LAWS GOVERNED ROLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN SUPPLY CHAIN MANAGEMENT

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Abstract

The current investigation used a quantitative research plan as its guide, with the application of AI and ML in the process of supply chain automation serving as the primary focus of the investigation. The primary research interests in this work were supply chain automation trends, the impact that technologies and legal environment brings to machine learning and artificial intelligence and have impact on supply chain results, and the nature of technologies that contribute to supply chain enhancements. In addition, the study also explored the impact that technologies like machine learning and artificial intelligence have on supply chain results. The research study arrive at trustworthy conclusions by using a sample size that was sufficient in size (100 people) and the most appropriate according to the objectives of the study. These individuals were requested to complete an online questionnaire that included both survey questions and demographic questions. Because of this, the study is able to arrive at the conclusion that machine learning is utilized extensively throughout the supply chains of the UAE, whereas artificial intelligence is conspicuously absent from the country. According to the findings, this could be due to the fact that legal environment has an impact and AI is still in its early stages as a technology and still requires significant advancement before it can be useful in the current supply chain setting. In conclusion, the researchers suggest that under the legal boundaries, supply networks make use of technology to augment rather than replace human labor.

Keywords: Artificial intelligence, machine learning, legal environment, supply chain

INTRODUCTION

Access to artificial intelligence is easier now than at any time in the past. In addition, it is now widely adopted to improve company results and operations in a wide range of areas, including retail, healthcare, finance, logistics, transportation management, and many more. Maintaining smoother supply chain has become more complex along with the networked relationships among partners (Yuan and Wang, 2023).

Artificial intelligence (AI) has become a popular word now (Zamani et al., 2022). According to a recent survey conducted by Baryannis et al. (2019), approximately half of all businesses are striving to incorporate automation and solutions based on artificial intelligence. The widespread use of AI and ML may have a huge financial impact on businesses keeping its affordability as secondary factor (Reza and Pantanowitz, 2018). Simply put, with the help of this technology, businesses can break down massive amounts of data into manageable chunks of information that can improve the speed and accuracy of decision-making in the workplace. This technology is currently being used by supply chain managers thanks to its intelligence in tandem with machine learning, its companion technology,

to increase visibility into performance and the effectiveness of processes, which in turn can have a significant impact on the bottom line (Baryannis et al., 2019). Legal issues surrounding AI liability for mistakes made by AI systems are crucial to their deployment (Gupta and Kumari, 2017). Zatarain (2017) advocated that to successfully safeguard and reward human-generated work, the legal system needs to be significantly changed.

Transformation of business with technologies like AI will enable organizations and enterprises to operate more efficiently (Kupriyanovsky et al., 2017). COVID-19 has put a heavy burden on several sectors, particularly supply chains. There is a silver lining, an opportunity for improvement, which this event has brought about. The next-generation technology is bringing the digital transformation which is going to improve efficiency and revenues as well (Manavalan and Jayakrishna, 2019). Companies need to abandon old and inefficient investments and tools in favor of focusing on efficient tools and processes in order to satisfy the demands and expectations of consumers. Supply chain expansion may be slowed and even reversed by using machine learning and AI to solve problems brought on by the epidemic. If implemented properly, these technologies may improve logistics visibility, facilitate the efficient automation of operations, and supply data-driven insights into planning (Pandian, 2019). Just like other promising and growing technologies, machine learning and AI have been overstated or misrepresented as posing unacceptable risks (Pandian, 2019). When deciding whether and when to implement new technologies, logistics companies must act with due diligence and caution according to the legal environment of the country. Particularly highly designed procedures, complicated equipment, and hasty recruitment of data scientists might limit the use of these helpful and formidable technologies. Businesses should instead make an effort to comprehend how early adopters are using these tools successfully.

Aim and Objectives of the Research

Here are some of the research questions that have been addressed in the current study:

1. Where do artificial intelligence and machine learning stand as trends in efficiency within the supply chain?
2. In what ways may these machine learning and artificial intelligence improve supply chain performance within the legal boundaries?
3. How advanced would machine learning and artificial intelligence have to be for achieving maximum outcome of supply chain?

By framing the research inquiry in terms of these questions, the research study has set out to undertake a systematic assessment of the academic literature alongside a bibliometric evaluation of it in order to evaluate the applicability of artificial intelligence and machine learning to the supply chain setting. In particular, a descriptive analysis has been performed to respond to the questions; the results serve as a resource that professionals and academics alike can use to keep tabs on the development of the field and to foresee the potential of machine learning and artificial intelligence in supply chains. There is a lack of comprehensive examinations of artificial intelligence and machine learning application in the literature, particularly with regards to the legal environment support of supply chain process. Therefore, it is appropriate for the study to investigate the phenomena in order to help close the gaps in the current literature.

Significance of the Study

Supply chains require optimization, prediction, forecasting, and monitoring to function effectively in the complex legal and business environments in which they typically operate and to create robust and flexible supply networks. Many artificial intelligence (AI) applications have been created recently for a wide range of fields, including supply chains (Plastino & Purdy, 2018). With the help of this technology, computers can do routine tasks and make intelligent judgments without any human involvement. In order to better manage their supply chains, logistics, and warehouses, companies are turning to machine learning and artificial intelligence. Everyone has a somewhat different idea of what artificial intelligence is, but a narrow definition might include any tool or system that can simulate human intellect using processing power (Plastino & Purdy, 2018). Predictive techniques, made possible by AI, provide rapid assessments and significantly reduce the likelihood of disruptive and dangerous events occurring anywhere along the supply chain. It also allows users to discover

trends in the supply chain, which can be used to simply analyze the operation of a process and identify areas for improvement (Plastino & Purdy, 2018). By facilitating the identification of bottlenecks and opportunities for improvement throughout the supply chain, artificial intelligence provides businesses with an ongoing source of knowledge about where they can make enhancements, how they may improve performance, and what factors impact those variables. Artificial intelligence functions as an innovation in the supply chain with significant potential that has not yet been fully and thoroughly appreciated. Since there is a dearth of information about this technology's potential applications in the supply chain sector, this study will evaluate existing research and provide a fresh point of view on the topic, hopefully serving as a resource for future researchers and practitioners.

Literature Review

Certainly, Herbert A. Simon did not foresee all the changes that would result from his study on design, which he began while still delivering services for the RAND Project (study and Development) in the United States in the years following World War II. Geolocation apps, online shopping suggestions, and even music discovery and streaming services all make use of AI and design to varying degrees. The essay Revisiting Herbert Simon's "Science of Design" claims that Simon's theories provide a foundation for bringing the social sciences together through shared problem-solving frameworks and for establishing design as a scientific discipline. To rephrase what Hartley and Sawaya (2019) mean, scientific design may be investigated as a process that generates a stream of thought for addressing issues in social research and other fields, including the Logistics Sector. However, artificial intelligence (AI) attempts to surpass even our knowledge of human intelligence by building intelligent things that can completely replace humans. It was the thinking machine concept of Turing that inspired the primary definitions of artificial intelligence, which date back to the 1950s and the construction of the first computers (Sharma et al., 2020).

The term "artificial intelligence" (AI) has been around since at least 1956, when it was first defined by John McCarthy as "the science and engineering of producing intelligent machines" in a paper for the "Dartmouth Summer Research Project on Artificial Intelligence" (Toorajipour et al., 2021). Machine learning is a subfield of AI that focuses on creating algorithms that can learn from their own experiences (Hofmann et al., 2019). These algorithms may then be used to analyze data, identify patterns, and anticipate outcomes.

Machine learning is being applied in this space with the primary goal of improving supply chain demand forecasting. Machine learning algorithms, including neural networks, recurrent neural networks, and support vector machines, have been compared to more conventional statistical techniques like moving averages, naive forecasting trends, and linear regression by Gray-Hawkins & Lăzăroiu (2020). It has been determined that machine learning algorithms outperform their human counterparts using data from both a simulated supply chain and the Canadian Foundries. However, they do not outperform classic models in terms of predicting accuracy (Gray-Hawkins & Lăzăroiu, 2020). Reyes, Visich, and Jaska (2020) analyzed statistical models for predicting future demand and found that Triple exponential smoothing using an extended seasonal autoregressive integrated moving average, Holt Winters Extreme gradient boosting, random forest, and the deep learning models of long-term short-term memory and multilayer perceptron are all examples of effective machine learning algorithms.

METHODOLOGY

This research was initiated with the primary goal of determining whether or not artificial intelligence and machine learning may be useful in the logistics sector, and how legal environment affects the process. The research study used a quantitative survey questionnaire to examine the function of AI and ML in the supply chain. When the boundaries between a phenomenon and its real surroundings are unclear, as they often are in quantitative studies, Kothari (2004) argues that researchers should use an empirical method that explores the phenomenon in question using many data sources. It aims mostly to shed light on the phenomena in question. Dodds and Hess (2020) state that the term "quantitative study" refers to the gathering of numerical information that may be utilized to shed light on a phenomenon, event, or experience. In this investigation, a questionnaire served as the

primary means of collecting information, however comments option was also given in the questionnaire. One hundred supply chain professionals having experience of AI and ML were included in the study's sample, all of whom were chosen purposely. After the information was coded, statistical analyses were performed. The large sample size ensures that the study's findings can be independently confirmed.

Results

The researcher has surveyed a total of one hundred people to accomplish the goals and answer the research questions of the current study. Each of these individuals played an essential role in the global supply chain process and contributed valuable insight to the discussion. The electronic survey that was sent out to participants included both demographic questions (there were five total) and more specialized questions (there were fourteen total). Therefore, it is vital to understand the demographics of the participants in order to have a proper understanding of the data provided by the participants. In particular, the participants ranged in age from 28 to 37, as seen in the following graph. This indicated that the majority of respondents were under the age of 30, a demographic that is disproportionately likely to have firsthand contact with and knowledge of today's cutting-edge technology (Dash, et al., 2019).

When asked how they felt about the idea that their company did not integrate machine learning at all, participants gave comments that were diametrically opposed to the finding that more than 70% of organizations have incorporated machine learning fully. This is another evidence that the supply chain was aggressively implementing machine learning and comparable automations. This reflects a global trend towards increased reliance on technology, as well as a general shift in the UAE (Baryannis, Dani, & Antoniou, 2019). Similarly, it is clear that some of the participants demonstrated that their organizations partially incorporated machine learning under the risk of legal consequences, with over 40% demonstrating such an integration and over 30% demonstrating that they did not. Finally, over 10% claimed that machine learning was not implemented in their workplace. The following figure is the illustration.
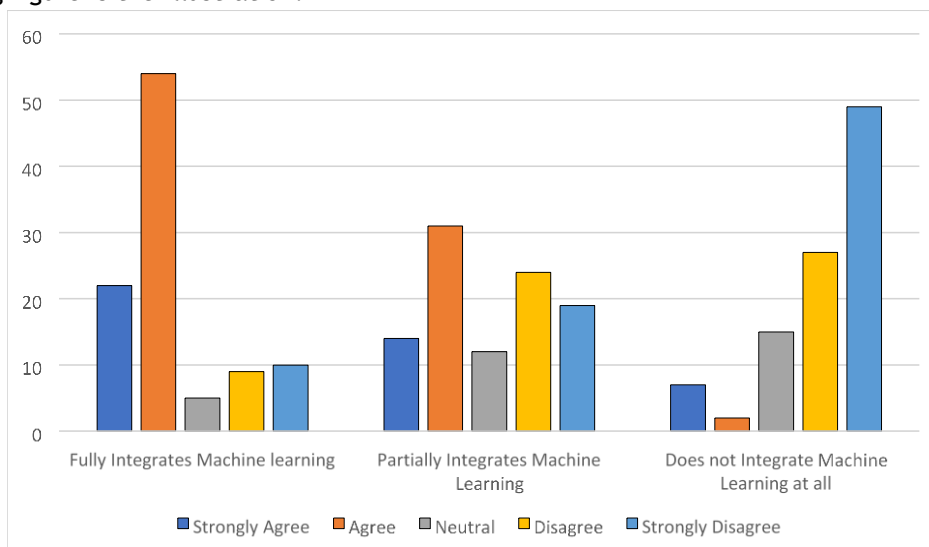

Figure 1 Integration of machine learning

According to the participants' comments, their companies prioritized automating jobs while simultaneously assigning someone to oversee the system to prevent any mistakes. However, the specific reasons why the respondents' companies had done this remained unknown, highlighting the need for more investigation into the topic. Last but not least, we inquired as to whether or not the respondents' employers had primarily used AI and ML technologies to automate tasks like inventory management, as this was alluded to in previous responses and is widely reported to be the case in supply chains. The responders' unanimous agreement supports this conclusion, which is supported by the relevant literature. This exemplifies how automation was primarily utilized to guarantee that unattended, straightforward chores could be mechanized. The primary goal of integrating such

automated technology was to improve the whole supply chain by supporting human workers and allowing them to perform better.

This component of the survey was the penultimate, and its goal was to collect responses from respondents about how they feel automation has improved the efficiency of their supply chain. The first item in this set of questions probed respondents on their opinion on the effectiveness of the supply chain at their respective firms. By voting overwhelmingly in the affirmative, about 70% of respondents indicated that they agreed that their company's supply chain was effective. Not only were these people more likely to work for organizations that had completely adopted automation in their supply networks, but they were also more likely to view the supply chain process as dependent on automation. Staff members were also questioned if they found it difficult to use such cutting-edge technology under the legal environment of UAE. As can be shown below, most people did not agree with this.

Seventy-plus percent of respondents disapproved of the idea that employees had struggled to learn how to utilize these technologies, while only a small percentage agreed. This demonstrated that these technologies were not difficult to use and that supply chain employees were either fluent in their use or capable of quickly picking them up. Then, after adopting these two technologies, the participants were hit with the realization that their supply chains had become more effective. This is where the overwhelming majority of people showed that they all agreed. In particular, approximately 80% of participants claimed this, demonstrating the tremendous improvement in their supply chains brought about by such automation technology. At the end of the study, participants were given the opposite question to gauge whether or not they felt automation technology had made their supply chain less efficient. However, this was not the case since the respondents who had all agreed with the second-to-last question item had all disagreed with the final question.

DISCUSSION

By surveying a wide range of stakeholders in the world's supply chain process and industry within the legal boundaries of the region, the present study employed a quantitative method to evaluate the outcomes and potential uses of automation technologies like AI and ML. Researchers used questionnaires and in-person meetings to collect information from managers, workers, and experts in the field. The results shed light on the level of interest and the possible barriers to applying automation technology in the global supply chain industry. This means that supply chains for most businesses will likely undergo significant transformations during the next few years. In addition, the majority of survey respondents were adult males with years of relevant professional experience, establishing their credibility and demonstrating their expertise. Additionally, the research study discovered that almost all supply chain workers throughout the world consider automation technologies like AI and ML to be risk-free and easy to implement having least risks of legal consequences. In addition, the researchers were able to determine that their findings correspond with those in the literature with respect to the second research question of the study. However the questions of why some firms are becoming more effective with the use of technology and some still lacking behind is still unanswered (Toorajipour et al., 2021). There is a consensus among academic studies that automation technologies improve supply chain management in a variety of ways. The current research backs up the promising outlook on these technologies, demonstrating how they may simplify processes and raise productivity.

Legislators, regulators, and policymakers should also look after the role of providers beyond data protection and intermediary liability, even though the starting point for legality is to address the issues with data protection law and the gap in legal protection for providers (Cobbe and Singh, 2021). The researchers found, in particular, that the supply chain outcomes achieved by these technologies are quite substantial and may considerably increase the efficiency of the businesses in which they are deployed. Technologies that automate such tasks have the potential to considerably benefit businesses by raising both efficiency and productivity. To avoid financial risks, Lei et al., (2023) proposed a risk prevention model using technology at optimum. In addition, rather than replacing humans entirely, these automation technologies complement them to produce more benefits for the

business. The study also found that the most beneficial automation technologies are those that complement human workers to boost both their and the company's productivity, answering the third research question at hand about the extent to which such technologies can lead to such outcomes. The vast majority of respondents relied on ones that could function independently of human oversight but were still subject to quality control checks by human operators. This allowed businesses to make sure that the tools they were using were compatible with their employees and wouldn't cause any risks and problems in the workplace. Both productivity and accuracy improved when businesses adopted this strategy of integrating automation technology with human oversight. The large amount of data dealing with the help of automation and artificial intelligence helps businesses to optimize opportunities and identify problems (Darvazeh et al., 2020). Human personnel monitoring the performance and output of these technologies would allow for the early detection and correction of any problems or faults, boosting the company's productivity as a whole. By including employees in the process of integrating and optimizing these automation technologies, this collaborative approach has also increased trust by minimizing risks and maximizing confidence in the workplace.

CONCLUSION

To evaluate the impact and application of artificial intelligence and machine learning technologies, the present work employed a quantitative methodology, focusing on the analysis of the perspectives and opinions of a large number of people involved in the global supply chain process and industry. The study discovered some noteworthy points of information while researching the topic at hand. In particular, the research study discovered a number of noteworthy tendencies in the global supply chain at the present time. It was discovered, in particular, that artificial intelligence and machine learning has become widespread in the nation's supply chain, especially via the use of machine learning. The anticipated supply chain system will be more likely running on the principles of ML (Narwane et al., 2021). However, there is a major gap in AI capabilities. This means that supply chains will likely undergo a number of shifts at various organizations around the country during the next several years. In addition, the majority of poll respondents were young or middle-aged men with established careers in the field, lending credence to their expertise and knowledge. According to the findings of current research, the vast majority of supply chain workers throughout the world see artificial intelligence and machine learning technologies like AI and ML as risk-free and easy to implement across legal environments. In addition, the authors were able to determine that their findings correspond with those in the literature with respect to the second research question of the study. In particular, it was discovered that the supply chain outcomes achieved by these technologies are quite important and may significantly enhance the efficacy of the firms to which they are applied within the legal boundaries. Artificial intelligence and machine learning solutions like this have the potential to significantly boost business operations and productivity. In addition, rather than displacing humans, these artificial intelligence and machine learning technologies complement them to boost productivity inside an organization. Finally, in regards to the third research question at hand, the level of these technologies that can lead to such outcomes, the study discovered that primarily those artificial intelligence and machine learning technologies are helpful that work alongside human workers and improve their performance as well as that of the company. The majority of respondents relied on machines that could function independently of human oversight but were still subject to quality control checks by human employees. In the coming days, more autonomous databases will be generated utilizing machine learning (Brown, 2021). By doing so, businesses could make sure their employees and the new technology they were implementing were working together smoothly and efficiently. This collaborative approach allowed companies to optimize productivity and achieve better outcomes. Additionally, the integration of artificial intelligence and machine learning technologies with human workers fostered a sense of job security, posing no risks to legal environment and increased job satisfaction among employees, as they were able to focus on more complex tasks that required human skills and creativity.

Recommendations

Based on the results presented here, the study proposes many changes to the supply chain as a whole, as well as to policymakers and those in charge of deploying laws and regulations related to automation technology of this type. First and foremost, individuals working in the supply chain need to make sure that they can effectively integrate these technologies into their operations, both at the level of individual employees and at the level of larger processes like inventory management and evaluation. Taking this step will ensure that workers benefit from new technologies in the most efficient and productive way possible. Both prior research and this study's findings indicate that, without human oversight, such technologies are risky and prone to committing many types of mistakes throughout their procedures. As a result, it is crucial to have a large enough group or a small enough number of people responsible for monitoring these technologies.

To ensure that supply chains are able to adopt these cutting-edge technologies, officials must guarantee that the country has the necessary technical, legal flexibility and infrastructure in place. Government officials can help companies contribute more to the economy and perform better if they allow the development and broad use of such technology by relaxing laws. Finally, it is advised that individuals adopting these technologies guarantee that they can be done in a way that does not require continual supervision, even when replacing human labor. However, those in charge of implementing them must take into account the effect they will have on human employees and the need to monitor the technology itself if they are to be used in conjunction with humans and it does not pose any potential risks while operating under the legal environment of the country. If they did this, their total efficiency and productivity would increase dramatically. Therefore, it is crucial for implementers of machine learning or artificial intelligence to take these considerations into account, as well as estimate the total costs associated with doing so.

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