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A Comparative Analysis of AI

A SWOT analysis of Germany, France and the United Kingdom

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Title
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The thesis investigates the impact of Artificial Intelligence on Germany, France, and the UK, commissioned by Company X, a marketing agency in Joensuu, Finland.

The study aims to provide insights into use of AI within Europe. It begins with a literature review covering AI definitions, components, risks, challenges, and GDPR implications.

The core analysis involves a SWOT analysis of AI's effects, governmental funding, and strategies in the three countries. The research highlights the dynamic nature of AI, acknowledging potential out-of-date data and the need for further dedicated study on extensive topics.

Germany, France, and the UK are integrating AI through national strategies. Germany focuses on manufacturing, France on research and innovation, and the UK on global leadership. Each faces challenges like skill gaps, ethical concerns, and rapid tech changes. The long-term economic impact of AI remains uncertain, but it is expected to boost their economies.

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1 Introduction

The thesis aims to gather information on the utilization of Artificial Intelligence (AI) in three separate countries, with a specific focus on how it affects them on an overall level. The countries that are analyzed include Germany, France, and the UK. The study is commissioned by Company X, a marketing agency based in Joensuu, Finland. The company is seeking to gain valuable insights on AI marketing within Europe or in close proximity. It has no immediate plans to expand its business beyond Finland, but it is seeking fresh perspectives on how to operate in the everchanging industry. The company hopes to gain an advantage in helping companies grow by exploring innovative approaches to AI in marketing.

The thesis research begins with a literature review that addresses fundamental questions such as the definition of AI, its components and how they work, and the common risks and challenges associated with its use. The thesis also includes information on General Data Protection Regulation (GDPR) and how it deals with this changing AI industry. Additionally, the literature review examines the main topic of the paper, which is a SWOT analysis and explains how it works.

This research looks into three separate countries' developments in AI over the past couple of years. These countries are Germany, France and the UK. With the growing trend of companies using AI it is essential to look into how it affects the market as a whole. The main factors that can affect the businesses are the risks and challenges that AI can bring to the table if not used carefully and thoughtfully. The risks and challenges can consist of misuse of AI, rules and laws not followed by the businesses or the government and ethical issues.

Companies must also consider their morals and values when implementing AI and determine how far they are willing to venture into the so-called "grey area," where potential issues depend on individual perspectives. A SWOT analysis is built on the risks and challenges of AI that the countries face from their separate perspectives, their governmental funding of AI and mainly their governmental AI

strategies and how they plan to implement them. Given the dynamic and ever-evolving nature of the topic, it is challenging to provide the most up-to-date information. By the time the research is published, some data may already be outdated. Additionally, certain topics discussed are so extensively that they require separate, dedicated research.

The process of writing this thesis included the use of the AI tool ChatGPT, developed by OpenAI. It has been used to verify the spelling of the text and assist in organizing the text into a proper format. ChatGPT was used as well to provide suggestions and ideas on topics to explore during the research process. ChatGPT has not been used for the purpose of seeking critical information and has been treated with appropriate caution throughout the thesis process. (ChatGPT 2024.)

2 Literature review and theoretical background

2.1 What is Artificial Intelligence

Artificial Intelligence (AI) is an area within computer science that focuses on creating intelligent machines that can perform activities that usually require human intelligence (LAB University 2024). AI has technically existed since the 1930s, when physicist and inventor John Vincent Atanasoff, along with his assistant Clifford Berry, developed the Atanasoff-Berry Computer (ABC). This computer was capable of solving up to 29 simultaneous linear equations.

Machine Learning (ML) is a type of AI that allows systems to improve their performance by learning from usage, rather than relying on explicit programming and commands. The understanding of entities, domains, and their connections is dependent on inputs such as training data or knowledge graphs. This comprehension enables the beginning of deeper cognitive processes. Deep Learning (DL) is machine learning that allows computers to complete tasks that humans naturally do. Data Science (DS) is a multidisciplinary domain that combines experience in a certain field, programming abilities, and a strong

understanding of mathematics and statistics to extract valuable insights from data. Data Analytics (DA) uses comprehensive methods to analyze and test data, resulting in deeper and complex revelations. Neural networks imitate the functioning of the human brain, enabling computer programs to identify patterns and address typical challenges in the fields of AI, ML, and DL. Artificial neural networks (ANNs) or simulated neural networks (SNNs) are essential elements of DL techniques. Their design and operation are derived from the biological neural networks found in the human brain. (LAB University 2024.)

Algorithms comprise an initial input and a collection of instructions for manipulating this input. The input might consist of numerical or textual data, which is subjected to a sequence of computations, encompassing arithmetic operations and decision-making procedures, to generate an output. Ethical AI tackles the task of guaranteeing that AI systems take ethical concerns into account when making decisions, similarly to how humans do. Cybersecurity includes the safeguarding of computers, servers, mobile devices, electronic systems, networks, and data against malevolent intrusions. Cybersecurity, also referred to as information technology security or electronic information security, is applicable in several situations such as business and mobile computing. It contains multiple common categories. (LAB University 2024.)

2.2 Overview of Artificial Intelligence types

Systems used with AI work by combining large data with intelligent, iterative processing algorithms. This way the combination enables AI to learn from different patterns and features in the analyzed data. (LAB 2024.)

2.2.1 Purely Reactive AI

Purely reactive AI machines start working without any data and are used specifically for tasks such as playing chess.

2.2.2 Limited Memory

As the name suggests, these AI machines have minimal capabilities when it comes to its memory. For example, these kinds of machines are used to suggest nearby restaurants.

2.2.3 Theory of Mind

Theory of Mind AI is estimated to work in the future to socially understand human emotions and thoughts.

2.2.4 Self-Aware

Self-Aware AI is the final step in developing AI systems that are, as name suggests, self-aware and capable of forming representations about themselves. (LAB 2024.)

2.3 Consumer Behaviour and personalization

According to Katie King, (King 2022) in both business to business and business to consumers contexts, digital marketing methods are becoming more advanced and increasingly impactful. With the help of AI tools traditional marketing strategies can be customized into extremely flexible campaigns. Marketers can use large amounts of data to get detailed information and understanding of consumer behavior and their preferences. With the data-driven strategy, marketers can optimize their campaigns in real time, with the results of improved precision in targeting and better customer engagement. Additionally, AI enables the automation of mundane and repeating tasks, allowing marketers to focus their time and efforts on creative and strategic activities. As a result, this increases both efficiency and return on investment (ROI) for marketing campaigns. King (2022) argues that AI enables businesses to track changes in trends, consumer behavior and their attitudes which will identify their needs in order to meet the demand more effectively. According to

King (2022) with the help of AI marketers can quickly and efficiently detect various changes and trends, making it the most useful tool in their toolbox.

This is also supported by Shane Barker (2024), who states AI has the capability to forecast consumer behavior and their preferences by enabling personalized content and product suggestions. On top of ROI Barker (2024) says with the help of AI marketers are able to increase consumer satisfaction as well as conversion rates. In her LinkedIn article, Amber Sharma (2024) discusses similar benefits AI can bring to marketers and mentions that AI will increase consumer brand loyalty as customers are more likely to support businesses that recognize their wants and needs. Sharma (2024) argues that while AI is a powerful tool for personalization, it can also present significant challenges and risks when it comes to the consumer privacy. This is due to the increased awareness in consumers as well as the implementation of strict legislation in the area due to The General Data Protection Regulation.

2.4 Rules and ethics of AI

AI can raise significant ethical issues and questions regarding fundamental values, principles and consumer rights. The impact of AI on aspects of privacy, dignity, freedom, equality, justice, security and democracy are important and require careful attention. It is essential to define and apply ethical principles to guide the use and development of AI, while respecting human rights and universal values. (Jean-Joachim-Eurasie 2024.)

According to the LAB University's AI course "Introduction to AI" (LAB University 2024), companies that are using AI technologies must prioritize the preservation of human dignity and ensure that AI does not cause harm to people in any way. Ethics are standards that determine the appropriate actions a person should take. This often refers to terms of rights, duties, social benefits, justice, or other moral and ethical principles. Essentially, ethics aim to identify what is right or wrong. The ethical development of AI must include issues related to justice, anti-gun policies, and responsibility, including situations of self-driving vehicles involved in accidents. (2024). Linus Sebastian from Linus Tech Tips (Sebastian

2024) also states that currently AI is misleading at best and that at the current state self-driving cars can only operate so far to work correctly.

When it comes to robotics, Isaac Asimov (Asimov 1942), published three main moral rules. These rules are as follows.

1. “A robot may not injure a human being or, through inaction, allow a human being to come to harm.”
2. “A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.”
3. “A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.”

Asimov (1942) later added fourth law that states:

4. “A robot may not harm humanity, or, by inaction, allow humanity to come to harm.”

2.5 Morals and values of AI

Advertising strategies are strongly involved in AI. Therefore, ethical aspects play a major role in this field. Promoting transparency and accountability, protecting privacy, addressing bias, assuring fairness, consumer control and consent and balancing personalization and privacy are the guidelines to follow for utilizing responsibility and maintaining the fundamental values. (Farzan 2023.)

More widespread AI-powered marketing reinforces the importance of transparency and accountability. In transparency, the main focus is the work of algorithms, gathered and detailed data, used techniques and decision-making procedures explained. Consumers get to familiarize themselves with the usage of their data and how AI is acting during different marketing techniques. Trust is created more easily such as the knowledge of the impacts and benefits of AI applications in marketing. (Floridi & Cowls 2019.) In accountability, AI

applications must study with control processes to verify the rules of ethics. (Lowenthal 2024.)

AI systems can intentionally adopt assumptions identified in the data used for training, thereby generating prejudiced results. Implementing regular evaluations and using a variety of training data helps to reduce such prejudices. Ensuring equal treatment in AI-driven promotions is crucial to avoid prejudiced or restricting approaches. (AIContentfy team 2023.)

With AI-driven marketing campaigns advertisements can leverage valuable consumer data to create personalized experiences. However, information security must be prioritized, and proper consent for both collecting and using this data must be obtained. Making clear privacy policies, explicit consent mechanisms, and robust data security measures are therefore essential. (Unique Logic 2023.) It is also essential for making it possible for consumers to supervise their own personal data that has been gathered. This includes presenting clear opt-out alternatives in addition to mechanisms for accessing, adjusting, and removing collected personal data. (Unique Logic 2023.) Although specific advertising can enhance consumer experience, it still needs to be balanced against concerns in confidentiality. It is crucial to remember that acquiring only the necessary information and utilizing it in a clear and harmless way is the means to safeguard the consumers' privacy and trust.

2.6 General Data Protection Regulation

The General Data Protection Regulation (GDPR) is the most strict legislation worldwide concerning privacy and security. Despite being initially created and passed by the EU, the responsibilities imposed by GDPR extend to organizations worldwide as long as their targeting and data collection involve individuals from the EU. The implementation of this regulation started on May 25, 2018. The legislation can be intimidating due to its extensive and vaguely defined rules, making GDPR compliance challenging for many, especially for SMEs. (GDPR 2024.)

According to GDPR's own definition (2024) the legislation includes a large number of legal terms. Below are included the most relevant and important definitions.

2.6.1 Personal data

Personal data is any information referring to an individual who could be identified either directly or indirectly. Most commonly this information is provided in the form of names, email addresses, geographical details, ethnicity, gender, biometric data, religious affiliations, website cookies and political views. Pseydonymous data can be regarded as definitive information that facilitates the easy identification of an individual. (GDPR 2024.)

2.6.2 Data processing

Data processing refers to any action or activity created on data regardless if its automated or manual. This includes, but is not limited to collection, recording, organizing, structuring, storing, using and erasing the data. (GDPR 2024.)

2.6.3 Data subject

Data subjects refer to individuals whose data is being processed. These can include customers or visitors on any website. (GDPR 2024.)

2.6.4 Data controller

Data collectors decide how and why collected personal data will be collected. These personnel are usually owners or employees of said businesses. (GDPR 2024.)

2.6.5 Data processor

Data processors refer to third-party individuals, tools, or companies that perform the processing of gathered data on behalf of a data collector. The GDPR provides specific regulations intended for individuals as well as businesses. These can contain several different cloud server or email service providers. (GDPR 2024.)

2.7 Machine learning

ML is a subset of AI and software engineering that centres on employing data and algorithms to help AI mimic human learning processes, progressively enhancing its precision (IBM 2024). Essentially, ML is a method of data analysis that automates analytical model building. (LAB 2024.)

There are four different types of Machine Learning, each of which use different kinds of learning algorithms.

2.7.1 Supervised learning

This learning algorithm is used against data that has no earlier use cases. The system basically does not know the correct answer. Instead, the algorithm must figure this out with the given data. The goal of this system is to explore the datasets and find structure within. This works and is used with transactional data. (LAB 2024.)

2.7.2 Unsupervised learning

This learning algorithm is used against data that has no earlier use cases. The system basically does not know the correct answer. Instead the algorithm must figure this out with the given data. The goal of this system is to explore the datasets and find structure within. This works and is used with transactional data. (LAB 2024.)

2.7.3 Semisupervised learning

This learning algorithm is used with similar applications as with supervised learning. Where it differs is that it uses both labelled and unlabelled data for learning. It is useful when the cost of using fully labelled data is too high. One early example of this kind of algorithm is identifying a person's face on a webcam. (LAB 2024.)

2.7.4 Reinforcement learning

Reinforcement Learning is often used in use of robotics, gaming industry and for navigational purposes. This type of learning has three primary parts. The agent or user (the learner or decision maker), the environment (everything the agent interacts with), and actions (what the agent can do). This is a way for the AI to learn the best policies. (LAB 2024.)

2.8 Machine learning process

According to IBM (2024) and LAB University (2024), the learning systems of machine learning algorithms can be divided into three primary components.

2.8.1 Decision process

In a decision process, machine learning techniques are generally employed to predict or identify data. Given certain input information, identified or unidentified, the technique provides an estimate of a pattern within the data. (LAB 2024.)

2.8.2 Error function

In an error function, an error mechanism assesses the model's expectations. When actual examples exist, it can evaluate them to determine the model's correctness. (LAB 2024.)

2.8.3 Model optimization

Finally, in a model optimization prosess, to increase the model's fit to the training information, components are modified to minimize the variance between actual instances and the algorithm's predictions. This constant process called assess and optimize persists, with the algorithm continually modifying weights until the desired degree of quality is achieved. (IBM 2024 & LAB 2024.)

2.9 Deep learning

Deep learning is an area of machine learning that teaches computers to mimic the natural learning process of humans. In general, it is a Neural Network that consists of three or more layers. These networks attempt to replicate the function of the human brain. Deep Learning is defined as the presence of multiple hidden layers in a neural network. Typically, neural networks consist of 2-3 hidden layers; however, they can contain up to 150 hidden layers. (LAB 2024.)

2.9.1 Data science

Data science is an area of study that combines domain knowledge, programming competence, and proficiency in mathematics and statistics in order to obtain useful insights from data. In other words, it is about gathering data, analyzing and decision-making. It combines five different components: Domain Expertise, Data Engineering, Advanced Computing, Visualization and Statistics. Some of the tools Data Science can be used with are R, SQL, MATLAB, Java, SAS and Python. (LAB 2024.)

The Data Science process includes six key steps: discovery (obtaining data from different sources), data preparation ("cleaning" and refining data), model planning (selecting techniques to establish connections between variables), model building (training and evaluating the model), operationalizing (implementing the model) and communicating results (distributing findings to stakeholders). This process is used in a wide range of fields, including route

planning, flight planning, revenue forecasting, health benefit analysis, election predictions and optimizing delivery times. (LAB 2024.)

2.9.2 Data analytics

Compared to Data Science, Data Analytics mainly focuses on analyzing historical data rather than engaging in predictive modelling, machine learning, statistical modelling, or training machine learning tools. Data Analytics use comprehensive methods and advanced techniques to analyze and utilize data. (LAB 2024.)

2.9.3 Neural Network

Neural Networks mirror the behavior of the human brain, making computer programs possible to recognize different patterns and solve simple and common problems in the field of AI. These include machine learning and deep learning. Neural Networks are sometimes called artificial neural networks (ANNs) or simulated neural networks (SNNs); they are a subset of machine learning and at the center of deep learning algorithms. (LAB 2024.)

This research paper will not concentrate on the previously mentioned artificial intelligence areas any further. The discussed topics have been included in the study to provide a fundamental understanding of artificial intelligence.

3 Research methodology

A SWOT analysis was selected as the method for analyzing the collected data in this research. A SWOT analysis offers a systematic framework to evaluate the Strengths, Weaknesses, Opportunities and Threats related to the topic.

3.1 SWOT analysis

A SWOT analysis tool is used for planning to understand the following key components – the strengths, weaknesses, opportunities and threats, which are parts of a project or an organization. It is used for identifying the internal and external key factors that are either supportive or unfavorable in achieving the objective. SWOT is often used as part of strategic or planning research processes, although it can be applied to help understand the organization or a situation, and also for decision making for many different scenarios (see Figure 1).

In essence, when working with SWOT, it is first recommended to create a list of questions to answer for each factor. These serve the organization as a guide for completing the SWOT analysis and creating a balanced list for needed information. Formatting the SWOT analysis can consist of different frameworks such as in list format, as free text, or most commonly used four-cell table with each section dedicated to each key factor. Strengths and weaknesses are always listed first, followed by opportunities and threats. (Investopedia 2024.)
A SWOT analysis offers valuable information for organizations' self-assessment. The methodology for using it can be both quick and dirty tool or a comprehensive management tool which makes it one of the most flexible tools that can be factored in the success of an organization. (Figure 1.)

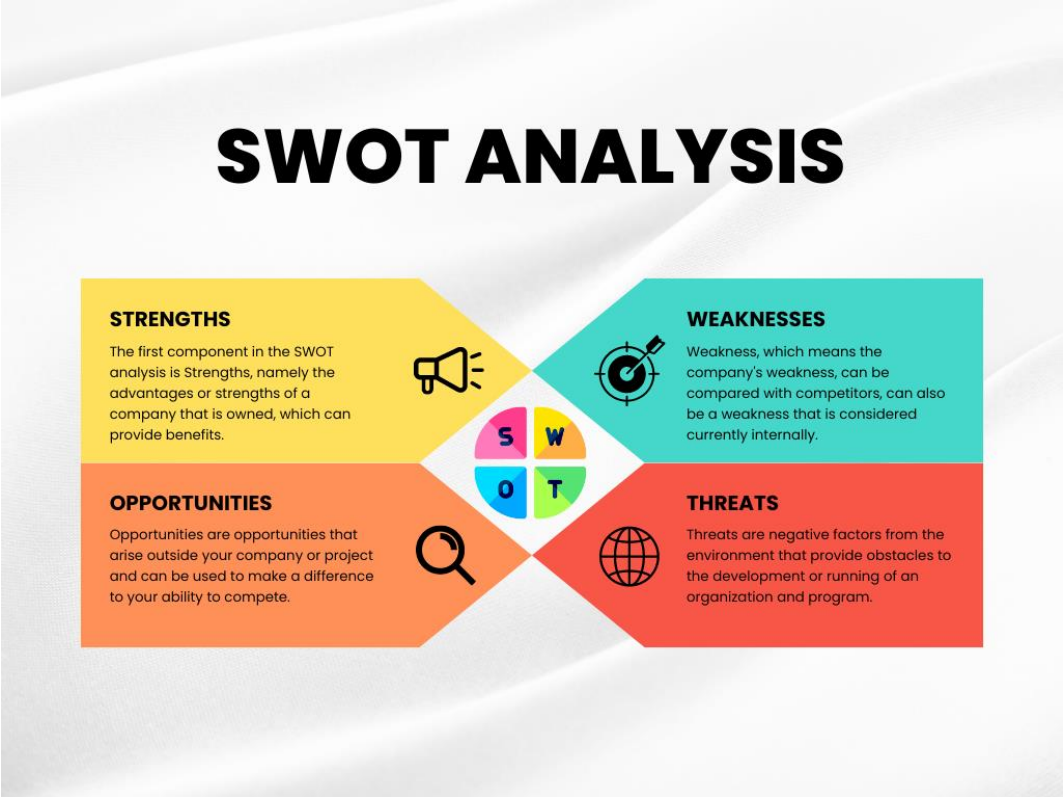

Figure 1. SWOT Analysis example (Liwan 2022).

3.1.1 Strengths

Strengths are the areas in a SWOT analysis which an organization demonstrates exceptional performance and differentiates itself from competitors. These can include a well-established brand, a dedicated client base, strong financial position, innovative technology and other similar factors. For example, an organization working in funding a business could have created an exclusive trading method that provides superior results compared to the market and other similar competitors. After this the organization needs to choose the most effective approach to utilize said findings in order to attract probable investors. (Investopedia 2024.)

3.1.2 Weaknesses

Weaknesses are those factors that stop or slow down an organization from performing at its optimum level. These are areas in which the business needs to

improve to remain competitive. These can be a weak brand, high turnover, high levels of debt, inadequate supply chain or lack of capital. (Investopedia 2024.)

3.1.3 Opportunities

Opportunities are external factors that could give an organization a competitive advantage. These can be increasing sales and market share, moving into an new potential market area, changing customer needs, using competitors' weak brand recognition as an advantage and many more.

3.1.4 Threats

Threats are the factors that refer to the potential harm the organization may face. For instance, the introduction of new laws and regulations can force organizations to change how they operate in the field, which in turn affects their profit margin. Other possible threats can be growing prices for resources, increased levels of competition and a limited supply of labour or other resources. (Investopedia 2024.)

3.2 Advantages and disadvantages of SWOT analysis

As mentioned earlier, a SWOT analysis is a simple and effective tool to provide a comprehensive overview of an organization's strategic position, helping to identify strengths, weaknesses, opportunities and threats. However, the results of a SWOT analysis can be subjective and can oversimplify difficult and complex situations. A SWOT analysis often gives a static perspective, lacks the prioritization of detected issues and does not provide effective solutions for organizations strategies.

3.2.1 Advantages

The use of a SWOT analysis comes with a variety of advantages. It assists organizations in evaluating their strengths and weaknesses while also encouraging strategic thinking. With a SWOT analysis senior management is

able to focus on the strengths and opportunities as well as anticipate and mitigate possible future threats to their businesses. Additionally, a SWOT analysis provides flexibility, which enables it to be adapted to a multitude of different business scenarios. (CIPD 2024.)

3.2.2 Disadvantages

The disadvantages of a SWOT analysis and its framework include a number of liabilities, one of which is the potential for oversimplifying the use of insufficient data, which can lead to a poor decision-making process. On the other hand, collecting excessive amounts of data can lead to a “paralysis by analysis”. The reliability of the analyzed data can be compromised if the data is based on inaccurate assumptions in the future. The quality of the gathered internal data can also be time consuming and even politically challenging, especially in organizations that are essentially complicated. The framework that a SWOT analysis provides lacks the detailed structure, which can cause important elements to be overlooked. Additionally, the rapid rate of changes can make it difficult to anticipate any future developments, and for the framework to remain effective, it has to be updated regularly. (CIPD 2024.)

4 Risks and challenges of AI

In the world of e-commerce, AI has created exceptional opportunities, but with it also comes new risks. With it businesses can captivate widespread growth of the capabilities of different AI models that allow them to reach new levels of value and generalization never attained before. With this also come drawbacks, as the opacity of AI models has also grown and the nature of their black boxes can make it difficult to explain in certain scenarios. In technological and social terms of training these systems can show new risks and critical points that can be compromised by prejudice and bias with discrimination. This is why it is possible that AI’s learning from certain digital traces of past user decisions can lead to including invisibility of existing prejudices into results of trained models.

(Artificial Intelligence (AI): new developments and innovations applied to e-commerce PE 648.791/2020, 2 §.)

The European Parliament has seen transparent algorithms spread increasingly to identify personal characteristics of individuals. These algorithms allow classification and prediction models of behavioral traits of different individuals such as credit score, insurance risk, health status, propensity to crime, personal preferences and orientations, using personal data disseminated in the digital environment by citizens, with or without their awareness. These automated decision-making processes are usually black boxes that observe the characteristics of the users, predict a class, a judgement, a vote and suggest different decisions without explaining the reason behind the proposed prediction or recommendation.

On top of the topic of transparency, the AI models are trained on different examples reconstructed on the basis of the digital traces of user activities, such as movements, purchases, online searches, opinions expressed on social media. This has resulted in the models inheriting the prejudices and defects that are hidden in the training data. Hiding them may result in decision algorithms that risk suggesting unfair, discriminatory or simply wrong choices, even possibly without the awareness of the decision maker and the topic of the final decision. For example, if a chat box powered by AI converses with users on social media and learns the wrong examples, e.g. racist utterance, it will be racist in the future, and the creators will evidently have to quickly and silently remove it. There have been several different cases that have already happened, such as the Twitter bot Tay, which was released by Microsoft in 2016 and was quickly shut down due to learning offensive and racist behavior from different online conversations. (Artificial Intelligence (AI): new developments and innovations applied to e-commerce PE 648.791/2020, 2 §.)

According to the British Government’s research the risks and safety of generative AI will likely increase by 2025 and is more likely to amplify existing risks than create whole new ones, although still increasing the speed and scale of some threats. The additional difficulty of predicting technological

advancements creates significant potential for additional threats emerging without anticipation. (GOV.UK 2023.)

The fast productivity and increasing accessibility of these technologies will most likely enable less-sophisticated threat actors to conduct previously unobtainable attacks. With the rise of AI also comes the risks in the digital realm such as cyber-attacks, frauds, scams and impersonation, which are most likely to appear and to have the highest impact by 2025. (GOV.UK 2023.)

The probability of risks to political systems and societies will increase as AI technology advances and its usage expands. The growing number of synthetic media threatens to undermine democratic participation and public confidence in governmental institutions. The risks to physical security are expected to increase when Generative AI is integrated into more physical systems, particularly critical infrastructures. (GOV.UK 2023.)

4.1 Cyber-attacks

Although generative AI can be used to increase faster paced and more efficient and larger scale cyber attacks through tailored phishing methods or replicating malware, the vulnerability discovery and evading detection are significantly less mature at the time of writing. Due to this, a fully automated computer is unlikely to happen by 2025. (GOV.UK 2023.)

4.2 Increased digital vulnerabilities

Integrating generative AI into critical functions and infrastructures presents a new surface to attack by corrupting used training data, hijacking model output, extracting sensitive training data, misclassifying information and targeting computing power. (GOV.UK 2023.)

4.3 Decrease of trust in information

The development of generative AI may result in the corruption of the public information ecosystem through hyper-realistic bots and synthetic media, such as deepfakes, which might influence societal debates and reinforce existing social prejudices. This risk can include the creation of fake news, personalized disinformation, the manipulation of financial markets and compromising the criminal justice system. By 2026, synthetic media could make up a significant portion of online content, consequently compromising trust in governments and promoting discord and extremism. Authentication techniques, such as watermarking, are in development but now lack reliability and need improvements as generative AI progresses. (GOV.UK 2023.)

4.4 Political and societal influence

Generative AI methods have shown the ability to influence human perceptions on political matters and potentially amplify the scope, effectiveness, and distribution of disinformation and misinformation. This means that in general, generative AI can produce hyper-targeted content at unprecedented volumes and complexities. (GOV.UK 2023.)

4.5 Insecure use and misuse

The integration of generative AI into essential systems and infrastructures poses concerns of data breaches, biased and discriminatory outcomes and impaired human decision making due to inadequate information security and unclear algorithmic processes such as AI hallucinations. Improper usage by any large scale company can lead into unforeseen repercussions and trigger a chain of disasters. The integration of generative AI into essential operations may lead to excessive dependence on supply chains that are non-transparent, potentially vulnerable and dominated by a limited number of companies. (GOV.UK 2023.)

4.6 Weapon training

Generative AI can be used to compile information on physical assaults by non-governmental violent entities including chemical, biological and radioactive weapons. Leading generative companies are implementing different measures to prevent such hazardous outcomes, although the effectiveness of these measures can vary. Additional challenges to entry will still remain, such as sourcing components, manufacturing equipment and intuitive knowledge. These challenges have however been diminishing, and generative AI could accelerate this. (GOV.UK 2023.)

To have a complete understanding of the topic on hand, a thorough and separate risk analysis must be created.

4.7 Hallucinations

Despite the successful accomplishments, large language models (LLMs) continue to be vulnerable to factual mistakes and hallucinations. What this means is that LLMs are prone to creating information that seems to be realistic yet is entirely false. This is an critical concern given their widespread use in critical fields such as law and medicine despite existing research has aimed to understand the core causes of these hallucinations (Stanford University 2024). According to a benchmark conducted using HaluEval, including over 35,000 samples, both authentic and hallucinated, the research reveals that ChatGPT generates unreliable information in around 19.5% of its responses. The responses differed on language, climate, and technology. This indicates that many LLMs have difficulties in generating reliable information for specified tasks, underscoring the ongoing difficulties associated with them (Li, Cheng, Zhao, Nie & Wen 2023.)

5 Comparative analysis between the countries

As previously stated, AI continuously transforms the world as we understand it, and marketing certainly follows behind. In contrast to the past, AI has the capability to analyze large amounts of data with significantly more precision than even the most experienced statisticians in a much shorter period of time. This section will provide a comparative analysis of the studied countries examining how each country handles the unique challenges and opportunities that AI brings to the field. This analysis highlights the similarities and differences in their strategies, how each country deals and addresses the risks and challenges associated with AI technology as well as investments and future plans on how AI will be implemented in the future.

5.1 National AI strategies

5.1.1 Germany

Germany, as other countries, is faced with the task of managing the structural changes caused by digitalization in several sectors such as business, the labor market, and society. Due to this, the manufacturing industry, which has always been strong and dominated by small and medium-sized companies (SMEs), is now experiencing significant opportunity.

Simultaneously, the race to attract talent, creativity, technology, data and investment is quickly picking up speed. With this comes the challenge of transferring the new AI technologies across Germany's economy, which is currently dominated by SMEs. None the less, with the complex transfer process and the exchange of data, especially between SME's provides great potential for value creation. It is also believed that AI will offer a great deal of potential for different sections of public administration and other public sector tasks. (KI-strategie-Deutschland 2024.)

The German Federal Ministry for Economic Affairs and Climate Action (BMWK 2018) has been focusing on AI with Open Innovation Platform since 2017. This

strategy focuses to work together with the German community to learn the possible opportunities, potential and challenges of AI as part of Germany's smart networks. (2018). The purpose of this strategy is to establish and maintain a position of top worldwide excellence in the research, development, and implementation of AI in Germany and Europe. (BMWK 2018.)

Based on AI Marketing Engineers findings, businesses in Germany are playing "high-stakes game of chess" with their marketing. To strengthen their digital marketing, they are using Predictive Analytics as their main tool. It helps with figuring out the next viable move by getting personal with their customers, strengthening their advertising and this way staying on top of their competitors. (AI Marketing Engineers 2024.)

The Federal Government of Germany presented a nation wide strategy for International trademark of AI with modern, secure and public-interest oriented AI applications based on the European values. The government will provide around five billion euro for the strategy by 2025. The Learning Systems platform will accompany the implementation of the AI strategy and is planned to expand into whole platform. (Die Bundesregierung 2024.)

Germany's political goals for the new AI strategy are based on solid research, aiming to position the country as a world leader in the research, development and application of AI. In the centre of this vision is the desire for technological leadership, represented by the quality seal "AI Made in Germany", along with a commitment to responsible, public welfare-oriented AI development and use. Different AI solutions are also being cultivated as part of the contributions to environmental and climate protection with a broad social dialogue supporting these efforts. The main goal is to establish a European ecosystem that enhances the industry and research competitiveness which will encourage diverse AI applications in the interest of society and European values. (Die Bundesregierung 2024.)

In the terms of action, Germany plans to expand its AI research capabilities. This includes establishing a nation-wide network of at least 12 different centres

and application hubs, forming a leading European AI network under the brand of “AI – Made in Europe”, creating atleast 100 new AI based professorships. Germany will focus on fostering multi functional AI research which should attract top talent through the competitive working conditions and establishing different partnerships such as the German-French research and innovation network. In order to encourage innovation, Germany plans to implement different challenges with AI and introduce a national award for “AI made in Germany”. (Die Bundesregierung 2024.)

As we know, the exchange of knowledge, application and entrepreneurship are important parts of such large operation. This will involve speeding up the transtition from research to practical AI applications through field tests, real world laboratories and regional clusters. With this, SMEs will gain access to AI technologies through initiatives such as Mittelstand 4.0 competence centres (Die Bundesregierung 2024). Mittelstand-Digital provides support for SMEs and skilled crafts as they engage the transition to a digital world and teaches these SMEs about the benefits and challenges of digitalisations (Mittelstand-Digital 2024). Additionally, AI startups will be supported through funding programs such as EXIST and venture capital iniatives. The establishment of AI agencies focusing on breakthrough innovations, creating the European AI innovation cluster and the public showcasing of best practices of AI will also be part of the strategy. (Die Bundesregierung 2024.)

In 2019 France and Germany signed the joint AI roadmap known as the “Toulouse Declaration”, which is one of the cornerstones of this initiative. The idea of the roadmap is to create a virtual AI network to strengthen the connection of economic factors in both countries by coordinating the approach to standardize AI and joint efforts on legal and data security matters. In addition it also promotes conversation on breakthrough innovation projects and a secure sovereign data infrastructure. (Die Bundesregierung 2024.)

To make the strategy humane and comprehensive due to the changing nature of AI, Germany will focus on skill development, social security and employee well-being. To accomplish this, Germany has established regional competence

centres for work research and design along with skilled worker monitoring and a national training strategy to help promote necessary digital and AI skills. Germany's commitment to manage the AI-driven transformation of workplaces is underlined by early involvement of work councils in AI applications, along with the creation of AI-supported portals for professional training. (Die Bundesregierung 2024.)

As discussed earlier on in this paper, data use, security and ethics are critical components of working with AI. This is no difference with Germany's AI strategy, as Germany will focus the research on the traceability of algorithmic systems, consumer protection and the promotion of privacy along with data-sharing partnerships between companies and research institutions. Germany plans to adapt laws around competition, copyright and labor to make gathered data more accessible but, at the same time, protect personal and sensitive business information. The idea is to create a clear regulatory framework that proves legal certainty for those working with AI. (Die Bundesregierung 2024.)

As a last part of the strategy Germany will foster international and social dialogues to ensure AI is used in a human-centered way, especially in the workplaces. This includes societal discussions on the ethical, legal, cultural and institutional aspects of AI, with the platform for AI playing a key role. Germany is also developing a civic-oriented AI ecosystem under the "Civic Coding" label which supports projects such as the Civic Innovation Platform, Civic Data Lab and the AI Ideas Workshop for Environmental Protection. (Die Bundesregierung 2024.)

5.1.2 France

As of 2024, France stands at the forefront of AI development, showing a strong commitment to innovation and implementation. The nation has prioritized AI as a critical component of its economic and technological strategy, with significant investments in research and development and strengthening a collaborative ecosystem that includes government agencies, academic institutions and private sector leaders. France's national strategic initiative launched in 2018

and its following updates have aimed to balance the advancements with ethical considerations, making sure AI's benefits are widely and equally distributed. (Economie.gouv.fr 2024.)

France's AI Booster strategy is built on two core pillars. The goal of the AI-cluster project is to turn French research and education centers into international hubs' AI knowledge. The AI-cluster project aims to increase AI specialists in France by 2030 by also aiming to enhance the standing of at least three French institutions within the top 50 global universities specialising in AI. (Krasavina 2023.)

As a second core pillar for the AI strategy of France works the AI-Booster strategy that focuses on supporting the digital transformation of French SMEs. Its main goal is to facilitate the integration of AI technologies into these smaller businesses (Krasavina 2023). According to the the Ministry of Economy, Finance and Industrial and Digital Sovereignty, they initiated the AI Booster France 2030 program to benefit French businesses from all sectors. The program consists of four different services that businesses can utilize. These are awareness and acculturation to AI solutions, AI Data Diagnostics, help with choosing the AI solution and experimenting with the chosen AI solution. (Economie.gouv.fr 2024).

Additionally, the French AI strategy's vision is to bridge the gap between AI, data science and robotics skills within the workforce. To achieve this, the strategy will keep offering financial incentives to higher education and research institutions. These incentives are intended to promote the enhancement of initial training programs across all levels of education, including fundamental, intermediate and advanced levels, in addition to dual programs, retraining and additional education. (Krasavina 2023.)

In order to bring more talent to France, Prime Minister Élisabeth Borne officially opened the Generative Artificial Intelligence Committee in 2023. This committee brings together stakeholders from different sectors such as cultural, economic, technological and research to strengthen development of training of AI,

ensuring that the economic fabric has the means to make the most of this technology, and to invest in promoting French innovation on international scale and to define correct regulations for each one to protect individuals within them. (economy.gouv.fr 2023.)

5.1.3 The United Kingdom

The UK excels in the innovation of AI in 2024 as the country's commitment to harness AI is underlined by a strong strategic foundation both reflecting the established objectives and rational actions required to sustain its dominance in this rapidly developing sector.

The UK's National AI Strategy was launched in 2021 providing a comprehensive roadmap that aims to secure the nation's position as a global leader in AI (Latif 2024). According to the UK's Department for Science, Innovation and Technology (GOV.UK 2022), the impact of AI will be extensive on the businesses across the UK over the next ten years. The government of the UK believes that through the new discoveries and methods for capturing the capacity of machines to learn, aid and assist in new ways will surface, giving them new opportunities to grow and transform businesses of all sizes and seize the benefits of new innovations across the nation. The UK's main core pillars to build this strategy on during these years are found in the following paragraphs.

By concentrating on three main pillars, the UK's National AI Strategy seeks to establish the nation as a worldwide AI leader during the next ten years. The first pillar is funding the long-term requirements of the AI ecosystem. This includes developing strong data and computational infrastructure to support AI advancements, encouraging high-risk, high-reward AI research and innovation, and bolstering AI skills through educational initiatives and visas to draw in talent from around the world. (HM Government 2021.)

The second pillar's main goal is to make sure AI helps all industries and areas. This entails promoting AI-driven economic benefits throughout all UK regions, including support for startups and scale-ups, integrating AI in public healthcare

and social services via strategic actions, and supporting AI adoption across a range of industries, particularly in lower AI-maturity sectors. (HM Government 2021.)

Effective AI governance is the subject of the third pillar. This entails creating pro-innovation legal structures that strike a balance between invention and public safety and trust, setting moral standards and openness requirements for AI applications, and participating in global AI governance to mold international norms and standards in accordance with UK principles. (HM Government 2021.)

The National AI Strategy of the UK includes the release of guidelines with the goal of improving the accessibility of data, collecting feedback on cyber-physical infrastructure, and supporting the development of AI knowledge through training courses. Additionally, it includes performing research on the requirements for AI skills, accelerating the spread of AI technology, and implementing collaborative global AI research and development operations. In addition, the strategy prioritizes the study of semiconductor supply chains, the launch of a national AI research program, and ensuring of AI integration in trade deals. (HM Government 2021.)

The strategy prioritizes the importance of public trust, the ethical development of AI, and collaboration within government, industry, and education to achieve its goals. The HM Government for AI supervises the implementation, with progress monitored using statistical metrics and continuous involvement in the community. (HM Government 2021.)

The UK’s former Secretary of State for Science, Innovation and Technology, Donelan, stated in a 2023 white paper that the nation has to approach delivering AI to the nation with a common-sense and outcomes-oriented way to get right to the heart of delivering on the priorities of people across the UK. She believed that better public services, high-quality jobs, and opportunities to learn new skills would drive the nation’s goals to become a science and technology superpower by 2023. She also pointed out that AI is already providing social

and economic benefits such as improving NHS medical care and making transportation safer for the public. The UK's vision is for AI to empower various other sectors as well, making the UK the smartest, healthiest, safest and happiest place to live and work.

Donelan (2023) specified that the UK has invested over £2.5 billion in AI science since 2014 with the most recent investments including £110 million for the AI Tech Missions Fund, £900 million for a new AI Research Resource and an exascale supercomputer. (Donelan 2023.)

5.2 Potential risks of AI

While it is anticipated that each country will likely encounter similar challenges as those previously discussed in the report, this section delves into these issues from country specific perspectives, providing more understanding on how each country views these risks and challenges the AI brings.

5.2.1 Germany

As is the case in other countries, Germany is no different when it comes to the risks of AI. The potential challenges presented by AI, including ethical concerns such as bias and discrimination, more systematic issues such as loss of employment and data privacy, are just as relevant in Germany as they are on a global scale. While the specifics of AI adaptation can vary, the core risks and challenges remain mostly consistent, driven by the technology's inherent complexities and the fast pace of its development. This is why Germany faces the same critical need for responsible AI supervision as other countries.

During a press conference held in Berlin in 2023, Ferda Atama, the German Government's independent Anti-Discrimination Commissioner, assessed the potential of AI and the growing fears that AI could amplify structural racism and other forms of discrimination and that it needs to be changed. Ataman stated that "AI makes many things easier – unfortunately also discrimination." (Ataman & Fürstenau 2023.)

At the conference, Ataman presented an in-depth study on improving measures to safeguard individuals from potential discrimination by self-learning algorithmic decision-making (ADM) systems. Ataman's study highlighted numerous examples of the implementation of this particular type of AI that are currently available. These include processes for applying for employment, obtaining loans from banks, insurance companies, or the distribution of government benefits such as social welfare. Ataman stated that what appears objective at first glance can automatically reproduce prejudices and stereotypes and under no circumstances should someone underestimate the dangers of digital discrimination. (Ataman & Fürstenau 2023.)

Ataman emphasized the need for more transparency among organizations that use AI. She specifically advocated for organizations to provide details about the data used and the operating processes of their AI systems. Within an expert assessment written by the legal scholars Indra Spiecker and Emanuel V. Towfigh, AI-based systems are described as a "black box," where it is very difficult for individuals affected to identify the underlying reasons for possible downsides. The research emphasizes that a distinct phenomenon associated with the usage of ADM systems is that their capacity for discriminating may already be built-in to the system. These kind of issues can result from data sets that are defective, inappropriate for the intended purpose, or otherwise misleading. (Ataman & Fürstenau 2023.)

Despite Germany's substantial investments in AI research and development, German companies who fail to adopt AI face the possibility of losing their global competitiveness as well as being exposed to disruptions in their supply chains. Consequently, the rate at which the industry is adopting this technology remains low in comparison to its European competitors. The manufacturing sector specifically is slower taking up AI applications compared to other sectors despite holding the main role in the German economy. Its delayed acceptance may have an impact on several variables, from challenges unique to a certain industry sectors to more generalized legislative and economic contexts. Germany, like many other countries, is experiencing a shortage of AI competence. While its educational institutions demonstrate exceptional

proficiency in producing high-quality graduates, the demand for AI competency considerably surpasses the available supply. (OECD.org 2024.)

5.2.2 France

Although retailers are aware of the security and risks in trust associated with generative AI, they are prepared to address these issues and are already taking necessary steps towards fixing them. In a survey done by Salesforce (2024), only 52 percent of respondents said they are able to fully comply with data security standards and privacy regulations. However, half of the respondents identified bias towards the main risk associated with using generative AI, as the fact remains that AI algorithms mainly produce results that are based on stereotypes. Additionally, one of the major risks were considered AI hallucinations and the toxicity of AI. According to the survey, 68 percent of respondents would follow ethical guidelines for data transparency, security and privacy while using generative AI and have made commitments to produce trustworthy and unbiased results. (Salesforce 2024.)

According to Michele Goetz (Goetz 2023), 60 percent of workers in France will use their own AI to perform their jobs and tasks. This means that employees often bypass their organizations security policies as they believe its more efficient way to finish given tasks. Goetz (2024) says during 2024, so called underground AI tools are going to grow as organizations struggle to manage regulatory, privacy and security issues with the widespread use of Bring Your Own AI (BYOAI). Additionally to generative AI tools, employees will likely also use AI software for work that they have purchased for personal use, which will contribute towards the rise of BYOAI in the coming years. (Goetz 2023.)

Eighty-five percent of businesses will use open source models while developing AI. The use of proprietary OpenAI models has been a major driving force for the 2023 growth in genAI experimentation and adoption. When businesses get more experience with genAI design, a lot of them will start using open-source models like FLAN-T5, BERT, and GPT-J. This movement will pick up pace with the introduction of wearable models like Llama 2, marketplaces like Hugging

Face, and corporate investment in these projects. Proprietary models will not go away, but there will be more options when developing the genAI strategy. (Goetz 2023.)

The increase of the use of OpenAI models has been a major driving force for the 2023 growth in generative AI experimentation and adoption. According to Forrester's estimate, 85% of companies in France will use AI to build open source models. However, when the businesses get more experience and get more comfortable with the generative AI design, many will begin to use open source models such as FLAN-T5, BERT and GPT-J. This trend will pick up the pace with the introduction of wearable models such as Llama 2, marketplaces such as Hugging Face and corporate investments in these projects. This will not be the end of proprietary models, but this means there will be more options when developing the generative AI strategies. (Goetz 2023.)

Generative AI's tendency to hallucinate or make mistakes is changing the way how risk management and complex risk transfer strategies can be calculated. Insurance companies have tried to fill coverage gaps while expanding their list of exclusions for AI hallucinations. However, given the expected growth of Generative AI, insurance companies that are forward-thinking will be more inclined to to cover unique and difficult to insure risks, such as the previously-mentioned AI hallucinations. (Goetz 2023.)

According to Comarketing News the annual State of Customer Engagement report made by Twilio, 51% of French consumers consider data protection to be the primary factor that brands need to focus on. Additionally 34% of consumers state that they would be more likely to trust a brand if it disclosed how customer data is used in AI-based interactions. Also, 39% of French businesses surveyed believe that balancing between security and customer experience are one of the most difficult challenges they will be facing in 2024. (Comarketing News & Twilio 2024.)

The report revealed that 81% of French companies claimed to provide good or excellent customer engagement, yet only 65% of consumers agreed with this

claim. With the increasing number of companies implementing AI into their business, most of them have trouble utilizing the client data the correct way. This is proven by comparison that only 16% of global brands strongly believe that they have the needed data to understand their customers and only 19% state that they have a complete profile of their customers. While companies excel with the AI-powered personalization, consumers are more likely to spend on average 54% more on their products and services compared to the brands that do not. In France, 48% of consumers show that they would pay extra for personalized experiences, and 44% claim they have come back to purchase again from the same business that catered their needs with AI during the first time. (Comarketing news & Twilio 2024.)

5.2.3 The United Kingdom

The potential for utilizing AI to deceive people or persuade them to act in a certain way due to commercial, economic, or political objectives is a further problem that comes up often. Election manipulation tactics and deceptive advertising are nothing new. Nonetheless, these tactics, when paired with the massive data gathering for AI algorithmic structures, have greatly increased the potential of what might be achieved to influence consumers' decisions and actions.

Based on the report made by Frontier Economics in 2023, issues related to disability, sex and ethnic origin can surface without its users or developers being able to know this while using AI-systems. This is a so-called reconstruction problem, where the AI system is able to deduce said information even if the data points on the characteristics are not included in the training data set. Another potential frequently mentioned challenge in AI is the possibility of using the technology to mislead users or to convince them to behave in a certain way by motivating through commercial, economic or political interests. Such manipulative marketing strategies have always existed. However, these strategies, when combined with the collection of large amounts of data for algorithmic systems, have expanded so much that the capabilities of such

strategies can drive users towards specific choices and behavior easily. (Frontier Economics 2023.)

Cybercrime can manifest in various forms such as terrorist content, activities related to child abuse and exploitation, hate crime and digital fraud. It is important to remember that there is a substantial amount of damage in online world that falls outside the view of AI technologies and that the connection between AI and online is complicated and unindirectional. (Frontier Economics 2023.)

The concerns with price discrimination comes from the potential for AI systems to allow companies to charge different prices to different customers for the same or similar products, utilizing the large amounts of personal data shared online. AI can enhance the use of personal data in ways that can violate the privacy of users by significantly increasing the power and speed of data analysis. Facial recognition is one of the good examples of this increased risk. Rich databases of digital photographs are available through social media, websites, driver's licence registries, and surveillance cameras, all of which may enable rapid machine recognition of individuals. (Frontier Economics 2023.)

In a news article made by The Guardian, and in one in question in particular, Sarah Cardell, the chief executive of the Competition and Markets Authority (CMA) stated that the general purpose of AI systems such as OpenAI's ChatGPT and Google's Gemini are a potential "paradigm shift" for society, and the challenges that they bring is to harness the significant and powerful technology and its benefits while safeguarding society against the potential exploitation of market power and unintentional consequences. (Cardell & Hern 2024.)

Cardell stated that there are three connected risks that could take over competition in the field of AI. These can be companies that take control over vital inputs such as computer chips and information and limiting entry to the market to protect themselves from competition. These companies can use their market power to manipulate choice in AI services and partnerships between key

players aggravating concentrations of market power. She stated that there remains a real risk that with AI and its development, it can undermine consumer trust and create a monopolistic market dominated by a few key players and preventing the full benefits from being felt across the economy. (Cardell & Hern 2024.)

According to Cardell and Hern, the six identified key companies by CMA are Google, Microsoft, Meta, Amazon, Apple and Nvidia, the leading suppliers of chips for training and using AI. The CMA highlights that these companies are involved in over 90 partnerships and investments, which could potentially limit market diversity and consumer choice. (Cardell & Hern 2024.)

Jonathan Dupont, Denise Baron, Amy Price, Michela Arena & Seb Wride at the Public First, Center for Data Innovation conducted a survey on AI generated content from the public of the UK in 2024. In response to the question of whether or not materials created by AI would cause issues with the spread of information, 68 percent of respondents stated they believe it would. This issue is likely partly due to 53 percent of individuals in the UK being unsure if they could identify fraudulent information created by AI on the internet. Additionally, the level of confidence considerably decreased as the age of the respondents grew. There was a significant amount of support for improved labelling, with 66 percent of people in the UK stating that governments and businesses need to do far more to improve labelling and prohibit deceptive information created by AI. It was the elderly and children who were judged to be at the greatest risk of being deceived, with 53 percent and 45 percent of respondents pointing to each category separately when the question was phrased in an indirect way. Only one percent of respondents who participated in the survey said that they did not have any concerns about anybody. Only 35 percent of individuals in the UK have indicated they believe it is possible that new AI capabilities might assist in reducing the amount of disinformation. (Dupont, Baron, Price, Arena & Wride 2024.)

5.3 Funding of AI

The results clearly indicate which of the three nations is leading in AI investment across both government and business sectors (Figure 2).

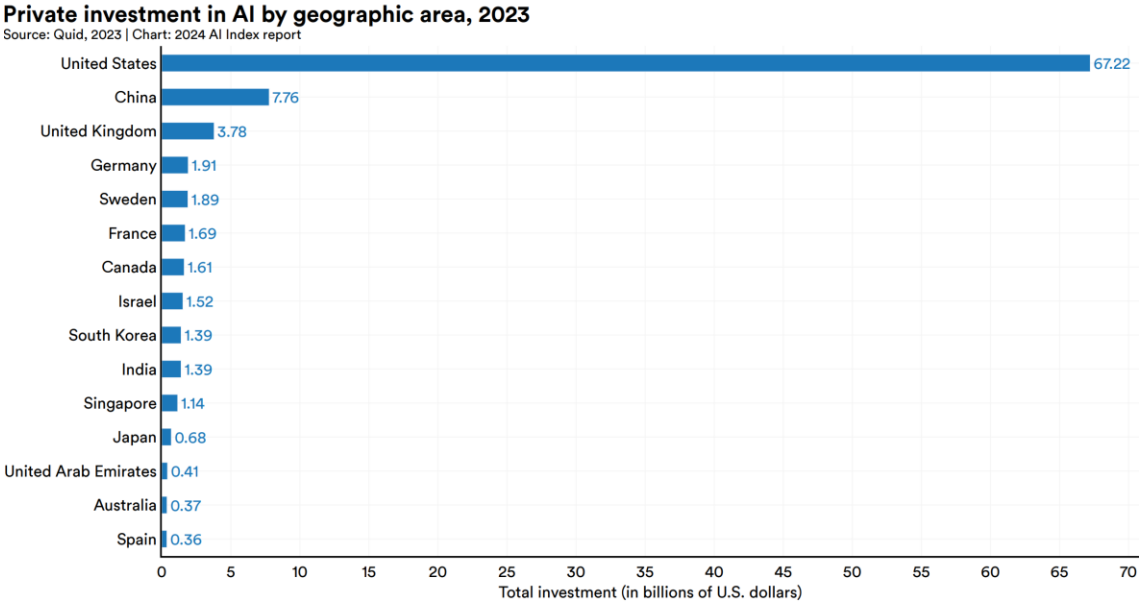

Figure 2. Investment in AI in 2023 (Stanford University 2024.)

5.3.1 Germany

The German Federal Government established an AI Action Plan aimed at developing AI competence centers and enhancing computational resources. The Innovation Park Artificial Intelligence (IPAI) in Heilbronn is a notable initiative designed to create one of the most extensive AI ecosystems in Europe. The objective is to provide stakeholders in the public sector, academic institutions, new businesses, and public sector stakeholders the opportunity to use AI in practical applications. Additionally, the German government announced an investment of €1.75 billion to support new technology startup companies.

Amazon Web Services (AWS) announced that it plans to spend €7.8 billion in the AWS European Sovereign Cloud. The first AWS Region in the State of Brandenburg is expected to launch in 2025. In early 2024, Microsoft announced an investment of €3 billion in Germany over the following two years. The

primary objective of this is to invest in data centers, therefore enhancing Germany's status as an AI powerhouse. Apple initially spent €1 billion in 2021 and announced a further €1 billion investment in Germany in 2023 to be allocated over the following six years. (International Trade Administration 2024.) According to the Bitkom trade body Germany spent €6.3 billion in AI software, services and related hardware in 2023. With this the AI market grew by a third compared to 2022 (Deutschland.de 2024.)

5.3.2 France

Although France lags behind China and the United States in terms of prominence, it is currently well-positioned within the European scale, all thanks to a diverse and varied network of researchers, entrpreneurs, industrialists, investors and public authorities, all dedicated to the development of AI. The government of France provided support to the industry in the form of a €2.5 billion national AI policy called Plan France 2030. (Jean-Joachim-Eurasie 2024.)

France's national strategy for AI also includes the aim to improve the ecosystem of research and teaching for AI. This will be achieved by investing €560 million of public funds to support these efforts. This funding will be allocated to improve the existing institutes of competence within the French school of AI, with a specific focus on expanding the capacity to provide AI training at a national level. (Economy.gouv.fr 2024.) Additionally, the AI Booster France 2030 initiative will receive €25 million from the state. This initiative is intended for SMEs and Intermediate-sized enterprises (ETIs) that generate more than 1 million euro in turnover. (Jean-Joachim-Eurasie 2024.)

Eighty percent of responding companies in France stated that they have reserved a separate dedicated budget to AI, and on average 54 percent of these funds are going to be dedicated to different generative AI projects. This percentage is the highest compared to the other countries surveyed by Salesforce (Salesforce 2024), with 52 percent in the UK, and 50 percent in Italy, Germany and Spain. In France the three main areas of application in AI are customer service, digital commerce and supply chain. This shows retailers

make customer service a priority. Therefore, this would benefit by providing their agents with hyper-personalized and automated messages and content to send quickly to their customers. (Salesforce 2024.)

5.3.3 The United Kingdom

Thanks to large governmental funding in AI, intensive research in the field, major venture capital funding and AI startups and the considerable adoption of AI in enterprises, the UK has become one of the strongest pioneers in the field of AI. The UK's AI sector is currently valued at over $21 billion (€19 billion) and is estimated to exceed $1 trillion (over €9 billion) by 2035. The country ranks as the third largest AI market globally, behind the US and China. The National AI Strategy and Action Plan was published by the UK Government in 2022 outlining a comprehensive package of support for the sector totaling in more than $1.3 billion (€1.18 billion). This support strengthened and complemented the prior $2.8 billion investment that the UK had already provided to AI. Additionally, the AI sector provided investments in AI solutions, while major global AI enterprises allocated significant funds to grow the UK's AI market. (International Trade Administration 2023.)

The UK's Labour Government originally planned to launch £1.3 billion (€1.55 billion) funding for technology and AI iniatives simultaneously raising uncertainty about the UK's first next-generation supercomputer. The project originally included £800 million (€953 million) for a exascale supercomputer at the University of Edinburgh and an additional £500 million (€595 million) for the research of AI resources with the support of AI supercomputing. In 2024, around £300 million (€357 million) of said funding for the AI Research Resource remained unaffected and continues as originally planned and rest of the initial funding was cancelled by the Labour Government. (Kollewe & Milmo 2024.)

The UK government has allocated £32 million (€38 million) to support 98 AI projects aimed at enhancing productivity and efficiency across various sectors, including public services in 2024. These projects will benefit over 200 businesses and research organizations. The Minister for Digital Government

and AI, Feryal Clark, emphasized that AI will drive positive change by improving both the economy and public services. The funding aims to position AI as a central force in boosting productivity and driving innovation across key areas of the UK’s economy. (Sensi 2024.)

According to the Department of Science, Innovation and Technology (DST), the government has taken difficult but crucial financial measures across all departments in response to unfunded commitments amounting to billions of pounds. These measures are necessary for restoring economic stability and achieving national growth goals. (Sensi 2024.)

6 SWOT analysis

This SWOT analysis examines the strengths, weaknesses, opportunities, and threats that Germany, France and the UK face. The analysis highlights how each country can control its strengths to capture opportunities while simultaneously address weaknesses and how threats can affect them. This helps understanding each country's distinctive characteristics and challenges in identifying strategic routes that promote overall growth and global competitiveness. The SWOT analysis is based on the information of the countries discussed earlier in this research paper.

6.1 Germany

Germany is making progress in addressing the structural changes brought by digitalization, with a strong AI strategy that focuses on both opportunities and challenges. Key strengths include a strong manufacturing industry, significant government investment in AI, and international collaborations. However, the country faces certain weaknesses such as complexities of AI technology transfer processes and ethical concerns related to AI bias and discrimination. The opportunities of Germany include attracting new talent, AI applications in the public sector and the expansion of the AI ecosystem. Threats involve rapid

technological changes, ethical and security concerns and potential reductions in employment due to AI automation (Figure 3).

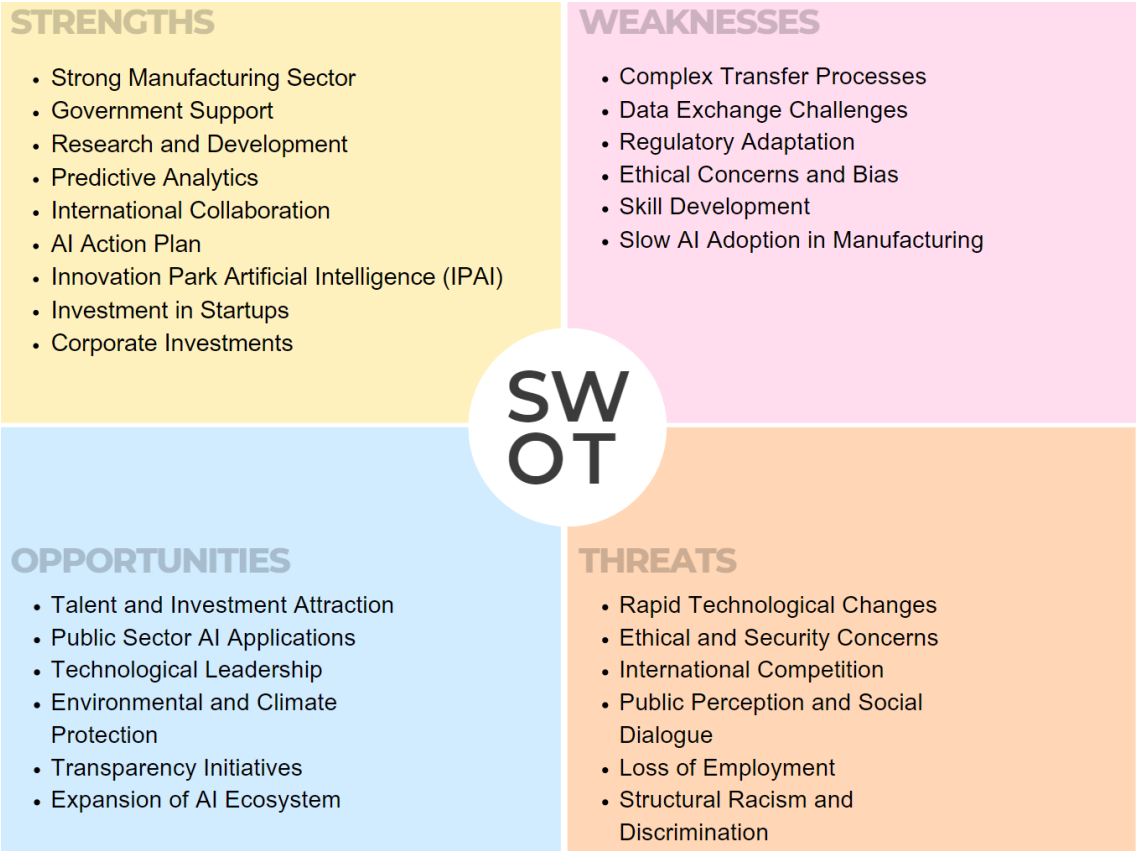

Figure 3. SWOT analysis of Germany.

6.1.1 Strengths

The manufacturing industry in Germany, particularly SMEs, have significant potential due to digitalization. The German Federal Ministry for Economic Affairs and Climate Action (BMWK) and other governmental bodies are heavily invested in AI development and support. Germany focuses on AI research, development and implementation, aiming to be at the top on the global scale through the use of Predictive Analytics used by businesses to enhance their digital marketing efforts. Germany also made international collaboration with France through the Toulouse Declaration to further strengthen its AI initiatives. Additionally, the German Government has established an AI Action Plan to develop AI skill centers and enhance computational resources. The Innovation Park Artificial Intelligence (IPAI) in Heillbronn is set to be one of the most

extensive AI ecosystems in Europe by providing a hub for practical AI applications. The government has also announced an investment of €1.75 billion to support new technology startup companies, and with significant corporate investments from AWS, Microsoft and Apple, Germany is able to enhance its AI infrastructure even further.

6.1.2 Weaknesses

Although the strong competence of Germany's new AI technologies across the economy, they can be complex and challenging for these SMEs. The exchange of data between the companies can pose difficult challenges despite AI's potential for value creation. Making the data more accessible while still protecting sensitive information is going to be challenging considering that the laws around competition, copyright and labor have to be adapted.

Adapting laws around competition, copyright, and labor to make data more accessible while protecting sensitive information is an ongoing challenge. Ethical concerns, including bias and discrimination in AI, are significant issues that need addressing. Ensuring the workforce is adequately trained in AI and digital skills is another ongoing challenge. Additionally, the manufacturing sector is slower in adopting AI applications compared to other sectors, which may impact its overall competitiveness.

6.1.3 Opportunities

Germany has great opportunities to attract new talent, creativity, technology, data, and investment in AI and has great potential for different public administration and other public sector tasks. The country focuses on establishing a leading position in AI research, development and implementation, both in Europe and on global scale. Controlling AI for environmental and climate protection will strengthen Germany's fight against ecological challenges and underscores their commitment to a sustainable future. Transparency in AI usage and data handling builds trust with the public establishing a solid foundation for collaboration. The expansion of the AI ecosystem driven by

initiatives such IPAI and investments in tech startups opens up greater opportunities for growth and innovation. However, navigating potential ethical concerns and technical challenges remain a crucial part of this development.

6.1.4 Threats

On the other side of things, Germany faces threats from fast technological changes, ethical and security concerns and intense international competition. Ensuring that AI is used in a human-centered way and addressing societal concerns through public discourse can be challenging, and the potential loss of jobs due to automation is a significant threat. Additionally, there are critical concerns that AI could amplify structural racism and other forms of discrimination. Despite Germany’s large investments in AI research and development, companies that fail to adopt AI can risk losing their global competitiveness and face disruptions in their supply chains. Particularly the manufacturing sector is slow in its adaptation of AI applications. This could have wide indications. Additionally, Germany is suffering from a shortage of expertise in the field of AI, and the demand for AI competency significantly surpasses the available supply.

6.2 France

Strong investments and commitments are shown in France's AI strategy, which also includes a collaborative ecosystem and strategic initiatives meant to strike a balance between technological progress and ethical considerations. France must deal with challenges such as labour shortages, data security regulations, and AI prejudices, but it also has chances to establish itself as a global hub for AI and enhance customer care by implementing hyper-personalized solutions. However, it must navigate through concerns with customer trust, regulations, and global competition (Figure 4).

Figure 4. SWOT analysis of France.

6.2.1 Strengths

France has demonstrated a strong commitment to research and innovation, positioning it at the forefront of AI development. With large investments in research and development, the country has made AI the priority and a key element of its economic and technical strategy. Leaders in the public and private sectors work together in a cooperative ecosystem that is supported by this substantial funding. In addition to helping SMEs' digital transformation, strategic efforts such as the AI-cluster project and AI-Booster strategy aim to turn French research and education institutes into global hubs. To guarantee the equitable and widespread distribution of AI's benefits, France's AI plan also strikes a balance between technological breakthroughs and ethical issues.

France's AI approach is also supported by significant financial resources, including a €2.5 billion national AI policy and €560 million in public funding to improve research and education ecosystems in AI. Eighty percent of French

businesses have set aside a budget for AI, with 54% committed to generative AI initiatives. This demonstrates a strong commitment to expanding AI in a variety of areas, despite the challenges and a competitive environment.

6.2.2 Weaknesses

Potential weaknesses are the challenges in using the technology and the requirement to close skills gaps in robotics, data science, and AI in the workforce. Another issue is that only 52% of respondents could fully comply with rules for data security. Additionally, biases, toxicity, and hallucinations caused by AI are something that should be taken seriously and cause issues easily.

6.2.3 Opportunities

There are several opportunities for France to become a global leader in AI research and education, and to produce more AI specialists by 2030. Two major priorities are encouraging the improvement of training programs and supporting SME transformation into the digital world. To improve and strengthen AI education and research, the Generative AI Committee brings a variety of stakeholders together. The growing popularity of open-source models such as GPT-J, BERT, and FLAN-T5 creates new opportunities for AI applications. Hyper-personalized and automated messaging in customer support and services can greatly improve the experience in supply chain and digital commerce sectors.

6.2.4 Threats

Despite France’s opportunities in the field of AI, it still must compete with challenges from international competition in AI and difficulties enforcing laws that both protect the public and promote innovation. To guarantee that all industries profit fairly from AI technology, economic integration continues to be difficult. The use of personal AI tools by employees, who might bypass company rules and restrictions presents large security risks. Additionally, only

65% of French customers agree that organizations are doing a good job of engaging customers, indicating that striking a balance between security and customer experience is a serious problem.

6.3 The United Kingdom

The AI strategy of the UK exhibits noteworthy proficiency in strategic planning, investment, and invention; nonetheless, it confronts challenges associated with economic distribution, public trust, and complex governance. Global leadership and the integration of AI across industries present opportunities, but there are also threats associated with cybersecurity, quick technological advancements, and the possible manipulation of AI (Figure 5).

Figure 5. SWOT analysis of the UK.

6.3.1 Strengths

The National AI Strategy of the UK offers a thorough plan for positioning the country as a leader in AI worldwide. The UK has demonstrated a significant commitment to AI innovation with over €2.9 billion invested in AI science since 2014, including recent investments in the AI Tech Missions Fund and new AI Research Resource. AI is already improving transportation safety and NHS medical treatment, with observable societal and economic gains. The plan calls for financing high-risk AI research, data and computing infrastructure, and instructional programs. Furthermore, the UK is a major innovator in the field of AI, with a sector estimated to be worth over €19 billion and surpassing €919 billion by 2035.

6.3.2 Weaknesses

One of the challenges is making sure that all UK areas and industries, especially those with lesser AI skills and knowledge, benefit from AI. Public trust and moral AI development are essential for the successful application of AI techniques. Complex governance is required to strike a balance between public safety and trust, and pro-innovation legal frameworks. Uncertainty can also result from changes to government funding programs, such as the Labour Government's cancelation of AI projects.

6.3.3 Opportunities

The potential for the UK to become the smartest, healthiest, safest, and happiest place to live and work exists with the integration of AI across several industries. Global leadership in AI governance can be strengthened by influencing international AI norms and standards in line with UK values. Visas and educational programs can draw talent from around the world, expanding the pool of AI experts. Growth and innovation in the UK's AI sector can be further stimulated by sustained government financing and substantial investments from big international AI companies.

6.3.4 Threats

Maintaining global leadership while keeping up with the fast advancements in AI is a significant challenge. The spread of AI technology raises the possibility of infrastructure vulnerabilities and cyber threats. It is vital to ensure the relability of semiconductor supply chains, as they are essential to AI technology. AI runs the possibility of being used to trick or convince people for business, financial, or political purposes, such as manipulated elections and false advertising. AI systems might inadvertently reveal sensitive information related to disabilities, sex, and ethnic origin, even if such data points are not included in the training data set. Digital fraud, child abuse, hate crimes, and terrorist propaganda are just a few of the cybercrimes that can leverage AI. AI technologies have the potential to violate customers' privacy by allowing businesses to charge varying prices for the same products to different customers through increased data analysis. Finally, because of the dominance of key companies in AI technology and partnerships, there are threats of monopolistic markets and limited customer choices.

Conclusions

The three countries studied have taken the use of AI seriously as a part of their society and businesses, utilizing their own separate national AI strategies.

Germany’s manufacturing industry, especially SMEs, benefits from digitalization and AI development, supported by strong governmental initiatives and international collaborations. However, challenges such as the complexity of AI, data exchange issues, and slower adoption in the manufacturing sector can create difficult challenges. Despite this, Germany has the opportunity to attract talent and investment, enhance environmental protection through AI and expand its AI ecosystem. The country must address threats from rapid technological changes, ethical concerns, and a shortage of AI expertise to maintain its competitive edge and ensure sustainable growth.

France’s strong commitment to AI research and innovation, backed by substantial financial investments and strategic initiatives positions it as one of the leaders in the field. The cooperative ecosystem between public and private sectors further strengthens this position. However, challenges such as skill gaps, data security compliance, and ethical concerns need to be addressed. Opportunities include enhancing training programs and leveraging open-source models, while threats from international competition and security risks persist. Balancing technological advancements with ethical considerations and customer engagement remains important for sustainable growth in AI.

The National AI Strategy of the UK outlines a comprehensive approach to establishing the UK as a global leader in AI. The strategy highlights significant investments and innovations in AI, which have already started to give social and economical benefits. However, the country also identifies several challenges, including the need for unbiased AI benefits across all regions and industries, and the importance of public trust and ethical AI development. Nonetheless, the national strategy also acknowledges threats such as fast technological developments, cybersecurity risks, and potential misuse of AI. Ensuring reliable supply chains and addressing privacy concerns are critical to mitigating these

threats. Overall, the strategy emphasizes the importance of balancing innovation with ethical considerations and robust governance to harness AI's full potential while safeguarding public trust and safety.

To conclude the research, it is clear that the AI has significant impact to the industries across the field. It is still unclear how the large investments will affect the industries in a long run, as most of the AI strategies are still in their early stages, and some of them are planned to last up until 2030. What is clear is that the AI strategies will affect each country economically on a larger scale and boost their market place within the Europe, although the US and China will most likely keep the lead position on a global scale no matter what. All the countries face similar challenges and risks in the use of AI, which is not unusual, as mainly most of the AI tools are globally available to everyone. In some cases AI is looked at with suspicion, mainly on the consumer side, and this can bring a lack of trust. The dominance of key AI companies also present a risk of monopolistic markets, which could limit consumer choices.

This thesis only scratches the surface of the topic, providing readers with a general understanding of AI. The research could be improved by including more in-depth knowledge from white papers and information behind paywalls, such as on Statista (Statista 2024).

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