Assessing Business Students' Views on Achieving Workplace Readiness in Business Intelligence Skills

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Abstract

This thesis explores the perspectives of Finnish business students regarding their workplace readiness in Business Intelligence (BI) skills. The primary objective is to understand how well-prepared future business professionals perceive themselves to meet the increasing demand for BI skills in the business world. The study consists of a literature review discussing the importance of BI skills, the current state of BI education, and the gap between academic preparation and industry requirements, as well as an empirical section focusing on the perceptions and assessments of BI skills readiness among Finnish business students, faculty, and company representatives.

A mixed methods approach was employed, involving surveys conducted among Finnish business students, faculty members, and company representatives. The survey results were analyzed using quantitative and qualitative methods to identify trends, gaps, and areas for improvement.

The findings reveal a notable gap between the BI skills taught in academic settings and those required in the workplace, highlighting the need for closer alignment between higher education institutions and industry requirements.

The thesis presents recommendations for improving BI curricula based on the results. These recommendations include integrating more hands-on experience with industry-relevant tools, expanding course options, emphasizing soft skills development, fostering industry partnerships, and promoting lifelong learning. By implementing these suggestions, Finnish higher education institutions can enhance their BI programs and prepare graduates to navigate the demands of the field effectively.

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Key words

Business Intelligence, Analytics, BI, Data, Decision-making, Business Administration

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1 Introduction

Business Intelligence (BI) analyses data and information to support decision-making and strategic planning in organizations. In today's data driven business environment, BI skills are becoming increasingly critical for undergraduates and new graduates entering the workforce. As Finnish companies adopt more data-driven strategies and analytics, there is a growing need for business students with strong BI competencies who can transform data into insights.

By obtaining a better understanding of the students' perspectives, lectures, employers, and the students themselves can obtain valuable insights into any gaps in competency that require attention and improvement. Such insights would aid in enhancing the quality of education and work preparedness of the students and benefit the overall business with Bi-related community in Finland. Therefore, this study aims to assess Finnish business students' views on achieving workplace readiness in BI skills.

In this study, surveys will be utilized as a research method. The approach will involve gathering feedback from a range of stakeholders, including business lecturers, employers, and employees who work with business new hires or undergraduates. The objective is to identify areas for improvement and enhance the effectiveness of learning in the field of BI.

1.1 Background of the Topic

The business realm is transforming with the advent of big data and advanced analytics, heading to where Bi skills have become a cornerstone for any company aiming to maintain a competitive edge. In the broader business context, BI encompasses the strategies and technologies employed by enterprises for the data analysis of business information, providing historical, current, and predictive views of business operations (Chen et al. 2012). Proficiency in BI tools and methodologies enables organizations to make data-driven decisions, optimize processes, spot market trends, and uncover previously obscured insights. As corporations globally strive to harness the power of data, the demand for skilled BI professionals is surging (Davenport 2013).

The importance of this topic cannot be overstated. Businesses increasingly rely on data to inform strategy and operation in a rapid evolving digital landscape. According to the World Economic Forum (2020), the need for digital skills is increasing, and employers have reported a growing skill gap, with new market entrants lacking the required skills. Meanwhile, Finland's education system stands out for its high-quality teachers and well-rounded curriculum, which focused on fostering creativity and critical thinking skills (Niemi 2020), along with a strong emphasis on technology and

innovation. Therefore, assessing the readiness of its business students to tackle BI challenges becomes an essential inquiry.

This thesis aims to delve into Finnish business students' perspectives regarding their preparedness to enter the workforce with adequate BI skills. This exploration aims to bridge the gap between academic institutions and the business sector, identify potential shortcomings in the current curriculum, and propose actionable strategies to enhance the BI competency.

1.2 Research Question

The goal is to offer insights on improving BI education to cultivate a workforce adept in the skill required for data-centric positions. The intent is to narrow the possible disparity between educational training and workplace expectations, ultimately proposing targeted curriculum improvements to reinforce the proficiency of students learning BI. The core research question focuses on business students' perceptions of their readiness for the workplace in the context of BI skills. To support this question, three investigative questions (IQs) have been formulated based on these aiming questions:

- Which BI skills do business students identify as crucial for workplace success?
- How do students perceive the alignment of their business education with the BI skill requirements of the job market?
- How do employees/ employers who work with recent business students evaluate their preparation in BI skills?
- In what ways can higher education institutions' BI courses, content, pedagogies, and industry collaborations be enhanced to develop job-ready graduates?

Table1. Research Matrix

Investigate Questions	Data Source	Data Collection Methods
IQ1: How do Finnish business students perceive their readiness in BI skills needed for the workplace?	Business students from multiple universities.	Survey questionnaire.
IQ2: How do employees who work with recent business graduates/ undergrads evaluate their preparation in BI skills?	University faculty teaching BI courses; Employers/ employees hiring/ working graduates for BI/data roles.	Survey questionnaire.

IQ3: What recommendations can be made to enhance BI curricula for developing job-ready graduates?	Findings synthesized from IQ1 and IQ2.	Analysis of qualitative and quantitative data.

1.3 Benefits

Previous studies have suggested that business students often feel unprepared to use BI tools and lack the practical B skill required in the workplace (Wixom et al. 2014). BI courses are gradually being incorporated into the school curriculum. The research will reveal specific areas where students are least prepared in BI competencies required by company. This allows tailored development of BI skills training.

Assessing the perception of Finnish students regarding their preparedness in BI skills needed for the workplace can led to valuable outcomes for multiple stakeholders. The research aims to identify specific competency gaps that new hires feel least confident in, such as data analysis, visualization, or using BI tools. Addressing the BI skills gaps revealed by the study will lead to more qualified business students who meet job requirements and company demands.

The study also seeks insights from faculty members, lecturers, employers, and employees as key players. Their perspective on aligning classroom training with professional expectations can shape effective strategies like collaborative projects, case competitions, and partnerships that integrate workplace experiences. Overall, engaging multiple stakeholders will catalyze impactful improvements in university-level BI education.

Besides, this study contributes to the development of a more sustainable workforce in the field of BI from a sustainability perspective. This study aims to identify and address the gaps in BI education, promoting the cultivation of well-prepared professionals who can effectively use data-driven insights to make informed decisions. This, in turn, can lead to more sustainable business practices. Companies can leverage the skills of these new hires to optimize processes, minimize resource consumption, and make data-driven decisions that prioritize environmental sustainability.

Moreover, by fostering collaboration between higher education institutions and industry partners, the study encourages the creation of a sustainable ecosystem for BI education. This collaborative approach ensures that skills taught in academia align with the evolving needs of the business world, thereby reducing the need for extensive training and optimizing the allocation of educational resources. This research can also facilitate the exchange of knowledge and best practices

between academia and industry, fostering a more sustainable and future-oriented approach to BI education.

1.4 Delimitations of the Research

This research targets bachelor's degree business students in Finland, and the results may not apply to students in other geographic regions. The study was conducted between March and May 2024, during which data collection was done through surveys. The surveys, which produces research findings, has also been carried out during the period from 24 April to 14 May.

The analysis will not explore multiple theories that could explain the development of BI skills. The aim is to evaluate the current state of readiness rather than following changes over time. Besides, both the surveys aim to gather self-reported perceptual data on confidence and observed skill gaps rather than measure actual BI abilities objectively. Evaluating the efficacy of specific pedagogical techniques is also outside of this research.

1.5 Key Concepts

Big Data: Big Data refers to extremely large, complex, and rapidly growing datasets that are difficult to process and analyze using traditional data management tools and techniques (Tiao 2024).

BPM: Business Process Management is a systematic approach to improving an organization's business processes by designing, modeling, executing, monitoring, and optimizing end-to-end processes (Tucci 2023).

DBMS: A Database Management System (DBMS) is a software system that enables users to define, create, maintain, and control access to a database. A DBMS serves as an interface between the database and end-users or application programs, ensuring data integrity, security, and consistency while allowing for efficient storage, retrieval, and manipulation of data. (MongoDB s.a.)

DSS: A Decision Support System (DSS) is an interactive computer-based system that aids decision-makers in utilizing data and models to solve unstructured or semi-structured problems, supporting managerial decision-making by providing relevant information and analysis tools (Power s.a.).

ETL: Extract, Transform, Load (ETL) is a data integration process that involves extracting data from various sources, transforming it to fit the operational needs of the business, and loading it into a target database or data warehouse (IBM s.a.).

ERP: Enterprise Resource Planning (ERP) is an integrated software system that unifies and manages core business processes across various functional areas within an organization. ERP system provides a platform for automating and streamlining processes, improving operational efficiency, enhance decision-making capabilities, and gain a competitive advantage (Microsoft s.a.).

2 Theoretical Framework

2.1 Business Intelligence

The term intelligence has been associated with artificial intelligence since the 1950s. However, it was not until the 1990s that the term BI became widespread in business and IT communities (Bhatiasevi & Naglis 2018). In recent years, BI has become essential study areas for academics and practitioners.

Business Intelligence (BI) refers to the techniques, technologies, systems, practices, methodologies, and applications that analyze business data to help organizations better understand their business and market and make informed decisions (Chen et al. 2012). Although there is no universally recognized term for combining internal and external insights necessary for making informed business decisions, BI is a well-known concept encompassing the methodologies and technologies used in information management to enhance decision-making capabilities (Presthus & Sæthre 2015).

BI can be divided into two main aspects that cater audiences: BI for developers and BI for business users. BI for Developers focuses on the technical implementation and development of BI systems. This involves designing and creating data warehouses, ETL (Extract, Transform, Load) processes, data integration, and custom BI applications. BI developers are responsible for building the infrastructure and tools that enable business users to access and analyze data effectively. (Bhatiasevi et al. 2018)

On the other hand, BI for business users is aimed at non-technical users who rely on BI tools and applications to make data-driven decisions. Business users interact with BI through user-friendly interfaces, dashboards, and reports that provide insights into business performance, trends, and opportunities. These users are typically from various departments such as sales, marketing, finance, and operations, and they use BI to monitor key performance indicators (KPIs), conduct ad-hoc analyses, and generate reports. (Olszak & Ziemba 2007)

The theoretical framework aims to provide an in-depth exploration of various aspects of BI that are particularly relevant to business users. As this research focuses on assessing the importance and applications of BI for business students, the author will strive to offer a comprehensive overview of BI in general while emphasizing its practical relevance and value for professionals in business domain. The goal is to present a detailed and accessible explanation of all main aspects of BI, ensuring that readers gain a thorough understanding of the subject matter and its significance in

the context of business. By doing so, this thesis will demonstrate the essential role that BI plays in equipping business students with the knowledge and skills necessary to leverage data-driven insights for organizational success in Finnish business landscape.

2.1.1 BI Process

BI functions both as a product and a process. As a product, it provides the intelligence that allows organizations to anticipate the actions of their competitors, suppliers, and customers, as well as changes in technology, acquisitions, markets, products, and services, along with the general business environment. As a process, it includes an organization's methods to generate helpful information or intelligence to aid its success. (Caseiro & Coelho 2018)

According to Tavera et al., (2021), BI is also regarded as a crucial process for decision-making that leverages the organization’s data through integration and analysis. It is becoming essential across various industries because information is now considered a key asset for organizational growth.

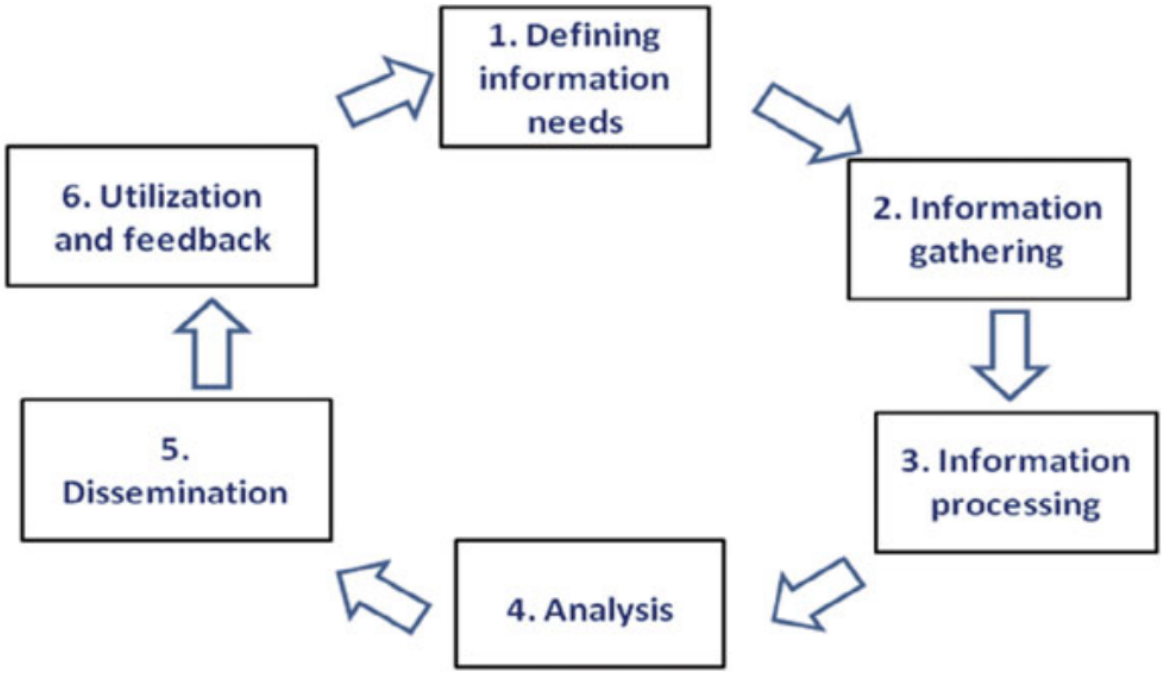

Figure 1. A generic business intelligence process model (Vouri 2006).

The BI process begins with data collection from various internal and external sources. The collected data then undergoes data integration, where it is cleansed and consolidated into a coherent dataset. This step is crucial for ensuring the accuracy and reliability of data analysis. The next step involves data analysis, where analytical tools and techniques are applied to extract

meaningful insights from the integrated data. The final step in the BI process is the presentation of these insights in an accessible format, such as dashboards or reports, to inform decision-making. (Larson & Chang 2016)

This systematic approach allows to make informed decision, thereby improving operational efficiency, identifying market trends, and gaining a competitive edge. By following the BI process, organizations can effectively harness the power of their data to drive success and maintain a competitive advantage in their respective markets (Trieu 2017).

2.1.2 BI System

A BI system is an IT solution that facilitates the BI process by providing the necessary tools and technologies for data collection, integration, analysis, and presentation. BI systems are seen as supporting a continuous process where data are gathered and stored, then transformed into information by analysis (Shollo & Galleries 2016). At its core, a BI system includes data warehouses for storing integrated data, ETL (Extract, Transform, Load) tools for data processing, analytical tools for data analysis, and reporting tools for visualizing data insights.

Alternatively, in a book by Sharda et al. (2014), it is discussed that a BI system consists of four key components:

- A data warehouse that stores the source data.
- Business analytics tools that manipulate, mining, and analyze the data in the data warehouse.
- Business performance management (BPM) for monitoring and analyzing performance.
- A user interface (such as a dashboard) to display data.

The relationship between these components is illustrated in Figure 2.

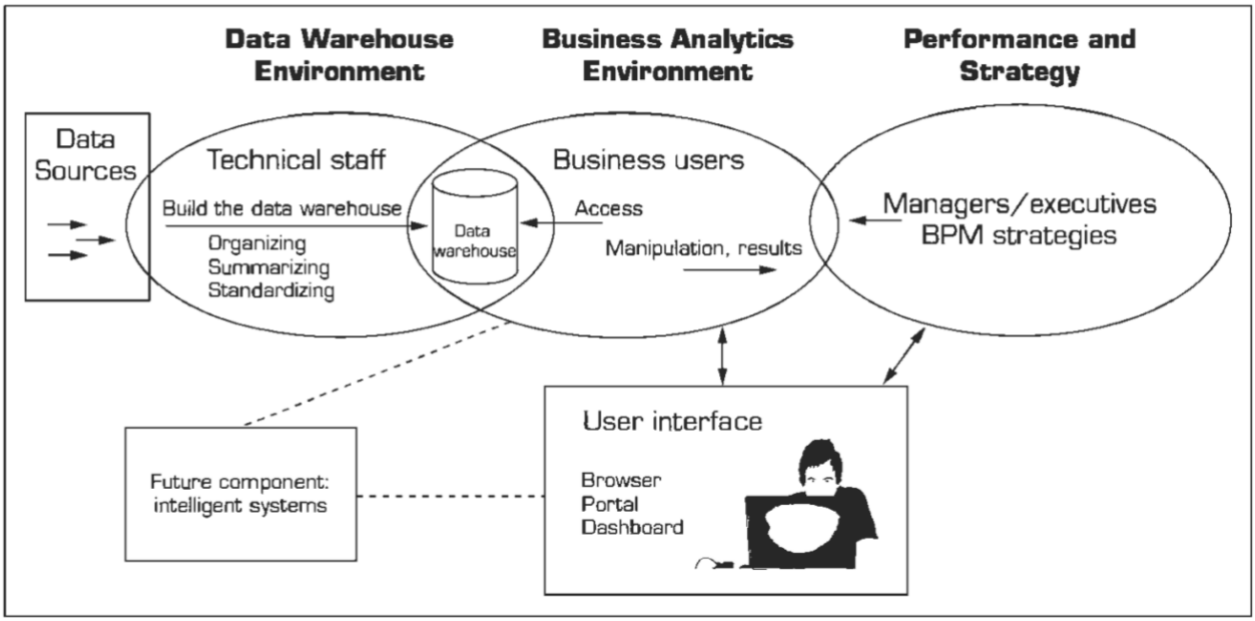

Figure 2. A high-level architecture of BI (Sharda et al. 2014)

Effective BI systems are designed to handle large volumes of data from diverse sources, offering scalability and flexibility to meet an organization's evolving needs. By automating routine data processing tasks, BI systems enable organizations to focus on analyzing deriving valuable insights.

2.1.3 BI&A

In the late 2000s," business analytics" became an essential part of business intelligence (BI), according to Davenport (2006). While some argue that business intelligence and business analytics are two distinct disciplines, each with its own set of skills and software, this paper focuses on positioning business analytics within the undergraduate curriculum in a manner that best serves students. Business intelligence and analytics (BI&A) are closely related, with analytics being a crucial subset of the BI process. Rado Kotorov, a chief innovation officer at Information Builders (2020), explains that analytics is a subset of BI capabilities that includes accessing data, managing metadata, developing reports, and publishing and distributing packaged results. Similarly, Davenport (2006) defines analytics as using statistical and computational techniques to extract meaningful insights from raw data.

The synergy between BI and analytics enables organizations to comprehensively understand their operations and make informed decisions at every level (Chen et al. 2012). Business students who understand the capabilities of BI&A can combine data management and reporting capabilities with advanced analytical techniques to analyze historical data and predict future outcomes. This allows

organizations to identify potential risks, optimize resource allocation, and personalize customer experiences.

The adoption of big data presents businesses with the challenge of processing and analyzing massive datasets from diverse sources, such as social media, sensors, and transactional systems (Russom 2011). Integrating analytics withing BI has facilitated the adoption of a more agile and responsive approach to decision-making. Real-time analytics capabilities enable businesses to monitor key performance indicators, detect deviations from expected outcomes, and take corrective actions in near real-time (Watson & Wixom 2007). By embedding analytics within their BI systems, organizations can empower decision-makers at all levels with timely and relevant insights, enabling them to make informed decision and drive business value.

As a demand for data-driven decision-making grows, business students need to develop a strong foundation in BI&A to achieve workplace readiness. By understanding the capabilities and potential of BI&A, business students can position themselves as valuable assets to their organizations, contributing to data-driven decision-making, strategic planning, and overall business success (Wilder & Ozgur 2015). The term analytics in this thesis refers to the use of diverse processes and techniques that transforms unprocessed data into valuable information that can assist in making informed decisions.

2.2 BI in Organizations

2.2.1 BI in universities

As business report a greater need for employees with BI skills, the importance of bridging this skills gap becomes more critical (Business Higher Education Forum 2017, 6). In response, many business schools are introducing specialize majors and concentrations focused on analytics to equip students with the necessary analytical skills. Students can leverage BI tools to gain insights into trends and easily query, search, and merge data to inform their next steps. This trend is reflected in the creation of distinct academic course tracks catering to undergraduates, including business analytics, social media analytics, and business intelligence. (Phuong et al. 2023)

At the graduate level, similar efforts are being made to accommodate this demand, illustrating the educational sector’s commitment to preparing students for the data-driven challenges of the modern business environment (Schweitzer 2019). This offering reflects the recognition of analytics as a critical competency within the business field, driving faculty to adapt their curricula to meet the

needs on the industry. The incorporation of analytics into business programs signal a broader shift towards experiential learning, where students not only understand the theoretical concepts but also apply them in real-world scenarios. This hands-on approach is designed to equip future professionals with the practical skills necessary to navigate ad leverage the vast amounts of data in corporate landscape.

Recently, it has become common for academic institutions to team up with industry leaders. This partnership allows students to gain valuable insights and experiences directly from the forefront of BI. These collaborations highlight the significance of analytics in shaping the future of business education and practice. Such alliances underscore the pivotal role of BI in molding the future of business education and practice, thereby demonstrating the mutual benefits and the importance of these partnerships for both academia and industry.

2.2.2 BI in Workforce

BI is widely recognized as a decision support system (DSS), supported by advanced information technologies and analytical techniques. According to Davenport (2013) and Foley & Guillemette (2010), BI represents a paradigm shift in how businesses approach decision-making, leveraging systematic capabilities to collect and analyze data and convert it into actionable insights. This process aims to identify opportunities and threats, facilitating intelligent solutions for corporate operations (Božić & Dimovski 2019; Chen et al. 2012; Henschen 2010).

An empirical study conducted by Hannula and Pirttimäki (2003) involving 50 Finnish companies offers valuable insights into the motivations behind BI system investments. Contrary to common assumptions, most companies did not priorities cost or time saving as the primary benefits of adopting BI systems. This finding suggests a strategic orientation towards leveraging BI to enhance decision-making quality and gain competitive advantages rather than merely reduce operational expenses.

Besides, a 2018 survey by the Winterberry Group underscores the growing emphasis on data-centric operations within the business community. The findings reveal that 44% of companies aimed to achieve "extremely" data-centric operations by the end of 2019, marking a significant increase from just 9% at the time of the survey. Additionally, 30% of companies described their operations as "fairly" data-centric, while 41.5% considered themselves "somewhat" data-centric.

BI enhances current operations by analyzing existing data, facilitating a deeper understanding of business process, and enabling informed decision-making. Additionally, Business intelligence

supports numerous workforce risk management skills and practices (Popovič et al. 2018). By interpreting real-time data, business intelligence can improve various strategies. As a result, the popularity of BI in companies is on the rise, and its application in the workforce brings advantages. It not only enhances decision-making processes but also improves workforce planning and development.

2.3 BI Skills

BI skills encompass a broad set of competencies that enable individuals to effectively transform data into actionable insights for strategic decision-making. These skills bridge the gap between raw data and the analytical processes required to derive meaningful information that can inform business strategies. According to experts and practitioners in the field, BI skills can be broadly categorized into three main areas: analytical, technical, and business skills (Smith & Doe 2020).

2.3.1 Analytical Skill

The integration of analytics into business education is not just a trend, but a necessity, as it equips future leaders with the tools to make informed, data-driven decisions (Davenport et al. 2012). For business students, acquiring BI skills is important as organizations rely more on data to inform their judgements. Familiarity with BI processes, systems, and the requisite analytical, technical, and business skills prepares students for the challenges of the modern business environment. It equips them with the ability to contribute to data-driven decision-making processes, enhancing their employability and career prospects in a wide range of industries. Furthermore, the inclusion of analytics in the curriculum fosters a culture of continuous learning and adaptation, essential in the ever-changing landscape of business and technology (Manyika et al. 2011).

Business students must develop a strong understanding of BI&A to achieve workplace readiness. By harnessing the power of analytics, organizations can uncover hidden patterns, forecast future trends, and optimize their strategies based on data-driven insights (Sharda et al. 2018). Business students who possess skills in BI&A can contribute to their organizations by helping them shift from a reactive to a proactive stance, anticipating challenges and seizing opportunities before they materialize.

Statistics in Analytical Skills

Among these analytical skills, statistical knowledge and ability play a fundamental role. Statistics can be defined as "the science of collecting, organizing, analyzing, interpreting, and presenting

data" (Lind et al. 2021, 4). In the context of BI, statistical techniques enable professionals to extract meaningful patterns, relationships, and trends from large volumes of structured and unstructured data (Chen et al. 2012). Statistical skills involve understanding and applying various techniques such as descriptive statistics, inferential statistics, hypothesis testing, regression analysis, and predictive modelling (Davenport et al. 2012). These techniques allow BI users to summarize and visualize data, identify significant differences or associations, make predictions, and uncover hidden insights that can drive business value (Shmueli & Koppius 2011).

Based on the textbook "Basic Statistics for Business & Economics" by Lind et al. (2021), there are several key types of statistics that are relevant to Business Intelligence (BI). Descriptive statistics involve methods for organizing, summarizing, and presenting data meaningfully, including central tendency and dispersion measures. Probability distributions help BI professionals model and analyze data, assess risks, and make probabilistic predictions. Sampling and estimation techniques enable BI professionals to draw accurate conclusions about a larger population based on a representative subset of data. Hypothesis testing allows BI professionals to make data-driven decisions by assessing the statistical significance of observed results. Regression analysis helps examine the relationship between variables and make predictions based on those relationships. In addition to these critical types of statistics, time series analysis is another crucial technique. Time series analysis involves analyzing data points collected over time to identify patterns, trends, and seasonality (Lind et al. 2021).

Another important aspect of statistical skills in BI is data visualization. Data visualization involves presenting data in a graphical or pictorial format to make it easier to understand and interpret (Lind et al. 2021). While data visualization itself is a technical skill, it is closely linked to analytical skills because compelling visualizations require a deep understanding of the data and the ability to identify patterns, trends, and relationships. BI learners can use various visualization techniques, such as bar charts, line graphs, scatter plots, and heat maps, to communicate complex data insights effectively to stakeholders (Imhoff & White 2011). By combining statistical analysis with data visualization, BI users can help their organizations informed decisions based on these insights.

Big Data Analytics in Analytical Skill

Big data analytics has become an increasingly crucial skill for Business Students to acquire, as it enables them to process and derive value from large and complex datasets, leading to a more profound understanding of Business Intelligence (BI). While business students may not need the same level of technical expertise as data scientists, data analysts, a solid grasp of big data

analytics concepts and their applications in BI is essential for success in today's data-driven business landscape.

The ability to perform big data analytics demands various technical skills, such as programming, data mining, and machine learning, as well as business acumen and domain knowledge (Debortoli et al. 2014). Machine learning algorithms can automatically recognize patterns and relationships in large datasets, enabling BI professionals to find hidden insights and make more precise forecasts (Lind et al. 2021). Data mining methods, such as clustering and association analysis, help discover previously unknown relationships and segments within the data (Han et al. 2011). By leveraging these advanced statistical techniques, BI professionals can provide organizations with a deeper understanding of their data, facilitating more sophisticated data-driven decision-making (Howson 2014).

2.3.2 Technical Skill

Technical skills in BI encompass proficiency in specific BI tools and technologies, including data warehousing, ETL tools, database management systems, and data visualization software (e.g., Tableau, Power BI). Knowledge of programming languages such as Python or R for data analysis is also valuable. These technical skills are essential for managing the BI infrastructure, processing data, and creating insightful visualizations.

BI learners should have a solid understanding of various BI functionality classes, each serving a specific purpose. Data collection and storage tools, such as ETL (Extract, Transform, Load), data warehouses, data marts, and data lakes, are crucial for gathering, integrating, and storing data from diverse sources (Kimball & Ross 2013). Self-service tools, query, and reporting tools empower end-users to access and explore data independently, enabling faster decision-making (Imhoff & White 2011). Multidimensional analysis and OLAP (Online Analytical Processing) allow users to analyze data from multiple perspectives and drill down into details, facilitating a deeper understanding of business performance (Thomsen & Pedersen 2009).

There are varying opinions among experts on how to classify BI functionality. However, most agree on general categories of BI technology based on their function. According to the book "Business Intelligence" by Skyrius (2021, 146-148), the categories of BI function are as follows:

- Data collection and storage involve different processes such as ETL (extract, transform, load), data warehouses, data marts, and data lakes, among others. These technologies are

the foundation of BI, enabling organizations to gather, integrate, and store data from various sources, creating a centralized analytical repository (Kimball & Ross 2013).

- Self-service tools; query and reporting tools: Self-service BI tools empower business users to access, explore, and visualize data independently, reducing reliance on IT and accelerating decision-making (Imhoff & White 2011). Query and reporting tools allow users to retrieve specific information and generate reports based on their needs (Howson 2014).
- Multidimensional analysis, OLAP: OLAP tools enable users to analyze data from multiple dimensions, drill down into details, and perform complex calculations, providing a comprehensive view of business performance (Thomsen & Pedersen 2009).
- Data mining for large data sets: Data mining techniques, such as clustering, association rules, and classification, help uncover hidden patterns and relationships in large datasets, enabling organizations to make data-driven decisions and optimize processes (Han et al. 2011).
- Big Data analytics; AI and machine learning: Big data analytics tools, like Hadoop and Spark, allow organizations to process and analyze massive volumes of structured and unstructured data (Russom 2011). AI and machine learning algorithms automate the discovery of insights, predictions, and anomaly detection, enhancing the accuracy and efficiency of decision-making (Thomsen & Pedersen 2009).
- Text analysis and mining: Text analysis and mining techniques enable organizations to extract valuable information from unstructured text data, such as customer reviews, social media posts, and emails, providing insights into customer sentiment, preferences, and trends (Han et al. 2011).
- Modelling and simulation: Modeling and simulation skills enable BI professionals to create data-driven models that predict future outcomes, optimize business strategies, and assess the impact of various scenarios on organizational performance (Han et al. 2011).
- Presentation and visualization: Data visualization tools, such as Tableau, Power BI, and QlikView, allow BI professionals to create interactive and engaging dashboards, charts, and graphs, making it easier for stakeholders to understand and interpret complex data (Few 2012).
- Communication and collaboration platforms: Communication and collaboration tools, such as Slack, Microsoft Teams, and Confluence, facilitate data-driven discussions, knowledge sharing, and cross-functional collaboration, ensuring that insights are effectively disseminated and acted upon throughout the organization (Gartner 2021).

All common platforms

To help students develop technical skills in BI, it is essential to familiarize them with the industry's most common and widely used BI platforms.
These platforms offer a range of functionalities, from data integration and modeling to advanced analytics and visualization. According to Gartner, in 2021, some of the most popular BI platforms include:

- Microsoft Power BI
- Tableau
- Qlik Sense
- SAP BusinessObjects
- IBM Cognos Analytics
- SAS Visual Analytics
- Oracle BI
- MicroStrategy
- Looker (Google Cloud)
- Domo

Each platform has its strengths and weaknesses, and the choice of platform often depends on the organization's specific needs, budget, and existing technology stack.

Microsoft Power BI, for example, is a cloud-based BI platform that offers a user-friendly interface, strong data integration capabilities, and advanced analytics features, making it a popular choice for businesses of all sizes (Microsoft 2023). Tableau, on the other hand, is known for its powerful data visualization capabilities and ease of use, enabling users to create interactive and engaging dashboards with minimal technical knowledge. Qlik Sense is another popular platform that offers a unique associative data engine, allowing users to explore data freely and discover hidden insights. SAP BusinessObjects, IBM Cognos Analytics, and Oracle BI are well-established platforms catering to large enterprises' needs, offering robust data integration, reporting, and security features. MicroStrategy and SAS Visual Analytics are known for their advanced analytics capabilities. At the same time, Looker (Google Cloud) and Domo are cloud-native platforms that offer modern data architectures and self-service capabilities. (Gartner 2021)

By familiar with different platforms, students can learn how to connect to various data sources, create data models, design interactive dashboards, and perform advanced tasks. Additionally, students should be encouraged to explore each platform's unique features and capabilities to broaden their skill set and adapt to the evolving needs of the industry. As the BI landscape

continues to evolve, with new platforms and technologies emerging regularly, students should stay updated with the latest trends and best practices in the field.

Database

Database management is the basic for storing, organizing, and retrieving data efficiently. Relational database management systems (RDBMS), such as MySQL, Microsoft SQL Server, Oracle, and PostgreSQL, are commonly used in BI environments. These databases use structured query language (SQL) to manipulate and analyze data in relational databases. On the other hand, NoSQL databases, like MongoDB, Cassandra, and Couchbase, have gained popularity in recent years due to their ability to handle unstructured and semi-structured data, which is common in big data environments. (Gandomi & Haider 2015; Han, Pei, & Kamber 2011). Business students learning BI should be familiar with the differences of database technologies and know how to choose the appropriate database for a particular BI project.

Cloud Services

Cloud services, such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP), offer a range of tools and services for data storage, processing, and analytics (Armbrust et al. 2010). As organizations generate and collect more data from various sources, cloud platforms provide scalable, flexible, and cost-effective solutions for handling large volumes of data and overcoming the limitations of traditional on-premises BI infrastructure (Mell & Grance 2011). BI learners should be familiar with the core components of cloud platforms, such as storage services (e.g., Amazon S3, Azure Blob Storage), database services (e.g., Amazon RDS, Azure SQL Database), and data processing services (e.g., AWS Glue, Azure Data Factory). Cloud platforms also provide managed BI services, such as Amazon Quick Sight, Microsoft Power BI, and Google Data Studio, allowing users to create interactive dashboards and reports without requiring extensive infrastructure setup. Moreover, cloud-based BI solutions enable organizations to leverage advanced analytics services, such as machine learning, natural language processing, and real-time streaming, without significant upfront investments (Han et al. 2011), and enable collaboration and data sharing among teams and partners (Marston et al. 2011).

Business students should have the basic understanding of the pros and cons of using cloud-based BI solutions, including their cost-effectiveness, scalability, and data security implications. As part of their skill set, business students should be familiar with the fundamental concepts of cloud service architectures, such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). This knowledge will enable them to assess the suitability of

cloud-based BI solutions for various business scenarios and contribute to the design and implementation of efficient BI architectures in their future career.

2.3.3 Business Skill

Alongside technical skills, business students should develop a strong set of domain skills to succeed in the field of BI. Business domain skills refer to the knowledge and understanding of various business functions, processes, and industry-specific concepts that enable BI users to apply their abilities in business contexts effectively. These skills are essential for bridging the gap between the technical aspects of BI and the practical needs of businesses, ensuring that BI solutions are aligned with organizational goals and deliver tangible value (Wixom et al. 2014).

One of the key business domain skills for students learning BI is a deep understanding of business processes and operations in their specific field. Students should be familiar with majors such as finance, marketing, supply chain management, and human resources, as well as industry-specific processes relevant to their target domains (Olszak & Ziemba 2012). This knowledge enables them to identify the data requirements and key performance indicators (KPIs) that drive business decisions and to design BI solutions that provide actionable insights for process optimization and performance improvement (Marr 2021).

Another aspect of business domain skills is the ability to analyze and interpret business requirements. By accurately capturing and prioritizing business requirements, learners can ensure BI applications and dashboards provide relevant insights that support the project process. Likewise, data storytelling is another essential skill that students learning BI should grasp. Data storytelling involves crafting compelling narratives around data, using visual elements, and contextual information to help stakeholders understand and act upon the insights derived from BI systems (Cote 2021). By developing data storytelling skills, students can bridge the gap between technical data analysis and effective communication, ensuring that insights are not only accurate but also impactful and actionable. This skill enables them to present findings in a way that resonates with diverse audiences, from executive decision-makers to front-line employees, driving data-driven culture and facilitating organizational change (Berinato 2019).

Furthermore, each industry has unique challenges, regulations, and competitive landscapes that shape how businesses operate and make decisions (Chiang et al. 2012). Business students developing BI expertise who possess industry-specific knowledge are better equipped to identify the key drivers of business performance, anticipate market shifts, and develop BI solutions that provide a competitive edge (Lönnqvist & Pirttimäki 2006). Students have the opportunity to gain

industry-specific knowledge through various means such as coursework, case studies, internships, and by engaging with industry professionals and associations. By keeping themselves updated with the latest industry trends and best practices, students can maximize emerging opportunities.

2.4 Adaptability and Industry Engagement

As organizations increasingly rely on data to inform strategic decisions and gain a competitive edge, the demand for professionals with a strong foundation in BI continues to grow (Chen et al. 2012). This section explores the significance of BI skills for business students, focusing on two key aspects: adaptability to future trends and technological advancements, and the benefits of collaborative projects and industry engagement.

2.4.1 Adaptability to Future Trends and Technological Advancements

One main trend shaping the future of BI is the increasing adoption of artificial intelligence (AI) and machine learning (ML) techniques. Significantly, AI transforms how organizations approach data analysis and decision-making by enabling them to automate processes, uncover hidden patterns, and generate predictive insights (Davenport 2006). An MIT Sloan Management Review study found that more than 80% of organizations see AI as a strategic opportunity, and almost 85% see AI to achieve competitive advantage (Duan et al. 2015). The integration of AI and ML into BI systems also enables the automation of routine tasks, such as data preparation, quality assurance, and report generation. This automation frees up time for business analysts to focus on higher-value activities, such as data interpretation, storytelling, and strategic planning (Kowalczyk & Buxmann 2015). Moreover, AI-powered chatbots and virtual assistants can help non-technical users interact with BI systems using natural language queries, making data insights more accessible across the organization (Bharadiya 2023)**.**

To adapt to these future trends and technologies, exposing to the information of AI, or moreover, ML concepts, tools, and techniques is essential for students. Familiarity with these areas will enable them to identify opportunities for automating processes, improving decision-making, and creating value from the growing volume and variety of data available to organizations. And business students who cultivate a mindset of lifelong learning and actively seek opportunities to update their BI skills will be better prepared to adapt to future advancements and industry demands (Olszak & Ziemba 2012).

2.4.2 Collaborative Projects and Industry Engagement

Engaging in collaborative projects and industry partnerships is one aspect of developing BI skills for business students. These experiences provide students with practical opportunities to apply their BI knowledge and skills to real-world business problems while fostering valuable connections with industry professionals and organizations. Collaborative projects and industry engagement can take various forms, such as internships, capstone projects, case competitions, and research collaborations, each offering unique skills development and career preparation benefits.

Besides, guest speakers from the BI field, such as industry experts, consultants, and field managers, can provide valuable insights into real-world BI applications, share their experiences, and offer guidance on career development (Lönnqvist & Pirttimäki 2006). These interactions expose students to diverse perspectives and help them understand the practical challenges and opportunities in the BI field. Both case study projects and research collaborations, along with guest speaker sessions, offer valuable learning experiences, helping students stay informed about the latest BI trends, build professional networks, and position themselves for success in the competitive BI job market.

3 Methodology

This section aims to explain how the survey was designed and implemented. It covers the goal, survey design, how it was conducted, and data collection methods. The research uses a mixed-methods approach, combining both quantitative and qualitative data to investigate questions (IQs) related to the readiness of Finnish business students in BI skills for the workplace. The methodology is designed to provide a comprehensive understanding of the current state of business students acquiring BI skills and their alignment with industry requirements.

3.1 Research Approach

Two separate surveys are developed to capture a clearer view of the research topic. The first survey targeted current business students, aiming to understand their perceptions of how well their academic programs are equipping them with necessary BI skills. The second survey focused on teachers and employers, employees working with these students, assessing their views on the applicability and adequacy of students' BI skills in real-world business settings. Both surveys comprised a combination of quantitative questions and qualitative questions for open-ended reflections. Both surveys are created online using the Webropol platform, allowing easy access and data management.

According to experts and practitioners in the field, BI skills can be broadly categorized into three main areas: analytical, technical, and business skills (Smith & Doe 2020). The surveys were designed to cover all three skill areas to ensure a comprehensive assessment of BI readiness. Quantitative questions were structured to gauge proficiency and confidence in specific analytical, technical, and business skills. Qualitative questions were included to gather more detailed insights into applying these skills in real-world scenarios and the challenges faced and perceived gaps in BI education. By including only the relevant demographic information, such as field of study for students and years of experience for teachers, employers and employees, the surveys maintain focus on the key aspects that contribute to the research objectives while ensuring the credibility of the collected data.

3.2 Data Collection

The process of collecting data was split into two surveys, each focusing on a different group. The first group consists of current business students and recent graduates who are gaining expertise in BI, while the second group includes lecturers, employers, and employees who work with these students.

3.2.1 Data Collection from Survey 1

The survey is distributed to current business students enrolled in BI-related courses at Finnish universities. Participants were recruited through email invitations and online platforms, ensuring a diverse representation of academic institutions and study levels. The survey designed for current business students aims to assess their perceptions of readiness in BI skills. The survey was divided into four main sections: general questions, BI analytical skills, technical skills, and business (domain) skills.

The general questions section gathers information on the number of BI-related courses, students' level of agreement with statements about their BI coursework, and their opinions on the importance of various BI competencies. This section also inquired about the availability of verified certificates from recognized institutions and the use of training platforms. The BI analytical skills section assessed students' confidence in using BI tools for predictive analysis, interpreting data visualizations, and applying statistical methods. It also identified the statistical concepts applied in their coursework or projects.

The technical skills section focuses on students' familiarity with various BI software platforms, understanding data modeling and database concepts, and experience with cloud-based BI tools. It also asked students to recommend the top three BI software they consider crucial for gaining BI skills. The business (domain) skills section evaluated students' experience in team projects involving BI, their ability to communicate BI findings to non-technical audiences, integrate BI insights into business strategy, and present BI findings effectively. This section also sought students' opinions on the importance of case studies and guest lectures from industry professionals in BI education.

Additionally, the survey includes open-ended questions to gather qualitative insights on areas of BI education that students wish were taught more extensively and the specific areas of BI they feel most passionate about. Demographic information such as age, current education level, and field of study was also collected.

3.2.2 Data Collection from Survey 2

The survey targets teachers involved in BI education and employers in BI-related industries. Teacher participants were identified through university faculty directories and professional networks, while employer participants were invited through industry LinkedIn and distributed via email. The survey is designed for lecturers, employers and employees to assess their evaluation of

business students related BI skills. Same as the first survey yet for different viewpoints, the survey was divided into four main sections: general questions, BI analytical skills, technical skills, and business (domain) skills.

Each section is scaled down from the first survey, as it was determined that extensive details is not necessary. For instance, the demographic section collects data only on participants' years of experience in their current positions, their experience with business students, and the type of organization they are affiliated with, whether an academic institution or a company. Or the open-ended questions, which sought qualitative feedback on the prediction of future trends related to BI skills, suggesting for improving BI education.

3.3 Data Analysis

The data analysis process for this research involves combining quantitative and qualitative techniques to derive meaningful insights from the survey responses. Comparisons will be made between the responses of students, teachers, and employers to highlight any similarities or differences in their perceptions of BI skills readiness. With the open-ended questions, the responses will be carefully reviewed, identify, and categorize insights. Because the study aims to develop a comprehensive understanding of the readiness of Finnish business students to acquire business intelligence (BI) skills. To achieve this, the study will integrate both quantitative and qualitative findings. This approach will enable the identification of convergent or different patterns, strengthen the validity of the conclusions, and provide a more subtle interpretation of the results.

3.4 Ethical Considerations

This research adheres to strict ethical principles to ensure the protection of participants' rights, privacy, and well-being. Informed consent will be obtained from all participants, and the surveys will be designed to ensure anonymity and confidentiality. Participation in the surveys will be entirely voluntary, and all data collected will be stored and processed in compliance with relevant data protection regulations. By adhering to these ethical considerations, this research aims to maintain the highest standards of integrity, protect the rights and well-being of the participants, and contribute to advancing knowledge in BI education.

4 Empirical Findings

This section details the results obtained from the two surveys: one directed at business students and the other at lecturers, employers and employees working with business students. The approach uses both quantitative and qualitative methods to analyze data, combining numerical survey results with detailed responses from open-ended questions. This approach allowed us to capture a comprehensive view of the data from different perspectives. By linking these results with the research objectives, significant implications of the research can be identified, thereby offering valuable insights into both academic and workplace settings.

4.1 Participants Demographics

4.1.1 Survey 1: Business Students' Perceptions of Readiness in Business Intelligence (BI) Skills

For the first survey, which targeted business students, more demographic data were collected to understand the background of the participants. This data includes age, year of study, major of study, and other relevant demographic information that could influence their responses and insights regarding their educational experience and expectations.

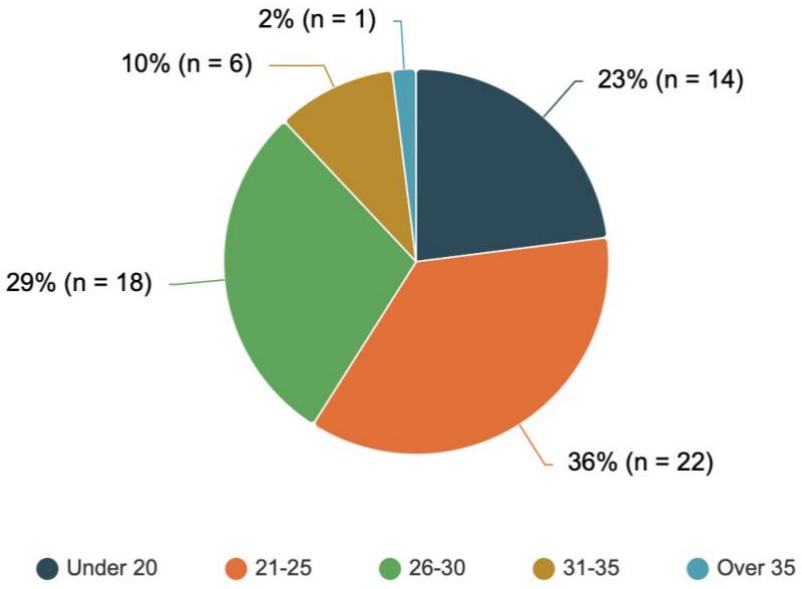

Figure 3. The distribution of survey respondents' age.

The survey was distributed to 217 Business students, out of which 61 responded, resulting in a response rate of 28.1%. This indicates that slightly more than one-fourth of the students who

received the survey link clicked through and completed the survey. The age distribution of the participants was diverse from under 20 to over 35, with the majority (88.6%) being 30 years old or younger.

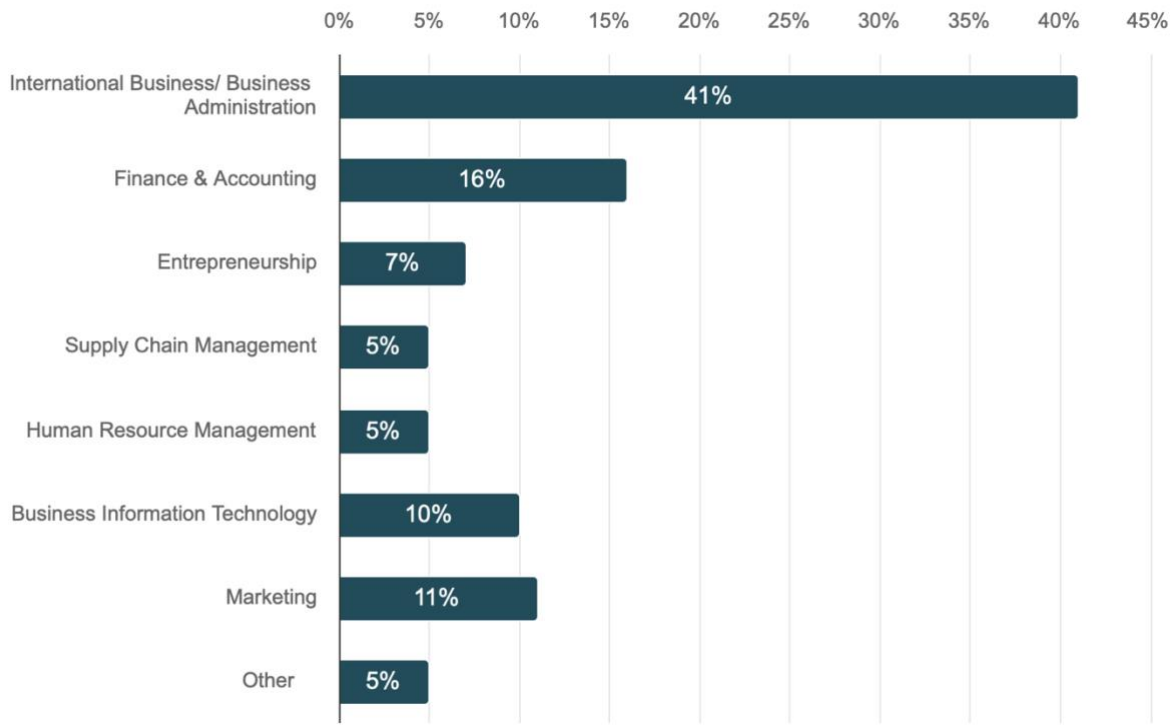

Figure 4. The distribution of survey respondents' field of study.

The respondents represented various academic levels and majors within the Business program. In term of academic level, 65.0% of the participants were undergraduate BBA students, while the remaining 35.0% were postgraduate BBA students. This diverse sample of Business students, with varying ages and academic levels and majors, provides a comprehensive perspective on the perceptions of readiness in Business Intelligence skills among the Finnish student population.

4.1.2 Survey 2: Employers, Employees and University Faculty's Evaluation of Business Students' Business Intelligence (BI) Skills

In contrast, the second survey, titled "Employers, Employees and University Faculty's Evaluation of Business Students' Business Intelligence (BI) Skills", which focused on lecturers, employers, employees, did not collect specific demographic information except the year of working experiences and the year of working with students to focus purely on the professional experience of the respondents. This decision to limit the data collection was made to ensure the anonymity of

the participants and because the detailed demographic background was not deemed necessary for the objectives of this part of the research.

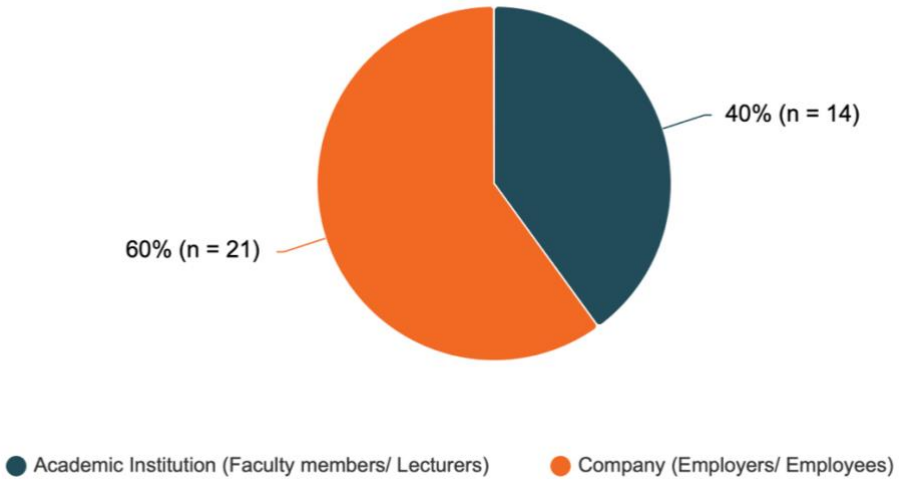

Figure 5. The distribution of survey respondents' type of organizations.

The survey was opened by 110 respondents, out of which 43 started responding. The survey completion rate was 32.1%, with 35 respondents completing the survey out of the 81% who clicked through to participate. The survey included participants from both academic institution and company. 40.0% of the respondents were faculty members or lecturers from Finnish academic institutions, while 60.0% were employers or employees from companies inside Finland. This distribution ensures that survey captures perspective from both the academic and professional sides, providing a comprehensive evaluation for business student's BI skills.

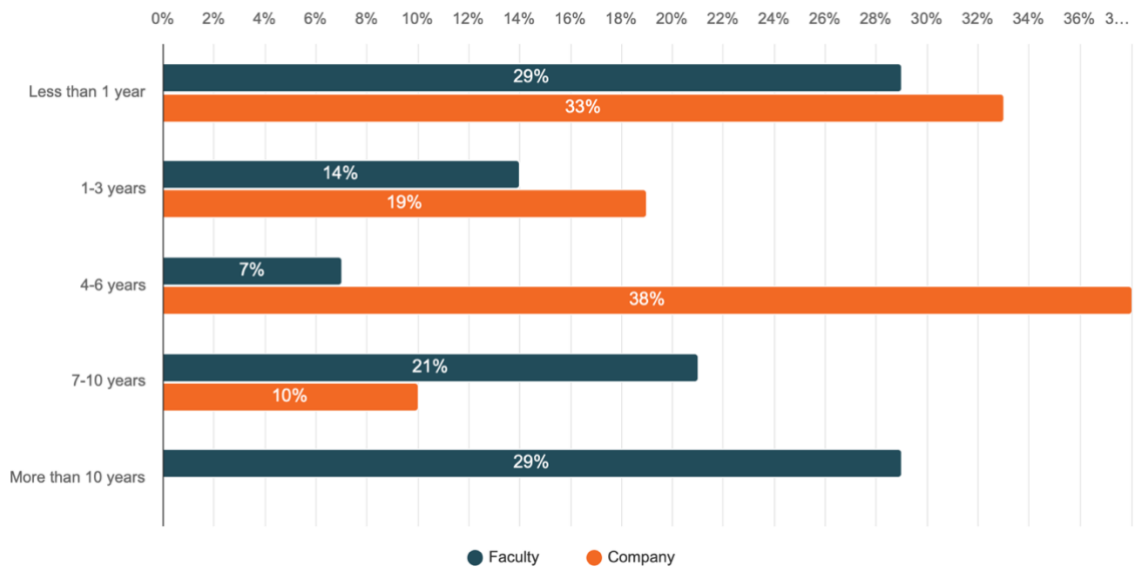

Figure 6. The distribution of survey respondents' years of experience in the current position.

When comparing the use of experience in the current position between faculty and company, some differences were observed. Among faculty, 28.6% had less than 1 year of experience, 14.3% had 1-3 years, 7.1% had 4-6 years, 14.3% had 7-10 years, and 35.7% had more than 10 years of experience. In contrast, among company, 33.3% had less than one years of experience, 19.1% had 1-3 years, 38.1% had 4-6 years, 9.5% had 710 years and none had more than 10 years of experience. (Figure 6)

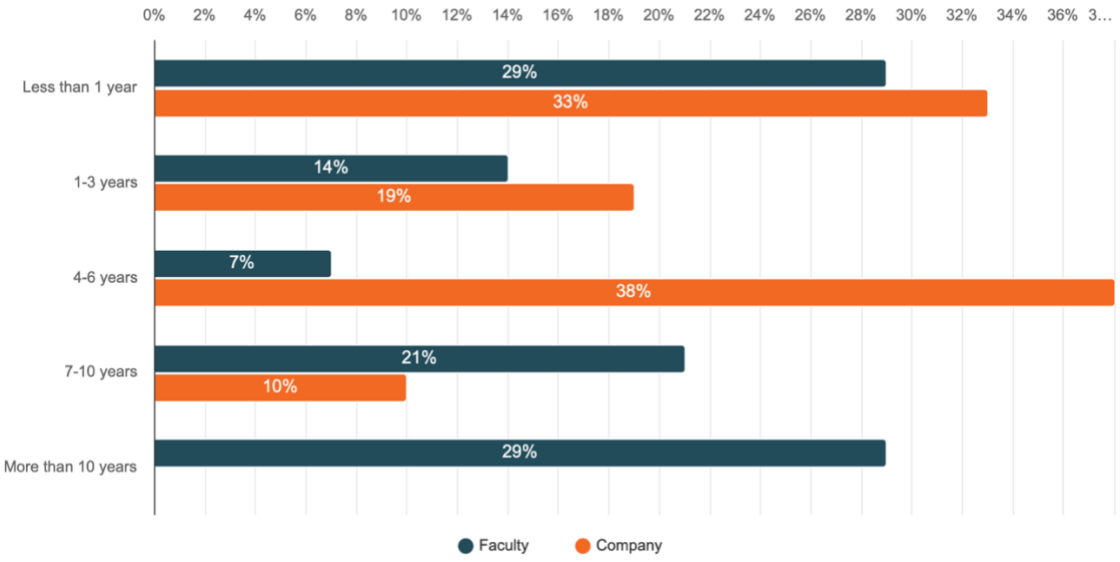

Figure 7. The distribution of survey respondents' years of experience working with business students.

Regarding experience working with Business students from the figure 7, notable differences were observed between faculty and company. Among faculty, 28.6% had less than one year of experience working with students, 14.3% had 1-3 years, 7.1% had 4-6 years, 14.3% had 7-10 years, and 35.7% had more than 10 years of experience. On the other hand, among company employees 47.6% had less than one years of experience working with students 33.3% had one three years 14.3% had for six years 4.8% had seven to 10 years and similarly, none had more than 10 years of experience working with Business students.

4.2 Perception and Evaluation of BI Skills Readiness

Students' Self-Assessment

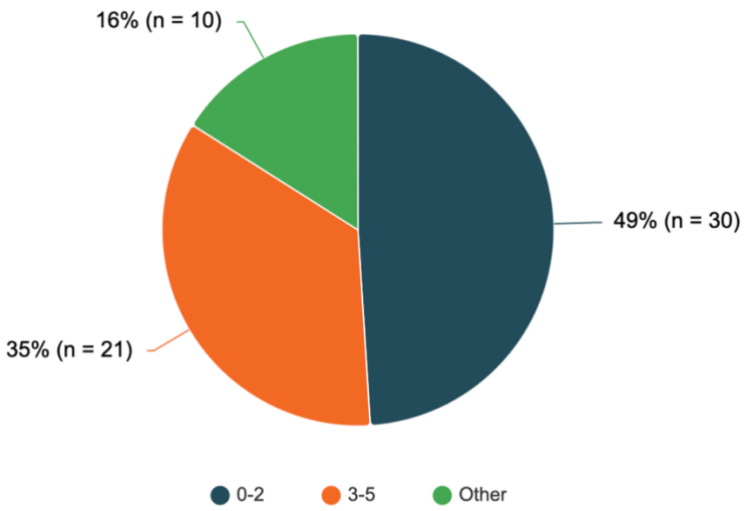

Figure 8. BI-related courses students completed during studies.

The data shows business students (83.6%) have completed at least one Bi-related course during their studies, suggesting that Finnish universities and university of applied sciences are offering BI courses as part of their business programs. In general, students report having taken an average of 3.2 BI-related courses during their studies, with a range of 1 to 6 courses. (Figure 8.) However, the depth and scope of the BI curriculum may vary across institutions.

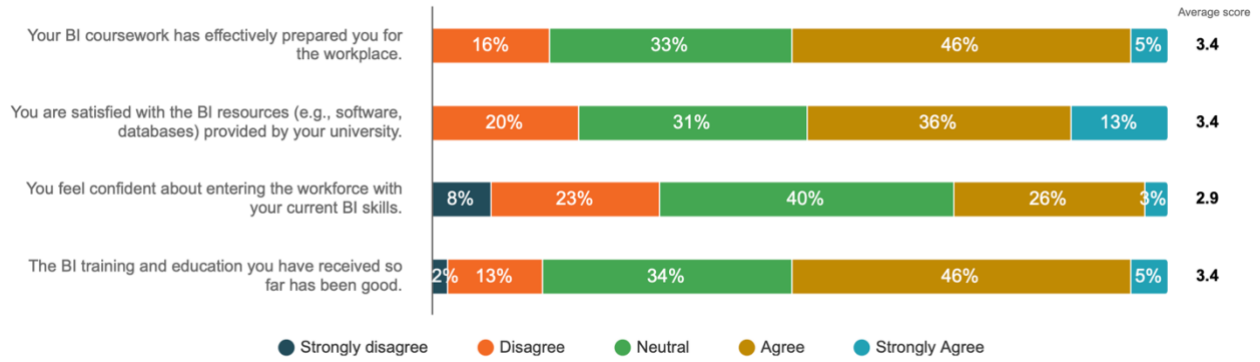

Figure 9. Level of agreement with BI skills statements.

The result from figure 9 shows students have varying perceptions regarding the effectiveness of their BI coursework in preparing them for the workplace. Overall, the average satisfaction with BI course in preparing for the job-readiness is 3.4 on a scale of 1-5. While nearly half of the students (50.8%) agree that their BI coursework has effectively prepared them, a significant percentage (32.8%) remain neutral on this matter, indicating possible uncertainties about the sufficiency of their BI education for professional demands. Besides, the survey result indicates that 45.9% of students agree that they are proficient in interpreting data visualizations and reports. However, a considerable percentage of students (31.2%) remain neutral about their proficiency in this area, underscoring the need for further emphasis on developing student's abilities to effectively analyze and communicate data insights.

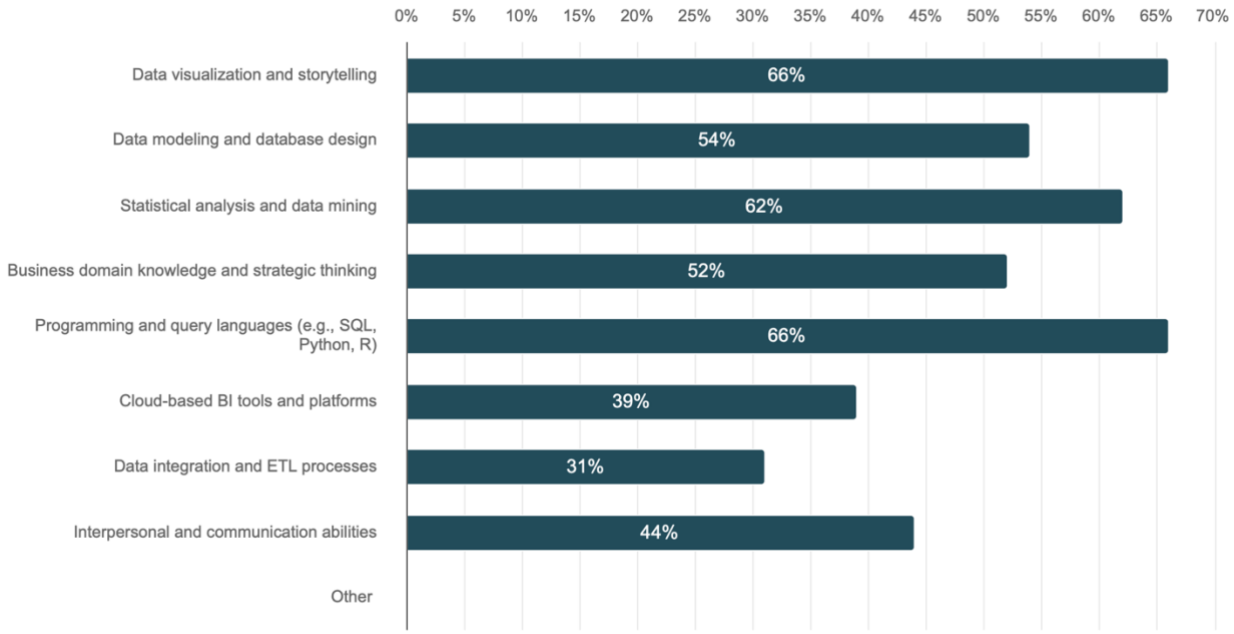

Figure 10. BI competencies for students to acquire.

Students consider data visualization and storytelling, data modelling and databased design, statistical analysis and data mining, business domain knowledge and strategic thinking, and programming and query languages (e.g. SQL, Python) to be important BI skills. Many students believe they meet 50-75% of the expectations for BI readiness upon entering the workforce.

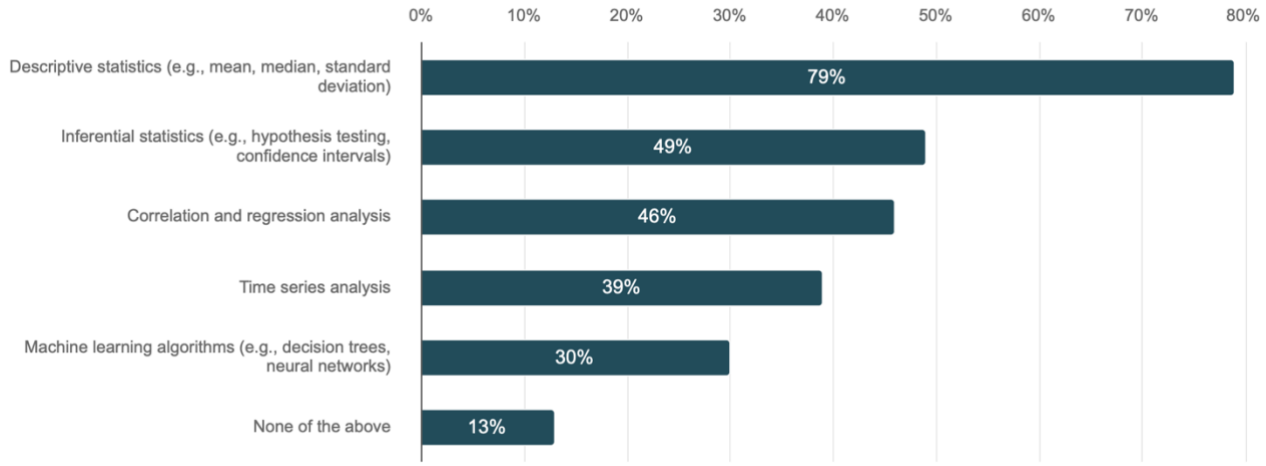

Figure 11. Statistical concepts that students applied in coursework.

The results showed that the most commonly applied statistical concepts were descriptive statistics (79%), inferential statistic (49%), and correlation and regression analysis (46%). These findings suggest that Finnish business students are exposed to a variety of statistical techniques in their BI education, and that the number of BI courses taken varies among students, potentially impacting their level of BI skills readiness.

Second Assessments by Faculty, Employers and Employees

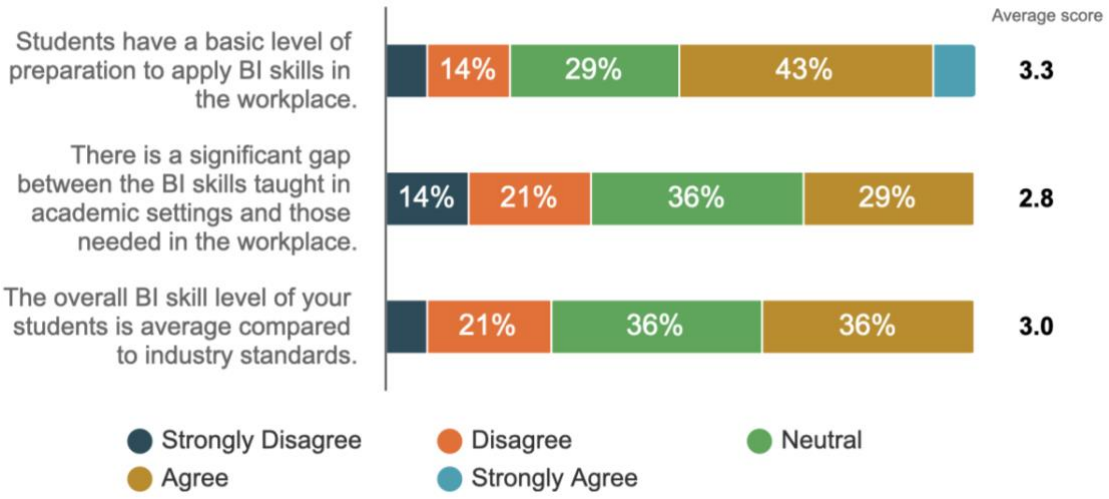

Figure 12. Valuation of the Bi skills taught from Faculty.

The survey results from faculty, employers, and employees provide valuable insights into the perceived alignment between the Bi skills taught in academic settings and those required in the workplace. Only 7% of faculty strongly agree that students have a basic level of preparation to apply BI skills in the workplace. 29% agree, while 21% disagree or strongly disagree. 43% of faculty estimate that 25-50% of students meet expectations for BI readiness, while 29% estimate 50-75% of students do.

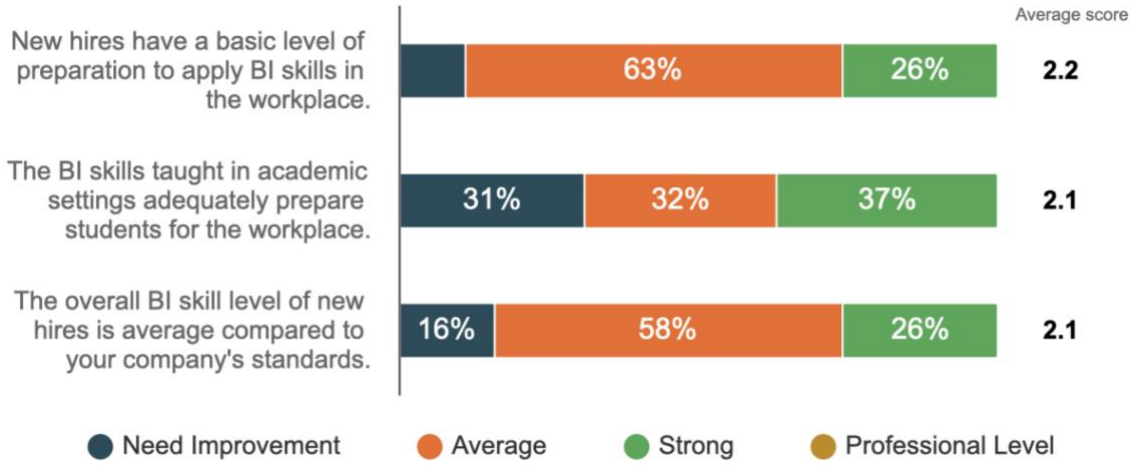

Figure 13. Valuation of the Bi skills taught from Company.

Employers and employees rate new hire\s overall BI skill level as average compared to company standards (2.1 average rating). 47% of employers estimate that 50-75% of new BI hires meet job readiness expectations. Employers most commonly find new hires' BI skills to be average across analytical abilities, technical skills, data preparation, and performance/adaptability. Ratings in the "strong" range are limited (25-36%). (Figure 13)

Comparison between the viewpoints of both surveys

Students seem to have a higher estimation of their own BI readiness compared to the assessments of faculty end company. While students largely believe they meet a majority of workplace readiness expectations, only about a third of faculty and company find students/ new hires to have a strong BI skill on average. According to the data, most faculty members/ lecturers and employers, employees rate them as average. As a result, the discrepancy implies that there be a gap between students' perception of their own skills and the actual expectations and requirements of the industry. Students may overestimate their readiness based on understanding

of the practical skills needed in the workplace. However, average ratings still skew more positive than negative overall.

4.3 Effectiveness of BI Education in Preparing Students for the Workplace

Educational Preparation

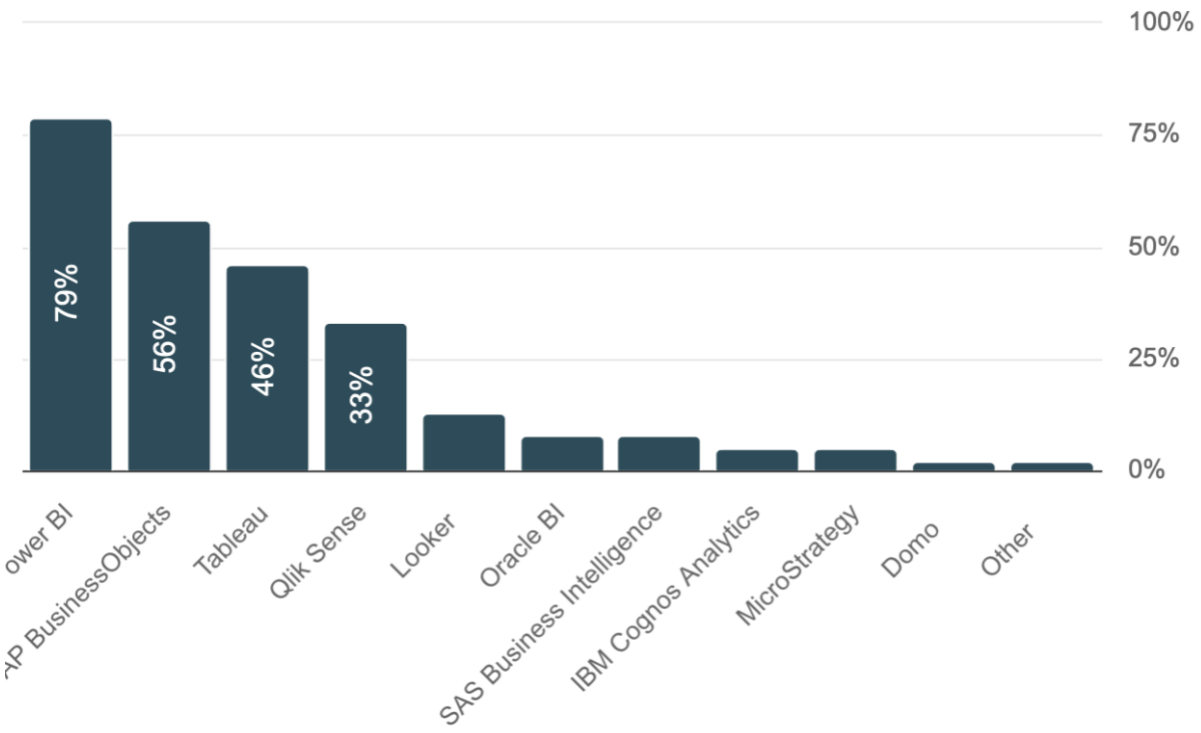

Figure 14. Top three BI Platforms Considered Crucial by Students.

While a high percentage of students primarily agrees on the importance of Power BI (79%), SAP (56%), Tableau (46%) and Qlik Sense (33%), the range of platforms students are exposed to in schools is more limited (Figure 14). It is crucial for schools to regularly review and update their Bi course offerings to ensure that students are exposed to a wide range of tools and technologies commonly used in the workplace.

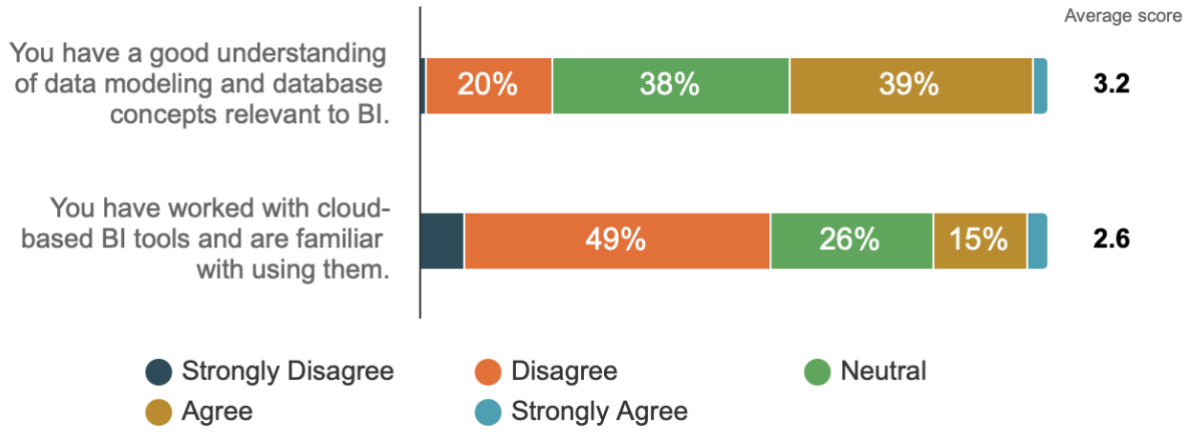

Figure 15. Level of Agreement with BI Concepts & Cloud Tech by Students.

While many respondents report at least neutral understanding of data modeling and database concepts (78.7% combined for Neutral, Agree, and Strongly Agree), the same cannot be said for cloud-based BI tools, where a significant 49.2% disagree with the statement about their familiarity, suggesting a gap in knowledge or experience with these technologies (Figure 15). This discrepancy highlights an area for potential improvement in training or curriculum development aimed at enhancing proficiency with cloud-based BI tools.

Additionally, from the textbox, the most frequently mentioned tools include Microsoft Power BI (both Power BI Service and Power BI on Azure), Google Cloud Platform (including Google Data Studio), and Amazon Web Services (AWS). Other notable tools mentioned were SAP, Qlik Cloud, Salesforce, and Tableau. Moreover, only 29.5% of student have the opportunities to earn verified certificates from recognized industry or academic institutions, highlighting the need for universities to explore partnerships with industry leads and certification providers.

Feedback from Faculty, Employers and Employees

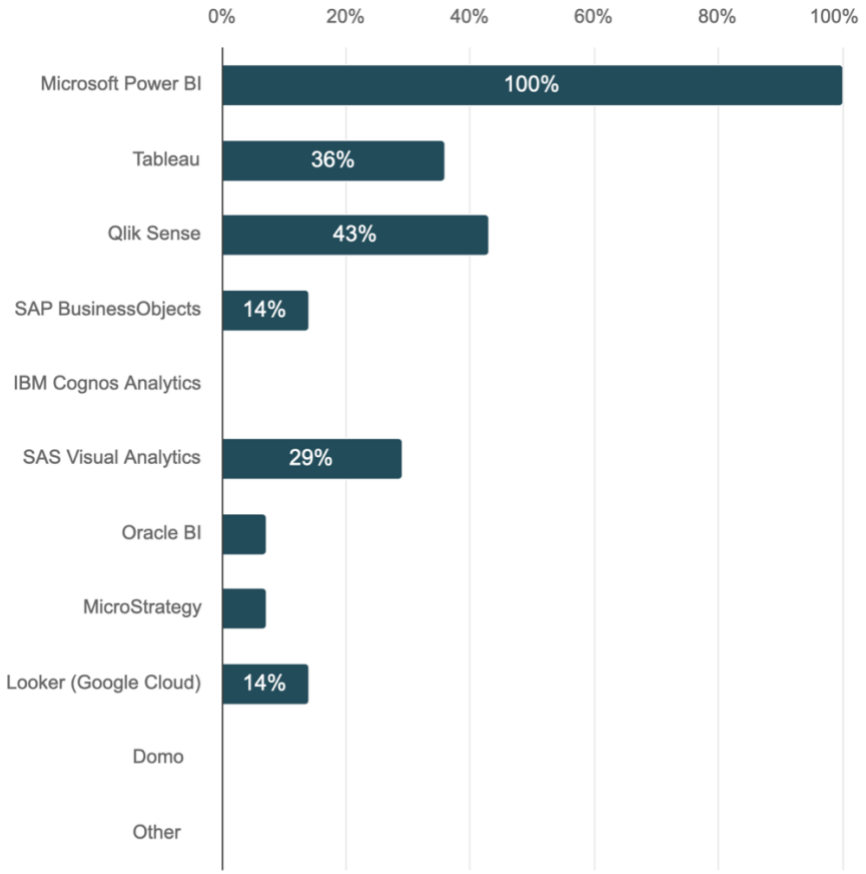

Figure 16. Top three BI Platforms Considered Crucial by Faculty.

The data shows that Microsoft Power BI is the most highly regarded BI software among respondents, with a 100% considering it beneficial for students preparing for a BI career. Tableau and Qlik Sense also stand out, receiving endorsements from 35.7% and 42.9% of respondents, respectively, indicating their perceived value in the Bi industry. (Figure 16) These top three choices suggest that proficiency in Power Bi, Tableau and Qlik Sense, could be particularly advantageous for students aiming to enter the Finnish BI field.

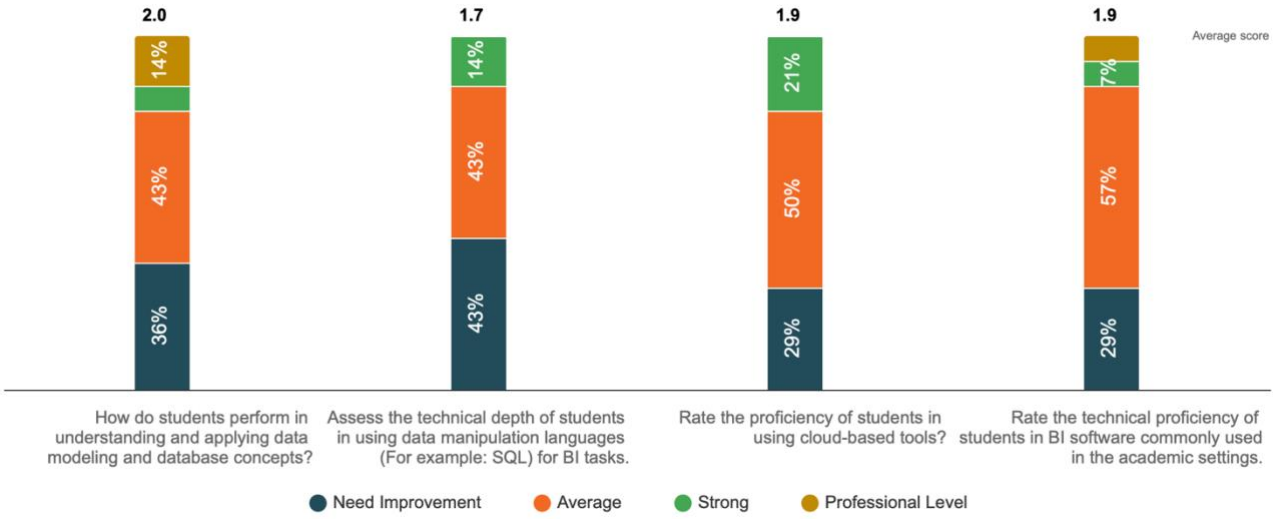

Figure 17. Level of Agreement with BI Concepts & Cloud Tech by Faculty & Company.

The feedback from faculty, employers, and employees explains the effectiveness of BI education in preparing students for the workplace. Only 36% agree that students effectively apply Bi tools to analyze data and generate valuable insights, suggesting a gap between theoretical knowledge and practical application. Besides, the result indicates that 50% of respondents rarely find students proficient in advanced BI analytical techniques, highlighting the need for faculty to place greater emphasis on teaching advanced topics such as predictive modelling, machine learning, and data mining.

Likewise, 44% find their company's own BI training program average in preparing new hires for their roles, while 22% see it as needing improvement. Furthermore, faculty and company rate business students' ability to interpret data visualizations and reports and their statistical analysis abilities in BI tasks as average.

Comparison between the viewpoints of both surveys

While students express a high value for practical, hands-on experiences and show particular interest in platforms, there is a gap in their exposure to and proficiency with cloud-based BI tools. This suggests that while educational institutions are partially addressing the needs for BI tool proficiency, they might not be fully preparing students for the specific demands and technological environments they will face in the workplace.

Feedback indicates that both faculty and employers see a significant gap between the theoretical knowledge provided by BI educational programs and the practical application of this knowledge in the workplace. Only a minority of faculty and employers feel that students can effectively apply BI

tools to analyze data and generate valuable insights. Also, the relatively low opportunity for students to earn verified certificates (29.5%) is a concern echoed by employers and faculty. Certifications are often valued in the BI industry as a testament to a candidate's skills and knowledge, and the lack of these opportunities can hinder students' job readiness and marketability.

4.4 Recommendations for Enhancing BI Curricula and Student Preparedness

Improvement Suggestions from Students

Many students express a desired for more hands-on experience with various BI platforms and tools, such as Power BI, Qlik Sense, and Tableau. They want that exposure to a wider range of tools would better prepare them for the diverse technologies used in the field. Some students also highlight the need for more extensive coverage of advanced topics, such as introduction to machine learning, AI, and their integration with BI frameworks. They recognized the growing importance of these technologies in driving sophisticated decision-making processes.

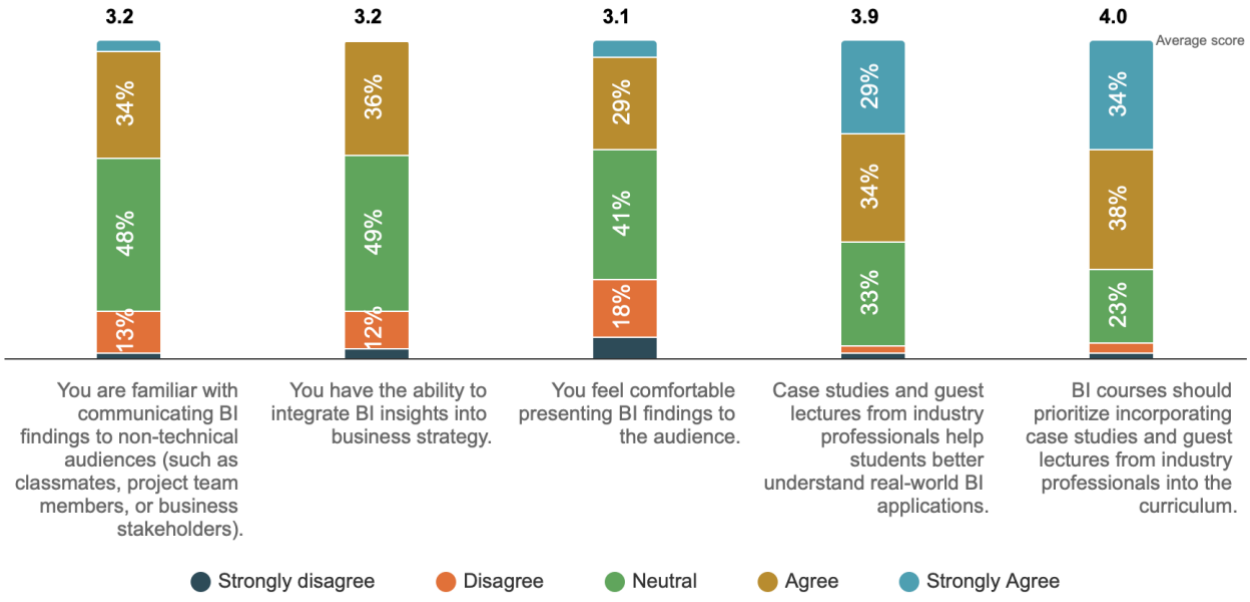

Figure 18. Level of Agreements with BI Domain Skills.

The survey results from figure 18 show that 37.7% of students agree or strongly agree that they are familiar with communicating BI findings to non-technical audiences, while 63.9% agree or strongly agree that case studies and guest lectures from industry professionals help them better understand real-world BI applications. Furthermore, 72.1% of students agree or strongly agree that

BI courses should prioritize incorporating case studies and guest lectures into the curriculum, emphasizing the importance of real-world examples and expertise in BI education.

The role of external resources and continuous learning in bridging skills gaps

The open-ended responses from employers, employees and faculty clarify their perspectives on bridging the skills gap between academia and industry. They emphasize the importance of developing students' soft skills. They note that while technical skills are essential, the ability to communicate insights, collaborate with diverse stakeholders, and understand business objectives is equally crucial for success in BI roles. Respondents suggest that universities should provide more opportunities for students to develop these skills through group projects, presentations, and cross-functional collaborations.

Another key theme is the need for continuous learning and professional development. A significant portion of student (59%) used LinkedIn learning and 44.3% use Coursera to supplement the skills outside of school courses. This suggests that students are proactively seeking additional learning opportunities to enhance the knowledge and stay up to date with the latest development in the field. On the other side, company and faculty recognize that the field of BI is constantly evolving, with new tools, techniques, and best practices emerging regularly. They suggest that schools should encourage and facilitate lifelong learning by providing students with access to industry certifications, online course, especially from open-learning platforms, and professional networks from Bi-related field.

Comparison between the viewpoints of both surveys

From the open-ended answers provided by students, they are particularly interested in broader exposure to a range of BI tools beyond just Power BI, as well as deeper understanding of programming languages and data cleaning techniques in realistic scenarios. They also seek more practical experiences, such as hands-on projects, workshops, and case studies that offer detailed guidance on using BI tools in major fields like financial analysis, logistics, or marketing. Additionally, students expressed a desire for an earlier introduction to Bi concepts in their curriculum to grasp its significance sooner, alongside structured learning on how Bi integrates with emerging technologies like ML and AI.

Similarly, the feedback on emerging BI trends underscores the growing integration of AI and ML, emphasizing the need for students/ new hires to not only grasp these technologies but also apply them practically in BI process. This trend, alongside the demand for expertise in big data

frameworks and cloud platforms, illustrates a shift towards more technologically advanced, or real-time data analysis environments. Equally important are the foundational skills like understanding business requirements, data storytelling, and effective communication with stakeholders. Therefore, external resources and continuous learning play an essential role in bridging the skills gaps, suggesting that both academic and company must evolve rapidly to incorporate both trending technologies and enduring BI competencies to prepared business students for the future demands of the BI-related field.

5 Discussion

This chapter presents a comprehensive discussion of the research findings, delving into the interpretation of the data, exploring how the findings contribute to the understanding of the research topic and its broader context. Furthermore, the discussion will identify areas for further research, suggesting avenues for exploration that can deepen understanding and address any limitations arising from the current study. This chapter aim to provide a holistic view on the research and its potential impact within the Finnish BI field.

5.1 Key Findings

The survey results provide valuable insights into the perception and evaluation of BI skills readiness among Finnish business students, faculty, and company. The key findings include:
IQ1: Finnis business students' perception of their BI readiness for the workplace.

- Students have mixed perceptions about the effectiveness of their BI coursework in preparing them for the workplace, with a significant portion expressing neutrality or doubts.
- Students demonstrate higher confidence in specific Bi competencies, such as interpreting data visualization and reports, but there is room for improvement in their overall readiness for the workforce.
- Only a minority of students feel fully prepared to enter the job market with their current BI skills.

IQ2: Faculty 's and Company's assessment of recent graduates' BI preparation.

- The second assessments by faculty and company reveal a notable gap between the BI skills taught in academic settings and those required in the workplace, highlighting the need for closer alignment with industry requirements.
- Proficiency in advanced BI analytical techniques is rarely found among students, and their abilities in data interpretation and statistical analysis are rated as average by faculty and company.
- Only a small proportion of respondents believe that students have a basic level of preparation to apply BI skills professionally, suggesting a need for a better alignment with industry requirements.

IQ3: Recommendations for enhancing BI curricula.

- Incorporate more hands-on experience with industry-relevant BI platforms and tools to align with the diverse technologies used in the field.
- Expand earlier course offerings in curriculum to include advanced topics such as machine learning, AI, and their integration with BI frameworks.

- Emphasize the development of soft skills, including teamwork, management reporting, and insights communicating, and presenting, to enhance students' ability to collaborate and communicate.
- Establish industry collaborations through guest lectures, workshops, and real-world projects to expose students to current trends, best practices, and challenges in the BI field, bridging the gap between theory and practice.
- Encourage and facilitate continuous learning and professional development by providing access to industry certifications, online courses, and professional networks.

5.2 Reflection on the Results

The survey design and sample may not perfectly capture the richer population's view, suggesting a potential bias in the findings. Yet, from both the surveys gathered in this research, it becomes evident that students perceive a need for a BI curriculum that is both more diverse and practically oriented to better prepare them for the complexities of the BI-related working field. While Finnish university and university of applied sciences provide a solid foundation in BI proficiencies, there is a strong concern for the integration of the more advanced analytics, programming languages, and real-world BI applications earlier in the educational journey. Moreover, the feedback emphasizes the necessity for increased collaboration between academia and company to ensure that the BI education provided is timely and relevant.

Overall, the results of this study "Assessing Business Students' Views on Achieving Workplace Readiness in Business Intelligence Skills" contribute to a better understanding of the current state of BI education in Finland and provide actionable insights for improving the alignment between academic preparation and industry needs. By addressing the identified gaps and implementing the recommended enhancements, Finnish universities can strengthen their BI programs to produce graduates who are well-prepared to meet the challenges of the modern business intelligence landscape.

5.3 Recommendation for Future Research

Based on the insights derived from this study, several recommendations for future research can be proposed to further enrich the understanding of BI education and its alignment with industry needs. First, conduct longitudinal studies to track the progression of BI skills among Finnish business students from their academic inception through to their early professional stages. This will provide a deeper understanding of the enduring impact of BI education. Additionally, refining the survey

design to attract a more diverse respondent base not only from the Helsinki region but throughout Finland would enhance the representativeness of the results.

Further research should also focus on the specific BI skill demands of majors such as finance, supply chain management, or marketing. Tailoring BI curricula to meet the unique needs of these fields could significantly enhance graduate employability. Finally, incorporating different methodologies such as interviews can provide additional perspectives, enriching our understanding by capturing more nuanced insights into the skills and needs of future Bi professionals. This multifaceted approach will ensure a more robust and throughout exploration of how BI education can best prepare Finnish students for the demands of the modern workplace.

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Appendix

Survey 1

Business Students' Perceptions of Readiness in Business Intelligence (BI) Skills

Mandatory questions are marked with a star (*)

General Questions

How many BI-related courses have you completed during your studies? *

- ○ 0-2
- ○ 3-5
- ○ Other

Rate your level of agreement with the following statements: *

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
Your BI coursework has effectively prepared you for the workplace.	○	○	○	○	○
You are satisfied with the BI resources (e.g., software, databases) provided by your university.	○	○	○	○	○
You feel confident about entering the workforce with your current BI skills.	○	○	○	○	○
The BI training and education you have received so far has been good.	○	○	○	○	○
You feel comfortable using statistical methods (e.g., regression analysis, cluster analysis) in BI projects.	○	○	○	○	○

Which of the following statistical concepts have you applied in your BI coursework or projects? (Select all that apply) *

- ☐ Descriptive statistics (e.g., mean, median, standard deviation)
- ☐ Inferential statistics (e.g., hypothesis testing, confidence intervals)
- ☐ Correlation and regression analysis
- ☐ Time series analysis
- ☐ Machine learning algorithms (e.g., decision trees, neural networks)
- ☐ None of the above

Next

Which of the following BI competencies do you consider important for business students to acquire? (Select all that apply) *

- ☐ Data visualization and storytelling
- ☐ Data modeling and database design
- ☐ Statistical analysis and data mining
- ☐ Business domain knowledge and strategic thinking
- ☐ Programming and query languages (e.g., SQL, Python, R)
- ☐ Cloud-based BI tools and platforms
- ☐ Data integration and ETL processes
- ☐ Interpersonal and communication abilities
- ☐ Other

Does your BI coursework offer opportunities to earn verified certificates from recognized industry or academic institutions? *

- ○ Yes
- ○ No

BI Analytical Skills

Rate your level of agreement with the following statements: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
You feel confident in using BI tools to predict future trends from historical data.	○	○	○	○	○
You are proficient in interpreting data visualizations and reports.	○	○	○	○	○

Technical Skills

Which of the following BI software platforms are you familiar with? (Select all that apply) *

- ☐ Tableau
- ☐ Power BI
- ☐ Qlik Sense
- ☐ SAP BusinessObjects
- ☐ Oracle BI
- ☐ IBM Cognos Analytics
- ☐ SAS Business Intelligence
- ☐ MicroStrategy
- ☐ Looker
- ☐ Domo
- ☐ Other

From the list provided, which top three BI software do you recommend or believe are crucial for gaining BI skills? *

- ☐ Tableau
- ☐ Power BI
- ☐ Qlik Sense

- [ ] SAP BusinessObjects
- [ ] Oracle BI
- [ ] IBM Cognos Analytics
- [ ] SAS Business Intelligence
- [ ] MicroStrategy
- [ ] Looker
- [ ] Domo
- [ ] Other

You can select from 1 up to 3 options
Selected options: 0

Rate your level of agreement with the following statements: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
You have a good understanding of data modeling and database concepts relevant to BI.	○	○	○	○	○
You have worked with cloud-based BI tools and are familiar with using them. *	○	○	○	○	○

How often do you engage in self-learning to enhance your technical skills? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Business (Domain) Skills

How many team projects involving BI have you participated in during your studies? *

- ○ None
- ○ 1-2
- ○ 3-4
- ○ 5-7
- ○ Other

Rate your level of agreement with the following statements: *

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
You are familiar with communicating BI findings to non-technical audiences (such as classmates, project team members, or business stakeholders).	○	○	○	○	○
You have the ability to integrate BI insights into business strategy.	○	○	○	○	○
You feel comfortable presenting BI findings to the audience.	○	○	○	○	○
Case studies and guest lectures from industry professionals help students better understand real-world BI applications.	○	○	○	○	○
BI courses should prioritize incorporating case studies and guest lectures from industry professionals into the curriculum.	○	○	○	○	○

How often have you applied BI skills in a real-world business context during your studies? *

- ○ Never (please elaborate)

- ◯ Rarely
- ◯ Sometimes
- ◯ Often
- ◯ Very Often

Reflecting on your BI education, what is one thing you wish was taught more extensively? (in English or Finnish, as preferred)

Beside school courses, which of the following platforms have you used for learning BI skills? (Select all that apply) *

- ☐ Coursera
- ☐ Udacity
- ☐ LinkedIn Learning
- ☐ DataCamp
- ☐ None (please elaborate)
- ☐ Other

You are likely to recommend Coursera/Udacity/LinkedIn Learning, etc. to someone looking to learn BI skills. *

- ◯ Yes
- ◯ No

What specific area of BI do you feel most passionate about, and why?
(Open-ended) (in English or Finnish, as preferred)

Previous Next

Demographic Information

Age:

- ◯ Under 20
- ◯ 21-25
- ◯ 26-30
- ◯ 31-35
- ◯ Over 35

Current Education Level:

- ◯ Undergraduate BBA
- ◯ Postgraduate BBA

Field of Study:

- ◯ International Business/ Business Administration
- ◯ Finance & Accounting
- ◯ Entrepreneurship
- ◯ Supply Chain Management
- ◯ Human Resource Management
- ◯ Business Information Technology
- ◯ Marketing
- ◯ Other

Previous Submit

Survey 2 - Faculty

General Questions

Rate your level of agreement with the following statements: *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Students have a basic level of preparation to apply BI skills in the workplace.	○	○	○	○	○
There is a significant gap between the BI skills taught in academic settings and those needed in the workplace.	○	○	○	○	○
The overall BI skill level of your students is average compared to industry standards.	○	○	○	○	○

Estimate the percentage of students who meet the expectations for BI readiness upon entering the workforce. *

- ○ Below 25%
- ○ 25%-50%
- ○ 50%-75%
- ○ 75%-100%

BI Analytical Skills

Students effectively apply BI tools to analyze data and generate valuable insights. *

- ○ Strongly Disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

How often do you find students proficient in advanced BI analytical techniques? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Evaluate students' BI analytical skills: *

	Need Improvement	Average	Strong	Professional Level
Evaluate students' ability to interpret data visualizations and reports.	○	○	○	○
Rate students' statistical analysis abilities in BI tasks.	○	○	○	○

Next

Employers' and Faculty's Assessment of Business Students' Business Intelligence (BI) Competencies

ⓘ Mandatory questions are marked with a star (*)

Demographic Information

Years of Experience in Your Current Position: *

- ○ Less than 1 year
- ○ 1-3 years
- ○ 4-6 years
- ○ 7-10 years
- ○ More than 10 years

Experience Working with Business Students: *

- ○ Less than 1 year
- ○ 1-3 years
- ○ 4-6 years
- ○ 7-10 years
- ○ More than 10 years

Type of Organization: *

- ◉ Academic Institution (Faculty members/ Lecturers)
- ○ Company (Employers/ Employees)
- ○

Academic Institution

Technical Skills

In your experience, which top three BI software are most beneficial for students to learn in preparation for a career in BI? *

- ☐ Microsoft Power BI
- ☐ Tableau
- ☐ Qlik Sense
- ☐ SAP BusinessObjects
- ☐ IBM Cognos Analytics
- ☐ SAS Visual Analytics
- ☐ Oracle BI
- ☐ MicroStrategy
- ☐ Looker (Google Cloud)
- ☐ Domo
- ☐ Other

You can select from 1 up to 3 options
Selected options: 0

Evaluate BI technical skills: *

	Need Improvement	Average	Strong	Professional Level

How do students perform in understanding and applying data modeling and database concepts?	○	○	○	○
Assess the technical depth of students in using data manipulation languages (For example: SQL) for BI tasks.	○	○	○	○
Rate the proficiency of students in using cloud-based tools?	○	○	○	○
Rate the technical proficiency of students in BI software commonly used in the academic settings.	○	○	○	○

How often do students demonstrate strong skills in data preparation tasks (such as combining data from multiple sources, cleaning data, and transforming data for analysis)? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Business (Domain) Skills

How often do students effectively communicate complex BI concepts to their peers or in classroom presentations? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Assess the effectiveness of current BI education in preparing students for workplace demands.	○	○	○	○

Which platform(s) do you recognize as providing substantial BI skills that meet industry standards? *

- ☐ Coursera
- ☐ Udacity
- ☐ LinkedIn Learning
- ☐ DataCamp
- ☐ None
- ☐ Other

In your view, how valuable are BI certifications from online platforms (e.g., Coursera, LinkedInLearning) when assessing a candidate's qualifications? *

- ○ No Value
- ○ Low Value
- ○ Neutral
- ○ Valuable
- ○ Highly Valuable

How important are the following for students to excel in BI roles? *

	Not important	Somewhat Important	Important	Very important
Hands-on projects	○	○	○	○
Industry certifications	○	○	○	○
Internships	○	○	○	○

Assess students' BI performance and adaptability: *

	Need Improvement	Average	Strong	Professional Level
Communicating BI findings to non-technical audiences (such as classmates, project team members, or business stakeholders).	○	○	○	○
Applying BI insights to strategic business decision-making	○	○	○	○
Understanding the strategic importance of BI in business	○	○	○	○
Rate the impact of BI courses with real-world case studies and guest lectures from industry experts on a student's performance	○	○	○	○

Additional Observations

How often do students meet your expectations in BI skills? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Assess students' BI performance and adaptability: *

	Need Improvement	Average	Strong	Professional Level
Rate students' ability to adapt BI skills to new industries or business contexts.	○	○	○	○

Development of soft skills (e.g., communication, teamwork)	○	○	○	○

What trends or changes in BI do you foresee becoming crucial in the next five years that graduates should prepared to adapt to these changes? (in English or Finnish, as preferred)

Previous Next

Survey 2 – Company

	Need improvement	Average	Strong	Professional level
Rate the familiarity of business students with data quality concepts and data cleansing techniques.	○	○	○	○
How do new hires perform in understanding and applying data modeling & database concepts?	○	○	○	○
Assess the technical depth of new hires in using data manipulation languages (For example: SQL) for BI tasks.	○	○	○	○
Rate the proficiency of new BI hires in using cloud-based tools?	○	○	○	○
Rate the technical proficiency of new BI hires in software commonly used at your company.	○	○	○	○

How often do new hires demonstrate strong skills in data preparation tasks (such as combining data from multiple sources, cleaning data, and transforming data for analysis)? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Previous Next

BI Analytical Skills

New hires effectively apply BI tools to analyze data and generate valuable insights. *

- ○ Strongly Disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly Agree

How often do you find new BI hires proficient in advanced analytical techniques? *

- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ Very Often

Evaluate new hires' BI analytical skills: *

	Need Improvement	Average	Strong	Professional Level
Evaluate new hires' ability to interpret data visualizations and reports.	○	○	○	○
Rate new hires' statistical analysis abilities in BI tasks.	○	○	○	○

Technical Skills

Evaluate new hires' BI techinical skills: *

Employers' and Faculty's Assessment of Business Students' Business Intelligence (BI) Competencies

ⓘ Mandatory questions are marked with a star (*)

Company

General Questions

Rate your level of agreement with the following statements: *

	Need Improvement	Average	Strong	Professional Level
New hires have a basic level of preparation to apply BI skills in the workplace.	○	○	○	○
The BI skills taught in academic settings adequately prepare students for the workplace.	○	○	○	○
The overall BI skill level of new hires is average compared to your company's standards.	○	○	○	○

Estimate the percentage of recent new BI hires who meet your expectations for job readiness. *

- ○ Below 25%
- ○ 25%-50%
- ○ 50%-75%
- ○ 75%-100%

Business (Domain) Skills

Assess new hires' BI performance and adaptability: *

	Need Improvement	Average	Strong	Professional Level
Rate the ability of new BI hires to apply BI insights to strategic business decision-making.	○	○	○	○
Rate their proficiency in communicating BI findings to non-technical stakeholders.	○	○	○	○
Rate the students' proficiency in collaborating with cross-functional teams (such as IT, sales, marketing, or finance) to gather BI requirements and deliver impactful solutions.	○	○	○	○
Rate the impact of real-world case studies and guest speakers on a new hire's initial productivity.	○	○	○	○
Assess the effectiveness of your organization's BI training program in preparing new hires for their specific job responsibilities.	○	○	○	○

Additional Observations

How often do new hires meet your expectations in BI skills? *

- ◯ Rarely
- ◯ Sometimes
- ◯ Often
- ◯ Very Often

Which training platform(s) provide skills well-aligned with your standards? (Select all that apply) *

- ☐ Coursera
- ☐ Udacity
- ☐ LinkedIn Learning
- ☐ DataCamp
- ☐ None
- ☐ Other

In your view, how valuable are BI certifications from online platforms (e.g., Coursera, LinkedInLearning) when assessing a candidate's qualifications? *

- ◯ No Value
- ◯ Low Value
- ◯ Neutral
- ◯ Valuable
- ◯ Highly Valuable

How important are the following for new BI hires to excel in their roles? *

	Not Important	Somewhat Important	Important	Very Important
Hands-on projects	◯	◯	◯	◯
Industry certifications	◯	◯	◯	◯
Internships	◯	◯	◯	◯

What BI trends do you foresee becoming crucial in the next 5 years for which new hires should be prepared? (in English or Finnish, as preferred)

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