The Impact of Artificial Intelligence on Business Processes

Kavaj, Sara Ana

SVEUČILIŠTE U RIJECI

Fakultet za menadžment u turizmu i ugostiteljstvu

Sveučilišni preddiplomski studij

SARA ANA KAVAJ

Utjecaj umjetne inteligencije na poslovne procese

The Impact of Artificial Intelligence on Business Processes

Završni rad

Opatija, 2024.

UNIVERSITY OF RIJEKA

The Faculty of Tourism and Hospitality Management

Undergraduate Study Program

SARA ANA KAVAJ

The Impact of Artificial Intelligence on Business Processes

Bachelor's Thesis

Opatija, 2024.

UNIVERSITY OF RIJEKA

Faculty of Tourism and Hospitality Management

Undergraduate Study Program

Business Economics in Tourism and Hospitality

Hospitality Management

The Impact of Artificial Intelligence on Business Processes

Bachelor's Thesis

Scientific field:	Managerial Economics	Student:	Sara Ana Kavaj
Mentor:	Dr. Sc. Daniel Dragičević, prof.	Student ID number:	24387/18

Opatija, September 2024.

SVEUČILIŠTE U RIJECI UNIVERSITY OF RIJEKA
FAKULTET ZA MENADŽMENT U TURIZMU I UGOSTITELJSTVU
FACULTY OF TOURISM AND HOSPITALITY MANAGEMENT
OPATIJA, HRVATSKA CROATIA

IZJAVA O AUTORSTVU RADA I O JAVNOJ OBJAVI OBRANJENOG ZAVRŠNOG RADA

Sara Ana Kavaj	24387/18
(ime i prezime studenta)	(matični broj studenta)

The Impact of Artificial Intelligence on Business Processes

(naslov rada)

Izjavljujem da sam ovaj rad samostalno izradila/o, te da su svi dijelovi rada, nalazi ili ideje koje su u radu citirane ili se temelje na drugim izvorima, bilo da su u pitanju knjige, znanstveni ili stručni članci, Internet stranice, zakoni i sl. u radu jasno označeni kao takvi, te navedeni u popisu literature.

Izjavljujem da kao student–autor završnog rada, dozvoljavam Fakultetu za menadžment u turizmu i ugostiteljstvu Sveučilišta u Rijeci da ga trajno javno objavi i besplatno učini dostupnim javnosti u cjelovitom tekstu u mrežnom digitalnom repozitoriju Fakulteta za menadžment u turizmu i ugostiteljstvu Sveučilišta u Rijeci.

U svrhu podržavanja otvorenog pristupa završnim radovima trajno objavljenim u javno dostupnom digitalnom repozitoriju Fakulteta za menadžment u turizmu i ugostiteljstvu Sveučilišta u Rijeci, ovom izjavom dajem neisključivo imovinsko pravo iskorištavanja bez sadržajnog, vremenskog i prostornog mog završnog rada kao autorskog djela pod uvjetima *Creative Commons* licencije CC BY Imenovanje, prema opisu dostupnom na http://creativecommons.org/liceses/.

U Opatiji, Rujan 2024.

SAKavaj

Potpis studenta

Abstract

The growing integration of artificial intelligence (AI) into various aspects of human life and business has led to its widespread influence across different sectors. Therefore, this paper explores the deep impact that AI has on business operations and management practices, recognizing that its influence surpasses just altering the way people live. Existing studies have already demonstrated the significant influences of AI on business processes, and this paper presents real-world examples to demonstrate these findings. Using this information as a foundation, the paper further analyses the extent to which AI's influence spread through different industries, with an additional focus on the Republic of Croatia as a member of the European Union. The research investigates the country's progress through the years, and tendencies to adopt smart solutions and compares it to European trends. The study reveals notable deviations in the implementation of AI within business processes in Croatia, which can be attributed to differences in market structures and the hesitation of entrepreneurs to fully trust the accuracy of data generated by AI tools.

Keywords: Artificial intelligence (AI); Business processes; Impact

Table of contents

Introduction

Since its first introduction in 1950. by Alan Turing Artificial Intelligence, more known as "AI", has seamlessly blended into day-to-day life, finding its place in every segment of the modern world. While once defined as "human-like intelligence", AI swiftly surpassed centuries of human cognitive abilities development in a few decades, resulting in the fourth industrial revolution. Today, it is the non-human capabilities that hold the most value, from impressive data analysis capacity to limitless knowledge and fast self-learning algorithms. Technology has undergone a significant transformation in recent years, and it is believed that every future product will have an intelligent assistant integrated with it. Consequently, this transformation led to changes in various industries, altering dynamics in the competitive global market. While some companies have implemented artificial intelligence tools in their business processes to adapt to these newly formed rules and are thriving, others are struggling under the pressure of embracing the new changes in the realm of business.

Artificial intelligence is often presented as the future of business due to its productivity, accuracy and unlimited resources. Leaders, owners, managers, and directors are turning to high-tech technology and AI tools intending to optimise their business strategies. However, that may not be the case for companies in countries which due to certain circumstances had delayed technological advancements such as Croatia.

While European technological advancements started in the ‘60s, Croatia joined only in the ‘90s, after a long period of armed conflict that left the country in resource scarcity and a national economic crisis. The negative impact of the war on population, infrastructure and economy seriously undermined the speed of Croatia's technological development. Nonetheless, as today's member of the European Union, Croatia is steadily and reliably progressing to global standards.

This thesis aims to explore the impact of artificial intelligence on business processes, delineating the qualitative benefits of integrating AI into the world of business. Furthermore, the research will explore the likelihood of Croatian entrepreneurs enhancing their business strategies with intelligent solutions and the potential impacts of AI implementation on both managerial decision-making and operational levels. Additionally, the thesis seeks to investigate the correlation between the probability of implementing those technological advancements and company characteristics such as number of employees, owners or managers

age and managements level of trust in AI in the Republic of Croatia. Ultimately, participants' opinions on Croatia's position relative to the rest of the world will be analysed and incorporated into the conclusion.

In the making of this thesis, the primary source of information was research made by the author of this paper, while various published literature was used as secondary sources. Secondary sources mainly consist of books, previous research, scientific articles and online journals focusing on the topic of artificial intelligence, digitalization, management and business transformation. All credits to the respected authors for used material are given according to strictly defined rules.

During the research, the qualitative method of data collection was applied by administering an anonymous questionnaire to the participants of different age groups, professions and geographical locations. It included carefully selected open and closed questions, to narrow the possible outcomes as well as to ensure participants felt complete freedom in sharing their opinions. The research was primarily tailored for managerial positions, however operational levels were not excluded. The gathered responses were meticulously studied and will be presented in the conclusion of this paper.

The paper is divided into three chapters, an introduction and a conclusion. The – *Introduction*- briefly presents the topic of the thesis, summing up the changes generated by artificial intelligence, its presence in daily life, its importance in ventures and the Croatian standing point in technological development. Moreover, it defines the subject and research aim, the scientific methods used and briefly presents the structure

The first chapter - *Early Beginnings of AI* - guides us through the history of developing autonomous machines and the first merging of artificial intelligence into enterprises explaining how impact evolved through time to today's significance. It also provides a deeper understanding of Croatian technological progress and defines factors and unfortunate circumstances which led to today’s state.

The second chapter - *How AI Shapes Our World Today* - focuses on the present amplifying the importance of this topic. It outlines the fields of AI’s usage today, how AI impacts companies today, in which area was proven to be useful and what are the benefits of implementing AI on real-life examples of successful companies that have used AI and machine learning to solve difficult situations and improve their business processes.

The third chapter – *Research* - focuses on research done using questionnaires and Eurostat data analytics. An in-depth analysis is provided of the methodology, sources, approach, tested subjects, their opinions and results. Correlations are drawn between AI-consuming tendencies and organisation characteristics.

The - *Conclusion* - is the final part in which all the information presented in this paper is summarised and interpreted to form a well-grounded conclusion.

1.Early beginnings of AI

Where the journey of making artificial intelligence started is undefined and debatable. “Some might say it began in the 1956 Dartmouth Conference when John McCarthy and his peers coined the term ‘artificial intelligence' for the first time.”[1] While from that mark AI continuously developed under the defined term, the idea of machines with human capabilities is almost as old as science itself.

1.1. The idea of a human-like machine

The first indication of mechanized human behaviour can be found in the 6th century BCE. Around this era Homer in his poem “The Iliad”, introduced self-propelled chairs called tripods and golden attendants constructed by Hephaistos, the blacksmith god, to help him get around.[2]

“The ancient Greek philosopher Aristotle (384-322 BCE) dreamed of automation as well but thought of it as an impossible fantasy thus making slavery necessary if people were to enjoy leisure.”[3] A similar purpose of AI is seen today in its ability to speed up and replace some human cognitive ability thereby providing extra leisure time or simply reducing the mental workload leaving room to concentrate on more crucial tasks.

Around the year 1495, Leonardo Da Vinci sketched designs for a humanoid robot in the form of a medieval knight.[4] Leonardo's knight was supposed to be able to sit up, move its arms and head, and open its jaw.[5]

In the centuries that followed, in addition to fictional artifices, several people constructed actual automata that moved in startlingly lifelike ways.[6] In the 16th century, automated singing birds were widely integrated into European clocks, while in the 17th century, Gottfried Wilhem Leibniz invented an improved version of the mechanical calculator.[7] However, the most sophisticated of these was the mechanical duck designed and built by the French inventor and

[1] Latrice Tennin, Ray, Sorg, *Cases on AI Ethics in Business,* abstract
[2] The Iliad of Homer, translated by Richmond Lattimore, p. 386
[3] Nilsson, *The Quest for Artificial Intelligence, 19*
[4] Ibid, 20
[5] https://en.wikipedia.org/wiki/Leonardo%27s_robot
[6] Nilsson, *The Quest for Artificial Intelligence, 21*
[7] McCorduck, *Machines who think*, 24.

engineer, Jacques de Vaucanson. In 1738, Vaucanson displayed his masterpiece, which could quack, flap its wings, paddle, drink water, and eat and "digest" grain.[8]

In 1920 a play called R.U.R. (Rossum's Universal Robots) was published by Karel Čapek, Czech author and playwright, who is credited with coining the word robot, which in Czech means forced labour or drudgery.[9] The name comes from the Czech word "Robotnik" meaning peasant or serf.[10] The play is centred around a robot factory, where the factory Director H. Domin and the President of the Humanity League H. Glory share their different point of view on the emotional capacity of created robots (robots in the play aren't mechanical devices, but rather artificial biological organisms that may be mistaken for humans).[11] In the play, Domin refers to robots as creatures incapable of forming their own thoughts and therefore incapable of taking independent actions and an emotional bond, which is revealed to be incorrect as later through the play, Helena and one of the robots fall in love.

In 1937. The theoretical idea of a universal computing machine was presented by Alan Touring, describing a small machine with the ability to solve any mathematical function or infinitely repeated word.[12] Independently at the same time, Konrad Zuse developed Z1, a motor-driven mechanical computer able to execute basic arithmetic operations that could be programmed using punched tape.[13] In the process of developing Z1, Zuse concluded (what would later on become a reality) that the technology will eventually become an artificial brain.[14]

Although mechanical machines as they evolved through centuries gradually more resembled the original idea of manlike creation, the progress was slowed down until the technology boom in the late 20th century. Another area of development which greatly impacted the creation of AI, as we know it today, is neuroscience. The emergence of computing and neuroscience has produced a synergy effect, forming a base for composing intelligent technology.

1.2. Early AI in Business

When discussing early AI, it is important to highlight that a key characteristic of intelligent machines is the ability to "think" or operate autonomously, which is the ability computers and

[8] https://en.wikipedia.org/wiki/Digesting_Duck
[9] Nilsson, *The Quest for Artificial Intelligence, 23*
[10] ibid
[11] https://en.wikipedia.org/wiki/R.U.R.
[12] https://en.wikipedia.org/wiki/Universal_Turing_machine#Smallest_machines
[13] https://en.wikipedia.org/wiki/Z1_(computer)
[14] McCorduck, *Machines who think*, 25.

robots demonstrated more prominently after the year 2010. Although, before that time, the programs and software contained intelligent components, they did not function as fully autonomous intelligent machines.

1.2.1. Expert systems and rule-based systems

Rule-based and expert systems are foundational concepts of Artificial Intelligence. Both are formed by an imported set of rules which work on the IF-THEN principle, to recognise a conclusion at the end of the process. The difference between the two is that, like the human experts, the expert system has imported knowledge or data in a specific and narrow niche. Building such systems was a costly and time-consuming venture as it took a minimum of 5 years of data entry.

One of the first large-scale programs to use task-specific knowledge, as heuristics and automate its assets, was called DENDRAL.[15] It was an expert system used in chemistry that helped determine organic compound structure using data from mass spectrometers.[16] The substance analysed might, for example, be a complicated compound of carbon, hydrogen, and nitrogen.[17] Starting from spectrographic data obtained from the substance, DENDRAL would hypothesise the substance's molecular structure.[18] Due to the considerable amount of knowledge, DENDRAL's performance rivalled that of a chemist's expert at this task, and the program was used in industry and academia.[19]

The knowledge obtained from tries and errors in making DENDRAL was used in building MYCIN, an expert system that diagnosed patients based on symptoms and test results, suggested further tests and recommended treatments. It could explain its reasoning and use around 500 rules, achieving competence similar to specialists in blood infections and outperforming general practitioners.[20] However, despite its astonishing accomplishments, it was never commonly used.

An example of a rule-based system at a time was a Decision Support System (DSS). Made for simplifying decision-making processes, at all management levels, DSS solves problems by combining raw data, business models, and documented and personal knowledge. Typical

[15] Lindsay, Buchanan, Feigenbaum and Lederberg, "DENDRAL: a case study of the first expert system for scientific hypothesis formation", 210
[16] Winston and Prendergast, *The AI business: The commercial uses of artificial intelligence, 308.*
[17] https://www.britannica.com/technology/DENDRAL
[18] ibid
[19] ibid
[20] https://www.britannica.com/technology/MYCIN

information that a DSS might gather, and present includes comparative sales figures between one period and the next, projected revenue figures based on product sales assumptions and inventories of information resources.[21] A specific example is the Canadian National Railway system, which tests its equipment regularly using a decision support system.[22] A key problem for railroads is worn-out or defective rails, which can lead to frequent derailments. The company successfully reduced derailments by implementing a DSS, while other companies saw an increase in incidents.

1.2.2. Evolution and Integration

Over time, expert systems became increasingly advanced, which contributed to the emergence of business process automation, as well as data mining and analytics.

XCON is an example of advanced expert systems, made by the company Digital. Primarily made to solve problems in their own computing system, XCON was shown to be a key business tool. Utilised as a sort of controlling mechanism, XCON analysed orders and alerted the personnel if there were any specifications within the order, as well as reported any problems with his recommended solution. Implementing such a system into business infrastructure resulted in significant cost reduction for the company.

As the program became commercially available to other enterprises, Digital developed XSEL and XSITE to complement systems like XCON. XSEL was designed to enhance the configuration tasks managed by XCON, while XSITE focused on optimizing site layout and configuration. The successful integration of XCON, XSEL, and XSITE opened the door for advancements in business process automation, particularly in manufacturing, corporate order distribution, and diagnostic applications

Lotfi A. Zadeh in the year 1994. introduced the concept of soft computing, a product of artificial neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning and hybrid systems. Most prized for its capability of resolving complex real-life problems, even with imprecise and partially correct data, the program found its place in various domains and left a great mark on the business environment.

Combining soft computing techniques with business automation in the manufacturing domain led to the development of IMACS and ILOG. While IMACS is a system, homogenized

[21] https://en.wikipedia.org/wiki/Decision_support_system
[22] ibid

of several cooperative expert systems within a manufacturing plant, aimed at improving workflow management in conjunction with conventional systems, the ILOG focuses on addressing the challenge of coordinating material shipments from multiple plants to the customer's site.[23] This reformation improved the overall business performance by proper allocation of time and labour within the processes, and additionally, laid the foundation for quality control.

Data mining and analytics are evident in finance and banking, where neural network credit scoring models were employed to forecast firm insolvency and assess individual credit risk. With the fast growth of the finance and banking industry during that time, even a small improvement in predictive accuracy was reducing losses. The advantages of credit scoring, include reducing the cost of credit analysis, enabling faster credit decisions, closer monitoring of existing accounts, and prioritizing collections.[24] Today credit scoring is used by 97% of banks that approve credit card applications and by 82% of banks that determine whom to solicit for credit cards.[25]

1.2.3. Data-driven AI and Early Machine Learning

From the 1950s to the 2000s, the quest for AI experienced alternating phases of intense investment and significant disinterest, the most notable period of the latter being the AI winter. Developers and enthusiasts encountered various challenges as they attempted to transition from rule-based to advanced data-driven systems, primarily due to low computing power and limited resources. These limitations nearly led the entire AI community to dismiss AI's potential.

As technology advanced in the 2000s, so did the use of the internet and the World Wide Web. The increasing accessibility of computers has brought more and more users to online platforms like Facebook, MSN, and Myspace, generating a large amount of data. With this explosion of online information and the growing capacity of computers to process and store it, machine learning finally began to move from theoretical exploration to practical application. Initially conceptualised by Nilson in the 1950s, machine learning introduced the idea of self-evolving algorithms that could "learn" from data over time, mimicking the way humans learn.

One of the greatest challenges in earlier AI development was the large amount of data required to make these algorithms effective. However, as technological advancements

[23] Winston and Prendergast, *The AI business: The commercial uses of artificial intelligence, 49.*
[24] Brill, "*The importance of credit scoring models in improving cash flow and collections*" 7-16.
[25] West*, "Neural network credit scoring models",1132*

addressed these limitations, the era of "big data AI" emerged. The widespread adoption of the internet made data collection more affordable and accessible, providing the necessary resources to fuel machine learning. As a result, the world gradually shifted away from rule-based systems in favour of machine learning-driven approaches. “It played a key role in the development of recommendation systems, fraud detection algorithms, and autonomous vehicles, showcasing its versatility and potential impact on society”[26]

A company that benefited from the integration of ML (machine learning) models during that time is the most powerful search engine today – Google. Even though Google in the 2000s was already significantly advanced compared to its competitors thanks to its PageRank algorithm, Google used “a simpler version of machine learning, statistical ML, to detect spam and suggest better spellings for people’s web searches.”[27]Clearer input meant better-targeted and quality output, therefore saving time.

Machine learning is the foundation of the AI we know in the 21st century and the groundwork for its more advanced successor which appeared a decade later. Deep learning (as his predecessor), uses neural networks, but in multiple layers which resulted in subtler pattern learning “such as what’s in an image or what word was spoken in some audio.”[28] Today we divide AI into “weak” and “strong”.” Weak AI, also called narrow AI, is capable of performing a specific task that it’s designed to do. Strong AI, on the other hand, is capable of learning, thinking and adapting like humans do. That said, strong AI systems don’t actually exist yet.”[29]

1.3. State of technological development in Croatia

Although Croatia declared independence in 1991, the country remained embroiled in conflict until 1995. The serious consequence of unfortunate periods of war and its aftermath is, among other things, that Croatian technology lags behind developed countries.[30] During this time, it seemed that this issue had not been given any significance or importance (that it deserves) neither in the political arena nor in the broad public.[31]

[26] https://adaptiveaiventures.com/2024/03/theevolutionofdataandaiinthe2000s/#:~:text=During%20the%202000s%2C%20AI%20made,computing%20power%2C%20and%20data%20availability.
[27] https://blog.google/technology/ai/decade-deep-learning-and-whats-next/
[28] ibid
[29] https://builtin.com/artificialintelligence/strongaiweakai#:~:text=Weak%20AI%2C%20also%20called%20narrow,don't%20actually%20exist%20yet.
[30] https://www.pilar.hr/wp-content/images/stories/dokumenti/zbornici/27/z_27_445.pdf
[31] ibid

In 1993, the first program for technology development in the Republic of Croatia was formed in collaboration with the German Federal Ministry for Education, Science, Research, and Technology (BMBF).[32] The program focused on promoting research and development, leading to the establishment of research centres a few years later in Zagreb, Rijeka, and Split, the three largest cities in Croatia.

After the initial collaboration with Germany, Croatia expanded its international cooperation to include partnerships with Italian and U.S. institutions which resulted in forming the Business and Innovation Centre in Vukovar.

"Business and Innovation Centre of Croatia (BICRO) is a government institution, established by the Government of the Republic of Croatia, under a direct jurisdiction and within the system of financial support of the Ministry, through co-financing operational costs (overheads), but not development. This technology policy assigns BICRO a very important role in the implementation of the program for the creation and development of knowledge-based small and medium enterprises."[33] Unfortunately, due to unfavourable economic conditions and a lack of sustained government support, the program's successes were limited.

After 2000, significant efforts were made to narrow the gap in technological development between Croatia and the rest of European countries. However, another setback occurred with the Great Recession in 2008. Although the crisis affected most European countries up till 2009., Croatia suffered from its unfortunate impact until 2014.

Today, "Croatia ranks 21st of 27 EU Member States according to the 2022 edition of the Digital Economy and Society Index (DESI). Despite this overall low ranking, there are some technologically advanced segments. Seventy-seven percent of Croatia's population uses the Internet and Croatia has the highest share of individuals aged 16 to 24 with basic or above basic overall digital skills (97%) in the European Union. While Croatia has good, fast broadband coverage (86% national and 39% rural), its overall fixed broadband uptake is slightly below the EU average. It is also stated in DESI 2022 that Croatia ranks 14th among all EU countries regarding the integration of digital technology. Advanced technologies are becoming more popular among Croatian enterprises, with 35% using cloud solutions, 43% using e-invoices, and 9% (8.9%) using AI solutions."[34]

[32] ibid
[33] ibid
[34] https://www.trade.gov/country-commercial-guides/croatia-information-and-communication-technology

In the context of AI solutions, the percentage of enterprises in Croatia adopting AI technologies, as reported in the 2022 edition of the DESI, saw a slight decrease from the previous value of 9% to 7.9% in 2023.[35] Despite this minor decline, it's important to note that Croatia's current AI adoption rate is closely aligned with the broader European trends. The average for AI adoption in the European Union stands at 8%, with the median value also at 7.9%.[36] These figures indicate that Croatia's AI adoption is very much in line with European standards, demonstrating that the country is keeping pace with the digital transformation occurring across Europe. This alignment suggests that while there is room for growth, Croatia is not significantly lagging behind the rest of EU members in the integration of AI solutions within its business sectors.

[35] https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Use_of_artificial_intelligence_in_enterprises

[36] ibid

2. How AI Shapes Our World Today

Artificial intelligence has gone through a rapid transformation in recent years, and there is no debate that this change massively affected the human way of living. By providing useful information, AI is subtly altering the decision-making process and thereby affects our decisions. From selecting the “next best watch” based on individual interests on Netflix, intelligent home gadgets like Amazon’s Alexa which administers homes by voice commands or smart vacuums that choose the best strategy for effective vacuuming area, selecting the best products for one's needs in online stores, calculating the fastest route from destination “A” to destination “B” by considering possible traffic issues, average speed and speed limits, improving language skills through grammar extensions, carefully selecting content on social media platforms, to more important aspects of life such as finding a medical diagnosis, determining credit scores, grading academic success, evaluating job prospects by screening applications, travelling safety (in self-driving cars) or even business success.

2.1. Importance of Artificial Intelligence in Business Processes

Each enterprise is founded based on the specific intentions its founders aim to achieve. For some, this might involve offering unique solutions to consumer needs, gaining a significant market share, or leaving a meaningful mark on society by providing value. Therefore, business success is subjectively interpreted by each entity. However, regardless of the underlying intention, the primary goal of every enterprise is to build a self-sufficient business that can adapt to market changes, remain competitive, stay profitable, and secure enough capital for future investments and growth.

Globalisation brought many challenges to the market but the most prominent is the high competition. While it is arguable whether such competitiveness is an advantage or disadvantage, this change is certainly pushing the margins. Consequently, the accomplishment of these goals is greatly dependent on a well-elaborated strategy. The chosen strategy will, later on, define the business processes, thereby business processes represent activities a company will execute in the endeavour to achieve these goals. Pragmatically, the better the optimisation of the business processes is, the higher the chances of business success.

This is also the reason why enterprises are, more and more, keen on artificial intelligence and where the importance of this topic lies. The advancements AI brings can transform

business, by increasing productivity, analytics, strategic planning, customer relationship management, etc.

There are three key use cases for AI in business, which can overlap to some degree, but help to segment the opportunities. Businesses can use AI to: [37]

- change the way they understand and interact with customers,
- offer more intelligent products and services
- improve and automate business processes.

This paper concentrates on the final case of usage, with the next section dedicated to explaining the impact of artificial intelligence on business processes through real-life examples.

2.2. Impact of Artificial Intelligence on Business Processes

It is important to highlight that when it comes to the usage of Artificial Intelligence in business, it is the task-specific type, commonly referred to as "weak AI", that is utilized for various reasons such as supply chain optimisation, automation of routine tasks, customer engagement and many others.

2.2.1. Automation Of Routine Tasks

In the majority of business operations, the most time-consuming and labour-intensive are mundane tasks, which do not require a special set of skills or cognitive abilities. Because of their repetitive nature, high intensity, invariability and basic requirements, these groups of tasks are the ideal foundation for building automata, which not only increase the speed of task performance and accuracy but also give a company the ability to better allocate human resources. By replacing employees with machines, their cognitive abilities can be redirected to more important or complex assignments. This is why many companies utilize automation, even if they are not implementing advanced smart solutions. However, human involvement is still necessary for oversight and repair management in such cases.

[37] Marr, *Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems,* 6

Giving automated machines an “intelligent” component can take the advancements even further, completely liberating activity from human interventions. Although the most known such machines are Tesla automobiles with their self-driving abilities, due to clear visibility of automation and everyday usage, there are more examples found in day-to-day life that may not be so obvious. Another great example is the McDonald's restaurant chain.

It is well known that the restaurant business can be difficult as a consequence of unpredictable demand for a certain product, or in this case a meal. A restaurant should always have enough ingredients to satisfy all consumers' desires, but at the same time not go overboard with preparation because of the spoilage risk. Moreover, a restaurant must fulfil those desires in a relatively short time, which can be challenging in rush hours. Although McDonald's became famous because of its good operation in waves of high demand and because it solves most of these inventorying problems with frozen food, rapid turnover appeared when self-service kiosks were implemented in their restaurants. “Rather than just being straightforward terminals, these kiosks, that have sprung up around the world in recent years, as well as the digital menu boards used in stores, are equipped with smart, analytic technology.”[38]

The kiosk is deeply knowledgeable of food inventory, helping to balance the demand for different dishes. Items with lower demand are promoted more aggressively, while those with higher demand are advertised less. Analytics track which products are most popular based on the time of day, location, trends and weather conditions, along with what food is nearing the end of its shelf life, allowing advertising to be adjusted according to this information. “This means that decisions can be made autonomously at the restaurant level about what to promote and sell to customers.”[39]

Another way McDonald's collects information to manage demand more effectively is by developing their mobile application, which is used to predict which products will be preferred on specific days by offering various discount coupons. The app simultaneously collects data on consumers based on their individual characteristics.

This type of technology in restaurants is not uncommon, “for example, KFC in Beijing has partnered with Baidu to fit kiosks with facial recognition technology, which uses AI to predict what menu items a customer is likely to be interested in, based not only on their age and sex but also their mood. Items that match those ordered by people with similar profiles are

[38] Ibid, 106
[39] Ibid

displayed most prominently on the screen."[40] Moreover," Caliburger, a US-based fast-food chain, is experimenting with a robotic kitchen assistant called Flippy. This robot, equipped with thermal vision, can efficiently cook burgers and place them onto buns."[41]

The result of substituting employees with automated self-service machines is increased profitability." In Canada where stores were first fitted with the digital, predictive menu boards, sales increased overall by 3 to 3.5% in their first year, while in Japan, users of the mobile phone app spend on average 35% more per transaction, which McDonald's attributes to a presentation of individually chosen promotions."[42]

2.2.2. Supply Chain Optimization

During the COVID-19 pandemic, due to strict measures which every retail store had to follow to suppress the spread of the disease, a large part of the world's population turned to alternative solutions for buying needed goods. At that time online shopping reached its peak, and newly formed habits remain to this day. While a person probably does not own a certain set of criteria for instance an avocado, that is unlikely the case for clothes that greatly contribute to personal appearance. Therefore, by offering home delivery, the company risks the high possibility of customers returning the order which can increase costs. The reason behind this statement is the fact that a brand, to stay competitive must offer free returns if the item does not fit which may include several steps in the supply chain for an item to reach retail from a customer. This can also lead to overstocked warehouses during price drops, and if the company is unable to sell all the products, they are likely to be burned or recycled, further driving up costs.

To address this issue, Stitch Fix, a retail store acting as a personal stylist based in California, has shifted its supply chain operations from a 'buy then deliver' model to a 'deliver then buy' approach. The company is combining stylists and AI to analyse one's style based on the answers obtained from the questionnaire given at the beginning of the process while taking into consideration age, body shape and measurements. Additionally, if permission is given, the program incorporates data from social media platforms like Instagram and Pinterest, analysing liked, saved, or posted outfits to gain a deeper understanding of an individual's style

[40] Ibid, 107
[41] https://emerj.com/ai-sector-overviews/fast-food-robots-kiosks-and-ai-use-cases/
[42] Marr, *Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems,* 108

preferences. Following that, the program filters and selects clothing that fits the criteria, which is later on sent to the customer's doorstep. A customer pays a small fee before shipment which is later on subtracted if the items are kept in possession.

This integration of smart solutions resulted in a better understanding of customer needs and preferences, which gave Stitch Fix the ability to automatically ship items that, according to its data, customers are most likely to love and keep. “This allows it to avoid wasted warehouse space, shipping costs, return expenses and end-of-season overstock. Adoption of machine learning has allowed it to increase revenue and customer satisfaction while decreasing overall costs.”[43]

2.2.3. Risk Management

Every business inherently involves a degree of uncertainty and risk and while the extent of this risk varies depending on the nature of the business, it is always its fundamental aspect. It can manifest in many different forms, such as financial problems, strategic challenges, legal issues, or security concerns and although risks cannot be entirely predicted, they can be managed and controlled. It is of significant importance for the company to timely spot potential risks, assess their impact correctly, situate controls in place, and constantly reevaluate those controls monitoring their effectiveness.

Each of those mentioned actions plays a crucial role in reducing uncertainties as they are integral components of strategic and well-executed risk management. These activities are especially important for financial institutions, where large sums of money are handled daily, making the stakes even higher and the need for efficient risk management even more intense.

For a financial institution, the risks have always been colossal, however in recent years they enlarged with the growth of the Internet and online shopping. The reason is the fact that in the majority of cases a customer, to finalise their purchase, must enter credit or debit card information, and even though there is special encryption between the payment software and an issuing bank, security cannot be guaranteed. On the internet, every activity leaves traces which is a fertile ground for credit card fraud. Moreover, the consumption of cards became a favoured

[43] Ibid, 125

payment method, especially among the younger population. To this also contributed popularity of contactless cards, which do not require authorization on a POS terminal.

While most businesses now accept no paper currencies policy and most people do not withdraw money from their accounts at ATMs, integration of cards with society is so excessive that, for instance, in London even the homeless own POS terminals to receive donations. This puts enormous pressure on banks and credit unions, whose task is to detect card misuse and act in accordance with these situations.

To ease their challenges, many financial institutions turned to AI to detect fraud and improve customer experience, including American Express which "handles more than 25% of US credit card spending, accounting for $1.1 trillion of transactions in 2017, and is the world's most valuable financial services brand according to Forbes."[44]

Banks and financial institutions, including card issuers and insurers, have long relied on patterns in historical data to identify potential fraud. For instance, they monitor for unusual activity, such as cardholders making unusual purchases or transactions occurring from locations outside their homeland. When a transaction is confirmed as fraudulent, it is recorded, and its characteristics are marked as potential warning signs for detecting similar fraudulent activities in the future. "American Express has built AI systems that are able to read in data from card transactions around the world in real-time as they happen. This means fraudulent characteristics can be logged and fed back into detection algorithms almost in real-time."[45]The speed of the detecting algorithm is a game-changing factor since it can detect anomalies before the transaction is completed, thereby preventing potential fraud.

This algorithm is highly sophisticated, responding to even the slightest indication of card misuse. The cardholder is immediately contacted and informed of the next steps, which involve blocking the compromised card and issuing a new one. In such cases, the cardholder is spared from dealing with customer service protocols or worrying about missing funds on their accounts, as the transaction is halted before it can be completed.

The result of this implementation is that "more fraudulent transactions will be blocked as they occur, meaning it is less likely that remedial action, such as recovering spent funds, will

[44] https://www.forbes.com/companies/american-express/?list=powerful-brands/
[45] Marr, *Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems,* 207

have to be taken after the fact, drastically reducing the costs involved in dealing with fraud."[46] In an institution like American Express, even a small percentage of improvement has a large cost-saving impact. This model has been shown to improve "fraud detection accuracy by up to 6% in specific segments."[47]

Mastercard has experienced similar success when it comes to "false positives" in fraud detection. A false positive refers to transactions that were labelled as used fraudulently but were in fact used by the owner. These occasions, although without material damage, have negative outcomes, since the cardholder is unable to use their funds when needed. "Since the rollout of its network-wide AI platform, the organization has increased its success rate at detecting fraud threefold, and the number of false positives has been reduced by roughly 50%."[48]

2.2.4. Cost Reduction

Cost reduction is one of the most desired outcomes of certain business processes an enterprise is aiming to achieve owing to its direct influence on gross profit and therefore net income. More capital means more reinvestment in research, innovations and growth, thereby maximizing shareholders' value which potentially attracts more external funding. Furthermore, it can lead to more accessible and quality products for consumers which increases revenue (with the exception of products whose demand is price-sensitive, such as Veblen goods, where price and demand increases are proportional). Each of the mentioned end results contributes to companies' stability, scalability and flexibility, ultimately raising competitiveness.

Regardless of how simple the equation may seem - revenue subtracted by total expenses equals earnings before tax – managing costs is a complex process requiring significant attention from management in decision-making. The difficulty comes from various costs needing supervision such as operation costs, production costs, acquisition costs, unforeseen expenditures, different taxes, fees and many others. The key is identifying a process whose costs can be reduced regarding their variability or fixability.

---

[46] Ibid, 208

[47] https://www.nvidia.com/en-us/case-studies/american-express-prevents-fraud-and-foils-cybercrime-withnvidiaaisolutions/#:~:text=American%20Express%20Results&text=A%20GPU%2Daccelerated%20LSTM%20deep,six%20percent%20in%20specific%20segments.

[48] Marr, *Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems,* 247

Although bookkeeping and financial reports are effective tools for analysing and keeping track of all company expenses, not all costs are explicit (immediately visible). Ones in particular are opportunity costs which are equally important in management as they can manifest in material expenditure later on and significantly influence on company's deviation in current and potential standing. This could emerge in all business segments, a few examples are strategic decisions, resource allocation and human resources.

"Matching applicants to job roles is a challenging and expensive task for businesses – according to Glassdoor, the average hire in the United States costs a company $4,000"[49] for the year 2019. In a case study done in 2018, "the UK Recruitment and Employment Confederation found that businesses were failing to make the right hires for two out of every five roles. It also calculates that an unsuccessful hire at the middle management level can cost a company an average of £132,000."[50]

The inefficiency of the recruitment process arises from insufficient information about a candidate's character and background. Typically, the application process relies on a few references, a resume, and a short interview often lasting just about an hour which is rarely enough to thoroughly examine a candidate's suitability for the role. In some cases, there are other factors such as the scarcity of skills required for specific positions, geographical constraints, position type, and the methods and platforms used for advertising the vacancy that further complicate the ability to effectively evaluate and choose potential hires. "Teaching is one example where 100,000 US classrooms began the 2016/17 academic year with a teacher not qualified to teach."[51]

"LinkedIn gathers data on millions of professionals and then uses AI search tools to match applicants with jobs, and vice versa."[52]To optimize recruitment workflow it offers powerful tools, making each step more productive saving up to 130 hours of hiring time per role.[53]

When a vacancy is published, LinkedIn gathers candidates who match the requirements for the position based on feedback from previous similar matches and sends them notifications. By carefully selecting potential prospective employees, taking into consideration the similarity of

[49] Ibid, 155
[50] Ibid, 156
[51] Ibid
[52] ibid
[53] https://business.linkedin.com/talent-solutions/resources/talent-acquisition/reducing-time-to-hire#:~:text=Reduce%20cost%20per%20hire%20by,open%20jobs%2C%20and%20your%20company.

the positions they applied to, the software ensures the alignment of potential candidates' professional wishes with the company's needs. By repeated evaluation of its efficiency, LinkedIn is offering its clients advanced and accurate recruitment AI tools by further advancing its machine learning.

The algorithm's success is based on the quality and quantity of information obtained, therefore, it is important to provide details which contribute to its realization. That is why the platform encourages building a community on the company's LinkedIn page, where brands can share their organization's culture and values to attract like-minded individuals. By doing so, entities are forming a pool of probable candidates which potentially decreases costs and increases chances of finding the right employee.

The improvements are evident in several areas:

"Automating repetitive tasks: AI can take care of repetitive tasks in recruitment such as resume screening or first contact with candidates. According to Ideal's report, 96% of recruiters believe AI has a positive effect on talent acquisition and HR. Through automation, recruiters save a lot of time while cutting recruitment expenses."[54]

"Time savings: Recruitment platforms powered by AI can save significantly for recruiters. According to a McKinsey research paper, AI-powered sourcing tools reduce position-fill time by up to 50%. The fewer days to fill mean more recruitment cost reduction per hire."[55]

"Better candidate matching: By analysing resumes, job descriptions, and other relevant data using AI algorithms, better matching between candidates and job requirements is achieved. This results in improved hiring quality while avoiding turnover which may be expensive for organisations. LinkedIn revealed that company adoption of AI for talent acquisition resulted in saving 75% off candidate sourcing hours spent which was previously at about three months average per employer."[56]

"Reduced cost per hire: AI-based recruitment systems have been found to decrease cost per hire by up to 70%, as concluded in a study carried out by Deloitte & Touche LLP. This

[54] https://www.linkedin.com/pulse/5-proven-strategies-ceos-slash-recruitment-costs-2024-processica-zpkuf/
[55] ibid
[56] ibid

recruitment cost reduction is attributed to increased efficiency, less time spent on manual tasks and enhanced matching of candidates."[57]

2.2.5. Enhanced Decision Making

When it comes to decision-making, the greatest asset AI possesses is the ability to transform large amounts of unorganized data into a piece of beneficial information. By combining different but complementary pieces of valuable information, knowledge is formed, ready to be used in real-life situations. Owning to its significant influence on the outcome of those situations, knowledge is the most important asset a person can possess, which is also the reason why human experts are highly desired.

On similar line of thinking was likely based famous phrase "Knowledge is power". Still, not all knowledge holds the same value. In decision-making, it is the knowledge about the future that can cause a paradigm shift, accordingly the sentence could be rephrased into "Knowledge of the future is power".

Although most managerial decisions are made under conditions of certainty where the outcome of each possible option is known, there are equally many on the other side of the spectrum - uncertainty.[58] Uncertainty arises from a decision's multiple outcome possibilities, in which the probability of each specific outcome is unknown or even meaningless. This may be due to insufficient information from the past or instability of the variable structure.[59] Nonetheless, this opens the door for implementing artificial intelligence, which doesn't create intelligence itself but rather provides a crucial element of it; prediction.[60]

To substitute the missing information humans naturally make predictions, relying on their experience, knowledge, intuition and perception of the world. Artificial intelligence, since it is based on human neuro works, does the same. The difference is that AI does it better, due to its few fundamentals. Apart from impressive data analytics, the key aspect is the speed at which the system can process inputs and simultaneously recognize patterns and correlations. These details are often unseen or overlooked by humans therefore the end result may vary. Moreover, machines no matter how humanised, lack emotions and by eliminating the emotional and subjective elements that can compromise judgment, AI can deliver predictions that are not only

[57] ibid
[58] Salvatore, *Managerial economics in a global economy*, 542
[59] ibid
[60] Agrawal, Goldfarb, and Gans, Prediction Machines: The Simple Economics of Artificial Intelligence, 2

more accurate but also more reliable. On the contrary, humans operate on emotional bias. Thoughts and actions are often influenced by personal values, morals, emotions, self-awareness, etc. creating pros and cons in decision-making.

The intention of AI is not to replace personnel (at all levels), but rather to complement them by providing support. This can be seen in all the examples above, where AI predicts and finds a problem or dysfunction, forms and implements preventative strategies. It is of exceptional importance for management positions, whose decisions dictate the course of the company's growth. The age of AI is often referred to as the era of the 'New Economy,' where companies are increasingly driven by smart solutions, yet the fundamental rules of the economic market have largely remained the same. The distinction lies in managers now having enhanced data insights into present circumstances and possible near future.

3. Research

The aim of this research is to examine the impact of artificial intelligence on business processes, focusing on its frequency, most common applications, purposes, benefits, and limitations. Additionally, the study seeks to determine whether there is a correlation between AI implementation and specific company characteristics and whether these trends are applicable to Croatian enterprises. Moreover, the research attempts to explain the viewpoint of survey participants on AI trends.

3.1. Research Methodology and Participants

In the study, a combination of both qualitative and quantitative methods was used to determine and outline the impact of artificial intelligence on business processes. The quantitative data was obtained from a large sample of participants residing in the area of the European Union. The analysis of collected data was performed by Eurostat with its published results allocated as a secondary source for this research. "Eurostat's 2023 survey on ICT usage in enterprises investigates the use of AI technologies among ca. 150 000 businesses with at least 10 employees".[61] For the qualitative method, a survey was used as the primary source of information obtained from a small sample group of intentionally selected participants living in the Republic of Croatia. The group is formed by 24 individuals with different backgrounds above 18 years of life. This approach ensures accuracy in defining the size of enterprises, as well as the number of enterprises using AI solutions internationally since quantitative methods were based on data such as the number of employees and revenue. The qualitative method deeply investigates employees, owners or managers' impressions, whether AI contributes to the organization and in which way. This information was collected by detailed questionnaire, suggesting possible advantages implementation of Artificial intelligence could bring. Some of the examples are increased sales, better marketing strategy, cost reduction, etc.

The data was collected by sharing a Google Forms survey across social media platforms for a duration of 3 months, from March to June. The survey questions were primarily intended and tailored for management positions such as managers, owners/shareholders and entrepreneurs. However, operational levels were not excluded. The questions examine respondents' age, gender, job position, business activity, size of a company and many others.

[61] https://economy-finance.ec.europa.eu/document/download/10867a27-f49f-4aa9-89bb-feb752513f78_en?filename=dp210_en_artificial%20intelligence_0.pdf

The results will be analysed in two steps. The first section will introduce the data published by Eurostat, explaining the tendencies of EU enterprises aggregating AI into their business processes based on its characteristics such as enterprise size, business activity, and its sector. The next section follows the results by analysing data acquired from the survey. The correlation will be drawn between companies in the Republic of Croatia and the rest of the members of the European Union. In an endeavour to better understand the presented results, the opinions of participants on the impact of AI in Croatian enterprises will be revealed

3.2. Research results

As mentioned in the previous paragraph, the next section presents statistical data from Europe and Croatia in two stages. To enhance understanding of correlations between certain data, various visual aids are put to use across various figures. While figures representing European data are outsourced, the ones illustrating Croatian data are made by the author of the thesis based on information obtained from the questionnaire.

3.2.1. Europe

By Eurostat's research, it is concluded that in the year 2023 "8 % of enterprises in the EU, with 10 or more employees and self-employed persons, used at least one of the following AI: "[62].

- technologies analysing written language (text mining)
- technologies converting spoken language into a machine-readable format (speech recognition)
- technologies generating written or spoken language (natural language generation)
- technologies identifying objects or people based on images (image recognition, image processing)
- machine learning (e.g. deep learning) for data analysis
- technologies automating different workflows or assisting in decision-making (AI-based software robotic process automation)
- technologies enabling machines to physically move by observing their surroundings and making autonomous decisions.

[62]https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Use_of_artificial_intelligence_in_enterprises#Purpose_of_using_AI_software_or_systems

According to the same research large enterprises are more inclined to implement AI into their business with 30.4% of questioned companies using AI technology. In contrast, medium and small enterprises are far behind with only 13% for medium and 6.4% for small enterprises. This can be potentially explained by the lack of investment funds for optimisation with smart solutions, a smaller scale of investment turnover for smaller and medium companies, or the complexity of integrating such systems in small businesses.

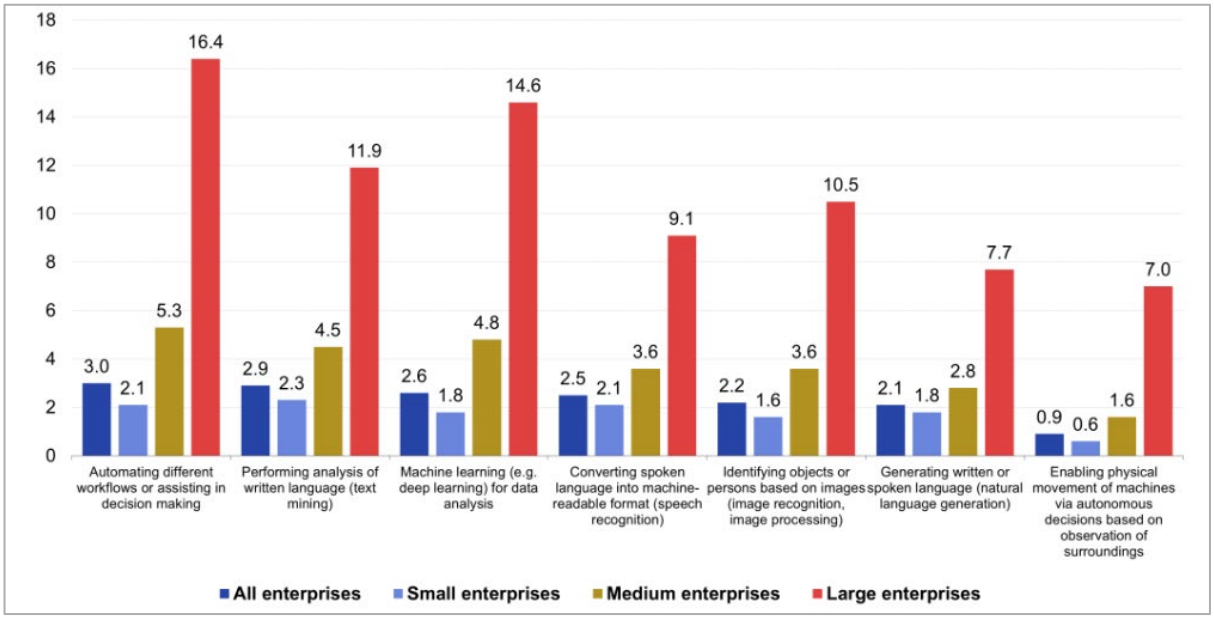


Figure 1: Enterprises using AI technologies by type of AI technology and size class, EU, 2023
Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Enterprises_using_AI_technologies_by_type_of_AI_technology_and_size_class,_EU,_2023_(%25_of_enterprises_).png

The dominance of large enterprises can be seen even if AI technology is categorized by type. As the graphs above show, the most frequent tasks assisted by AI are “automating different workflows or assisting in decision making” with 16.4%, followed by “machine learning (e.g. deep learning) for data analysis” with a percentage of 14.6. Given that larger companies make more strategic decisions with significant impact, have a larger customer base therefore more data, and need to manage and influence more people, this outcome is not surprising. It is also evident that smaller and medium-sized companies are, although on a smaller scale, following the trend.

However, the differences are less notable from the perspective of purpose. Although more large enterprises invest in ICT security and production processes, in other areas the use of AI

solutions shows less oscillations in implementation frequency. Yet again, it is logical for larger companies, with greater data resources and larger-scale production, to invest in ICT security and optimize production processes. Protecting valuable information and enhancing production efficiency, such as reducing costs and speeding up operations, aligns with their strategic interests. Within the purpose of "accounting, controlling or finance management ", the percentage of companies implementing systems is comparable in all categories. This may be attributed to the fact that small and medium enterprises often require smart solutions in areas where establishing dedicated departments is too costly. In contrast, larger organizations have the financial and human resources to develop independent systems for controlling and financial planning.

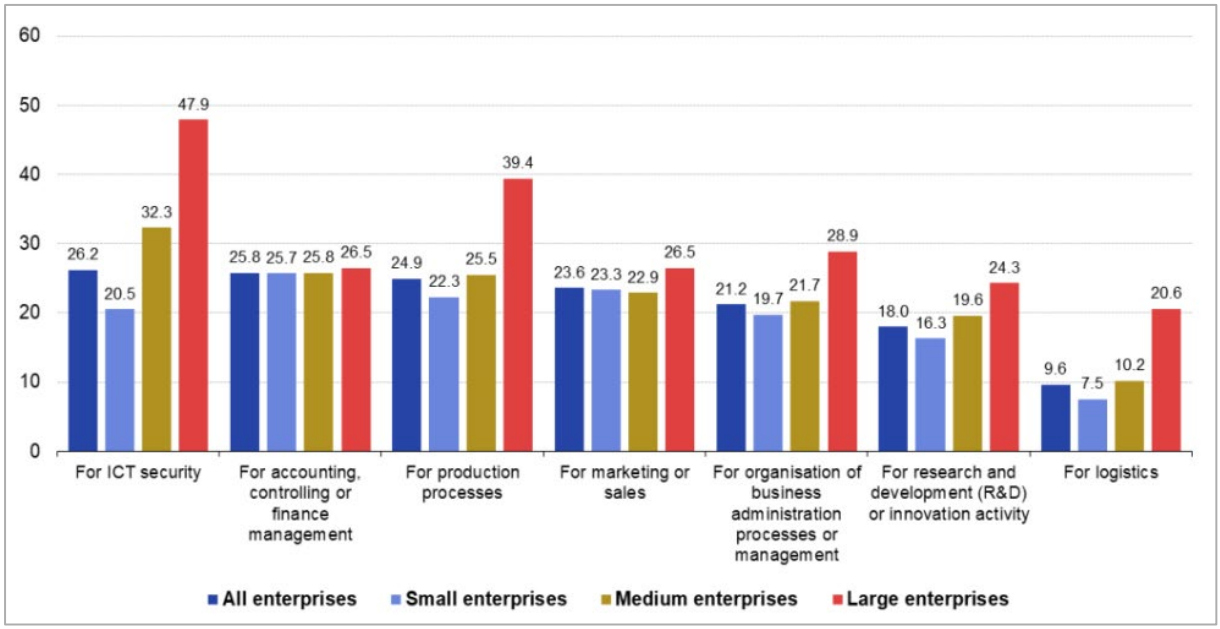


Figure 2: Enterprises using AI technologies by type of purpose and size class, EU, 2023

Source:https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Enterprises_using_AI_technologies_by_type_of_purpose_and_size_class,_EU,_2023_(%25_of_enterprises_using_at_least_one_AI_technology).png

Focusing on economic activities reveals that certain sectors adopt AI more extensively than others. In the graph below, it is evident that the categories "Information and communication" with approximately 29% and "professional, scientific and technical activities" with roughly 18% lead the chart, while in the rest of the activities, AI technologies are recorded in less than 10%. This pattern suggests that AI implementation may be more advantageous or easier to integrate in some industries than in others. The construction sector shows the lowest level of

implementation, which is consistent with most job descriptions in this field, as it due to the complexity of tasks, predominantly depends on human labour

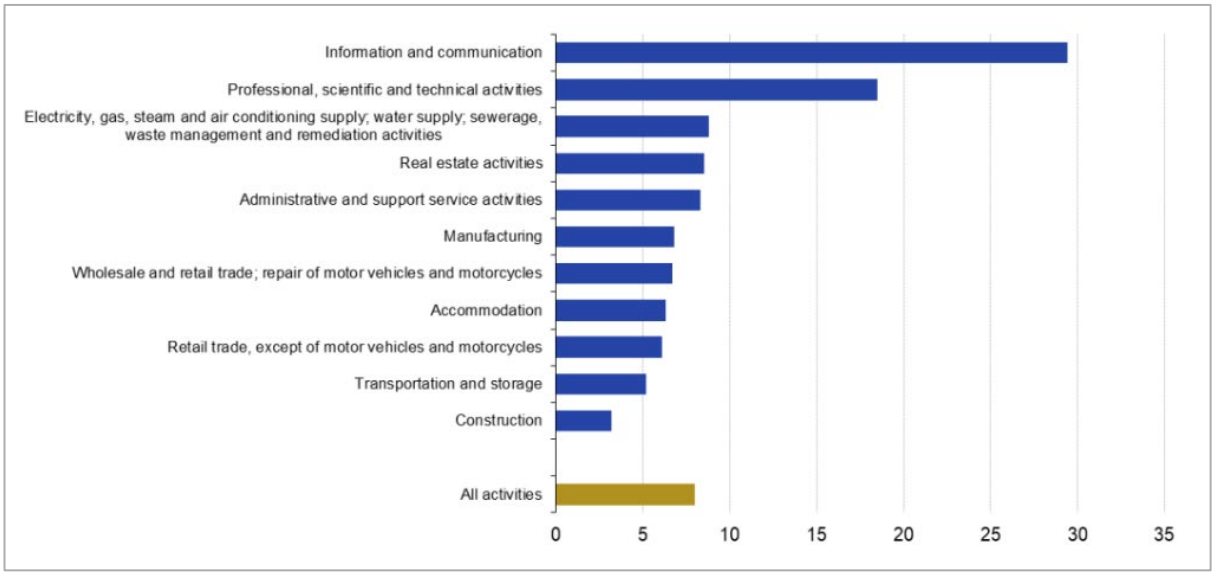


Figure 3: Usage of AI technology by economics activity in % of total enterprises, European Union, 2023.
Source:https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=File:Enterprises_using_AI_technologies_by_economic_activity,_EU,_2023_(%25_of_enterprises).png

By combining economic activity with purpose data, it is clear that businesses in different niches utilize AI for different purposes, according to their operational methods and specific needs. This conclusion is drawn from numbers in the table below, showing for example that accommodation and retail mostly use smart solutions for marketing and sales (more than 40%), while manufacturing invests in production processes (38.2%).

	For ICT security	For accounting, controlling or finance management	For production processes	For marketing or sales	For organisation of business administration processes or	For research and development (R&D) or innovation activity	For logistics
All activities	26,2	25,8	24,9	23,6	21,2	18,0	9,6
Manufacturing	27,5	20,7	38,2	14,3	16,2	14,8	14,2
Electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities	37,6	20,8	26,5	21,8	21,2	15,0	9,6
Construction	21,5	32,1	12,1	9,8	20,7	10,3	5,0
Wholesale and retail trade; repair of motor vehicles and motorcycles	26,3	25,9	18,0	35,4	19,3	10,8	14,2
Retail trade, except of motor vehicles and motorcycles	21,9	25,2	17,1	41,8	14,2	7,9	17,7
Transportation and storage	28,6	25,2	19,4	14,1	24,4	8,8	27,3
Accommodation	18,3	24,2	18,2	51,4	22,0	9,1	4,5
Information and communication	31,6	21,8	29,7	31,1	26,3	41,3	6,0
Real estate activities	24,3	34,8	11,7	20,9	16,3	:	:
Professional, scientific and technical activities	21,4	33,0	24,4	15,7	22,8	18,2	3,5
Administrative and support service activities	28,6	23,4	20,6	26,7	24,3	13,3	6,0

Figure 4: Enterprises using AI technologies by type of purpose and economic activity, EU, 2023
Source:https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=File:Enterprises_using_AI_technologies_by_type_of_purpose_and_economic_activity,_EU,_2023_(%25_of_enterprises_using_at_least_one_AI_technology).png

Currently, there is no comprehensive statistical data available on AI's direct contribution to the company's revenue or general growth within the EU, however, there are some specific cases which indicate the direct impact of AI on productivity. "For instance, AI is found to significantly increase firm productivity (measured as sales, controlling for all other inputs to the production function) by about 5% among a sample of German firms with at least five employees"[63] This demonstrates that AI indeed plays a role in driving revenue growth and improving business operations.

To confirm the previous statement US will be taken as an example. "A positive association between AI adoption and revenue growth a few years after the adoption is found within US firms, which could be indicative of performance gains following AI use. Moreover, US firms that invest more in AI are found to experience higher growth in sales as well as employment, a finding that holds across all industries"[64]

Furthermore, "recent engineering and consultancy studies on specific uses of AI find positive results along the same lines. Thanks to AI, software engineers code twice as fast, similar to the magnitude observed in the case of writing tasks. Additional evidence points to an increase of 14% on average in productivity in call centres and around 20% for economists. In total, it has been estimated that around 80% of (US) jobs would have at least 10% of their tasks that could be affected by AI and that about 15% of workers' tasks could be completed faster with no compromise on the level of quality".[65]

3.2.2. Croatia

In the conducted survey involving residents of the Republic of Croatia, a total of 24 individuals participated, comprising 58% males and 42% females. As illustrated in Figure 5 most respondents, taking 58.3% of the share, were between 44 and 59 years of life. This was followed by individuals aged 18 to 27, who represented 25%, while those aged between 28 and 43 involved only 16.7%.

[63] ibid

[64] https://economyfinance.ec.europa.eu/document/download/10867a27f49f4aa989bbfeb752513f78_en?filename=dp210_en_artificial%20intelligence_0.pdf

[65] ibid

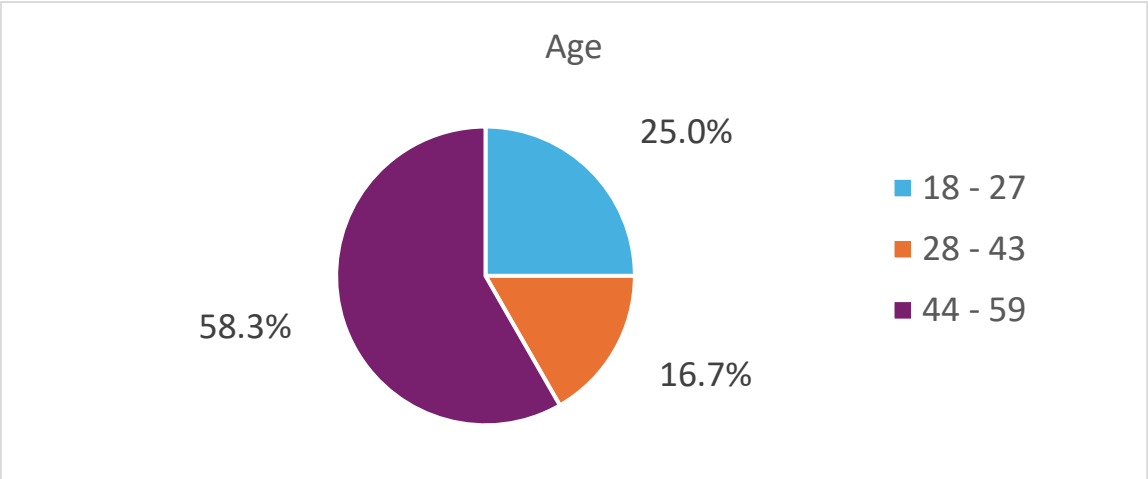


Figure 5: Participants age
Source: Made by the author

When it comes to the function each individual performs in an organization, 50% of individuals are employees, 25% are owners or shareholders, 16.7% hold management positions and 8.3% are entrepreneurs. The figure below shows that this data divides the survey into two equal parts of managerial and non-managerial positions.

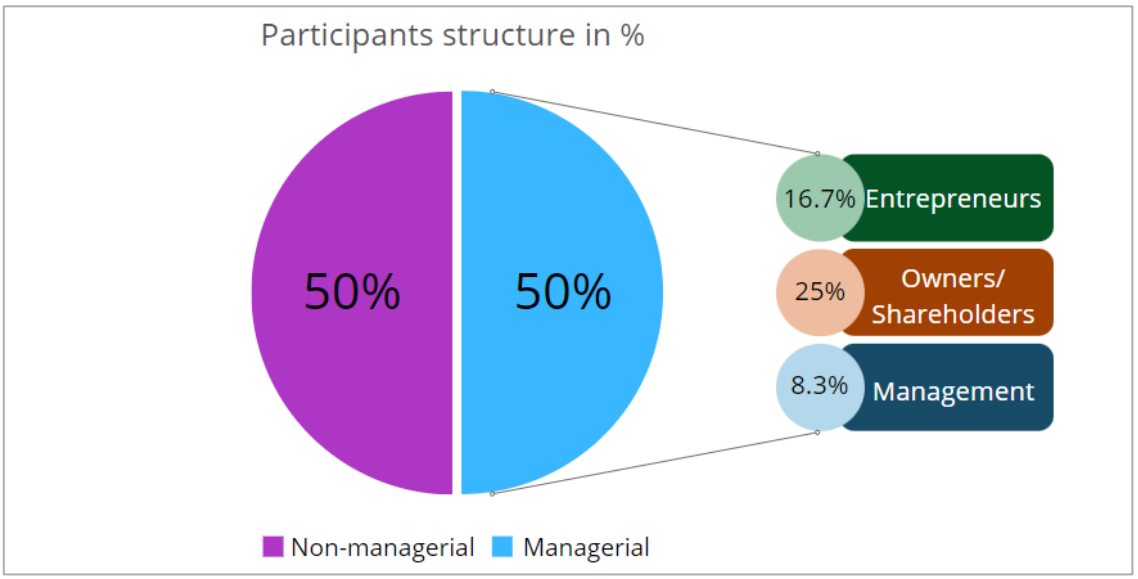


Figure 6: Structure of participants' function
Source: Made by author

Regarding the ventures, the survey shows that a significant majority (75% of enterprises) have adopted smart solutions in their business. Micro-enterprises make up the largest share, at 67%, followed by large enterprises at 23%, and medium-sized enterprises at just 10%. This data is unsurprising since, contrary to European trends, micro and small enterprises make up the largest share of the Croatian market.

To achieve a better understanding of how Croatian companies compare to those in the rest of the EU, participants were asked about the ways in which AI solutions are utilized to enhance their business processes. The responses were categorized according to the table shown in figure number 2.

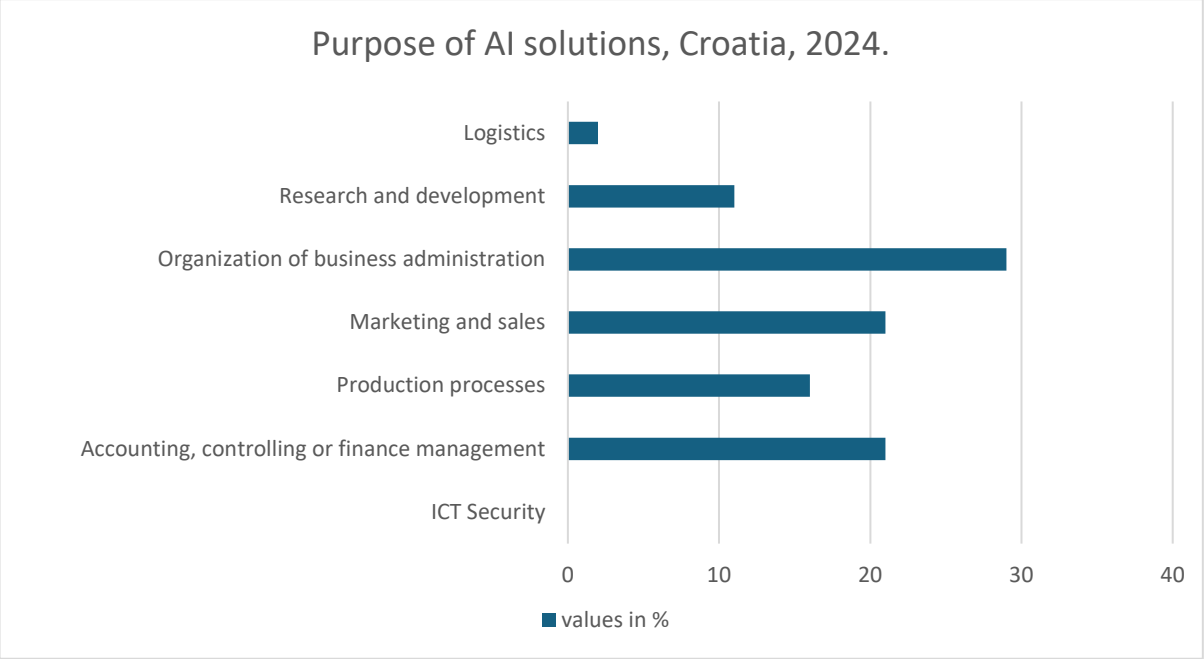


Figure 7: Purpose of AI solutions, Croatia, 2024.
Source: made by author

The graph shows that most Croatian enterprises use smart solutions for the purpose of better organisation of business administration (29%), followed closely with equal values (21%) by marketing and sales and accounting, controlling and finance management. There is no evident information about the ICT sector. Correlating this data with information from Figure 2, it is clear that trends do not match.

A possible explanation for this variation is that owners of micro-enterprises often coordinate multiple roles and work full-time, sometimes even more than their employees. This creates significant pressure when adding administration and organisation. Smart solutions can help reduce this mental load and save time. Despite the data in Figure 6, it's important to note that the majority of participants—67%—believe AI is shown to be most beneficial in marketing and sales.

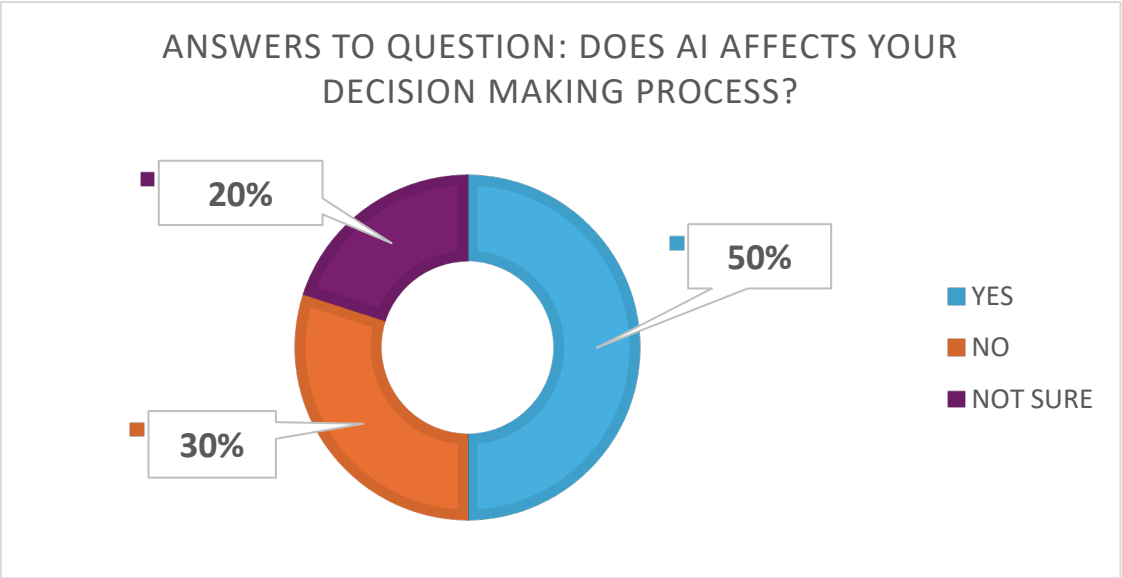
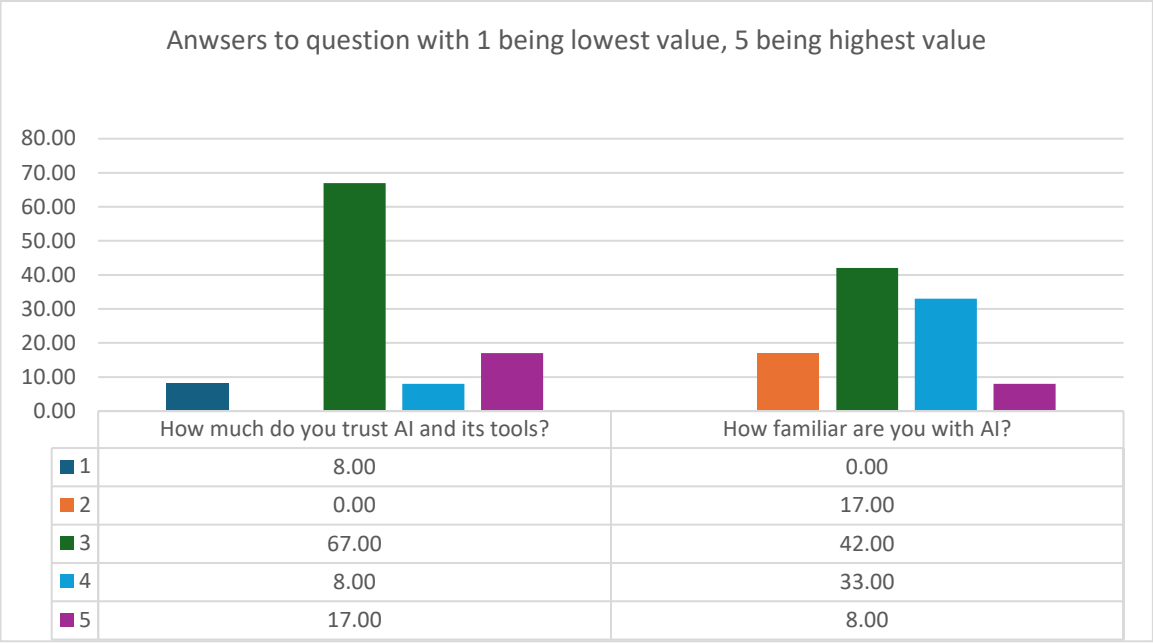


Figure 8: Answers to decision-making questions
Source: made by author

When asked whether AI tools influence the decision-making process, 50% of respondents answered positively, while 30% strongly disagreed. The remaining 20% were undecided, indicating that AI's impact may depend on the importance of information and the certain circumstances involved. These results are likely a direct consequence of the data illustrated in Figure 9.



	How much do you trust AI and its tools?	How familiar are you with AI?
1	8.00	0.00
2	0.00	17.00
3	67.00	42.00
4	8.00	33.00
5	17.00	8.00

Figure 9: Answers to questions
Source: Made by author

The graph shows that there is certain doubt among 67% of participants in the trustworthiness of AI tools and data provided by those tools, while 8% do not trust AI completely. When comparing this data to the responses regarding assessed knowledge in the area of Artificial

intelligence, it is easily assumed that the distrust source is a lack of deeper understanding. However, this isn't the case, as even participants with very good (4) or excellent (5) knowledge also graded their trust with a value of 3 or 4 and some even 1. When asked to explain the reasons for the lack of trust in AI, each participant had their own reason which to some extent overlapped, forming three different categories. The biggest issue seems to be transparency, followed by security and financial resources.

3.3. Research limitations

There are a few limitations that possibly undermine the research results. Firstly, only a selected few truly have the knowledge of whether the organization use AI solutions, in which the department is used and truly understands its intended use. Since the sample size includes participants as employees at all operational levels, it is unknown whether an employee is informed of such implementation in departments which defer from his workspace. Secondly, the research is done on a small sample size due to difficulty in establishing contact with targeted participants. Since the research is done by questionnaire, it relied on individual willingness to participate in research to obtain results. Moreover, the research covers only a small percentage of the total population and enterprises in the Croatian market and the vast majority have not expressed their opinion. Thirdly, the research is done under time limitations, which affect the overall outcome of the research.

Conclusion

In this research, efforts were made to prove the impact of artificial intelligence on business processes, and whether the global trend is mirrored on the market in the Republic of Croatia. Through the theoretical part and a short history, it is established that artificial intelligence, owing to its algorithm, can greatly contribute to the company in achieving its goals through cost reduction, better analytics, business improvement, etc. Furthermore, it is also determined that, due to these characteristics, smart solutions serve as a "right hand" to a successful manager by providing better visibility into company operations. Based on examples of good practice, existing examples of implementation in different departments in successful companies were shown, which confirms that artificial intelligence impacts on shape of business. In addition to confirming this claim, specific results on how optimization impacted these processes were attached.

In the research section, we explored the extent to which companies are inclined to implement artificial intelligence and analysed its key attributes. It is concluded that larger companies are more inclined to invest in AI, due to the fact that such companies require greater data analysis and thus assess more important information, have a larger customer base, and have greater production. Comparing these data with the situation in the Republic of Croatia, it is noticeable that the trend is not completely mirrored.

In the Republic of Croatia, smaller companies dominate, which have different needs than larger enterprises, therefore the implementation is prioritised in different areas. By analysing the participants' opinions, it was found that the majority lack a significant level of confidence in AI solutions, which is a possible explanation for less implementation and doubt about whether these solutions would contribute to the company's operations. Likewise, limited implementation is a consequence of the belief that such solutions are expensive to implement, lack transparency or represent a security risk.

At the end of the study, the conclusion is that artificial intelligence and its smart tools can, with effective management, transform a company's operations, ensuring competitiveness and securing market presence. However, in the Republic of Croatia, these systems are less widely implemented due to the diverse structure of companies in the market and entrepreneurs' scepticism about the benefits of AI.

Bibliography

1. Latrice Tennin Kyla, Ray Samrat, Sorg Jens M., *Cases on AI Ethics in Business,* 1st. ed. Hershey: IGI Global, 2024.
2. Homer. *The Iliad*. Translated by Richmond Lattimore, 1st ed., Chicago: University of Chicago Press, 2011.
3. Nilsson, Nils J. *The Quest for Artificial Intelligence: A History of Ideas and Achievements*. 1st ed. Cambridge: Cambridge University Press, 2010.
4. McCorduck Pamela, *Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence,* 1st ed., Natick: A K Peters Ltd. 2004.
5. Winston Karen A., Prendergast Patrick H, *The AI business: The commercial uses of artificial intelligence,* 4th ed., Cambridge: The MIT Press, 1984.
6. Marr Bernard, *Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems,* 1st ed. Chichester: John Wiley & Sons Ltd, 2019.
7. Salvatore Dominick*, Managerial Economics in a Global Economy*, 7th ed. Oxford: Oxford University Press, 2011
8. Agrawal Ajay, Goldfarb Avi, and Gans Joshua, *Prediction Machines: The Simple Economics of Artificial Intelligence,* 1st edition Boston: Harvard Business Review Press, 2018.
9. Robert K. Lindsay, Bruce G. Buchanan, Edward A. Feigenbaum, Joshua Lederberg, "DENDRAL: a case study of the first expert system for scientific hypothesis formation", *Elsevier,* Volume 61, Issue 2 (1993), 209-261, https://doi.org/10.1016/0004-3702(93)90068-M (accessed 12.8.2024)
10. Brill, Jeff. "The importance of credit scoring models in improving cash flow and collections", *Business Credit* 100.1 (1998): 16-17.
11. West, David, "Neural network credit scoring models", *Elsevier,* Volume 27, Issues 11–12, (2000), 1131-1152, https://doi.org/10.1016/S0305-0548(99)00149-5 (accessed 12.8. 2024.)
12. "Leonardo's robot", Wikipedia, https://en.wikipedia.org/wiki/Leonardo%27s_robot
13. "Digesting Duck", Wikipedia, https://en.wikipedia.org/wiki/Digesting_Duck
14. "R.U.R.", Wikipedia*,* https://en.wikipedia.org/wiki/R.U.R.
15. "Universal Turing Machine", Wikipedia, https://en.wikipedia.org/wiki/Universal_Turing_machine
16. "Z1 (computer)", Wikipedia, https://en.wikipedia.org/wiki/Z1_(computer)
17. "DENDRAL", Britannica, htts://www.britannica.com/technology/DENDRAL

18. "MYCIN", Britannica, https://www.britannica.com/technology/MYCIN
19. "Decision support system", Wikipedia, https://en.wikipedia.org/wiki/Decision_support_system
20. "The Evolution of Data and AI in the 2000s", Adaptive AI ventures, https://adaptiveaiventures.com/2024/03/the-evolution-of-data-and-ai-in-the-2000s/
21. "A decade in deep learning, and what's next", Google, https://blog.google/technology/ai/decade-deep-learning-and-whats-next/
22. "Strong AI vs. Weak AI", Built-in https://builtin.com/artificialintelligence/strongaiweakai#:~:text=Weak%20AI%2C%20also%20called%20narrow,don't%20actually%20exist%20yet.
23. "Croatian program for innovative technological development", Ivo Pilar Institute of Civil Sciences https://www.pilar.hr/wpcontent/images/stories/dokumenti/zbornici/27/z_27_445.pdf
24. "Croatia - Country Commercial Guide", International Trade Administration https://www.trade.gov/country-commercial-guides/croatia-information-and-communication-technology
25. "Use of artificial intelligence in enterprises", Eurostat, https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Use_of_artificial_intelligence_in_enterprises
26. "American Express Prevents Fraud and Foils Cybercrime With NVIDIA AI Solutions", Nvidia, https://www.nvidia.com/en-us/case-studies/american-express-preventsfraudandfoilscybercrimewithnvidiaaisolutions/#:~:text=American%20Express%20Results&text=A%20GPU%2Daccelerated%20LSTM%20deep,six%20percent%20in%20specific%20segments.
27. "How to reduce your time-to-hire with LinkedIn", LinkedIn, https://business.linkedin.com/talent-solutions/resources/talent-acquisition/reducing-time-to-hire
28. "5 Proven Strategies for CEOs to Slash Recruitment Costs in 2024", Linked, https://www.linkedin.com/pulse/5-proven-strategies-ceos-slash-recruitment-costs-2024-processica-zpkuf/
29. "Artificial Intelligence: Economic Impact, Opportunities, Challenges, Implications for Policy", European Commission, https://economyfinance.ec.europa.eu/document/download/10867a27-f49f-4aa9-89bb-feb752513f78_en?filename=dp210_en_artificial%20intelligence_0.pdf
30. "Use of artificial intelligence in enterprises", Eurostat, https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Use_of_artificial_intelligence_in_enterprises#Purpose_of_using_AI_software_or_systems
31. Walker Jon, "Fast Food Robots, Kiosks, and AI Use Cases from 6 Restaurant Chain Giants", Live Science, https://emerj.com/ai-sector-overviews/fast-food-robots-kiosks-and-ai-use-cases/
32. "The World's Most Valuable Brands", Forbes, https://www.forbes.com/companies/american-express/?list=powerful-brands/

List of illustrations