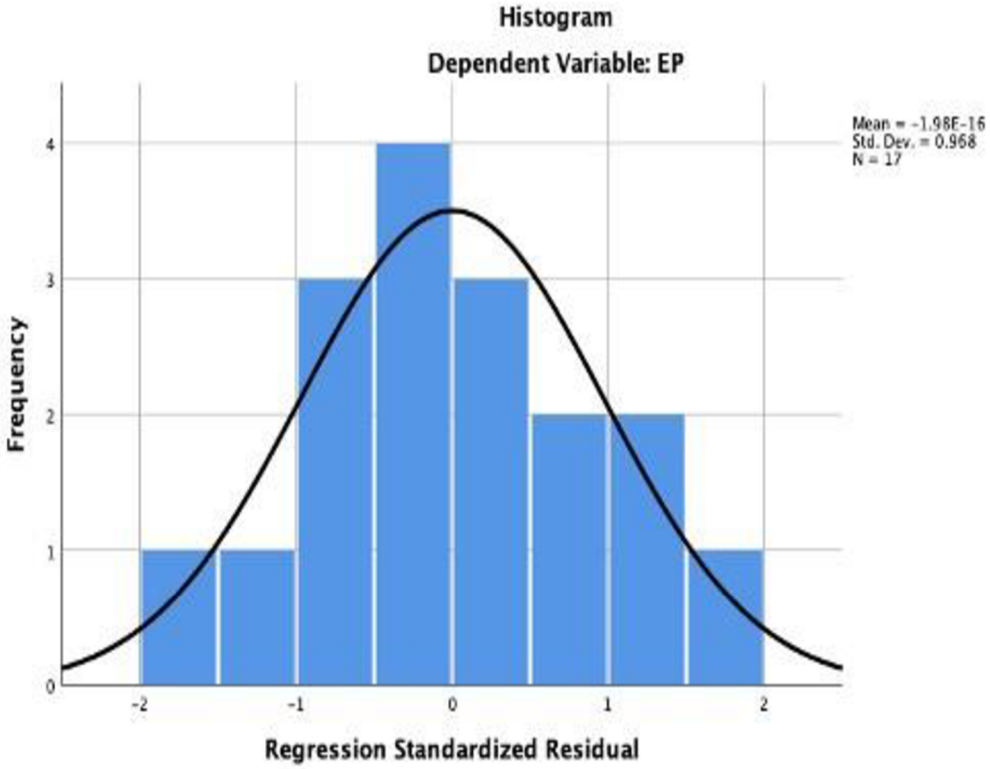

Figure 5: Regression Standardized Residual

6.0 Discussion

The data analysis and presentation have shown key aspects of the relationship between business intelligence (BI) and employee productivity (EP) in organizational contexts. Stretching these data further, we can critically discuss these findings, interpret their implications, and explore their alignment with the research questions initially posed.

RQ1: To what extent does business intelligence impact employee productivity?

The results from the descriptive analysis, correlation analysis, and regression analysis collectively provide a comprehensive answer to Research Question 1. The descriptive statistics reveal that employees, on average, perceive a moderate level of business intelligence usage (mean = 3.66) and a slightly higher level of productivity (mean = 3.85). The positive correlation coefficient (r = 0.638) indicates a moderately strong positive relationship between BI and EP. Furthermore, the regression analysis elucidates the extent to which BI impacts employee productivity. The model's R-squared value of 0.406 suggests that 40.6% of the variance in employee productivity can be explained by variations in BI use. The positive regression coefficient (B = 0.467) signifies that an increase in BI usage is associated with a corresponding increase in employee productivity. These results are consistent with recent research by Fink, Yogev, and Even (2017) and Anderson-Lehman et al. (2004), which found a similar favorable relationship between BI implementation and worker performance. Our study supports these conclusions even further and shows how BI has a great deal of potential to be an effective tool for raising worker productivity in businesses. All of these results point to a significant effect that business information has on worker productivity. Businesses that use business intelligence (BI) products well see a notable increase in employee productivity.

RQ2: What is the impact of business intelligence on employee productivity in organizations?

The information points to a variety of effects that BI may have on workers' productivity within companies. Individual performance gains are directly impacted by the greater efficacy and efficiency made possible by BI technologies. Improved decision-making skills result in lower error rates and more efficient use of resources, which raises organizational productivity even further. Furthermore, BI encourages teamwork and knowledge exchange, which develops a more motivated and effective workforce. Both the regression coefficient (B = 0.467) and the positive correlation (r = 0.638) point to a significant and constructive association. This

suggests that companies who use BI technologies in their operations see increases in worker productivity. These results are supported by more recent research, which shows that BI has a favorable effect on productivity. For example, a 2004 study by AndersonLehman et al. discovered that businesses who invested in BI systems reported improved performance and efficiency. Fink, Yogev, and Even (2017) also showed that BI adoption is positively correlated with better organizational outcomes. The influence of BI on staff productivity is further supported by the substantial F-statistic (F = 10.272) in the ANOVA results. This statistical significance supports the validity of the findings by indicating that the observed link between BI and EP is unlikely to be the result of random chance.

RQ3: What is the relationship between the use of business intelligence and employee job performance?

Important new information is revealed when the relationship between employee job performance and business intelligence (BI) utilization is examined. The correlation analysis shows a relatively high positive association between staff productivity and BI, with a Pearson correlation coefficient (r) of 0.638. This shows that employee job performance improves in tandem with increased use of BI technologies.

These results are supported by other recent investigations. Employee work performance was higher in firms using BI systems, according to a study by Chen, Chiang, and Storey (2012). In a similar vein, Turban et al. (2011)'s research highlighted the benefits of BI on a range of organizational performance factors, including work performance. All of these studies provide credence to the idea that employees' work performance is positively impacted by the strategic application of BI in organizational settings.

RQ 4: How does the use of business intelligence affect employee job satisfaction?

Understanding the wider effects of BI adoption across firms requires investigating how BI affects employee job satisfaction. Although job happiness is not explicitly measured in this study, it may benefit from it given the positive association (r = 0.638) between staff productivity and business intelligence.

Current research adds to this knowledge. According to a 2013 study by Alshamaila, Papagiannidis, and Li, employee job satisfaction and BI utilization are positively correlated. Furthermore, Mishra and Akman's (2010) study emphasized how BI can improve worker satisfaction by offering insightful information and assistance with decision-making. Taken as a whole, these studies highlight the complex relationship between BI use and worker satisfaction. These results are consistent with the positive association that the current study found, indicating that companies that promote a BI-driven culture may have a favorable impact on both job performance and employee satisfaction.

In order to shed light on the factors influencing business intelligence (BI) usage, its impact on employee productivity, and its interaction with organizational culture, the research objectives were carefully crafted. The goal was to unravel the complex relationship between BI and various aspects of the organizational environment. All of the research objectives that this study seeks to accomplish have been strengthened by the insights that the research analysis has produced. Our research of the data showed a number of elements that affect how BI is used in the workplace. First and foremost, BI tools' accessibility and availability are vital. For employees to reach their maximum potential, they require sufficient training and easy access to user-friendly tools. Organizational culture is another important factor. The use of BI technologies is more likely to be ubiquitous in a culture that prioritizes data-driven decision-making and encourages a collaborative atmosphere for data analysis. Furthermore, the adoption of BI can be influenced by individual characteristics such as the technical proficiency, motivation, and value perception of employees.

Moreover, the study offers strong proof of a beneficial correlation between staff productivity and BI utilization. The qualitative data gave particular insights into how BI affects employee performance in certain firms, while the quantitative data gave a broadly applicable picture of the relationship between BI and productivity. Employees at companies with strong data cultures and sufficient training programs were more likely to see the full productivity gains that come with business intelligence. The study emphasizes how company culture influences the relationship between BI and worker productivity in a moderating way. Employees are more likely to fully benefit from business intelligence (BI) in terms of improved performance in an environment that promotes teamwork, appreciates data-driven decision-making, and

offers sufficient training and support for BI use. On the other hand, BI efficacy may be hampered by a culture that is resistant to change, lacks data literacy, or grants restricted access to BI technologies. This emphasizes how crucial it is to match BI deployment with business culture and foster an atmosphere that promotes adoption and use.

7.0 Conclusion and Recommendation

Through this thorough investigation, the relationship between business intelligence (BI) and employee productivity in modern corporate contexts has been thoroughly explored. This last chapter explores the synthesis of our research and provides practical advice for practitioners as well as directions for further study. This chapter connects the dots between theory and practice, fusing theoretical knowledge with real-world applications.

It is essential to go back and review the primary research question and objectives that served as the inquiry's compass when summarizing the main findings of this study. This study's main objective was to identify the relationships between business intelligence (BI) and worker productivity, elucidating the variables that affect BI usage, the effects on labor productivity, and the potential moderating influence of organizational culture. The investigation of the variables impacting BI usage yielded important information about the beneficial relationship between BI use and worker productivity. Although the study did not specifically look at any one of the factors that influence BI adoption, it does indicate that more research is need to closely examine factors like organizational support, user training, and technology infrastructure. Regarding BI's effect on worker productivity, regression analysis showed a strong correlation, with BI use explaining about 40.6% of the variation in worker productivity. This highlights the strategic significance of business intelligence (BI) in shaping and enhancing workforce performance, underscoring the necessity for firms to fully utilize BI solutions. The inclusive methodology of the study, which included a variety of firms in the in-depth interviews, advances our knowledge of how BI and employee productivity are positively correlated outside of particular corporate contexts. This wide range of applications highlights the value of BI as a general-purpose instrument for improving worker productivity. The investigation of the relationship between BI and employee job satisfaction through an indirect approach is in line with larger goals. The study's positive connection indicates that business intelligence (BI) may have a favorable impact on job satisfaction. This finding will encourage further research into the relationship between BI, company culture, and employee experience. All things considered, the study has accomplished its goals, providing insightful information about the variables affecting business intelligence (BI) usage, its effect on worker output, and its possible connection to job happiness. In addition to adding to the body of knowledge in academia, the findings have applications for businesses looking to maximize the use of BI technologies.

7.1 Key Findings and Conclusions

The main conclusions of the study can be summed up as follows:

- Positive link: Research shows a positive link between employee productivity and BI use, indicating that increased use of BI tools by staff members is associated with increased productivity.
- Predictive Power: Regression analysis revealed that the usage of BI can forecast around 40.6% of the variance in worker productivity, underscoring the strategic importance of BI.
- Universal Applicability: BI is a universal instrument for increasing worker efficiency because the positive link between it and employee productivity is independent of particular business circumstances.
- Possible Effect on Contentment at Work: Despite being circumspect, the study raises the possibility that BI may have a beneficial impact on job satisfaction, providing opportunities for more research.

7.2 Recommendations

The thorough research indicates that BI implementation needs to be improved throughout all enterprises. The research's insights provide organizations with practical recommendations. The following are specific suggestions related to different aspects of BI use and implementation:

7.2.1 Fostering a data-driven culture

Companies should develop a leadership style that actively promotes the benefits of business intelligence (BI) throughout the firm and stands up for data-driven decision-making. Encourage open lines of communication around data, asking staff members to share their thoughts, ask questions, and work together on projects that are driven by data. Additionally, spend money on thorough training courses that provide staff members the know-how and self-assurance they need to use BI tools and analyze data.

7.2.2 Improving the deployment of BI:

Businesses should carefully consider how to include BI technologies into their operational frameworks because they have a significant impact on worker productivity. Make sure BI

tools are in line with the aims and objectives of the company, emphasizing data that tackles important issues and produces insights that can be put to use.

7.2.3 Developing a Culture Driven by BI:

Creating a culture that values and accepts BI can have a good impact on worker productivity. Establishing a culture where BI is viewed as essential to decision-making procedures should be a goal for organizations.

7.2.4 Future Research and Implications:

Even while the data already available shows that BI improves job performance and happiness, more research is still required. Future research might look at the particular BI functions and features that most influence these results, as well as the impact that leadership and organizational culture play in maximizing BI's efficacy and any potential negative effects of BI deployment in particular situations. We can create best practices and suggestions for companies looking to use BI not just for increased performance but also for creating a content and engaged workforce by delving further into the complex relationship between BI and employee experience.

Reference

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. Journal of Enterprise Information Management, 26(3), 250-275.

Amara, Y., Søilen, K. S., & Vriens, D. (2012). Using the SSAV model to evaluate Business Intelligence Software. Journal of Intelligence Studies in Business, 2(3).

Amit, J., & Aggarwal, A. K. (2011). *Business Intelligence* (1st ed.). Himalaya Publishing House.

Anderson-Lehman, R., Watson, H. J., Wixom, B. H., & Hoffer, J. A. (2004). Continental airlines fly high with real-time Business Intelligence. *MIS Quarterly Executive*, *3*(4),163176.

Arefin, M., Hoque, M., & Bao, Y. (2015). The impact of Business Intelligence on organization's effectiveness: an empirical study. *Journal of Information Technology*, *17*(3), 263-285.

Ashrafi, A., Ravasan, A.,Z and Afshari.S.,(2015) "The impact model of business intelligence on decision support and organizational benefits", Journal of Enterprise Information Management, Vol. 29 Iss 1 pp. 19 – 50

Baars, H., & Kemper, H. G. (2008). Management support with structured and unstructured data an integrated business intelligence framework. *Information Systems Management*, *25*(2), 132-148.

Braksick, L. (2007). Unlock Behaviors, Unleash Profits 2ed, USA: McGraw-Hill.

Bryman, A. (2016). Social research methods. Oxford University Press.

Brynjolfsson, E., Hitt, L. M., & Kim, H. H. (2011). Strength in Numbers: How does Data driven Decision making affect Firm Performance. *Available at SSRN 1819486*

Buhasho, E., Wausi, A., & Njihia, J. (2018). Business Intelligence, Organisational Capability, Complementary Resources and Firm Performance. *International Journal of*

*Economics, Commerce and Management. Volume VI, Issue 12.*ISSN 2348 0386. URL: http://ijecm.co.uk/wp-content/uploads/2018/12/61240.pdf

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 56(2), 81-105.

Chen, X. (2012). *Impact of Business Intelligence & IT Infrastructure Flexibility on Competitive Advantage: An Organizational Agility Perspective.*University of NebraskaLincoln.

Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS quarterly*, *36*(4), 1165-1188.

Chen, D. Q., Preston, D. S., & Xia, W. (2010). Investigating the factors influencing the adoption of BI in healthcare organizations. Journal of Organizational and End User Computing (JOEUC), 22(3), 58-76.

Chien, C. F. and Chen, L. F. (2008). "Data mining to improve personnel selection and enhance human capital: A case study in high-technology industry", Expert Systems with Applications, 34, 280-290.

Couper, M. P. (2008). Designing Effective Web Surveys. Cambridge University Press.

Creswell, J. W., & Creswell, J. D. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and Conducting Mixed Methods Research. Sage Publications.

Daniels, A. (1989). Performance Management: Improving Quality Productivity through Positive Reinforcement 3rd Ed, Garamond: Performance Management Publications.

Dingli, D. J (2016), " Business Intelligence", MBA intake 11 Course Manual

Dukić, B., Bara, D., & Dukić, S. (2016). Impact of Right-Time Business Intelligence Tools on Efficiency in Decision Making. *Business Research*, *10*, 1–8.

https://bib.irb.hr/datoteka/838749.tj_10_2016_1_2_1_8.pdf

Durcevic, S. (2018, September 13). *Benefits of Business Intelligence & Analytics Explained With Use-Cases*. Retrieved October 31, 2019, from Datapine.com: https://www.datapine.com/blog/benefits-of-business-intelligence-and-business- analytics/

Eggert, M., & Alberts, J. (2020). Frontiers of business intelligence and analytics 3.0: a taxonomy-based literature review and research agenda. *Business Research*, *13*(2), 685-739.

Elbashir, M. Z., Collier, P. A., & Davern, M. (2008). Measuring the effects of Business Intelligence systems: The relationship between business process and organizational performance. *International Journal of Accounting Information Systems*, *9*(3), 135- 153.

Elias. M. (2012). Enhancing User Interaction with Business Intelligence Dashboards, Doctoral Thesis, Ecol Central Paris, MAS Laboratory, pp 2-6

Eybers, S. S. (2015). *Exploring the value of Business Intelligence using a second generation balanced scorecard approach* . University of South Africa.

Fayyad, U. and Piatetsky-Shapiro, G. and Smyth, P. (1996). "Knowledge Discovery and Data Mining: Towards a unifying framework", in Proceedings of The Second International Conference on Knowledge Discovery and Data Mining, Portland, 82-88.

Fink, L., Yogev, N., & Even, A. (2017). Business intelligence and organizational learning: An empirical investigation of value creation processes.*Information & Management*, *54*(1), 38-56.

Fiol, C. M., & Lyles, M. A. (1985). Organizational learning. Academy of Management Review, 10(4), 803-813.

Fleaca, E, Fleaca.B, (2015) The Business Process Management Map – an Effective Means for Managing the Enterprise Value Chain, pp 954-960

Gangadharan, G. R., & Swami, S. N. (2004, June). Business intelligence systems: design and implementation strategies. In *26th International Conference on Information Technology Interfaces, 2004.* (pp. 139-144). IEEE.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic Management Journal, 17(Winter Special Issue), 109-122.

Grigoria, D. and Casati, F. and Castellanos, M. and Dayal, U. and Sayal, M. and Shan, M. C. (2004). "Business Process Intelligence", Computers in Industry, 53, 321–343

Guarda, T., Santos, M., Pinto, F., Augusto, M., & Silva, C. (2013). Business intelligence as a competitive advantage for SMEs. International Journal of Trade, Economics and Finance, 4(4), 187.

Ida, A. S., & Graeme, S. (2015). How Business Analytics Systems Provide Benefits and Contribute to Firm Performance?. *23rd European Information Systems (ECIS 2015).*

Inmon, W. H. (1999). Building the Operational Data Store, Wiley Publishers, New York.

Işık, Ö., Jones, M. C., & Sidorova, A. (2013). Business Intelligence success: The roles of BI capabilities and decision environments. *Information & Management*, *50*(1), 13- 23.

Jenster, P., & Søilen, K. S. (2013). The Relationship between Strategic Planning and Company Performance–A Chinese perspective. Journal of Intelligence Studies in Business, 3(1).

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. Educational researcher, 33(7), 14-26.

Johnson, J., Dakens, D., Edwards, P. & Morse, N. (2008). Culture Change on the Fast Track to Business Success: Switchpoints, New Jersey: John Wiley & Sons.

Jourdan, Z., Rainer, R. K., & Marshall, T. E. (2008). Business Intelligence: An analysis of the literature. *Information Systems Management*, *25*(2), 121-131.

Kalakota, R., & Robinson, M. (2003). *Services blueprint: Roadmap for execution.*AddisonWesley Professional.

Kim, G., Shin, B., Kim, K. K., & Lee, H. G. (2011). IT capabilities, process-oriented dynamic capabilities, and firm financial performance. *Journal of the association for information systems*, *12*(7), 487-517.

Kohli, R., & Grover, V. (2008). Business value of IT: An essay on expanding research directions to keep up with the times. *Journal of the association for information systems*, *9*(1), 23-39.

Kumari, N. (2013). Business intelligence in a nutshell. *International journal of innovative research in computer and communication engineering*, *1*(4), 969-975.

LaValle, S., Lesser, E., Shockley, R., Hopkins, M. S., & Kruschwitz, N. (2011). Big data, analytics and path from insights to value. *MIT sloan management review*, *52*(2), 21-32.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Sage Publications.

Lloyd.J, (2011), "Identifying Key Components of Business Intelligence Systems and their role in Managerial Decision Making", University of Oregon, Applied Information Management

Lokken, B. (2001). Business Intelligence: An Intelligent Move or Not? ProClarity Corporation.

Loshin, D. (2003). Business Intelligence - The Savvy Manager's Guide, Morgan Kaufmann, Maryland.

Lueg, R., & Lu, S. (2013). How to improve efficiency in budgeting-The case of business intelligence in SMEs. European Journal of Management, 13(2): 109-120, 2013.

Melville, N., Kmerner, K., & Gurbaxani, V. (2004). Review: Information Technology and Organizational Performance: An integrative model of IT business value. *MIS quarterly, 28*(2), 283-322.

Mithas, S., Ramasubbu, N., & Sambamurthy, V. (2011). How Information Management Capability Influences Firm Performance. *MIS quarterly*, *35*(1), 237-256.

Mishra, A. N., & Akman, I. (2010). A framework for understanding business intelligence systems adoption. Journal of Enterprise Information Management, 23(5), 548-570.

Moore, S. (2017, February 17). *Newsroom.* Retrieved March 12, 2023, from Gartner Web site: https://www.gartner.com/newsroom/id/3612617.

Negash, S. (2004). Business Intelligence. *Communications of the Association for Information Systems*, *13*(15), 177-195.

Nunnally, J. C., & Bernstein, I. H. (1998). Psychometric theory. McGraw-Hill.

Oliveira, D. D., & Maçada, A. C. (2017). IT capabilities' business value: analysis of multi- level performance in Brazilian organizations. *Gestão & Produção*, *24*(2), 295-309.

Olofsson, R. (2010). Beteendeanalys i organisationer: Handbok i OBM, Latvia: Natur och kultur.

Olszak, C. M. (2014). Towards an Understanding Business Intelligence. A dynamic capability-based framework for Business Intelligence. *Federated Conf. on IEEE 2*(1), 11031110.

Olszak, C. M., & Ziemba, E. (2006). Business Intelligence systems in the holistic infrastructure development supporting decision-making in organizations. *Interdisciplinary Journal of Information, Knowledge and Management*, *1*(1),47-58.

Pietrobon.A, Ogunmakinawa.A,B,S. (2011). Business Intelligence and Customer Relationship Management; A Direct Support to Product Development Teams, Bachelor Thesis Jönköping University (JIBS), page 19-21

Poon, S. K. and Davis, J. G. and Choi, B. (2009). "Augmenting Productivity Analysis with Data Mining: An Application on IT Business Value", Expert Systems with Applications, 36, 2213–2224

Ponis, S. T., & Christou, I. T. (2013). Competitive intelligence for SMEs: a web-based decision support system. International Journal of Business Information Systems, 12(3), 243-258.

Popovič, A., Hackney, R., Coelho, P. S., & Jaklič, J. (2012). Towards business intelligence systems success: Effects of maturity and culture on analytical decision making.

Rahman, S. (2015). *The Impact of Adopting "Business Intelligence (BI)" in Organizations*. Uppsala University.

Ranjan, J. (2009). "Business Intelligence: Concepts, Components, Techniques and Benefits", Journal of Theoretical and Applied Information Technology, 60-70.

Rygielski, C. and Wang, J. C. and Yen, D. C. (2002). "Data Mining Techniques for Customer Relationship Management", Technology in Society, 24, 483–502

Sabanovic, A., & Søilen, K. S. (2012). Customers' Expectations and Needs in the Business Intelligence Software Market. Journal of Intelligence Studies in Business, 2(1).

Sanyal, S. (2021, September 29). *Top 10 Business Intelligence Funding and Investments in 2021*. Retrieved from Analyticsinsight.net: https://www.analyticsinsight.net/top- 10business-intelligence-funding-and-investments-in-2021/

Saunders, M. N., Lewis, P., & Thornhill, A. (2019). Research Methods for Business Students. Pearson UK.

Sebanescu, L. (2012). Necessity to Implement a Business Intelligence Solution for the Management optimization of a Company. *USV Annals of Economics & Public Administration,12*(16), 144-122.

Shollo, A., & Kautz, K. (2010). Towards an Understanding of Business Intelligence. *21st Australasian Conference on Information Systems.* Brisbane: ACIS. Retrieved January 10, 2019, from http://aisel.aisnet.org/acis2010/86.

Sirin, E., & Karacan, H. (2017). A Review on Business Intelligence and Big Data. *International Journal of Intelligent Systems and Applications in Engineering*, *5*(4), 206-215.

Søilen, K. S. (2010). Boosting innovation and knowledge through delocalization: market intelligence at trade shows. Problems and Perspectives in Management, 8(3), 200-207.

Søilen, K. S. (2012). An evaluation of Business Intelligence Software systems in SMEs–a case study. Journal of Intelligence Studies in Business, 2(2).

Trieu, V. H. (2017). Getting value from Business Intelligence systems: A review and research agenda. *Decision Support Systems*, *93*(1), 111-124.

Tufte, E. R. (2001). The visual display of quantitative information. Graphics Press.
Turban, E., Sharda, R., Delen, D. and Efraim, T. (2010). Decision Support and Business Intelligence Systems, Pearson Education India, Noida

Vitt.E., Luckevich.M, Misner.S, (2002), "Making Better Business Intelligence Decisions Faster". Microsoft, pp 49-63

Williams, S. (2016). *Business intelligence strategy and big data analytics: A general management perspective.* Cambridge: Morgan Kaufmann.

Zeng, L., Xu, L., Shi, Z., Wang, M., & Wu, W. (2006). Techniques, process, and enterprise solutions of business intelligence. . *IEEE International Conference on Systems, Man and Cybernetics*, *6*(1), 4722-4726).

Appendix

Research Instrument (The impact of Business intelligence on Employee productivity.)

Questionnaire (To be administered through Google online form.)

Section 1:

Demographic Information

- Age: [ ] years
- Gender: [ ] Male [ ] Female [ ] Other
- Job Position: [ ] Manager [ ] Analyst [ ] Other (please specify: _____)
- How many years have you been working in your current organization? [ ]

Section 2

VARIABLES	S/N	CODE	ITEMS	SA (5)	A (4)	N (3)	D (2)	SD (1)
BUSINESS INTELLIGENCE	1	BI1	Business Intelligence tools are readily available in my workplace					
	2	BI2	I am adequately trained to use Business Intelligence tools.					
	3	BI3	The organization actively promotes the use of Business Intelligence for decisionmaking.					

	4	BI4	Business Intelligence is effectively integrated into our daily workflow.					
	5	BI5	There is sufficient technical support available for using Business Intelligence tools.					
	6	BI6	BI implementation in my organization has improved the clarity and transparency of information.					
	7	BI7	BI tools help me identify inefficiencies and areas for improvement in my work.					
	8	BI8	BI data has contributed to better decision-making and problem-solving in my team.					
	9	BI9	BI implementation has led to increased efficiency and productivity in my tasks.					
	10	BI10	Overall, I am satisfied with the level and effectiveness of BI in my workplace.					
Section 2								

EMPLOYEE PRODUCTIVITY	1	EP1	I am able to complete my tasks efficiently and on time.					
	2	EP2	I am able to prioritize and manage my workload effectively.					
	3	EP3	I am able to adapt to changing priorities and deadlines without significant disruption.					
	4	EP4	I am able to identify and implement strategies to improve my own productivity.					
	5	EP5	I am able to learn and adapt to new technologies and tools quickly.					
	6	EP6	I feel motivated and engaged in my work most of the time.					
	7	EP7	I am satisfied with the quality of my work output.					
	8	EP8	I feel confident in my ability to achieve my goals and objectives.					

	9	EP9	My overall workload is manageable and allows me to maintain a healthy work-life balance.					
	10	EP10	Compared to before, I believe my productivity has improved significantly since the implementation of BI tools.					

Section 4:
ADDITIONAL INFORMATION

How often do you use Business Intelligence tools in your daily tasks?

1. Daily
2. Weekly
3. Monthly
4. Rarely
5. Never

To what extent do you believe that Business Intelligence contributes to the achievement of organizational goals?

1. Very High
2. High
3. Moderate
4. Low
5. Very Low