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Application of Generative AI in Big Data Visualization for Enhancing International Business Decision-Making

Exploring Integration generative A.I. in generating visual data in form of graphs and charts from big data

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Final Projects
Spring 2023
International Business
Oulu University of Applied Sciences

ABSTRACT

Oulu University of Applied Sciences
Degree in International Business

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Title of Bachelor's thesis: Application of Generative AI in Big Data Visualization for Enhancing International Business Decision-Making

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Term and year of completion: Spring 2023.

Number of pages: 74

In this thesis, the author, a professional in the data visualization field at the commissioner's company, who has been engaged with data visualisation of customer-related datasets for their b2b clients across multiple industries, explores the challenges in big data visualization and examines the potential of generative AI as a transformative force in this domain. Starting with a comprehensive review of the challenges in big data visualization, the thesis delves into the potential of generative AI as a transformative force in this domain. The research explores the application of generative AI in big data visualization to enhance decision-making in the field of international business. The author of this thesis has leveraged the ability of generative AI in combination with tools; SQL (Structured Query Language), Google Sheets and WordPress to generate multiple charts related to products and customers of b2b clients. This thesis investigates the integration of generative AI and big data visualization specifically tailored for international business decision-making, addressing the existing research gap in this area. By leveraging generative AI, which offers innovative techniques for generating visual representations of large and complex data sets, The commissioner company seeks to extract insights and make informed decisions in the face of increasing data volume and complexity in the global business environment. With data's increasing volume and complexity in the global business environment, effective visualization plays a vital role in extracting insights and making informed decisions. Generative AI, an emerging technology, offers innovative techniques for generating visual representations of large and complex data sets. However, limited research exists on the integration of generative AI and big data visualization specifically tailored for international business decision-making. This study aims to address this gap by investigating the potential of generative AI in enhancing big data visualization, identifying challenges and limitations, and developing recommendations and best practices for its effective utilization. The research questions focus on the application, challenges, benefits, and best practices of incorporating generative AI in international business decision-making. The methodology includes a qualitative research approach which interprets and analyses past research papers and literature reviews, data collection from relevant sources, analysis and observation of generative AI techniques, and case studies with international businesses and other industries such as education, sports, medical fields and medicine. The expected outcomes include a better understanding of the application of generative AI in big data visualization and analytics for international business decision-making, identifying challenges and limitations, and developing recommendations for effective utilization. This research contributes to the field of international business by providing insights into leveraging generative AI to enhance decision-making processes and effectively utilize big data visualization in an increasingly data-driven global business landscape. By exploring the potential of generative AI in enhancing big data visualization, this research contributes to the field of international business, providing valuable insights to Commissioner Company and similar

companies seeking to leverage AI-driven data visualization as a service to their b2b clients and to find out whether or not it will be more effective in decision-making processes for their b2b clients. In an increasingly data-driven global business landscape, this research sheds light on the transformative power of generative AI and its role in extracting actionable insights from complex data sets in the form of effective graphs and charts and perhaps the ability to be interactive to users.

Keywords: Generative a.i. charts, data, data analytics, data visualisation, A.I.-integration, b2b, international business, big data.

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1 INTRODUCTION

1.1 Topic & Justification of Research

In today's data-driven world, businesses across multiple industries are facing challenges of extracting valuable insights from vast amounts of data that are complex and diverse. Since the dawn of the 20th century, statistics played a huge part on bringing out fact-based information that has helped organisations to see trends and changes of events in real life even in the near future. (Trendable, 2023) Today big data analytics has proven to be an emerging powerful tool for unpacking and helping users/viewers identify trends and patterns (Batistič and van der Laken, 2019). Often these datasets are given a visual representation such as graphs, line charts or pie charts even in the form of heat maps across the globe or focusing on a particular region. Over time the visuals also improved with more sophisticated technologies. However interpreting and visualizing data remains a challenge for businesses that runs on providing analytics to their customers such as Deloitte, Statista and Our World in Data (OWD) to name a few. Several studies have shown how organizational performances are influenced by big data analysis, which argues that firms forming strategies from data-driven decision-making have a tendency to be more profitable and productive than competitors (Brynjolfsson et al., 2011; LaValle et al., 2010). Big data includes important insights that may alter worldwide company strategy due to its volume, velocity, and diversity. The sheer scale and complexity of these databases, however, can impede decision-makers ability to extract useful information and unearth actionable insights. Challenges of Big Data lie in data capture, storage, analysis, sharing, searching, and visualization (Chen & Zhang, 2014).

To overcome this difficulty in large data visualization, the use of generative artificial intelligence (AI) approaches has emerged as a possible option. An area of AI known as generative AI focuses on constructing models capable of producing new material based on patterns seen in existing data. When combined with big data visualization, generative AI algorithms turn complicated data into visually intuitive representations, improving decision-making for multinational commercial ventures. The combination of generative AI with big data visualization has the potential to significantly improve multinational commercial decision-making. Decision-makers may develop dynamic and interactive visualizations that adapt to different contexts, datasets, and business scenarios by employing generative AI algorithms (Simon, 2014). These visualizations offer a

holistic view of complex data, enabling decision-makers to extract valuable insights, detect hidden patterns, and identify emerging trends pertinent to international business (Benke et al. 2018; Mahajan & Gokhale, 2017). One of the primary advantages of employing generative AI in big data visualization is its ability to address the challenges associated with data complexity, heterogeneity, and scale.

Traditional visualization tools frequently fail to portray high-dimensional, unstructured, or time-varying data, limiting comprehension of global economic dynamics. However, generative AI systems may provide meaningful and understandable visual representations of these complicated datasets. This enables decision-makers to understand the complex dynamics of worldwide marketplaces, consumer behaviour, and supply chain networks, allowing for more informed strategic decisions. Furthermore, generative AI-driven visualizations allow decision-makers to investigate "what-if" situations by modelling various tactics and assessing their potential effects. This capacity gives decision-makers a useful tool for analyzing the impact of various international business decisions before they are implemented. Generative AI-driven visualizations minimize uncertainty and improve decision-making by improving scenario analysis and risk assessment.

Justification

Generative AI is a branch of artificial intelligence that aims to create new data or content that resembles the original data or content such as images, texts, music or coding, Generative ai can be used for various purposes, such as data augmentation, content creation, data synthesis and data transformation (Kovalenko, 2023; Epstein et al., 2023). Researching generative AI in big data visualization is an emerging and interdisciplinary topic that involves the application of generative AI techniques to create or enhance visual representations of large and complex data sets. Big data visualization can help users to explore, analyze, and communicate data in an intuitive and interactive way. The author chooses qualitative analysis as the study methodology since it is crucial for a better understanding of social reality. It may be applied in several fields to examine a wide range of topics. To examine social phenomena, explain the meaning that individuals attach to events, circumstances, acts, or objects, and give a full grasp of many dimensions of social life, qualitative research is commonly utilized in the social and behavioural sciences.; to provide "thick descriptions" (Leavy, 2014; Stokel-Walker & Van Noorden, 2023).

In other words, Qualitative analysis can be used to assess the accuracy and efficacy of generative AI models and outputs, including their ability to accurately represent the traits, patterns, and trends of the original data, their realism and variety, and their impact on the user's perception and comprehension of the data. Additionally, this approach can assist in gaining an understanding of the user's requirements, preferences, and feedback in relation to the generative AI models and outputs, including the kinds of visualizations they want to view, how they interact with them, what they learn from them, and any challenges or difficulties they encounter. What attributes or data may be utilized as inputs or outputs, for instance, or what data transformations or manipulations can be employed,

In order to do research on generative AI in large data visualization, qualitative analysis might be a useful technique. It may be used to supplement the metrics, statistics, and experiment-based quantitative analysis techniques that are frequently employed in this discipline. A better and fuller knowledge of the data, the models, the results, and the users may be obtained through qualitative analysis.

1.2 Research Problems & Objectives

Big data is a term used to describe large, intricate datasets that come from several sources, including social media, sensors, and transactional data. These databases have the ability to provide useful information on market trends, consumer preferences, and competitive advantages for international corporate decision-making. However, because of issues with scalability, heterogeneity, noise, and privacy, it can be difficult to analyze and visualize such data. A kind of artificial intelligence called "generative AI" aims to produce unique and lifelike material, including music, literature, and graphics. By producing synthetic data that may supplement or enhance the actual data, its application can considerably improve big data visualization. This entails bringing diversity, new features, and values where there are gaps. Additionally, generative AI can produce interactive visualizations that are immersive and that engage viewers with natural language captions, 3D models, and animations.

Generative AI has a lot of potential, but it also has significant drawbacks and dangers when it comes to large data visualization. Important factors include dependability, quality, interpretability, and ethics. For instance, generative AI may produce unreliable or erroneous visuals that could lead people astray or cause them to get perplexed. It could also provide fictitious or biased visuals that hurt or deceive people. Furthermore, because generative AI frequently uses sophisticated statistical techniques and complicated algorithms, comprehending how it operates and why it generates specific results can be challenging. It is crucial to approach generative AI cautiously and make sure that it is used in an ethical, open, and reliable manner.

Research Objective:

This study's key goal is to investigate how generative AI may be applied to large data visualization to improve international corporate decision-making. The research specifically intends to:

1. Identify and evaluate the current cutting-edge, state-of-the-art software, methods and techniques of generative AI for big data visualization.
2. Develop and propose a framework or model of generative AI for big data visualization that can address the challenges and opportunities of big data and international business.
3. Analyze and discuss the potential benefits and limitations that can come from implementing AI in data management for business metrics.

To expand on this outline further, here are some possible questions for each research aim:

RQ1: How can generative AI be applied in big data visualization?

RQ2: What potential benefits, potential risks, limitations, privacy concerns and ethical considerations can be derived from the application of generative AI when implementing it in data visualisation?

RQ3: How do B2B stakeholders perceive the risks, limitations, privacy concerns, and ethical considerations associated with implementing generative AI in business decision-making?

1.3 The structure of a thesis

The thesis begins by defining artificial intelligence and introduces the reader to a few key terms, such as machine and deep learning and generative AI, with an emphasis on large data use cases. After learning the fundamentals of artificial intelligence, the thesis takes a little diversion to explain what big data is and how it relates to business. In general, the thesis examines one of the significant applications of generative AI, concentrating in particular on business analytics visualization. Following this exploration, the research will look into the most recent, state-of-the-art tools, methods, and techniques of generative AI for big data visualization, including the use of tools like SQL (Structured Query Language) queries and Excel with examples that the author himself has created and explored during the internship in the partnering commissioner company. After this, the study will address the opportunities and challenges of big data and global business. The study will also evaluate and examine the possible advantages of incorporating AI into data management for company KPIs, including marketing, finances, and even consumer behaviour for marketing strategy. The author has also looked at a literature review when studying the subject. The study methodology will be a qualitative analysis, and the literature evaluation will include articles and research papers from a variety of industries, including sports, education, and medical uses of big data and artificial intelligence. The technique comprises a survey of previous thesis papers and literature reviews, with an emphasis on large data visualization with artificial intelligence. Using interviews with professionals in the fields of business analytics and artificial intelligence, the author also analyzes this subject, primarily concentrating on the generative side of AI. The study continues by introducing the reader to the commissioner's firm and briefly examining its services and how the research relates to its daily operations. The author will briefly discuss the current state of generative artificial intelligence in the context of data analytics and visualisation in the conclusion and discussion section, with a focus on implementation strategy,

availability, security considerations, and privacy issues among B2B clients that can be analyzed from interviews and literature sources. Several posts from social networking sites like LinkedIn, Facebook, and Twitter are also included.

2 INTRODUCING ARTIFICIAL INTELLIGENCE

Artificial intelligence is a generic term for a machine (or process) that responds to environmental stimuli (or new data) and then modifies its operation to maximize a performance index (Russell & Norvig, 2010). In the realm of AI education, concepts such as mathematics, statistics, logic, and computer programming are instrumental. The AI model undergoes an iterative process of parameter adjustment and trial and error while being trained on data through reinforcement rules (Bellini et al., 2022). The overarching objective is to minimize the discrepancy between the model's predictions and experimental data, which serves as the performance index.

During the training phase, the AI system employs the classical scientific method, which dates back to Aristotle and was formalized by Francis Bacon around 1600. Once the AI model has been trained, it can be deployed to analyze new data and make informed decisions. This decision-making process involves detection, discrimination, and classification and is referred to as supervised learning due to its adaptive nature with a feedback loop and goal-oriented learning process. Examples of this approach include diagnosing diseases from pathology results or correctly categorizing labelled images of various skin cancers. Experts have suggested that AI can play a significant role in processing Big Data for predictive analytics due to the vast resources required. Big Data's potential is best understood as an artificial intelligence database. Some AI models do unsupervised learning using a clustering procedure, such as the k-means clustering algorithm, with the goal of detecting key groupings or defining characteristics in the data. A crucial difficulty in the future development of AI is figuring out how to use Big Data to create high-level abstractions that can replicate a human subjective reaction. In a clinical setting, there is potential for the development of a digital expert who supports the automated translation of pathology data into a written report or vocal explanation.

2.1 Machine learning and Deep learning

According to Benke & Benke (2018) and Nayariseri (2021), Machine learning is a subfield of AI that is based on training on new data using an adaptive approach, such as a neural network, but without explicit programming of new rules as required by other types of algorithms such as expert systems (Benke & Benke, 2018; Nayariseri et al., 2021). This means that machine learning allows computers to adapt and produce new outcomes without the need to input new instructions. These

instructions are called algorithms and are programmed sets of rules that tell the computer program how it should operate when it arrives at a desired outcome. According to Elmeri (2023), an algorithm takes an input and uses mathematics and computer logic to generate an output. Unlike traditional algorithms, A.I. algorithms use both inputs and outputs at the same time, allowing the A.I. to interpret the data logically and generate new outputs based on previously taught, updated, or produced knowledge or data. This reasoning enables artificial intelligence to learn to be more efficient and accurate when dealing with similar or identical material in the future (Elmeri, 2023).

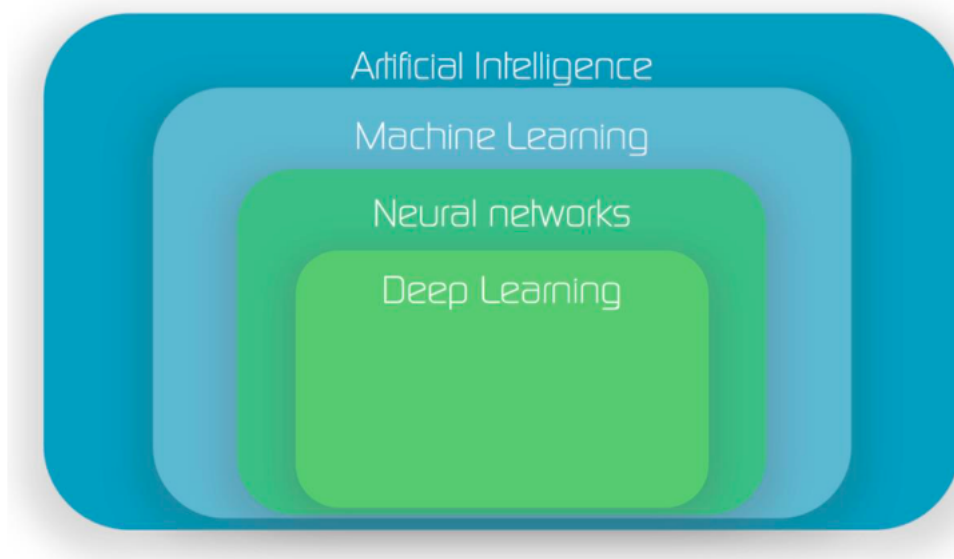


Figure 1.1: Illustrations of A.I. Subsets (OECD 2021)

Machine learning algorithms can be categorized into broad distinctions. Supervised learning, unsupervised learning and Reinforced learning. Advanced regressions and data classification are used in supervised learning to enhance predictions. And it employs traditional machine learning. Unsupervised learning uses input data to analyze data distribution in order to create automated customer categories, whereas deep/reinforced learning uses neural networks and may be used to unstructured data such as photos or speech/voice Deep learning neural networks replicate the way neurons interact in the brain by using numerous ('deep') layers of simulated interconnection (OECD, 2021). These models, inspired by the way the human brain functions, employ multi-layer neural networks to learn and recognize complex patterns in data. Deep learning models may recognize and categorize incoming data without the need for particular rules (no need to define specific detectors) and can uncover novel patterns that no person would have predicted or

designed. Such networks should be more noise-resistant and capable of working at several levels of generality from sub-features.

2.1.1 Why Big Data?

Machine Learning models make use of vast volumes of alternative data sources and data analytics, which are referred to as "big data." The phrase "big data" was initially used in the early 2000s to represent "the explosion in the quantity (and occasionally, quality) of available and potentially relevant data, mostly as a result of recent and unprecedented breakthroughs in data collection and storage technologies" (OECD, 2019). The big data ecosystem includes data sources, software, analytics, programming, and statistics, as well as data scientists who synthesize the data to filter out noise and generate comprehensible results. Climate data, satellite images, digital photographs and videos, transaction records, or GPS signals are examples of big data, as are personal data: a name, a photo, an email address, bank details, and social media postings.

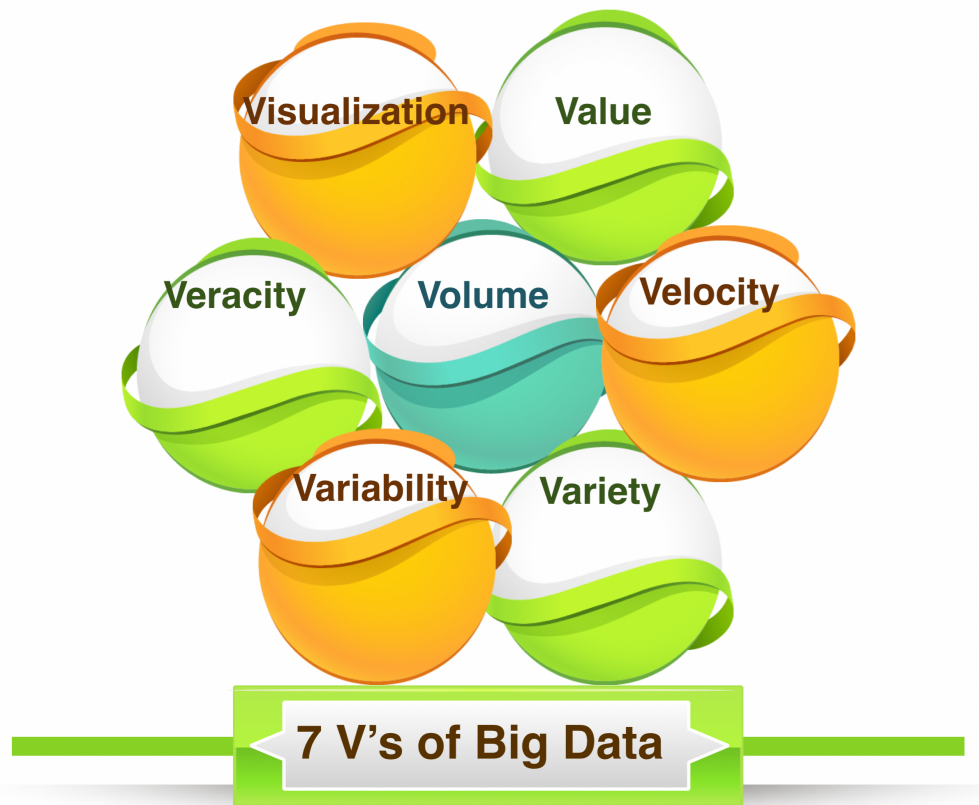


Figure 1.2: Illustrations of '7Vs' of Big Data

In the early years of this century, discussions around big data were dominated by the concept of three V's; volume, velocity, and variety, but now it has evolved to include seven key attributes, also known as the "7Vs" of Big Data (OECD, 2019; Moore, 2023). Firstly, volume, which refers to the quantity of data, a measure that has risen exponentially due to the Internet of Things (IoT). Secondly, velocity, signifying the speed of data processing and its accessibility, where real-time delivery is the norm. Thirdly, variety, indicating the challenge of organizing diverse data types, such as XML, video, and SMS, in a meaningful manner. Fourthly, variability, denoting the inconsistency in data meaning, which can affect data homogenization. Fifthly, veracity, emphasizing the accuracy of data and the need to prevent the accumulation of false data in systems. Sixthly, visualization, which stresses the importance of presenting complex data in a comprehensible format using charts and graphs. Lastly, value, asserting that after addressing the first six aspects, which requires significant time, effort, and resources, organizations must ensure they derive value from their data.

2.2 Generative A.I.

Generative artificial intelligence is a type of artificial intelligence that can generate a varying range of content including text, images, audio, and video (Chui, 2022). The technology behind chatbots was first developed in the 1960s, but it wasn't until the introduction of generative adversarial networks (GANs) in 2014 and large language models (LLMs) more recently that it reached its current state of advancement (Elmeri, 2023). What differentiates Generative A.I. from conventional AI is the foundational model first coined by Stanford University's Center for Research on Foundation Model. It is a machine learning (ML) model pre-trained on a broad dataset that can be adapted to solve a range of problems. Just as Microsoft's Win32 offers APIs for developers to access base-level hardware and OS functions (Deloitte, 2023). the model layer is designed to connect ambitious application developers to optimized hardware to help accelerate the adoption of and democratize Generative AI. Developers may fine-tune these models with additional training data to increase context, relevance, and performance for particular use cases while minimizing delivery costs. These models are frequently accessible to developers via closed and open APIs. Although this methodology may be used to many AI architectures, the most advanced Foundation Models used today (such as GPT-3, Stable Diffusion, and Megatron-Turing) are built using a neural network architecture called transformers that was developed by a team at Google Brain in 2017. 10 Transformers are a significant improvement over previous

systems in terms of machine learning performance since they can assign context, monitor relationships, and forecast consequences. Large amounts of training data were made readily available, which sped up the creation of Large Language Models (LLMs), a subset of Generative AI fundamental models, and these models are currently the most developed in the text domain. LLMs are taught to produce text by predicting the next word in a sequence or missing words within a paragraph.

Additionally, Generative AI may produce artifacts in a variety of formats, including code, photos, videos, audio, and 3D models. In a variety of capacities, from copywriting to research and software engineering, this might both disrupt and promote step increases in productivity. For instance, Generative AI might produce original writing, product descriptions, and visuals for advertisements in a matter of seconds. It may produce fake X-ray pictures for use in healthcare, aiding in the diagnostic training of doctors.

2.3 Use cases of Generative A. I in Business

Understanding the technological advances that have led to the emergence of generative AI, which were decades in the making, is necessary to comprehend what lies ahead. The development of ChatGPT, GitHub Copilot, Stable Diffusion, and other generative AI technologies that have recently attracted public interest is made possible by substantial investments that have advanced machine learning and deep learning. The AI applications built into many of the goods and services used on a daily basis are supported by this investment.

The most recent implementations of generative AI are capable of carrying out a variety of commonplace tasks, such as data categorization and reorganization. But what has made news is their capacity for writing texts, composing music, and producing digital artwork (Chui et al. 2022). Additionally, generative A.I. programs like ChatGPT, Genie, Bard, and Bing Chat have demonstrated a significant improvement in their capacity to generate software codes or, more pertinently for this study, codes for platforms like Python, SQL queries, and even complex excel functions for better table formation and structure. Additionally, generative AI has the ability to investigate enormous volumes of unstructured data (What is Big Data, 2023).

In the business field, specifically in marketing and sales, The benefits of generative AI are numerous. Increasing the likelihood of a sale is one method. By building comprehensive profiles

from a variety of data sources, it can identify and rate potential consumers while also advising employees on how to enhance customer engagement at every level. To close more sales, generative AI, for instance, can offer deeper insights into client preferences. By enhancing lead nurturing, generative AI can also be helpful. By generating pertinent product and customer data and constructing scripts for client dialogues that include chances for up-selling and cross-selling, generative AI may help sales reps create leads. Additionally, it may automate sales follow-ups and maintain contact with leads until they are prepared to speak with a real salesperson.

Additionally, by successfully and efficiently producing material, generative AI may assist. When it comes to brand voice, writing style, and format, generative AI may dramatically save the time and effort required for brainstorming and content development while maintaining consistency. Through generative AI, team members may work together to combine their ideas into a single, cohesive work. Teams would be able to customize their marketing messages on a scale that is not feasible with conventional techniques for various client groups, geographic areas, and demographics.. Depending on the audience, mass email campaigns may be instantaneously translated into as many different languages as necessary with distinct images and messages. The capacity of generative AI to develop content with a range of parameters may raise lifetime customer value, attraction, conversion, and retention rates.

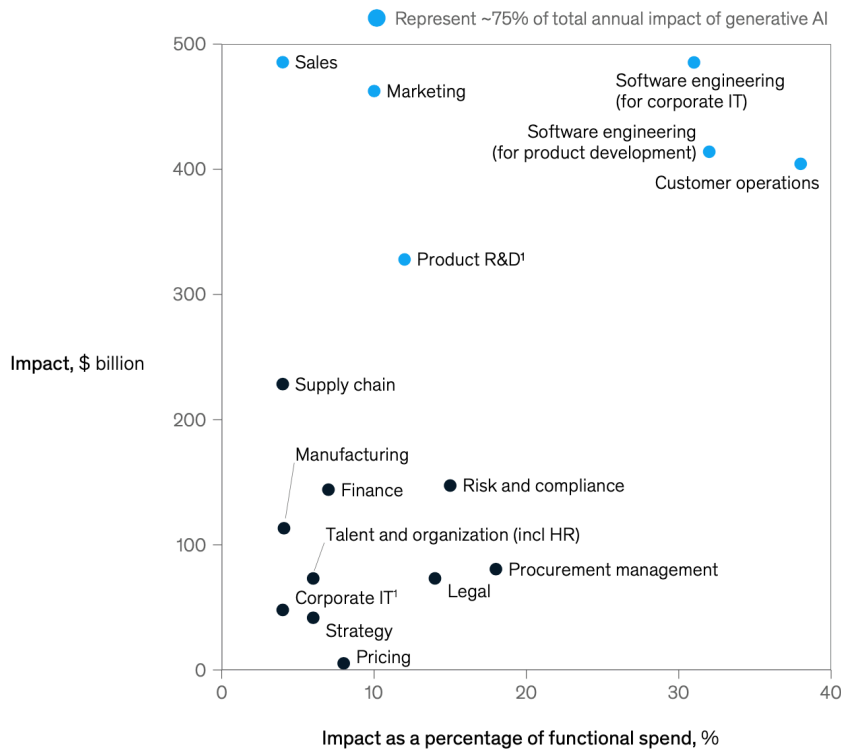


Fig 2.1 Impact on generative A.I. on potential corporate use cases.

Enhancing the usage of data is another way it may be helpful. By analyzing abstract data sources including text, graphics, and other structures, generative AI may be able to assist marketing operations in overcoming the difficulties posed by unstructured, inconsistent, and unconnected data, such as that from various databases. It may assist marketers in creating data-informed marketing strategies, such as targeted customer profiles and channel suggestions, by better-utilizing data such as territorial performance, synthesized customer feedback, and customer behaviour.. These systems might extract information from unstructured sources including social media, news, academic research, and consumer input and discover and synthesize trends, important drivers, and market and product prospects. Search engine optimization (SEO) for technical marketing and sales components including page titles, image tags, and URLs may help marketers increase conversion and save expenses. It may synthesise important SEO tokens, assist experts in the construction of digital SEO material, and provide tailored content to clients.

Finally, generative AI can be useful by tailoring product search and discovery. With the use of multimodal inputs like as text, photos, and audio as well as a thorough grasp of client profiles, generative AI can customize product discovery and search. For instance, technology may use a

user's preferences, actions, and past purchases to develop customized product descriptions and assist buyers in finding the most pertinent goods. By increasing website conversion rates, CPG, travel, and retail businesses would be able to increase their e-commerce revenues.

3 BIG DATA VISUALISATION IN BUSINESS

In order to get useful information, data analysis is a procedure that starts with gathering data from numerous sources and ends with evaluating it. Statistics, which has a rather extensive history, is where data analysis gets its foundation. According to legend, statistics got their start in ancient Egypt, where the construction of pyramids necessitated regular censuses. Statistics have been crucial to governments throughout history in the construction of censuses, which were utilized for a variety of planning initiatives, including, of course, taxes. Data analysis has been significantly improved by the development of computers and subsequent improvements in computing technology. In the past, data was traditionally gathered in the form of a census in the late 19th century, which took around 7 years to complete. The development of SQL queries in the 1980s altered how data is gathered after years of toil and several breakthroughs. It revolutionized the data-gathering process, enabling simpler, more affordable data collection with quicker, less expensive data storage (Smallcombe, 2021).

Starting in the late 1980s, there was a substantial increase in the volume of data collected, largely attributed to the diminishing costs of hard disk drives. According to Smallcombe 2021, William H. Inmon introduced the concept of a "data warehouse," a system specifically designed for the purpose of reporting and data analysis. Distinct from conventional relational databases, data warehouses were primarily engineered for optimized query response times, with infrequent use of operations such as DELETES and UPDATES and triggered the emergence of "Big data". (Smallcombe, 2021). For instance, in a scenario where a business sought to analyze sales trends on a monthly basis, all sales transactions could be timestamped and stored within a data warehouse, facilitating queries based on these timestamps. Additionally, in 1989, Howard Dresner at Gartner introduced the term "Business Intelligence" (BI). BI serves to enhance decision-making in the business context by systematically searching, collecting, and analyzing accumulated data. The emergence of this concept was a logical progression, considering the quality of technologies like databases and data warehouses available to support it. Notably, larger corporations adopted BI practices to systematically analyze customer data when making critical business decisions.

Today, the internet has produced many new sources of data that are vast in size and available to business executives. Big data is comprised of datasets that are too large to handle by traditional

database systems. To compete with other organisations, businesses need to adopt new technologies and processes to manage big amounts of data. The instruments are either expensive or not ideal for operations, and the data are often turned into graphs and charts, which need a tremendous amount of computing power. There are more and more ways to produce data; Multimedia material, social media, and other sorts of sensors have augmented the usage of conventional transactional databases. Users may now gather, communicate, aggregate, store, and analyze vast data sets, or "big data," thanks to advancements in information technology (Purcell, 2013). For firms that have relied on database technology to store and analyse data, the new data-collecting approaches present a problem.

3.1 Impact of Big Data on Business Models

Big data is a term that refers to the massive amounts of data that are generated by various sources and require special techniques to store and analyze. The size of big data can vary depending on the industry, the tools available, and the average data sets in that domain. According to Purcell (2013), big data can range from tens of terabytes to several petabytes. To take advantage of big data, businesses need to adopt new technologies and methods for data storage and analysis (Purcell, 2013). They need to identify the best solutions that match their information needs and goals. Businesses that ignore the potential of big data will risk losing their competitive edge in the market. The author of this study has served a consulting firm that specializes in big data for the consumer market and consumer behaviour. The firm provides insights and recommendations to its B2B clients based on big data analysis. One of the main tools that the author uses for managing and querying big data is SQL, which is a powerful language for manipulating complex data structures. The author uses SQL to create charts and graphs that illustrate the findings and trends from big data.

Big data has an impact on how companies generate revenue, enhance operations, please consumers, and outperform rivals. It enables firms to innovate with data, which entails utilizing data to create fresh solutions that address issues or cater to client wants. Innovation based on data may increase productivity, quality, customer happiness, and income. For instance, Netflix uses big data to customize its recommendations, optimize its content selection, and improve the quality of its streaming. Additionally, it makes new data ecosystems possible, which are networks of collaborators that work together to share, trade, and use data for everyone's advantage. Data

ecosystems can include a variety of participants, including data producers, users, middlemen, regulators, and consumers. Data ecosystems may encourage participant engagement, trust, openness, and value generation. It. The data economy has the potential to open up new markets, business ventures, and sources of income for data-related goods and services. As it poses issues like data ownership, privacy, security, and ethics, the data economy has the potential to challenge current corporate paradigms and regulations.

The language for accessing and manipulating relational databases, SQL, is one of the technologies that may help organizations use big data. Large and complicated data sets may be mined for pertinent information using SQL, which can also be used to do computations and aggregates on the data as well as merge and combine data from numerous sources. SQL can produce charts and graphs to help visualise the data in addition to filtering and sorting the data according to certain criteria. Businesses may use SQL to create graphs and charts that display big data insights and trends. Businesses may convey their results, make choices, and take actions based on the data with the use of charts and graphs. For instance, a company can utilize SQL to create a pie chart that shows the market share of different products or a line chart that shows the sales performance over time. An example from the author's own graph creation using SQL queries generated by ChatGPT^[TM] is shown below:

[SQL Query]

```
SELECT
YEAR(date) AS year,
SUM(CASE WHEN MONTH(date) = 1 THEN count_in ELSE 0 END) AS january,
SUM(CASE WHEN MONTH(date) = 2 THEN count_in ELSE 0 END) AS february,
SUM(CASE WHEN MONTH(date) = 3 THEN count_in ELSE 0 END) AS march,
SUM(CASE WHEN MONTH(date) = 4 THEN count_in ELSE 0 END) AS april,
SUM(CASE WHEN MONTH(date) = 5 THEN count_in ELSE 0 END) AS may,
SUM(CASE WHEN MONTH(date) = 6 THEN count_in ELSE 0 END) AS june,
SUM(CASE WHEN MONTH(date) = 7 THEN count_in ELSE 0 END) AS july,
SUM(CASE WHEN MONTH(date) = 8 THEN count_in ELSE 0 END) AS august,
SUM(CASE WHEN MONTH(date) = 9 THEN count_in ELSE 0 END) AS september,
SUM(CASE WHEN MONTH(date) = 10 THEN count_in ELSE 0 END) AS october,
SUM(CASE WHEN MONTH(date) = 11 THEN count_in ELSE 0 END) AS november,
SUM(CASE WHEN MONTH(date) = 12 THEN count_in ELSE 0 END) AS december
FROM
`visits`
GROUP BY
YEAR(date)
```

[Chart Output]

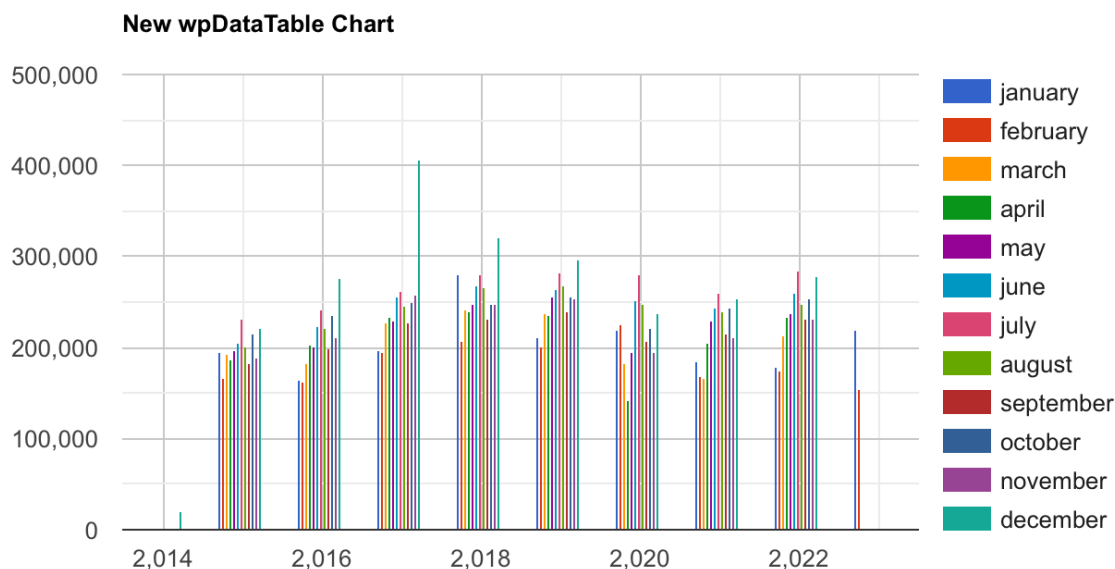


Fig 3.1.1: Wp Chart created to display entries of customers in mall entrance each month for nine years.

The chart above was created by the author during an internship at a consultant company. The chart depicts entries of customers/people through the main entrance of a mall for the last nine years. The data was collected using a camera and sensors which is then turned into metadata for it to be accessed easily by SQL tools (MySQL, 2023). During the operation, the author used several tools for generating queries for SQL. The queries above were created using MySQLWorkbench which was inserted in the SQL platform of WordPress data tables (changelog, 2023). Since the author is not a professional in the field of data engineering and coding there was a need for filling the skill gap. So, the author proceeded to work with an A.I. chatbot, ChatGPT (ChatGPT, 2023). This allowed a small demonstration of AI-human partnership. It enabled the author with no skill for coding to create a graph in seconds from scratch using generative AI.

3.2 Big Data in Data Management

Big data is a phrase used to describe data collections that are too big, diverse, and complicated for conventional data management methods to handle. High volume, high velocity, high variety, high variability, and high value are just a few examples of the many properties that big data may have. Machine learning, predictive modeling, and advanced analytics are just a few of the ways big data may be utilized to solve business challenges and influence choices.

Ingestion, processing, storage, and analysis are all stages of the big data lifecycle that must be governed, administered, and organized. Big data management is the process of handling big data's potential and difficulties, including scalability, performance, security, quality, integration, and governance.

Increased data sources and insights for data analytics are provided by big data in the context of data management. By expanding the sample size, diversifying the data, and increasing its complexity, big data can aid data analytics in producing better findings. In addition, big data can open up new applications and use cases that were previously impractical using conventional data sources. For example, according to Verma (2018), big data can help track consumer behaviour and shopping habits to deliver personalised product recommendations (Verma, 2018), monitor payment patterns and detect fraud in real-time, or use image and GPS data to improve road maintenance in cities (What is Big Data, 2023). Big data can also help data analytics leverage new technologies such as artificial intelligence, natural language processing and streaming process engines. (Loshin, 2023).

3.3 AI systems: Governance and accountability

According to Kroll (2018), an increasing number of consequential decisions are made automatically by software that employs machine learning, data analytics, and AI to discover decision rules using data. Gaps between conventional governance and oversight procedures and the practicalities of software-driven decision-making are exacerbated by the transition to data-driven systems. In place of having people manually write those rules, more and more software-mediated systems are leveraging machine learning, data analytics, and AI to extract decision rules from data. There is widespread social interest in guaranteeing the proper governance of

new technologies and creating accountable algorithms, whether they are used to approve credit applications, operate vehicles, or grant and reject visas. Businesses that use data-driven systems of all kinds, from the most basic descriptive analytics to the most complex deep-learning models, have always had to deal with a tangle of data governance regulations. Kroll (2018) questioned certain features of data governance while talking about conventional data governance; “How was a set of data collected or obtained?” “Were the data collected directly from customers, or was the dataset purchased from a third party?” “Is the use of the data restricted by a privacy policy or contractual requirements?” “Do any data protection or other laws apply, and from which jurisdictions?” “Can these data be combined with other data safely and legally?” “Are these answers the same for all customers, or do customers in different countries require different policies?” (Kroll, 2018).

With a clear understanding of the consensus approach to developing responsible data governance, it is crucial to examine the most recent policy framework for managing data-driven systems, the new GDPR (General Data Protection Regulation) in the EU (European Union) and consider how well it captures or promotes the best practices and principles of data governance. The previous Data Protection Directive (Directive 95/46/EC), which required each member state to enact a national data protection law that met minimum standards, has been replaced by the GDPR, a unified regulation that became operative in all EU member states at the beginning of 2018 (Wolford, 2023). It is generally accepted that any data processing involving EU people, whether it is carried out by an EU entity or a foreign organization, is subject to the GDPR. On October 24, 2023, the EDPS (European Data Protection Supervisor) released a self-initiated Opinion on the Artificial Intelligence Act (AI Act) as this proposed legislation nears the end of negotiations between EU's co-legislators. The AI Act's objective is to regulate the creation and application of AI systems within the EU, including EU institutions, bodies, offices, and agencies (EUIs). Through this Opinion, the EDPS offers targeted recommendations with an emphasis on its upcoming responsibilities as the supervising authority overseeing AI systems in EUIs (EDPS, 2023).

Although ChatGPT and GAI have the potential to transform how we approach data analysis and visualization applications, they also pose serious concerns and issues regarding their possible consequences on society, including issues of ethics, privacy, and security.

3.4 Emerging risks of using AI in Big Data

A McKinsey paper by Buehler et al. (2021) claims that AI is still in its "test" phase and that it is challenging to confront its potential, whether they are beneficial or harmful. Furthermore, it has shown that ignoring AI is not an option; doing so would make business organizations less competitive since they will continue to conduct workflow in a traditional manner rather than utilizing AI identified and described six potential dangers (Buehler et al., 2021).

Privacy: Any AI model depends on data to function. The use of data by businesses is governed by privacy laws in every country, while customer expectations establish industry norms. The consequences of breaking these rules and standards can include severe liability and harm to customers. Even if the data usage was legally legal, breaking consumer trust might result in reputation damage and a decline in b2b customer loyalty.

Security: The intricate, developing vulnerabilities of new AI models like ChatGPT present both fresh and well-known hazards (ChatGPT, 2023). Long-standing security strategies may face new difficulties as a result of vulnerabilities like model extraction and data poisoning in which "bad" data are added to the training set and alter the model's output). Many times, minimal security criteria must be met in accordance with current regulatory frameworks.

Fairness: It is possible to unintentionally incorporate bias into AI models or bias that already exists in the data being fed into the model. The business may be subject to fairness risks and responsibilities if there is bias that actually or potentially hurts specific classes and groups.

Transparency and explainability: The inability to explain how a model arrived at a certain outcome or a lack of openness regarding how a model was produced can cause problems, not the least of which is the possibility of breaking legal requirements. For instance, if a customer asks how their data was utilized, the company employing the data will need to know which models the data were put into.

Safety and performance: If AI applications are not developed and tested appropriately, they may have performance problems that violate legal obligations and, in some situations, endanger personal safety. Let's say a model is utilized to guarantee timely upgrades of equipment in mining

or manufacturing; if the model fails, it may be considered negligent behaviour under a contract and/or result in employee injury.

Third-party risks: The process of building an AI model often involves third parties. For instance, companies may contract out model selection, deployment settings, or data collecting. When working with third parties, an organization must be aware of the risk-mitigation and governance requirements that each third party adheres to. It should also independently test and audit any high-stakes inputs.

4 COMMISSIONER COMPANY

4.1 Value proposition

The company helps organizations that want dependable and secure cloud, AI, and IT services by providing 24/7 managed digital solutions. Their value offer is to support their clients in concentrating on their primary business objectives while they manage their analytics and IT infrastructure around-the-clock. They automate and optimize their clients' systems using state-of-the-art AI technology, and they also offer continuing maintenance and development. In addition, they provide e-commerce platforms, IT law and compliance, intranets and extranets, CTO-as-a-service, and a range of integrations and analytics tools. Any IT project or difficulty may be handled by the company's staff of skilled and trained IT specialists.

They service customers from a variety of industries, including retail, education, travel, and accountancy, and they are present all over the world. The organization uses cutting-edge AI technologies, such as machine learning, natural language processing, computer vision, and data science, to automate and optimize their clients' systems. Among their clients are a well-known real estate services company and international network of independent accounting firms. They may assist their clients in utilizing AI to enhance their decision-making, customer experience, company procedures, and creativity. To assist their clients in comprehending and putting AI solutions into practice, they can also offer AI consultancy and training. Additionally, they provide CTO-as-a-service, in which they serve as their clients' chief technology officer. With regard to IT strategy, architecture, and budgeting, they may support their clients.

Additionally, the business can develop e-commerce platforms for customers who wish to offer goods or services online. User-friendly, secure, scalable, and search engine optimized bespoke e-commerce websites may be designed and developed by them. Additionally, they may include several payment gateways, shipping companies, inventory

control systems, customer relationship management systems, and analytics tools with their e-commerce platforms. For clients looking to enhance cooperation and communication both internally and outside, the organization can also build extranets and intranets. They are capable of creating secure, interactive, responsive, and easily accessible intranets and extranets. Additionally, they may combine a variety of tools and apps with their intranets and extranets, including social networking, document management, project management, chat, email, and video conferencing. In addition, the organization may assist customers with IT legislation and compliance matters that may come up as a result of their IT projects or operations. Legal issues pertaining to IT contracts, data security, cyber security, intellectual property rights, e-commerce rules, consumer rights, tax laws, and other topics are all areas in which they can counsel their clients. Issues regarding They can also help their clients comply with the General Data Protection Regulation (GDPR).

For clients who want to link their systems or data sources with those of other clients' systems or data sources, the organization can also offer a variety of integrations and analytics solutions. They can assist their clients in integrating their systems or data sources with different online services, databases, cloud services, APIs (Application Programming Interfaces), Internet of Things (IoT) devices, or other platforms and/or devices. Additionally, they may assist their clients with data analysis utilizing a range of tools and methods, including dashboards, reports, charts, graphs, KPIs (Key Performance Indicators), dashboards, business intelligence (BI), and other metrics and indicators.

5 INVESTIGATION OF GENERATIVE A.I. IN BUSINESS ANALYTICS

5.1 Research Methodology

This section presents a comprehensive methodology that elucidates the approaches and strategies to be employed in attaining the research objectives and addressing the research questions concerning the integration of generative AI in big data visualisation and its ramifications for international businesses. A paramount method underpinning this research is the rigorous examination of pertinent literature. The literature review is instrumental in fostering a profound understanding of the multifaceted landscape, encompassing generative AI, big data visualisation, international business dynamics, and the adoption of AI in data management. The research employed an exploratory methodology to understand the potential benefit of Generative AI in Business decision-making through visual data presentation. The purpose of this methodology is to systematically review and explore (a) how generative AI be applied in big data, (b) the benefits of application of generative AI when implementing it in data visualisation, (c) businesses and consumers (b2b) view the implementation of generative AI in data in terms of potential risks, limitations, privacy concerns and ethical considerations. The study was guided by these research questions –(a) How can generative AI be applied in big data visualisation? (b) What potential benefits can be derived from the application of generative AI when implementing it in data visualisation? (c) How do businesses and consumers (b2b) view the implementation of generative AI in data in terms of potential risks, limitations, privacy concerns and ethical considerations associated with the implementation of AI in the b2b client’s business decision-making under current circumstances?

1. Comprehensive Literature Review:

The linchpin of this research is the exhaustive literature review, serving as the bedrock upon which the research objectives are built. The objective of this research is to perform a comprehensive exploration of Generative AI's role in enhancing international business decisions using Big Data Visualization. This entailed a systematic examination of current literature and a multi-faceted analysis with bibliometric, conceptual, and intellectual network methodologies to emphasize the importance of AI in business decisions and to provide direction for future research.

The literature review is structured into four salient components, each designed to unravel distinct facets of the research:

a. Evaluation of Generative AI: The first segment of the literature review embarks on the identification and rigorous assessment of the avant-garde software, methodologies, and techniques pertaining to generative AI's role in the visualization of large-scale datasets. It entails an extensive examination of scholarly articles, research papers, and industry reports to glean insights into the latest breakthroughs in generative AI, encompassing deep learning, Generative Adversarial Networks (GANs), and intricate neural network architectures.

b. Framework Conception: The second phase of the literature review engages in an intellectual exploration of the foundational principles and best practices encompassing the development of a framework or model for generative AI in the domain of big data visualization. A meticulous analysis of existing frameworks documented in the literature paves the way for the synthesis of this knowledge into a novel framework that adroitly addresses the unique challenges and opportunities presented by the big data landscape within international business contexts.

c. Benefits Discernment: The third facet of the literature review undertakes a comprehensive investigation into the myriad benefits that can be derived from the implementation of generative AI in data visualization. This comprehensive analysis encompasses an array of domains, including marketing, financial analysis, and customer behavior insights, with a focus on augmented decision-making, predictive analytics, and the optimization of business strategies.

d. Ethical and Privacy Implications: The final segment of the literature review delves into the multifarious perspectives held by businesses and consumers, particularly in the realm of Business-to-Business (B2B) relationships. This phase is dedicated to unraveling how these stakeholders perceive the introduction of generative AI into data visualization, paying particular attention to potential risks, constraints, privacy concerns, and ethical quandaries that often arise when AI is employed in the realm of business decision-making. This component encompasses an extensive review of surveys, studies, and reports, illuminating the ethical considerations and privacy issues that are intertwined with AI adoption in the sphere of international business.

2. Data Collection:

The data collection process for this research involves searching from a vast reservoir of publicly available resources from academic databases, peer-reviewed journals, authoritative industry reports, and trustworthy sources on AI and Data analysis. The literature incorporated in this research have been sourced from databases such as PubMed, Google Scholar, and ResearchGate. The search involves a combination of keywords like “Generative AI”, “Big data visualization”, “International Business”, “Decision-making”, arranged in different orders. The literature search spanned from November 1, 2022, to November 30, 2023.

3. Inclusion Criteria:

Given the limited research on Generative AI's role in international business decision-making, a broad inclusion criterion has been implemented. Instead of specific study designs, populations, or outcomes, a variety of literature from different fields have been included. The criteria encompass relevant articles, reviews, editorials, surveys, reports, conference proceedings, books, and theses published between 2002 and 2023. A total of 44 publications have been identified, including 3 original articles, 3 research articles, 7 articles, 11 review articles, 1 editorial, 5 reports, 3 conference papers, 3 books, 3 surveys and 5 theses (Table 1).

4. Data Analysis:

The harvested literature undergoes a rigorous analytical procedure, with an emphasis on identifying recurrent themes, existing research gaps, and emerging trends. Techniques such as thematic analysis and content analysis was judiciously employed to amalgamate and interpret the wealth of information accumulated during the literature review. Rather than using a standardized form or database to capture each study's key details, pertinent information was extracted from each study for interpretation, analysis, comparison, and synthesis of models.

5. Quality Evaluation:

Due to the broad range of literature from different fields, no specific checklist or criteria have been used to judge the studies' methodological quality. Quality or validity of each study has not been assessed individually; Full-text availability has also been ensured.

6. Data Integration:

The interpretations, results, and recommendations from different studies were amalgamated and compared through a narrative description. Unlike a systematic review or meta-analysis, no statistical analysis was performed.

7. Framework Elaboration:

The framework or model for the implementation of generative AI in big data visualization will be meticulously developed based on the profound insights garnered from the comprehensive literature review. This framework will be meticulously tailored to address the specific challenges and seize the opportunities unearthed during the review.

8. Ethical Sensitivity:

This research's ethical issues are interwoven throughout. Within the dynamic setting of international business, much consideration has been given to the ethical management of sensitive data and the thorough evaluation of privacy problems posed by the application of AI.

As the primary component of the research approach, the literature review plays a crucial role in this study. An in-depth understanding of the state of generative AI in big data visualization is provided by the thorough literature study, which acts as a launchpad for accomplishing the research goals and answering the research questions. Additionally, the technique makes certain that a strong framework is developed and that the benefits and ethical issues surrounding the integration of AI in the context of international business are thoroughly examined.

Table 1 Literature related to Generative AI in Big Data Visualization for Enhancing International Business Decision-Making.

Sl. No.	Literature Type
	Original Article
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2	Xu, H. (2023). The Application of Interactive Visualization and Computer Vision in Intelligent Education Based on Big Data AI Technology. <i>Wireless Communications and Mobile Computing</i> , 2023. https://doi.org/10.1155/2023/2119198

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- 3 Gligor, D. M., Pillai, K. G., & Golgeci, I. (2021). Theorizing the dark side of business-to-business relationships in the era of AI, big data, and blockchain. *Journal of Business Research*, 133, 79-88. <https://doi.org/10.1016/j.jbusres.2021.04.043>

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- 6 Kroll, J. A. (2018). Data Science Data Governance [AI Ethics]. *IEEE Security & Privacy*, vol. 16, no. 06, pp. 61-70. <https://doi.ieeecomputersociety.org/10.1109/MSEC.2018.2875329>
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 - 4 Muhammadian, R. (2020). Artificial intelligence in marketing. How AI is Revolutionizing Digital Marketing. Thesis. Centria University of Applied Sciences. <https://urn.fi/URN:NBN:fi:amk-2020070419501>
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5.2 Results

5.2.1 Results from the literature review have been demonstrated in Table 2.

Table 2 Findings from literature review.

Literature	Finding
	Original Article
Liu et al., 2023	Sports data analysis and visualization are vital in understanding collective tactics. In response to growing complex data, this study presents the Video-based Effective Visualization Framework (VEVF) using AI and big data. The VEVF applies machine learning to categorize sports videos, extracting temporal and spatial features via convolutional neural networks and temporal pooling layers. The VEVF outperforms existing models, achieving 98.7% accuracy, 94.5% recall, 97.9% F1-score, and 96.7% precision, highlighting its potential to enhance sports data analysis and visualization.
Xu, 2023	This paper outlines the creation of an online integrated education platform using big data AI technology. However, it notes issues with time-consuming external tool usage, inefficient tools leading to resource waste, unclear gesture recognition and visual display, and room for improvement in debugging result displays. Future work will seek to optimize these aspects.
Nemati et al., 2002	This paper introduces a knowledge warehouse (KW) architecture, an extension to the data warehouse model, to improve knowledge capture, coding, retrieval, and sharing across organizations. It proposes a new direction for Decision Support Systems (DSS) focused on knowledge enhancement. The effectiveness of future DSS will be gauged by their ability to promote and enhance knowledge, improve decision-makers' understanding and mental models, and thereby enhance decision-making.
	Research Article
Maddigan & Susnjak, 2023	This paper introduces Chat2VIS, a system that utilizes Language Model (LLMs) and prompt engineering to create visualizations from natural language queries. Despite queries being underspecified or misspecified, this approach proves accurate and efficient, reducing costs and surpassing traditional NLP methods that rely on hand-crafted grammar rules. The performance of two GPT-3 models and ChatGPT are compared, demonstrating that Chat2VIS is secure, preserves privacy, and can be applied to various datasets.

Literature**Finding**

- Khan et al., 2022 This study explores the role of AI and big data in adapting E-learning systems for students in Saudi Arabian higher education. Using a sample of 290 students and analysis via SPSS and SmartPLS 3 software, it finds that AI and big data facilitate smooth teaching and learning, even amidst a pandemic. Despite certain adaptation issues, the increased use of these technologies could enhance access to educational resources, efficiency, and personalization of learning tasks, giving students more time with teachers. The study suggests that AI will be central to higher education's future landscape worldwide.
- Gligor et al., 2021 This research explores how new technologies like AI, blockchain, and big data analytics can impact B2B relationships and potentially lead to 'dark side' effects. The study addresses concerns that the dark side of B2B relationships is under-theorized, focusing on their manifestations rather than underlying processes. It illustrates how overlooked theories such as social dominance, organizational inertia, organizational information processing, and role theory can offer fresh insights into examining these dark side effects that may emerge in B2B relationships due to the adoption of new technologies.

Article

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- Park et al., 2023 This paper introduces the Vessel Data Lakehouse architecture, comprising three layers: the Vessel Data Lake for handling marine big data, the Vessel Data Warehouse for processing this data and supporting AI, and the Vessel Application Services for marine services. This architecture efficiently manages diverse vessel data using an open-source big data framework, enabling low-cost integration. The Data Lakehouse allows direct utilization of these data in various vessel analysis services. The effectiveness of this architecture is demonstrated through a case study of a vessel analysis service using AIS data in the Busan area.
- Sarker, 2021 This paper provides an in-depth look at Data Science and advanced analytics methods, which can enhance application intelligence and decision-making in various scenarios. Ten potential real-world domains, such as business, healthcare, cybersecurity, and urban/rural data science, are explored in the context of data-driven smart computing. The paper also discusses challenges and potential research avenues in this field. Serving as a guide for researchers, decision-makers, and application developers, it emphasizes the importance of data-driven solutions for addressing real-world problems.

Literature	Finding
Bonami et al., 2020	This research explores the impact of AI and Big Data on education, beyond mere computational power, focusing on social impacts and 21st century skills. It introduces definitions and discussions about AI and Big Data from academic and international organizations. The methodology includes systematic reviews, bibliographic research, and quality analyses within case studies. The goal is to provide a comprehensive understanding of the intersection between education and new technologies, using a multimodal approach that includes both qualitative and quantitative procedures. It highlights the need to consider both human and non-human stakeholders in the digital age of education.
Gacarin & Wagner, 2019	The article discusses the limitations of traditional rule-based decision-making in next-generation programmable networks, emphasizing the need for a more adaptable approach to meet changing network and customer needs. It provides an overview of Customer Experience Management (CEM) components and their design challenges, focusing on data analytics and AI-driven CEM. The article aims to guide towards an autonomous CEM framework in future networks, laying the foundation for future advancements.
Benke & Benke, 2018	This article discusses the transformative potential of AI and Big Data in public health and medical sciences, particularly in diagnostics, and the consequent shift in roles for medical specialists. It suggests that AI could handle screening, detection, and diagnostics, leaving humans to manage case information and guide clinical decisions. However, it stresses the necessity of understanding these technologies for policy development and highlights the lack of debate on ethics and regulation in public health. The piece also raises questions about the long-term impact of generalized AI on the role of human experts.
Kroll, 2018	The article emphasizes the role of data scientists in creating responsible data science practices and machine-learning systems that are trustworthy. It suggests that these practices can shape policy implementation and public perception, shifting focus from bias and lack of accountability. It underlines the importance of responsible data governance, particularly as it becomes a legal requirement worldwide. The piece summarizes best practices for organizations in managing their data, covering data security, privacy, non-discrimination, accountability, and transparency.
Purcell, 2013	The article discusses the opportunities and challenges of big data for businesses. With the Internet enabling access to vast amounts of data, businesses need to adapt to remain competitive. Big data includes structured, semi-structured, and unstructured data, and is also provided by the Internet of Things. The use of big data can enhance data sharing, improve performance, augment market segmentation, increase decision support, and enable innovation. However, business owners need to follow trends in big data to make informed decisions suitable for their businesses.

Literature	Finding
	Review Articles
Wach et al., 2023	The article discusses the challenges and opportunities of generative artificial intelligence (GAI) in business, focusing on ChatGPT. The study identifies seven main threats of GAI: lack of regulation, poor quality, job losses due to automation, violation of personal data and privacy, social manipulation, socio-economic inequalities, and AI technostress. The article recommends regulating the AI market, continuous skill development for workers, prioritizing ethical considerations and user privacy in GAI development, and implementing responsible AI practices to mitigate these threats. It emphasizes the need for transparency in data usage, bias mitigation techniques, and monitoring of content for harmful information.
Zamani et al., 2022	The article explores the role of Artificial Intelligence (AI) and Big Data Analytics (BDA) in improving supply chain resilience. A systematic literature review of studies published between 2011 and 2021 was conducted, revealing that AI and BDA have potential benefits for supply chain management. The study assesses the current use of AI and BDA in supply chain literature and identifies how these technologies can enhance various phases of supply chain resilience, including readiness, response, recovery, and adaptability. The benefits of AI and BDA in the context of supply chain resilience are also synthesized.
Nayarisseri et al., 2021	This review explores how Artificial Intelligence (AI), particularly Machine Learning (ML) tools like GOLD, Deep PVP, LIB SVM, and algorithms like support vector machine (SVM), random forest (RF), and Artificial Neural Network (ANN) are revolutionizing drug development. These techniques help identify potential biologically active compounds swiftly, aiding in SNP discoveries, drug repurposing, drug design, Lead identification, QSAR modeling, and ADMET analysis. SVM has shown superior performance in predicting human intestinal absorption, and SVM and RF models have successfully identified potential colon cancer treatments. The review concludes that in the era of big data, ML is a powerful way to model small-molecule drugs, gene biomarkers, and identify new drug targets.
Wisetsri, 2021	The study explores the impact of artificial intelligence (AI) on marketing. The researchers conducted a systematic literature review of papers published between 1982 and 2020 and performed bibliometric, conceptual, and intellectual network analyses. They examined the work of prominent authors and sources in this field and used co-citation and co-occurrence analyses to reveal conceptual and intellectual networks. The Louvain algorithm was used to cluster data and identify research sub-themes and future research directions. The study aims to help practitioners identify the AI solutions most suitable for their marketing needs and guide future research in AI in marketing.

Literature	Finding
Obschonka & Audretsch, 2020	The article emphasizes the need for more focus on the role of artificial intelligence (AI) and big data in entrepreneurship research. The authors present reflections and papers discussing how these technologies can contribute to the evolution of entrepreneurship research and practice, including the concept of "smart entrepreneurship." They also highlight potential ethical issues and challenges, such as the contrast between entrepreneurial uncertainty and rule-based AI rationality. The authors encourage researchers and practitioners to prepare for future scenarios and unpredictable developments in the field, while showcasing potential research avenues and examples in this emerging area.
Khan & Alotaibi, 2020	The paper presents a systematic review of the application of artificial intelligence (AI) and big data analytics in mobile health (m-health) systems. It discusses various AI-based algorithms and big data frameworks in relation to the source of data, techniques used, and the area of application. The paper also proposes a model based on AI and big data analytics for improving m-health systems, especially for specific challenges. The findings from this study aim to guide the development of techniques that effectively combine AI and big data for managing m-health data.
Munim et al., 2020	The study reviews 279 studies on the use of big data and AI in the maritime industry. Four research clusters were identified: digital transformation in the maritime industry, the use of big data from Automatic Identification Systems (AIS), energy efficiency, and predictive analytics. The review suggests that while technological development is a focus, wider adoption into the maritime industry is necessary for impact. It recommends balancing technology development with research into the "softer" aspects of institutional change, such as legislation, culture and commercial structure. It also highlights the need for more research into increasing transparency and trust in the maritime industry, including legal issues like cybersecurity and data ownership.
Batistič & van der Laken, 2019	The study synthesizes past research on the potential organizational value of big data and analytics (BDA), using a dataset of 327 primary studies and 1252 secondary cited papers. It explores the intellectual foundations, historical evolution, and potential evolution of BDA and performance research. The study reveals an increasing academic interest in the BDA-performance link, identifies ten foundational research clusters, and notes an increase in cross-disciplinary collaborations over the past decade. The paper also highlights developing research topics, including risk management, text mining, and evolutionary algorithms, and concludes by discussing implications and gaps in different management domains.

Literature**Finding**

- Özdemir & Hekim, 2018 The article discusses the potential impacts of extreme automation, enabled by the Internet of Things (IoT), AI, and Industry 4.0, on Big Data and implementation science. It highlights the vulnerabilities of highly integrated systems, such as network collapse and the creation of new social and political power structures. The authors propose Industry 5.0, which aims to democratize knowledge co-production from Big Data, through a concept called symmetrical innovation. This includes a safe exit strategy for network failure, a balance between innovation acceleration and deceleration, and the use of new social science research for global governance of emerging technologies, dubbed "Post-ELSI Technology Evaluation Research" (PETER). Industry 5.0 aims to harness extreme automation and Big Data with safety and responsible implementation science.
- Singh & Singh, 2015 The paper emphasizes the importance of effective data analysis in research, using descriptive and inferential techniques. These techniques can summarize, organize, and test theories about data. While software can handle calculations, understanding the conceptual basis of analytical methodologies is crucial for meaningful data interpretation. The paper suggests that data analysis should be planned before data collection to avoid missing relevant facts. It also notes that certain assumptions must be met before applying analytical tools, requiring substantial experience and knowledge in data analysis. The paper aims to provide an introduction to commonly used analytical tools in business research.
- Wang et al., 2015 Interactive visualizations are superior to static ones, driving discovery and enhancing insight from big data. They can be linked with networks or web-based tools to aid scientific processes. However, conventional visualization methods fall short for big data, necessitating development of new tools. This paper presents advancements in big data visualization and conducts a SWOT analysis of current software. Integrating analytics and visualization can optimize big data applications. Notably, immersive virtual reality presents a promising approach for managing high dimensionality and abstraction, significantly boosting big data visualization.

Editorial

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- Gandomi et al., 2023 The article discusses AI's role in data analytics, using machine learning, deep learning models, and natural language processing techniques to extract insights from big data. The goal is to automate data analysis, making it faster, more accurate, and scalable. Future trends in this field include real-time analytics, edge analytics to process data at the source, explainable AI for transparency, integration with other technologies like blockchain, and personalized analytics for tailored insights. These advancements will allow organizations to fully utilize their data for informed decision making and innovation.

Report

Literature	Finding
D'Amico et al., 2023	The study used generative artificial intelligence to create synthetic data for hematologic neoplasms research. This synthetic data, generated from a conditional generative adversarial network, mimics real clinical-genomic features and anonymizes patient information. The data was tested for fidelity and privacy preservation. The results showed that synthetic data not only resolved lack of information and data augmentation issues, but also accelerated research in hematology by anticipating the development of molecular classifications. Synthetic data can enhance the scientific use of real data, hasten precision medicine in hematology, and aid in conducting clinical trials.
Deloitte, 2023	Generative AI is predicted to transform the future of work, becoming a crucial utility and making AI adoption essential in the workplace. Trust and ability to meet expectations will be key to its enterprise adoption. Hyper-personalization, enabled by analyzing large amounts of customer data, will drive business growth. Language model learning machines (LLMs), the first "general purpose" AI, could lead to the development of Artificial General Intelligence (AGI). Generative AI could free individuals from mundane work, unlocking unprecedented human potential and enabling new ways of living.
Chui et al., 2022	Generative AI is revolutionizing assistive technology, shortening app development time and empowering non-technical users. For businesses considering its adoption, a cross-functional team should be created to assess its potential impact, monitor its evolution, and address key questions such as potential disruption, investment strategies, use case selection, partner ecosystems, and legal compliance. While encouraging innovation, companies should also establish safeguards and experiment in secure environments. Despite the technology's exciting potential, executives should remain aware of the risks due to its early stage of development.
OECD, 2021	AI and machine learning are increasingly used in finance, from algorithmic trading to credit underwriting, offering competitive advantages through improved efficiency, quality of services, and personalized products. They could enhance financial inclusion by assessing the creditworthiness of clients with limited credit history. However, they may also intensify financial and non-financial risks, including potential biases, data misuse, and systemic risk due to their lack of explainability. Policymakers need to assess these technologies' implications, balancing support for AI innovation with ensuring financial stability, market integrity, and consumer protection. Existing regulation may need to be clarified or adjusted to mitigate emerging risks from AI deployment.

Literature**Finding**

- Buehler et al., 2021 As AI technology becomes integral to organizations, it brings a universe of risks and ethical challenges that could invite regulatory penalties. Leading organizations are those that proactively identify and manage these risks. To do this, companies should involve legal and risk-management teams in the AI development process from the start, ensuring models conform to legal requirements and social norms. They should also apply a risk-prioritization plan to manage the broad spectrum of AI risks. This involves cataloging an organization's specific AI risks, defining the harm to avoid, and following a clear methodology to evaluate and prioritize those risks for mitigation.

Conference Proceedings

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- Ghimire et al., 2020 AI, regarded as the fourth industrial revolution, is transforming industries worldwide by simulating human intelligence in computational systems. These systems can solve real-world problems more accurately and efficiently than hardcoded systems, making AI crucial in addressing business challenges. Subsets of AI, such as machine learning and deep learning, are used to optimize various business areas, including marketing, fraud detection, trading, customer service, portfolio management, and product recommendations. The combination of AI and big data has revolutionized the business world, accelerating growth and improving problem-solving capabilities.
- Sun et al., 2020 AI and big data are increasingly being used to enhance learning experiences and outcomes. A review of 980 articles using VOSviewer examined the main sources, disciplines, and keywords related to big data and AI in education. It identified several research clusters and main topics such as learning analytics, intelligent tutoring systems, collaborative learning, and higher education. This systematic mapping provides a foundation for educators, researchers, and policymakers to further research, curriculum development, and policy work in the field.
- Nguyen & Sidorova, 2018 AI technology is quickly advancing, with AI chatbots improving customer service in various industries. However, there is a lack of study on human-chatbot interactions. This research aims to compare user satisfaction between chatbot and website systems, and identify the factors influencing satisfaction. The proposed model examines the relationship between perceived autonomy, competence, cognitive load, performance satisfaction, process satisfaction, and system satisfaction. If validated, the model could provide insights on how these factors influence user satisfaction with AI systems. This study could boost understanding of human-AI interaction, and help improve chatbot design and abilities, thus enhancing the relevance of IS research to practice.

Book

Literature	Finding
Grigsby, 2022	The second edition of Marketing Analytics provides marketers and business analysts with predictive techniques to improve marketing performance. The book explores real-world marketing challenges and offers clear explanations on applying different analytical models. It covers everything from targeted list creation, data segmentation, campaign effectiveness testing, pricing structures, to demand forecasting. The new edition includes chapters on big data analytics, insights and panel regression, and updates on advanced tools for predictive analytics. The methods are simplified to ensure accessibility at any level of application. It also includes downloadable data sets and test bank resources, providing a foundation to optimize marketing analytics for daily business advantage.
McKinsey, 2014	Big Data offers a pivotal opportunity for marketing and sales, with companies who use it effectively seeing productivity and profitability rates 5-6% higher than their peers. Successful companies use analytics to identify opportunities, improve marketing return on investment (MROI), design products and offers that appeal to customers, and effectively deliver these to the market. The compendium explores business opportunities, examples, and organizational implications of Big Data and advanced analytics. Topics covered include using Big Data to find new micromarkets, driving growth through smart analytics, using marketing analytics to drive superior growth, and using Big Data for better pricing decisions.
Russell & Norvig, 2010	This updated edition reflects progress in AI since 2003, emphasizing partially observable and nondeterministic environments in nonprobabilistic search and planning. It delves deeper into various agent representations, planning, and first-order probabilistic models, with new material on open-universe models. The machine-learning chapter is rewritten to incorporate modern learning algorithms. Expanded coverage includes web search, information extraction, and large data set learning. It cites 20% post-2003 works and estimates 20% new material. The book presents AI as intelligent agents interacting with their environment, highlighting learning's role in agent design, with task environment determining agent design appropriateness.

Survey

Ghimire et al., 2023	Amidst the COVID-19 pandemic, online teaching has become a mainstream method in education, leveraging big data to understand epidemic risks and ensure student health. The development of online education, the impact of its combination with big data, and innovative online technologies like MOOCs, DingTalk, and virtual classrooms are discussed. The paper analyzes the current state and future prospects of online education using big data technology, showing its influence on the education industry and beyond. The study helps understand the challenges of innovative online education during the pandemic and the potential for future growth, emphasizing detailed methods for combining online education and big data.
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Literature**Finding**

- Himeur et al., 2023 Building Automation and Management Systems (BAMSs) currently only ensure heating, ventilation and air conditioning control, leaving tasks like performance evaluation and efficiency improvement to operators. Artificial Intelligence (AI) big data analytics can assist operators with data analysis and decision-making to enhance building performance. This paper surveys the use of AI-big data in BAMSs, including load forecasting and occupancy detection. The paper overviews existing frameworks, discusses current challenges, and presents three case studies on the application of AI-big data analytics in BAMSs. It concludes by identifying future directions and recommendations to improve the performance and reliability of BAMSs in intelligent buildings.
- Chui et al., 2022 AI adoption in organizations has doubled since 2017, with leading firms investing more in AI, employing advanced practices, and securing top AI talent. However, the proportion of organizations using AI has remained between 50-60% in recent years. A lack of diversity in AI teams persists, despite evidence showing diverse teams' correlation with high performance. The survey also indicates an increase in AI investment, with 63% of respondents predicting a rise in their organizations' investment over the next three years. Despite these advancements, there is a widening gap between AI leaders and other organizations, indicating a growing competitive advantage for the former.

Thesis

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- Elmeri, 2023 The thesis explores generative artificial intelligence and its applications in business, from chatbots to targeted marketing. It identifies both benefits and risks of integrating generative AI into daily operations. The scope of the study was broad, making it challenging to answer research questions effectively. The author suggests that future research could involve collaboration with a business keen to implement AI and then monitoring and reporting the results. Despite time constraints, the author acknowledges that better planning and emphasis on the applicative side of the thesis could have improved the study.
- Dunshin, 2022 This thesis examines the development of AI with a focus on global regulations, public opinion, and ethical dilemmas. It starts with an overview of the AI industry's inception, the reasons behind the chosen topic, methods used, and key terminology. The study investigates current AI regulations worldwide and public opinion regarding these regulations, resulting in a proposed set of rules for AI work. It also introduces the ECCOLA method for ethical AI product evaluation. An empirical survey involving IT professionals and the general public provides further insights. The conclusion reflects on the research findings and suggests potential improvements for further study.

Literature	Finding
Hoang, 2021	This thesis explores Enterprise Resource Planning (ERP) systems and their capacity to improve business efficiency, centralize data, and integrate with other software. It emphasizes the ongoing enhancements to ERP systems, including the application of AI and big data for more robust data analysis. ERP is increasingly used beyond IT, aiding business staff and departments like marketing and sales. Utilizing big data and AI can simplify data analysis, manage large data volumes, and streamline business operations. The study employs qualitative research and content analysis, presenting a case study on SAP, to demonstrate the benefits and challenges of integrating AI, big data, and ERP systems.
Muhammadian, 2020	This thesis investigates the impact of Artificial Intelligence (AI) on the marketing sector, including its implementation, risks, benefits, and future implications. The research employs a qualitative methodology to examine the influence of AI, machine learning, and deep learning on global business practices, specifically digital marketing. The study reveals that AI is transforming the marketing sector by enabling more personalized, predictive, and automated advertisements, and is becoming an essential component of future marketing and sales strategies. The research emphasizes that familiarity with AI capabilities will be beneficial in adapting to these changes.
Oyehan, 2019	This thesis investigates the role of Artificial Intelligence (AI) in retail services, focusing on the Finnish perspective due to the country's pioneering use of AI. The study examines the application of AI in three major Finnish companies - Elisa, OP, and KONE. Additionally, it analyzes a questionnaire distributed to students of Centria University of Applied Sciences to gain insight into the adoption of AI in public services and the customer experience in shopping malls. The research concludes that AI plays a significant role in Finland's retail services and its adoption in this sector is more advanced compared to other surveyed countries.

5.2.2 Diagram on application of generative AI in Big Data Visualization for enhancing international business decision-making (Figure 5.2.2.1).

This simplified diagram synthesized from extensive literature search depicts the utilization of generative AI for crafting visual representations of big data, which can assist companies in making more informed decisions.

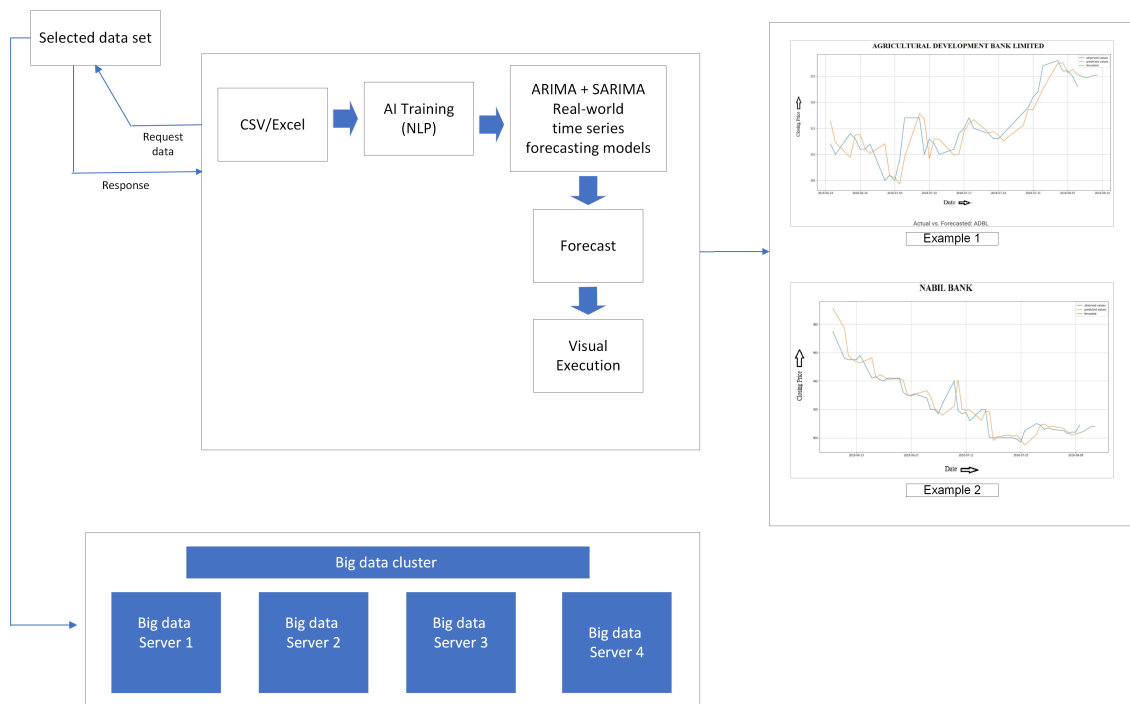


Fig 3.1.1: Diagram on application of generative AI in Big Data Visualization for enhancing international business decision-making.

6 DISCUSSION AND CONCLUSION

6.1 Findings from original articles

In Liu et al., 2023, the authors present the Video-based Effective Visualization Framework (VEVF) that uses AI and big data to categorize sports videos and extract temporal and spatial features via convolutional neural networks and temporal pooling layers. The VEVF outperforms existing models, achieving 98.7% accuracy, 94.5% recall, 97.9% F1-score, and 96.7% precision, highlighting its potential to enhance sports data analysis and visualization.

Xu, 2023, outlines the creation of an online integrated education platform using big data AI technology. However, the paper notes issues with time-consuming external tool usage, inefficient tools leading to resource waste, unclear gesture recognition and visual display, and room for improvement in debugging result displays. Future work will seek to optimize these aspects.

Nemati et al., 2002, introduces a knowledge warehouse (KW) architecture, an extension to the data warehouse model, to improve knowledge capture, coding, retrieval, and sharing across organizations. It proposes a new direction for Decision Support Systems (DSS) focused on knowledge enhancement. The effectiveness of future DSS will be gauged by their ability to promote and enhance knowledge, improve decision-makers' understanding and mental models, and thereby enhance decision-making.

Comparing the three papers, Liu et al., 2023, and Nemati et al., 2002, both propose frameworks to enhance data analysis and knowledge enhancement, respectively. In contrast, Xu, 2023, focuses on creating an online integrated education platform. While Liu et al., 2023, and Nemati et al., 2002, both use AI and big data, Xu, 2023, only uses big data AI technology. Liu et al., 2023, and Xu, 2023, both highlight the potential of their frameworks, while Nemati et al., 2002, focuses on the effectiveness of future DSS. Finally,

Xu, 2023, notes issues with their platform, while Liu et al., 2023, and Nemati et al., 2002, do not mention any issues with their frameworks.

Overall, Liu et al., 2023, and Nemati et al., 2002, propose frameworks that could have significant implications for sports data analysis and knowledge enhancement, respectively. Xu, 2023, outlines the creation of an online integrated education platform but notes issues with their platform that need to be addressed. Further research could focus on optimizing these frameworks and platforms to improve their effectiveness and efficiency.

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effectiveness of future DSS. Finally, Xu, 2023, notes issues with their platform, while Liu et al., 2023, and Nemati et al., 2002, do not mention any issues with their frameworks.

6.2 Findings from research articles

Maddigan & Susnjak, 2023, introduces Chat2VIS, a system that utilizes Language Model (LLMs) and prompt engineering to create visualizations from natural language queries. Despite queries being underspecified or misspecified, this approach proves accurate and efficient, reducing costs and surpassing traditional NLP methods that rely on hand-crafted grammar rules. The performance of two GPT-3 models and ChatGPT are compared, demonstrating that Chat2VIS is secure, preserves privacy, and can be applied to various datasets.

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Gligor et al., 2021, explores how new technologies like AI, blockchain, and big data analytics can impact B2B relationships and potentially lead to 'dark side' effects. The study addresses concerns that the dark side of B2B relationships is under-theorized, focusing on their manifestations rather than underlying processes. It illustrates how overlooked theories such as social dominance, organizational inertia, organizational information processing, and role theory can offer fresh insights into examining these dark side effects that may emerge in B2B relationships due to the adoption of new technologies.

Comparing the three papers, Maddigan & Susnjak, 2023, and Khan et al., 2022, both focus on the role of AI and big data in enhancing systems, with Maddigan & Susnjak, 2023, introducing Chat2VIS, a system that utilizes Language Model (LLMs) and prompt engineering to create visualizations from natural language queries, while Khan et al., 2022, explores the role of AI and big data in adapting E-learning systems for students in Saudi Arabian higher education. In contrast, Gligor et al., 2021, focuses on the potential negative effects of new technologies like AI, blockchain, and big data analytics on B2B relationships.

While Maddigan & Susnjak, 2023, and Khan et al., 2022, both use AI and big data, Gligor et al., 2021, focuses on the potential negative effects of these technologies. Maddigan & Susnjak, 2023, and Khan et al., 2022, both highlight the potential of their systems to enhance visualization and education, respectively, while Gligor et al., 2021, focuses on the need to examine the underlying processes of the dark side effects that may emerge in B2B relationships due to the adoption of new technologies.

Overall, Maddigan & Susnjak, 2023, and Khan et al., 2022, propose systems that could have significant implications for visualization and education, respectively, while Gligor et al., 2021, highlights the need to examine the potential negative effects of new technologies on B2B relationships. Further research could focus on optimizing these systems and examining the underlying processes of the dark side effects that may emerge in B2B relationships due to the adoption of new technologies.

6.3 Findings from articles

Park et al., 2023, introduces the Vessel Data Lakehouse architecture, comprising three layers: the Vessel Data Lake for handling marine big data, the Vessel Data Warehouse for processing this data and supporting AI, and the Vessel Application Services for marine services. This architecture efficiently manages diverse vessel data using an open-source big data framework, enabling low-cost integration. The Data Lakehouse allows direct utilization of these data in various vessel analysis services. The effectiveness of this

architecture is demonstrated through a case study of a vessel analysis service using AIS data in the Busan area.

Sarker, 2021, provides an in-depth look at Data Science and advanced analytics methods, which can enhance application intelligence and decision-making in various scenarios. Ten potential real-world domains, such as business, healthcare, cybersecurity, and urban/rural data science, are explored in the context of data-driven smart computing. The paper also discusses challenges and potential research avenues in this field. Serving as a guide for researchers, decision-makers, and application developers, it emphasizes the importance of data-driven solutions for addressing real-world problems.

Bonami et al., 2020, explores the impact of AI and Big Data on education, beyond mere computational power, focusing on social impacts and 21st century skills. It introduces definitions and discussions about AI and Big Data from academic and international organizations. The methodology includes systematic reviews, bibliographic research, and quality analyses within case studies. The goal is to provide a comprehensive understanding of the intersection between education and new technologies, using a multimodal approach that includes both qualitative and quantitative procedures. It highlights the need to consider both human and non-human stakeholders in the digital age of education.

Comparing the three papers, Park et al., 2023, and Bonami et al., 2020, both focus on the impact of AI and Big Data on specific domains, with Park et al., 2023, introducing the Vessel Data Lakehouse architecture for marine services, while Bonami et al., 2020, explores the impact of AI and Big Data on education. In contrast, Sarker, 2021, provides an in-depth look at Data Science and advanced analytics methods, which can enhance application intelligence and decision-making in various scenarios.

While Park et al., 2023, and Bonami et al., 2020, both use AI and Big Data, Sarker, 2021, focuses on advanced analytics methods. Park et al., 2023, and Bonami et al., 2020, both highlight the potential of their frameworks to enhance marine services and education,

respectively, while Sarker, 2021, emphasizes the importance of data-driven solutions for addressing real-world problems.

Overall, Park et al., 2023, and Bonami et al., 2020, propose frameworks that could have significant implications for marine services and education, respectively, while Sarker, 2021, provides a comprehensive guide for researchers, decision-makers, and application developers to enhance application intelligence and decision-making in various scenarios.

application Gacanin & Wagner, 2019, discusses the limitations of traditional rule-based decision-making in next-generation programmable networks, emphasizing the need for a more adaptable approach to meet changing network and customer needs. It provides an overview of Customer Experience Management (CEM) components and their design challenges, focusing on data analytics and AI-driven CEM. The article aims to guide towards an autonomous CEM framework in future networks, laying the foundation for future advancements.

Benke & Benke, 2018, discusses the transformative potential of AI and Big Data in public health and medical sciences, particularly in diagnostics, and the consequent shift in roles for medical specialists. It suggests that AI could handle screening, detection, and diagnostics, leaving humans to manage case information and guide clinical decisions. However, it stresses the necessity of understanding these technologies for policy development and highlights the lack of debate on ethics and regulation in public health. The piece also raises questions about the long-term impact of generalized AI on the role of human experts.

Kroll, 2018, emphasizes the role of data scientists in creating responsible data science practices and machine-learning systems that are trustworthy. It suggests that these practices can shape policy implementation and public perception, shifting focus from bias and lack of accountability. It underlines the importance of responsible data governance, particularly as it becomes a legal requirement worldwide. The piece summarizes best

practices for organizations in managing their data, covering data security, privacy, non-discrimination, accountability, and transparency.

Comparing the three papers, Gacanin & Wagner, 2019, and Kroll, 2018, both focus on the importance of data analytics and AI-driven systems, with Gacanin & Wagner, 2019, emphasizing the need for an adaptable approach to meet changing network and customer needs, while Kroll, 2018, emphasizes the importance of responsible data governance. In contrast, Benke & Benke, 2018, focuses on the transformative potential of AI and Big Data in public health and medical sciences, particularly in diagnostics.

While Gacanin & Wagner, 2019, and Benke & Benke, 2018, both use AI and Big Data, Kroll, 2018, focuses on responsible data science practices. Gacanin & Wagner, 2019, and Kroll, 2018, both highlight the potential of their frameworks to enhance customer experience management and data governance, respectively, while Benke & Benke, 2018, suggests that AI could handle screening, detection, and diagnostics, leaving humans to manage case information and guide clinical decisions.

Overall, Gacanin & Wagner, 2019, and Kroll, 2018, propose frameworks that could have significant implications for customer experience management and data governance, respectively, while Benke & Benke, 2018, highlights the transformative potential of AI and Big Data in public health and medical sciences. Further research could focus on optimizing these frameworks and examining the long-term impact of AI on the role of human experts.

Purcell, 2013, discusses the opportunities and challenges of big data for businesses. With the Internet enabling access to vast amounts of data, businesses need to adapt to remain competitive. Big data includes structured, semi-structured, and unstructured data, and is also provided by the Internet of Things. The use of big data can enhance data sharing, improve performance, augment market segmentation, increase decision support, and enable innovation. However, business owners need to follow trends in big data to make informed decisions suitable for their businesses. While big data has the potential to revolutionize businesses, it is important to note that it is not a panacea. Business owners

need to be aware of the limitations of big data and ensure that they are using it effectively. They should also be aware of the ethical implications of big data and ensure that they are using it in a responsible manner.

6.4 Findings from review articles

Wach et al., 2023, discusses the challenges and opportunities of generative artificial intelligence (GAI) in business, focusing on ChatGPT. The study identifies seven main threats of GAI: lack of regulation, poor quality, job losses due to automation, violation of personal data and privacy, social manipulation, socio-economic inequalities, and AI technostress. The article recommends regulating the AI market, continuous skill development for workers, prioritizing ethical considerations and user privacy in GAI development, and implementing responsible AI practices to mitigate these threats. It emphasizes the need for transparency in data usage, bias mitigation techniques, and monitoring of content for harmful information.

Zamani et al., 2022, explores the role of Artificial Intelligence (AI) and Big Data Analytics (BDA) in improving supply chain resilience. A systematic literature review of studies published between 2011 and 2021 was conducted, revealing that AI and BDA have potential benefits for supply chain management. The study assesses the current use of AI and BDA in supply chain literature and identifies how these technologies can enhance various phases of supply chain resilience, including readiness, response, recovery, and adaptability. The benefits of AI and BDA in the context of supply chain resilience are also synthesized.

Comparing the two papers, Wach et al., 2023, and Zamani et al., 2022, both focus on the role of AI in enhancing business and supply chain management, respectively. While Wach et al., 2023, identifies the threats of GAI and recommends responsible AI practices to mitigate these threats, Zamani et al., 2022, synthesizes the benefits of AI and BDA in the

context of supply chain resilience. Both papers emphasize the need for transparency in data usage and ethical considerations in AI development.

While Wach et al., 2023, focuses on GAI, Zamani et al., 2022, focuses on AI and BDA. Wach et al., 2023, identifies the threats of GAI, while Zamani et al., 2022, synthesizes the benefits of AI and BDA. Wach et al., 2023, recommends responsible AI practices to mitigate the threats of GAI, while Zamani et al., 2022, identifies how AI and BDA can enhance various phases of supply chain resilience.

Overall, Wach et al., 2023, and Zamani et al., 2022, propose frameworks that could have significant implications for business and supply chain management, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of AI and BDA in business and supply chain management.

. Nayariseri et al., 2021, explores how Artificial Intelligence (AI), particularly Machine Learning (ML) tools like GOLD, Deep PVP, LIB SVM, and algorithms like support vector machine (SVM), random forest (RF), and Artificial Neural Network (ANN) are revolutionizing drug development. These techniques help identify potential biologically active compounds swiftly, aiding in SNP discoveries, drug repurposing, drug design, Lead identification, QSAR modeling, and ADMET analysis. SVM has shown superior performance in predicting human intestinal absorption, and SVM and RF models have successfully identified potential colon cancer treatments. The review concludes that in the era of big data, ML is a powerful way to model small-molecule drugs, gene biomarkers, and identify new drug targets.

Wisetsri, 2021, explores the impact of artificial intelligence (AI) on marketing. The researchers conducted a systematic literature review of papers published between 1982 and 2020 and performed bibliometric, conceptual, and intellectual network analyses. They examined the work of prominent authors and sources in this field and used co-citation and co-occurrence analyses to reveal conceptual and intellectual networks. The Louvain algorithm was used to cluster data and identify research sub-themes and future research

directions. The study aims to help practitioners identify the AI solutions most suitable for their marketing needs and guide future research in AI in marketing.

Comparing the two papers, Nayarisseri et al., 2021, and Wisetsri, 2021, both focus on the impact of AI in enhancing drug development and marketing, respectively. While Nayarisseri et al., 2021, explores how AI and ML tools are revolutionizing drug development, Wisetsri, 2021, explores the impact of AI on marketing. Both papers emphasize the potential of AI to enhance their respective fields.

While Nayarisseri et al., 2021, focuses on AI and ML tools, Wisetsri, 2021, focuses on the impact of AI on marketing. Nayarisseri et al., 2021, highlights the potential of AI and ML tools to model small-molecule drugs, gene biomarkers, and identify new drug targets, while Wisetsri, 2021, aims to help practitioners identify the AI solutions most suitable for their marketing needs and guide future research in AI in marketing.

Overall, Nayarisseri et al., 2021, and Wisetsri, 2021, propose frameworks that could have significant implications for drug development and marketing, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of AI in drug development and marketing.

Obschonka & Audretsch, 2020, emphasizes the need for more focus on the role of artificial intelligence (AI) and big data in entrepreneurship research. The authors present reflections and papers discussing how these technologies can contribute to the evolution of entrepreneurship research and practice, including the concept of "smart entrepreneurship." They also highlight potential ethical issues and challenges, such as the contrast between entrepreneurial uncertainty and rule-based AI rationality. The authors encourage researchers and practitioners to prepare for future scenarios and unpredictable developments in the field, while showcasing potential research avenues and examples in this emerging area.

Khan & Alotaibi, 2020, presents a systematic review of the application of artificial intelligence (AI) and big data analytics in mobile health (m-health) systems. It discusses various AI-based algorithms and big data frameworks in relation to the source of data, techniques used, and the area of application. The paper also proposes a model based on AI and big data analytics for improving m-health systems, especially for specific challenges. The findings from this study aim to guide the development of techniques that effectively combine AI and big data for managing m-health data.

Comparing the two papers, Obschonka & Audretsch, 2020, and Khan & Alotaibi, 2020, both focus on the role of AI and big data in enhancing entrepreneurship research and mobile health systems, respectively. While Obschonka & Audretsch, 2020, emphasizes the need for more focus on the role of AI and big data in entrepreneurship research, Khan & Alotaibi, 2020, presents a systematic review of the application of AI and big data analytics in mobile health (m-health) systems. Both papers emphasize the potential of AI and big data to enhance their respective fields.

Overall, Obschonka & Audretsch, 2020, and Khan & Alotaibi, 2020, propose frameworks that could have significant implications for entrepreneurship research and mobile health systems, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of AI and big data in entrepreneurship research and mobile health systems.

Munim et al., 2020, reviews 279 studies on the use of big data and AI in the maritime industry. Four research clusters were identified: digital transformation in the maritime industry, the use of big data from Automatic Identification Systems (AIS), energy efficiency, and predictive analytics. The review suggests that while technological development is a focus, wider adoption into the maritime industry is necessary for impact. It recommends balancing technology development with research into the "softer" aspects of institutional change, such as legislation, culture and commercial structure. It also highlights the need for more research into increasing transparency and trust in the maritime industry, including legal issues like cybersecurity and data ownership.

Batistič & van der Laken, 2019, synthesizes past research on the potential organizational value of big data and analytics (BDA), using a dataset of 327 primary studies and 1252 secondary cited papers. It explores the intellectual foundations, historical evolution, and potential evolution of BDA and performance research. The study reveals an increasing academic interest in the BDA-performance link, identifies ten foundational research clusters, and notes an increase in cross-disciplinary collaborations over the past decade. The paper also highlights developing research topics, including risk management, text mining, and evolutionary algorithms, and concludes by discussing implications and gaps in different management domains.

Comparing the two papers, Munim et al., 2020, and Batistič & van der Laken, 2019, both focus on the potential of big data and AI in enhancing industries. While Munim et al., 2020, reviews the use of big data and AI in the maritime industry, Batistič & van der Laken, 2019, synthesizes past research on the potential organizational value of big data and analytics (BDA). Both papers emphasize the need for more research into the softer aspects of institutional change and highlight the potential of big data and analytics to enhance their respective fields.

Overall, Munim et al., 2020, and Batistič & van der Laken, 2019, propose frameworks that could have significant implications for the maritime industry and organizational value of big data and analytics (BDA), respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of big data and AI in the maritime industry and organizational value of BDA.

Özdemir & Hekim, 2018, discusses the potential impacts of extreme automation, enabled by the Internet of Things (IoT), AI, and Industry 4.0, on Big Data and implementation science. The authors propose Industry 5.0, which aims to democratize knowledge co-production from Big Data, through a concept called symmetrical innovation. This includes a safe exit strategy for network failure, a balance between innovation acceleration and deceleration, and the use of new social science research for global governance of emerging

technologies, dubbed "Post-ELSI Technology Evaluation Research" (PETER). Industry 5.0 aims to harness extreme automation and Big Data with safety and responsible implementation science. The authors highlight the vulnerabilities of highly integrated systems, such as network collapse and the creation of new social and political power structures. They recommend balancing technology development with research into the "softer" aspects of institutional change, such as legislation, culture and commercial structure. They also emphasize the need for more research into increasing transparency and trust in emerging technologies, including legal issues like cybersecurity and data ownership.

Singh & Singh, 2015, emphasizes the importance of effective data analysis in research, using descriptive and inferential techniques. These techniques can summarize, organize, and test theories about data. While software can handle calculations, understanding the conceptual basis of analytical methodologies is crucial for meaningful data interpretation. The paper suggests that data analysis should be planned before data collection to avoid missing relevant facts. It also notes that certain assumptions must be met before applying analytical tools, requiring substantial experience and knowledge in data analysis. The paper aims to provide an introduction to commonly used analytical tools in business research.

Wang et al., 2015, presents advancements in big data visualization and conducts a SWOT analysis of current software. Integrating analytics and visualization can optimize big data applications. Notably, immersive virtual reality presents a promising approach for managing high dimensionality and abstraction, significantly boosting big data visualization. Interactive visualizations are superior to static ones, driving discovery and enhancing insight from big data. They can be linked with networks or web-based tools to aid scientific processes. However, conventional visualization methods fall short for big data, necessitating development of new tools.

Comparing the two papers, Singh & Singh, 2015, and Wang et al., 2015, both focus on the importance of effective data analysis in research, but from different perspectives. While Singh & Singh, 2015, emphasizes the importance of understanding the conceptual basis of

analytical methodologies, Wang et al., 2015, focuses on advancements in big data visualization. Both papers emphasize the potential of their respective fields.

While Singh & Singh, 2015, focuses on data analysis, Wang et al., 2015, focuses on big data visualization. Singh & Singh, 2015, highlights the importance of planning data analysis before data collection, while Wang et al., 2015, emphasizes the need for new tools for big data visualization.

Overall, Singh & Singh, 2015, and Wang et al., 2015, propose frameworks that could have significant implications for data analysis and big data visualization, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of data analysis and big data visualization.

6.5 Findings from editorial

Gandomi et al., 2023, discusses AI's role in data analytics, using machine learning, deep learning models, and natural language processing techniques to extract insights from big data. The goal is to automate data analysis, making it faster, more accurate, and scalable. Future trends in this field include real-time analytics, edge analytics to process data at the source, explainable AI for transparency, integration with other technologies like blockchain, and personalized analytics for tailored insights. These advancements will allow organizations to fully utilize their data for informed decision making and innovation. The paper highlights the potential of AI to enhance data analytics and the importance of keeping up with emerging trends in this field. It also emphasizes the need for transparency and ethical considerations in AI development.

6.6 Findings from reports

D'Amico et al., 2023, used generative artificial intelligence to create synthetic data for hematologic neoplasms research. This synthetic data, generated from a conditional generative adversarial network, mimics real clinical-genomic features and anonymizes patient information. The data was tested for fidelity and privacy preservation. The results showed that synthetic data not only resolved lack of information and data augmentation issues, but also accelerated research in hematology by anticipating the development of molecular classifications. Synthetic data can enhance the scientific use of real data, hasten precision medicine in hematology, and aid in conducting clinical trials. The study highlights the potential of synthetic data to enhance research in hematology and the importance of privacy preservation. It also emphasizes the need for more research into increasing transparency and trust in emerging technologies, including legal issues like cybersecurity and data ownership.

Deloitte, 2023, predicts that Generative AI will transform the future of work, becoming a crucial utility and making AI adoption essential in the workplace. Hyper-personalization, enabled by analyzing large amounts of customer data, will drive business growth. Language model learning machines (LLMs), the first "general purpose" AI, could lead to the development of Artificial General Intelligence (AGI). Generative AI could free individuals from mundane work, unlocking unprecedented human potential and enabling new ways of living. Trust and ability to meet expectations will be key to its enterprise adoption.

Chui et al., 2022, highlights that Generative AI is revolutionizing assistive technology, shortening app development time and empowering non-technical users. For businesses considering its adoption, a cross-functional team should be created to assess its potential impact, monitor its evolution, and address key questions such as potential disruption, investment strategies, use case selection, partner ecosystems, and legal compliance. Despite the technology's exciting potential, executives should remain aware of the risks due to its early stage of development.

While Deloitte, 2023, and Chui et al., 2022, both focus on the potential of Generative AI, Deloitte, 2023, emphasizes the transformative potential of Generative AI in the workplace, while Chui et al., 2022, focuses on the potential of Generative AI in assistive technology. Both papers emphasize the potential of Generative AI to enhance their respective fields.

AI and machine learning are increasingly used in finance, from algorithmic trading to credit underwriting, offering competitive advantages through improved efficiency, quality of services, and personalized products. They could enhance financial inclusion by assessing the creditworthiness of clients with limited credit history. On the other hand, these could heighten both monetary and non-monetary hazards, such as potential prejudices, misuse of data, and systematic risk stemming from their inexplicability. Policymakers need to assess these technologies' implications, balancing support for AI innovation with ensuring financial stability, market integrity, and consumer protection. Existing regulation may need to be clarified or adjusted to mitigate emerging risks from AI deployment.

As AI technology becomes integral to organizations, it brings a universe of risks and ethical challenges that could invite regulatory penalties. Leading organizations are those that proactively identify and manage these risks. To do this, companies should involve legal and risk-management teams in the AI development process from the start, ensuring models conform to legal requirements and social norms. They should also apply a risk-prioritization plan to manage the broad spectrum of AI risks. This process includes identifying an institution's particular AI dangers, outlining the damage to prevent, and adopting a distinct approach to assess and rank these threats for reduction.

Comparing the two papers, OECD, 2021, and Buehler et al., 2021, both focus on the risks and ethical challenges of AI. While OECD, 2021, emphasizes the potential risks of AI in finance, Buehler et al., 2021, focuses on the risks of AI in organizations. Both papers emphasize the importance of proactively identifying and managing AI risks.

While OECD, 2021, focuses on AI in finance, Buehler et al., 2021, focuses on AI in organizations. OECD, 2021, highlights the potential risks of AI in finance, while Buehler et al., 2021, recommends a risk-prioritization plan to manage the broad spectrum of AI risks.

Overall, OECD, 2021, and Buehler et al., 2021, propose frameworks that could have significant implications for AI risks and ethical challenges. Further research could focus on optimizing these frameworks and examining the ethical implications of AI in finance and organizations.

6.7 Findings from conference proceedings

AI, regarded as the fourth industrial revolution, is transforming industries worldwide by simulating human intelligence in computational systems. These systems can solve real-world problems more accurately and efficiently than hardcoded systems, making AI crucial in addressing business challenges. Subsets of AI, such as machine learning and deep learning, are used to optimize various business areas, including marketing, fraud detection, trading, customer service, portfolio management, and product recommendations. The integration of AI and big data has transformed the corporate landscape, hastened expansion and enhancing the ability to solve problems.

AI and big data are increasingly being used to enhance learning experiences and outcomes. A review of 980 articles using VOSviewer examined the main sources, disciplines, and keywords related to big data and AI in education. It identified several research clusters and main topics such as learning analytics, intelligent tutoring systems, collaborative learning, and higher education. This methodical mapping serves as a base for educators, researchers, and policy makers to advance research, curriculum design, and policy efforts in the domain.

Comparing the two papers, Ghimire et al., 2020, and Sun et al., 2020, both focus on the potential of AI in enhancing different fields. While Ghimire et al., 2020, emphasizes the

potential of AI in business, Sun et al., 2020, focuses on the potential of AI in education. Both papers emphasize the potential of AI to enhance their respective fields.

While Ghimire et al., 2020, focuses on AI in business, Sun et al., 2020, focuses on AI in education. Ghimire et al., 2020, highlights the potential of AI to optimize various business areas, while Sun et al., 2020, identifies several research clusters and main topics related to big data and AI in education.

Overall, Ghimire et al., 2020, and Sun et al., 2020, propose frameworks that could have significant implications for business and education, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of AI in business and education.

Nguyen & Sidorova, 2018, highlights the potential of AI chatbots to improve customer service in various industries. However, there is a lack of study on human-chatbot interactions. This research aims to compare user satisfaction between chatbot and website systems and identify the factors influencing satisfaction. The proposed model examines the relationship between perceived autonomy, competence, cognitive load, performance satisfaction, process satisfaction, and system satisfaction. If validated, the model could provide insights on how these factors influence user satisfaction with AI systems. This study could boost understanding of human-AI interaction, and help improve chatbot design and abilities, thus enhancing the relevance of IS research to practice. The paper emphasizes the importance of understanding the factors that influence user satisfaction with AI systems, and the potential of AI chatbots to improve customer service. It also highlights the need for more research into human-AI interaction to improve chatbot design and abilities.

6.8 Findings from book

In Grigsby, 2022, provides marketers and business analysts with predictive techniques to improve marketing performance. The book explores real-world marketing challenges and

offers clear explanations on applying different analytical models. It covers everything from targeted list creation, data segmentation, campaign effectiveness testing, pricing structures, to demand forecasting. The new edition includes chapters on big data analytics, insights and panel regression, and updates on advanced tools for predictive analytics. The methods are simplified to ensure accessibility at any level of application. It also includes downloadable data sets and test bank resources, providing a foundation to optimize marketing analytics for daily business advantage. The book emphasizes the importance of predictive techniques in improving marketing performance and the potential of marketing analytics to enhance business. It also highlights the need for accessible methods and resources to optimize marketing analytics for daily business advantage.

McKinsey, 2014, highlights the pivotal opportunity Big Data offers for marketing and sales. Companies that use it effectively see productivity and profitability rates 5-6% higher than their peers. Successful companies use analytics to identify opportunities, improve marketing return on investment (MROI), design products and offers that appeal to customers, and effectively deliver these to the market. The compendium explores business opportunities, examples, and organizational implications of Big Data and advanced analytics. Topics covered include using Big Data to find new micromarkets, driving growth through smart analytics, using marketing analytics to drive superior growth, and using Big Data for better pricing decisions.

Russell & Norvig, 2010, presents AI as intelligent agents interacting with their environment, highlighting learning's role in agent design, with task environment determining agent design appropriateness. This updated edition reflects progress in AI since 2003, emphasizing partially observable and nondeterministic environments in nonprobabilistic search and planning. It delves deeper into various agent representations, planning, and first-order probabilistic models, with new material on open-universe models. The machine-learning chapter is rewritten to incorporate modern learning algorithms. Expanded coverage includes web search, information extraction, and large data set learning. It cites 20% post-2003 works and estimates 20% new material.

6.9 Findings from survey

Ghimire et al., 2023, discusses the impact of online education using big data technology during the COVID-19 pandemic. The paper analyzes the current state and future prospects of online education, emphasizing detailed methods for combining online education and big data. The study helps understand the challenges of innovative online education during the pandemic and the potential for future growth.

Himeur et al., 2023, surveys the use of AI-big data in Building Automation and Management Systems (BAMs), including load forecasting and occupancy detection. The paper overviews existing frameworks, discusses current challenges, and presents three case studies on the application of AI-big data analytics in BAMs. It concludes by identifying future directions and recommendations to improve the performance and reliability of BAMs in intelligent buildings.

Comparing the two papers, Ghimire et al., 2023, and Himeur et al., 2023, both focus on the potential of big data and AI in enhancing different fields. While Ghimire et al., 2023, emphasizes the potential of big data and online education, Himeur et al., 2023, focuses on the potential of AI-big data in BAMs. Both papers emphasize the potential of big data and AI to enhance their respective fields.

While Ghimire et al., 2023, focuses on big data and online education, Himeur et al., 2023, focuses on AI-big data in BAMs. Ghimire et al., 2023, highlights the impact of online education using big data technology during the COVID-19 pandemic, while Himeur et al., 2023, surveys the use of AI-big data in BAMs.

Overall, Ghimire et al., 2023, and Himeur et al., 2023, propose frameworks that could have significant implications for online education and BAMs, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of big data and AI in online education and BAMs.

Chui et al., 2022, reports that AI adoption in organizations has doubled since 2017, with leading firms investing more in AI, employing advanced practices, and securing top AI talent. However, the proportion of organizations using AI has remained between 50-60% in recent years. A lack of diversity in AI teams persists, despite evidence showing diverse teams' correlation with high performance. The survey also indicates an increase in AI investment, with 63% of respondents predicting a rise in their organizations' investment over the next three years. Despite these advancements, there is a widening gap between AI leaders and other organizations, indicating a growing competitive advantage for the former. The paper emphasizes the importance of diversity in AI teams and the potential of AI to enhance business. It also highlights the need for accessible methods and resources to optimize AI for daily business advantage.

6.10 Findings from thesis

Elmeri, 2023, explores generative artificial intelligence and its applications in business, from chatbots to targeted marketing. It identifies both benefits and risks of integrating generative AI into daily operations. The author suggests that future research could involve collaboration with a business keen to implement AI and then monitoring and reporting the results. Despite time constraints, the author acknowledges that better planning and emphasis on the applicative side of the thesis could have improved the study.

Dunshin, 2022, examines the development of AI with a focus on global regulations, public opinion, and ethical dilemmas. It investigates current AI regulations worldwide and public opinion regarding these regulations, resulting in a proposed set of rules for AI work. It also introduces the ECCOLA method for ethical AI product evaluation. An empirical survey involving IT professionals and the general public provides further insights. The conclusion reflects on the research findings and suggests potential improvements for further study.

Comparing the two papers, Elmeri, 2023, and Dunshin, 2022, both focus on the potential of AI in enhancing different fields. While Elmeri, 2023, emphasizes the potential of generative

AI in business, Dunshin, 2022, focuses on the development of AI with a focus on global regulations, public opinion, and ethical dilemmas. Both papers emphasize the potential of AI to enhance their respective fields.

While Elmeri, 2023, focuses on generative AI in business, Dunshin, 2022, focuses on the development of AI with a focus on global regulations, public opinion, and ethical dilemmas. Elmeri, 2023, highlights the benefits and risks of integrating generative AI into daily operations, while Dunshin, 2022, investigates current AI regulations worldwide and public opinion regarding these regulations.

Overall, Elmeri, 2023, and Dunshin, 2022, propose frameworks that could have significant implications for business and AI development, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of AI in business and AI development.

Hoang, 2021, explores Enterprise Resource Planning (ERP) systems and their capacity to improve business efficiency, centralize data, and integrate with other software. It emphasizes the ongoing enhancements to ERP systems, including the application of AI and big data for more robust data analysis. ERP is increasingly used beyond IT, aiding business staff and departments like marketing and sales. Utilizing big data and AI can simplify data analysis, manage large data volumes, and streamline business operations. The study employs qualitative research and content analysis, presenting a case study on SAP, to demonstrate the benefits and challenges of integrating AI, big data, and ERP systems.

Muhammadian, 2020, investigates the impact of Artificial Intelligence (AI) on the marketing sector, including its implementation, risks, benefits, and future implications. The study reveals that AI is transforming the marketing sector by enabling more personalized, predictive, and automated advertisements, and is becoming an essential component of future marketing and sales strategies. The research emphasizes that familiarity with AI capabilities will be beneficial in adapting to these changes.

Comparing the two papers, Hoang, 2021, and Muhammadian, 2020, both focus on the potential of AI in enhancing different fields. While Hoang, 2021, emphasizes the potential of AI in ERP systems, Muhammadian, 2020, focuses on the potential of AI in the marketing sector. Both papers emphasize the potential of AI to enhance their respective fields.

While Hoang, 2021, focuses on AI in ERP systems, Muhammadian, 2020, focuses on AI in the marketing sector. Hoang, 2021, highlights the ongoing enhancements to ERP systems, including the application of AI and big data for more robust data analysis, while Muhammadian, 2020, reveals that AI is transforming the marketing sector by enabling more personalized, predictive, and automated advertisements.

Overall, Hoang, 2021, and Muhammadian, 2020, propose frameworks that could have significant implications for ERP systems and the marketing sector, respectively. Further research could focus on optimizing these frameworks and examining the ethical implications of AI in ERP systems and the marketing sector.

Oyehan, 2019, investigates the role of Artificial Intelligence (AI) in retail services, focusing on the Finnish perspective due to the country's pioneering use of AI. The study examines the application of AI in three major Finnish companies - Elisa, OP, and KONE. Additionally, it analyzes a questionnaire distributed to students of Centria University of Applied Sciences to gain insight into the adoption of AI in public services and the customer experience in shopping malls. The research concludes that AI plays a significant role in Finland's retail services and its adoption in this sector is more advanced compared to other surveyed countries. The paper emphasizes the importance of AI in retail services and the potential of AI to enhance business. It also highlights the need for accessible methods and resources to optimize AI for daily business advantage.

6.11 Findings from the Diagram on application of generative AI in Big Data Visualization for enhancing international business decision-making

The diagram shows how generative AI can be used to create visualizations of big data that can help businesses make better decisions. Here are the main steps of the process:

Selected data set: This is the first step, where the user selects a data set that they want to analyze and visualize. The data set can be from any domain, such as finance, marketing, health, etc. The user can use a CPU to access the data set and send a request to the Big Data cluster, which is a group of servers that store and process large amounts of data.

Forecast: This is the second step, where the user trains a forecasting model using the selected data set. The forecasting model is a type of generative AI that can predict future values of a variable based on past data. For example, the user can use an ARIMA model, which is a seasonal forecasting model that can capture trends and cycles in the data. The forecasting model can then generate a forecast of the data for a given time period, such as a month, a quarter, or a year.

Visual Execution: This is the final step, where the user uses the forecast to create a visualization of the data. The visualization can be a chart, a graph, a map, or any other graphical representation that can show the patterns and insights of the data. For example, the user can create a world map that shows the sales of a product in different countries, or a line chart that shows the revenue of a company over time. The visualization can help the user understand the data better and make informed decisions based on the data.

6.12 Conclusions

Generative Artificial Intelligence (AI) is a frontier in AI technology that focuses on creating new content, resembling original data. It has seen significant application in the visualization of big data, transforming complex information into intuitive visual representations. This has revolutionized decision-making in multinational corporations. By employing generative AI algorithms, decision-makers can create dynamic, interactive visualizations that adapt to various contexts, datasets, and business scenarios. These visual representations offer a holistic view of complex data, enabling decision-makers to derive valuable insights, identify hidden patterns, and spot emerging trends relevant to international business.

The primary advantage of using generative AI in big data visualization is its ability to address challenges associated with data complexity, heterogeneity, and scale. Generative AI can be used for various purposes such as data augmentation, content creation, data synthesis, and data transformation. The study of generative AI in big data visualization is an emerging interdisciplinary field that uses generative AI techniques to create or enhance visual representations of large and complex data sets.

The process of using generative AI in data visualization involves three steps. First, a specific data set is selected and sent to a Big Data cluster for processing. Next, a forecasting model like ARIMA is trained on the selected data set to predict future trends. This model generates a forecast for a specific period. Finally, the forecast is used to create a data visualization. This could be a chart, graph, map, or other visual aids that reveal patterns and insights.

However, generative AI is not without its challenges. There are significant concerns about reliability, quality, interpretability, and ethics. For instance, generative AI can produce unreliable or erroneous visuals that could mislead or confuse. It could also generate false or biased visuals that harm or deceive. Additionally, understanding how generative AI operates and why it generates specific results can be challenging due to the sophisticated statistical techniques and complex algorithms it employs. Therefore, it is crucial to use generative AI with caution, ensuring it is used ethically, transparently, and reliably.

In conclusion, while generative AI holds immense potential in the visualization of big data, its application must be approached responsibly. With careful use, it can revolutionize decision-making in multinational businesses, providing a holistic and intuitive understanding of complex data sets.

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