**Report: Planned Research Project**

**ROLE OF DATA SCIENCE AND ARTIFICIAL INTELLIGENCE IN BUSINESSES**

**GROUP : 5**

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**Abstract**

Artificial Intelligence (AI) and data science continue to dominate both non-business and business contexts, despite several objections based on concerns that AI and data science technologies will endanger the role of people’s in company operations and future management. AI and data science have a positive effect on overall business operations, and investing in AI by businesses and management would improve market leadership and sustainability. AI and data science algorithms enable robots to make future predictions and decisions based on previously acquired insights and patterns. The new applications continue in improving decision making and efficiency and whole business operations. Business operations and management are in the era of data that shapes daily processes within business operations. This research provides a basic understanding of the role of data science and AI to create value for businesses. This paper would provide an idea about how AI and data science could be used for making businesses more successful.

# 1. Introduction

Throughout history, innovation has always been the main factor of higher living standards. The innovation process may be highly disruptive because it renders traditional technology obsolete. Data science helps to bring together all domain expertise from statistics, mathematics, and programming for creating insights and making sense of the data (Amirullah, Aulia and Arisandy 2020). The demand for data science is quite high and explains how digital data helps to transform businesses and help them in making crucial and sharper decisions. Hence, digital data is ubiquitous for people looking in working as data scientists.

Data science and artificial intelligence are transforming the way people work, live, and entertain themselves in all developing technologies. More advancements in these technologies may help to develop hyper-connectivity and hyper-automation, which will bring in Industry 4.0. This incredible speed by which AI and data science are entering all sectors is forcing the organizations in getting into a race for making their organization more profitable. It is impelling businesses, investigators, entrepreneurs, pioneers, and strategists in using AI and data science in designing new strategies and creating new sources for the business value (Benaben et al. 2019). The quick pace of data science and AI is propelling the strategists in reshaping the business models. It encourages the integration of data science and artificial intelligence (AI) into business processes; however, the repercussions of such adoption need to be considered and remain mostly unknown.

## 1.1 Research Context

Data science has a vital role to play in an organization. Whereas, artificial intelligence needs more application-oriented skills to create value.

## 1.2 Research Problem

Data science analytics improves business intelligence and marketing program initiatives. On the other side, the amount of value extracted from the data is a scary prospect. In this case, artificial intelligence might be useful. This is based on a large amount of data, including projections based on the data (Delacroix 2020). It comprises analytics data from various areas such as CRMS, content management systems, automation platforms, and Google Analytics.

## 1.3 Research Question

This literature review explains why data science is necessary for bringing in businesses. There is a wider range of journals, and authors claim that data science or artificial intelligence in business will benefit in the ability to do extensive analysis. Thus, the research question to be investigated upon is**: How does data science apply with artificial intelligence to create value in businesses?**

## 1.4 Intervention

It has been essential to understand, how the introduction of AI at the business level is making things simpler. Also, it is to be analyzed how it is helping them to expand and grow. Here, the key issue lies in the nature of the predictive model of the solution. For becoming actual AI, a productive model requires learning and development from its various predictions (Chergui, Kechadi and McDonnell 2020). Predictive analytics from data science indicates that machines predicted as per data and prescribed things to be done further.

**Interpretation 1:** Data science has already begun to make a significant influence in the industry, although AI is yet to be fully explored. As a result of interpreting AI's growth, new products are being developed that provide autonomy by dynamically doing various tasks.

**Interpretation 2:** As AI is deployed to bring value to enterprises, data can be examined as per business decisions by interpreting data science.

# 2. Background

AI and data science are the major technologies when this is about the products and processes with the automatic optimization and learning to be used within the industries in the future. AI and data science are the main technologies not in the daily lives of people and have several applications, like voice recognition and facial recognition. Innovation and adaptation are quite essential to organizations (Drobot 2020). The development must lead to sustainable development with the use of new technologies. AI and data science are all rising technologies that might create winners and losers all over the business world. However, in the last couple of years, this situation has dramatically changed, almost all fields employ these technologies. Several factors are responsible for it that includes advancement in computer technology, increase in transparency by code sharing, and a huge number of open-source software. Huge uses of such technologies in all fields that include healthcare, sports, security, agriculture, energy management, automobiles, environmental monitoring, gaming, and finance are changing the way people live, amuse themselves and work (Ebadi et al. 2019). The growth of data science and artificial intelligence (AI) lies at the heart of this improved performance of other technologies. AI and data science have several opportunities that might lead to significant changes in business and the economy as a whole.

Behind every real-world application is an intelligent agent (IA) that reacts to its environment in a cycle of sense, think, and act. This looks at all of the incoming data in order to learn correlations, recognize similarities, find suitable representations, and extract features at several levels. Earlier, the unavailability of efficient hardware and data was hindering the progress of data science and AI. Although, the availability of low-power and low-cost sensors has resulted in the generation of a significant number of data in recent years (Earley 2017). The research of data provider lists is carried out in order to determine the accessibility, diversity, and amount of datasets accessible on the internet.

## 2.1 State-of-the-art of Artificial Intelligence

Despite some setbacks, there is AI due to the development of neural networks with several hidden layers. Such advancement of artificial intelligence is attributed to several major factors, such as tensor processing units and hardware accelerators, and the availability of a huge volume of data. An increase in the popularity of artificial intelligence has led to the expansion in investment in several sectors of artificial intelligence that include production, marketing, development, and research (Fatima et al. 2018). Several organizations are making this technology available commercially in form of application program interfaces (APIs), professional and personal agents, libraries of deep learning, robots, and chatbots. It is enhancing the business valuation that adds new resources and makes the services and products intelligent.

Simultaneously, the AI-driven paradigm shift is enhancing all employees' intuitive, analytical, and mechanical skills, as well as altering all other business contexts. Artificial intelligence may be used in a wider range of fields as a result of increased funding. As a result, it becomes important to investigate the operation of AI systems in a variety of possible sectors within existing businesses (Gibert, Andreu and Castell 2019). Inspections of all market leaders and start-ups using AI systems are also required. Organizational adoption of AI will shape these commercial environments. Society will be aware of the acceptance and development of artificial intelligence in the future if it has a prior understanding of the domains.

## 2.2 Reshaping the process of innovation with data science and AI

AI and data science have reached the place where this could take financial decisions of the real world, chat with the people, work with them, and play games against humans. Behind every application of the real world, there is the intelligent agent or AI system. This interacts with the environment in the repetitive cycle of the sense think and act. This takes in data from the environment, takes the informed decision based upon experience and input data, and performs the action that affects the environment. The IA could be a software agent or machine (Kandasamy, Raji and Arun 2018). This takes data in form of text, sound, images, and videos, and analyzes the data with the use of algorithms of AI. The unprecedented amount of data is fuel for the AI system. The major currency of the business would be the ability in converting the data into artificial intelligence that drives several competitive advantages.

Data unavailability was hindering the progress of artificial intelligence. Although, in the last couple of years, the accessibility of low-power and low-cost sensors has resulted in the generation of a huge volume of data. Data from all sensors such as camera, smoke sensor, a global positioning system (GPS), motion detection sensor, health monitoring sector, and chemical sensor could be processed continuously or could be stored for gaining useful insights by several mechanisms (Khan and Alla 2021). Data from several sensors could be combined using the technique of sensor fusion. Also, there exist several other sources through online directories, surveys, review sites, census databases, actual sales of retail, online communities, and commerce websites from where data could be extracted by using web scraping techniques. All raw data that is obtained from the sources could be used and processed for training the intelligent agent.

The conversion of raw data to the processed data is a time-consuming and expensive task. After training the intelligent agent, this could teach all other agents and also make them much smarter. Data is fuel for machine learning; however, the data might be expensive, rare, slow, or risky. In such cases, the machines could create synthetic experiences or could share experiences for one another for augmenting or replacing data (Lai et al. 2020). Machine teaching would same power and time as for all small changes it would eliminate the need for training the agent from scratch. Such knowledge transfer in agents could increase the deployment and development of intelligent agents at a much quicker rate.

The intelligent agents explore input data for learning correlations, extracting features, detecting similarities, and discovering good representation at several levels. It needs the use of tools of AI and data science such as decision trees, support vector machines, Bayesian algorithms, and deep learning networks (DLN). DLNs are the most used approach in the last couple of years. Few of these DLNs are reported surpassing the human-level accuracy in specific tasks. For the speech data, RNNs and CNNs are preferred (Latif et al. 2020). The hype and success that is generated by the DLNs in the last couple of years have propelled several organizations in launching a huge number of AI-based services and machines. Several organizations invest in AI, collect appropriate data about the customers, services, products, and acquisitions. The data is analyzed for gaining knowledge about the commercial availability of intelligent services and machines. Artificial intelligence and data science have attained efficient growth regarding deployment, innovation, and research. A notable achievement is to surpass human-level accuracy within several tasks through classification, recognition, and games. It offers several opportunities for product innovation and process innovation; however, the issues such as security, privacy, trust, and bias need attention still. These are a few of the issues that are compelling to think about all the negative impacts of AI.

## 2.3 Strategic Objectives of the organizations

The achievements in the field of innovation and research have propelled several existing organizations into becoming AI organizations and also have spawned AI-based start-ups. It has increased also the involvement of the actors in AI-related academic events and research. The actors are adopting several other strategies for business growth in the field of artificial intelligence and data science by recruiting AI talents, acquiring AI start-ups, and investing in more AI organizations (Lu et al. 2019). Such an increase indicates that the corporate organizations aim in growing quicker with the most advanced technologies of data science and AI. The investments made in AI should have played crucial roles in the financial growth of the organizations; however, this wasn't possible in conclusively finding the direct correspondence among the organizations as there could be several factors behind this growth.

As start-up is considered as growth and innovation drivers of the economy, this would help in detection of impact of AI and data science on the business models. The inclination of the start-ups towards such organizations indicates that such industries would create much more opportunities in the future and also provide improved services and products by enabling the automation of several tasks. AI is used maximally in these five industries, such as healthcare, core AI, cybersecurity, sales and marketing, and business intelligence (Manjunath and Hegadi 2018). The adoption of technology of data science and AI has led also to shape the business contexts. There are several business contexts identified that are influenced by data science and AI and this is called the third dimension of the three-dimensional analysis of the overall impact of data science and AI on businesses.

## 2.4 Business Intelligence

The systems of business intelligence (BI) provide predictive, current, and historical views of the business operations, by using data gathered into the data mart or data warehouse and working from the operational data. The software elements support pivot-table analyses, reporting, statistical data mining, and visualization (Mühlroth and Grottke 2020). The applications tackle financial, production, sales, and several other business data sources for purposes that involve business performance management. Data is gathered often about other organizations within the same industry that is known as benchmarking. They are the competitors in the same produced products or domains that are presented or manufactured in the same marketplace. Organizations are currently starting to view that content and data mustn't be considered as separate aspects of the information management; however, must be managed in the integrated approach of the organization. Enterprise information management provides enterprise content management and business intelligence together (Prayogo and Ikhsan 2020). Organizations are increasingly focusing on operational business intelligence, which is currently underserved by suppliers. Business intelligence providers are going for the best. However, there is a new paradigm shift happening, with a focus on self-service business intelligence.

For the crucial business processes, there might be one or many risk atoms; however, the risk atom should reflect the crucial business processes. The self-service business intelligence provides the end-users ability in doing more with the data without having the technical skills. Such solutions are created usually to be easy-to-use and flexible, such that the end-users could analyze the data, make plans and decisions, and forecast on their own. The organizations have taken the approach of making BI an easily integrated application for all other tools of end-users. BI comprises the technologies and strategies that are used by the organization for data analysis of the business information. The technologies of BI provide predictive, current, and historical views of the business operations (Rachmawati, Sihombing and Halim 2020). BI leverages the services and software for transforming data into actionable insights that help to inform the tactical and strategic business decisions of the organizations. Tools of BI analyze and access data sets and also present the analytical findings in the dashboards, graphs, reports, maps, and charts for providing the users with detailed intelligence about the state of that business.

## 2.5 AI-based data science

The increasing use of artificial intelligence (AI) and data-driven technologies in industry and science is having a significant impact on data science as a subject. A wider version of the discipline is proposed in order to represent such a new reality. Data science is a multidisciplinary subject that applies scientific techniques, systems, algorithms, and procedures to extract information and insights from unstructured and structured data (Saiki et al. 2018).

Many AI-driven approaches, like evolutionary computation, deep learning, and machine learning generate the solutions by executing automatically the major steps of the scientific process. For machine learning, the hypothesis could be defined by automatically discover patterns or by labeled data (Sukumar 2015). The hypothesis would be evaluated on the validation data during the machine learning process, and a conclusion made regarding the correctness based on model performance.

Data science based on AI might infer solutions from multidimensional spaces with several variables and a large number of records. The characteristic is beyond the human intelligence's capabilities. Another benefit is that it is capable of collecting undiscovered complex patterns from the supplied data. This is quite difficult for human intelligence for detecting the patterns with several variables and on several different time scales (Yang et al. 2015). Many learning approaches, like reinforcement theory, statistical learning theory, and neural networks, are engines of the perpetual progress in the capabilities of objective intelligence.

# 3. Method

In this literature review research method of analysis that takes use of already acquired data. Existing data may be collected and analyzed to increase the overall efficacy of the study. Data has been collected from different databases such as University Library, Google Scholar and IEEE Explore. Such documents could be made available by the public libraries, data obtained from the filled surveys, and websites (Ampatzoglou et al. 2019). Data is available on the internet and could be downloaded quite easily. The data for this research is based upon tested and tried data is filtered and analyzed previously. This research approach is easy and fast. This aims to gain a wider understanding of the subject matter (Johnston 2017). The research is descriptive and exploratory and is approached from an interpretive perspective. Interpretivism states that the world of business is too complicated and the rich insights would be lost by law-like generalizations.

The research design is of quantitative method that provides particular direction for the procedures in the process of the research (Moore, Thomas and Gephart 2021). The selection of this search strategy is guided by the factors like the amount of the existing knowledge or information on this research question and time available for the research. This is the common approach to the systematic investigation where existing data is used for conducting this research. The research design includes collating, organizing, and analyzing the data for appropriate research conclusions. This research approach includes synthesizing the existing data that could be sourced from textbooks, journals, and the internet (Nuhoğlu Kibar and Akkoyunlu 2018). The secondary research depends on the data that is provided by the primary research. The research is conducted to evaluate and identify the gaps in the existing data before adopting to the primary research for gathering new data that would serve the research.

This research approach includes the assimilation of data from several different sources with the use of several available research materials. Data is collected through the internet. The Internet provides a huge pool of paid and free research resources that could be accessed easily. This method is the first step for the systematic investigation (Sherif 2018). This research method helps to utilize the knowledge to map put the novel direction for this research paper. This research approach depends on the existing data, and extra care is taken for ensuring that authentic data samples are used for this research. This research approach has helped to save much time to focus on other aspects of the research, as the data exists already and could be gathered easily through the internet (Trinh 2018). This process also helps to cut down the costs as there is no need for the collection of data for this research. This approach has helped to identify the gaps that could serve as the basis of more systematic investigation.

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