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Impact of Logistics AI System on Manufacturing Companies in Malaysia

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Abstract:

This research will study the impact of artificial intelligence systems in logistics on the creation of a sustainable market position for a manufacturing company in Malaysia in the context of industry 4.0. This study assesses the impact of artificial intelligence systems in logistics on manufacturing companies on the creation of sustainable market positions. AI unleashes the full power of Big Data in logistics so that logistics firms will be able to make more accurate forecasts and boost their performance with the help of Big Data. To help with strategic decision-making, it may also be utilized for greater predictive analysis and increased automation. Workers in the logistics sector may be replaced by robots. Warehouse operations can be improved using logistics-related artificial intelligence (AI). An increasing number of companies are turning to robots to help them organize, transfer, and monitor inventory. Henceforth, the four factors discussed are warehouse automation, demand prediction, planning and resource management, and real-time route optimization.

Keywords: artificial intelligence, logistics, Big Data.

物流人工智能系统对马来西亚制造企业的影响

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摘要:

这项研究将研究工业 4.0 背景下物流中的人工智能系统对马来西亚一家制造公司创造可持续市场地位的影响。本研究评估了物流中的人工智能系统对制造公司创造可持续市场地位的影响。人工智能充分发挥物流大数据的力量，让物流企业能够借助大数据做出更准确的预测，提升绩效。为了帮助制定战略决策，它还可以用于更好的预测分析和提高自动化程度。物流行业的工人可能会被机器人取代。使用物流相关的人工智能(人工智能)可以改善仓库运营。越来越多的公司开始使用机器人来帮助他们组织、转移和监控库存。今后，讨论的四个因素是仓库自动化、需求预测、规划和资源管理以及实时路线优化。

关键词: 人工智能、物流、大数据。

1. Introduction

Many artificially intelligent systems are used as part of the widely accepted idea of "Industry 4.0." There has been an increase in their significance in recent years. There are a variety of reasons for this, including the ability to increase the manufacturer's product line, more product customization, and improved communication between the firm and the customer (internal or external communication). The Internet of Things, Data Base, Cloud Computing, Block chain, SCADA (Supervisory Control and Data Acquisition), and SMAC are six such systems that are highlighted (Social, Mobile, Analytic, Cloud) (Stanislawski, 2021) The rise of artificial intelligence (AI) in logistics is being fueled by the development of machine learning, processing power, big data analytic, and industry leaders' embrace of the technology. The predictive and vision-recognition capabilities of AI have the potential to increase supply chain efficiency, enabling intelligent work flow automation and bringing innovative consumer experiences to market. In the last several years, AI has risen to the top of the priority list for businesses of all stripes, including the federal government. According to 83% of CEOs in 21 different industrial sectors, the idea of retaining a leading position in AI has become a significant part of political agendas throughout the world. Artificial intelligence (AI) is predicted to produce a third of all logistics value in the next 20 years, according to McKinsey (2023). Goldman Sachs (2022) believes that AI-powered robots, automation, process optimization, and data analytics will reduce costs by 5%. Improved supply chain efficiency and resilience can be achieved with a 5% increase in volume and margins.

One method supply chain specialist is resolving significant difficulties and boosting global operations is via the use of AI. An increasing number of supply chains are turning to AI-enhanced solutions to improve productivity, mitigate the effect of a global workforce shortage, and find better and safer methods to transport products. From the factory floor to the customer's front door, artificial intelligence (AI) applications may be found throughout the supply chain. When it comes to tracking the mechanical health and whereabouts of pricey cars and associated transportation equipment, shipping businesses are turning to the Internet of Things (IoT) for assistance (Crockett, 2023). As a result of the use of AI by customer-facing merchants, they are better

able to forecast future behavior. All of these supply chain procedures might benefit from the application of AI, which can improve, refine, and evaluate the flow of commodities from point A to B. While certain AI-related advantages are more difficult to quantify, others are more obvious to the human eye. In the long run, it may be beneficial to use supply chain data to assess the effect of predictive analytic. However, some organizations have found a clear correlation between revenue changes and the use of AI in supply chains. For leaders who have implemented AI into their supply chains, McKinsey and Company (2023) found that 61% reported lower costs and 51% reported improved revenues. Over a third of those surveyed reported revenue gains of at least 5%.

Modern technologies, such as artificial intelligence, have altered every industry, including logistics (AI). Today's innovations include self-driving cars, warehouse automation, predictive analytic, and smart highways. Currently, more businesses are realizing that machine learning and AI providers can help them increase productivity and delivery. As a result of a lack of an agreed-upon definition, most individuals, even some of the most powerful people in business, lack a thorough understanding of AI. To put it another way, artificial intelligence is a combination of technologies that operate together to enable robots to detect, understand, learn, and behave like humans. Why, therefore, do so many people happen to have a distinct conception of AI. In other words, AI covers a wide range of subjects. Massive data sets combined with quick, repetitive processing and advanced algorithms enable AI software to learn on its own from patterns and characteristics found in the data. It is a laborious process, but the result is an artificial intelligence system that outperforms our own skills by mimicking human traits and talents in a computer (The European Business Review, 2021).

XPO Logistics Inc. asserts that the use of robots in warehouse operations has increased efficiency by as much as six times in certain cases. Increased use of robots will be a corporate priority in 2014. The usage of self-driving automobiles is being encouraged by the usage of artificial intelligence in logistics. Self-driving vehicles are becoming more popular at a dizzying rate. It is possible that AI ability to outperform human drivers is part of the reason for this. Autonomous vehicles are equipped with sensors that work together to build a three-dimensional image of the vehicle

surroundings. This includes traffic signals and rules, recognition of obstacles, and interpretation of roadway signage.

2. Literature Review

2.1. *Effect of Warehouse Automation on Artificial Intelligence Systems in the Logistics*

In warehousing, artificial intelligence is revolutionizing data collection and analysis, as well as inventory management. In terms of forecasting product demand, artificial intelligence is the first tool to be used. The firm then sends in-demand commodities to regional warehouses to save money on transportation expenses. Computer vision is also used in automated warehouses and in a variety of other sectors. Using this technology, it is possible to identify and categorize various items. Computer vision will enable quality control to be controlled without the need for human intervention in the future. Artificial intelligence may also be used to connect several warehouses in a supply chain to determine the most efficient method of transporting items. Artificial intelligence influences a broad variety of warehouse functions, including data collection and inventory management (AI). Businesses will be able to generate more revenue as a result of this development. Artificial intelligence is being used in warehouse automation to estimate demand for certain goods. Orders may be modified as a result of this information, and the most popular items may be sent to the nearest warehouse. Because demand can be forecasted and logistics may be planned months in advance, transportation costs may be minimized to a bare minimum in certain cases. Many repetitive tasks can be automated using warehouse automation technology. Computer vision is the core technology employed in these systems, which can recognize and organize the inventory based on the information obtained from sensors. Another conceivable use for autonomous quality control is in manufacturing. It is also feasible to optimize the transportation of items into and out of warehouses using these technological advancements.

2.2. *Effect of Demand Prediction on Artificial Intelligence Systems in Logistics*

A successful company's ability to foresee future supply needs is critical for success. Your company faces the risk of running out of inventory and losing money if you do not make exact estimates and ensure that there is an adequate supply of things to fulfill strong demand. Nothing could be more detrimental to a company's bottom line than losing customers to competitors as a result of a failure to meet their expectations. With the help of artificial intelligence, you can predict these occurrences in the future. As a result, inventory is decreased, and warehouse management is simplified as a result of the use of artificial intelligence-based technology. It is a key necessity for almost any company to be aware of how many supplies and

commodities it will demand in the future. Consumers who transfer to a competitor's brand because of a lack of inventory suffer as a consequence of a shortage of inventory, which results in lower sales and revenue. Various algorithms developed by artificial intelligence are capable of forecasting future trends. According to Deloitte (2023), computer algorithms are frequently more accurate in forecasting outcomes than human professionals in certain situations. AI now has the capability of monitoring and quantifying every input and variable in a timely and precise manner, hence boosting the accuracy of forecasts and forecasting models. This will result in a decrease in inventory as well as a streamlining of the warehouse management procedure. The application of AI may allow consumers to have a more personalized shopping experience by obtaining suggestions that are tailored to their individual preferences. There are a range of approaches that may be used to incorporate AI into the supply chain and logistics business. It increases the efficiency of the supply chain while simultaneously lowering costs. Its ability to automate routine processes in back-office programs is also a significant component of its performance.

2.3. *Effect of Planning and Resource Management on Artificial Intelligence System in Logistics*

Managing your planning activities and resources is a critical component of making progress in your company's development. Efforts to increase customer satisfaction while also lowering expenses need the use of sound planning. The use of artificial intelligence in the prediction and analysis of prospective outcomes may prove to be a helpful tool. The use of artificial intelligence is also vital since it assists in better resource management, which may enable your organization to save money and become financially self-sufficient. With the help of this technology, supply chain optimization may be carried out in real time.

A growing number of companies are incorporating AI into their management decision-making processes, with AI taking on and supporting managers in speeding up their onerous and repetitive daily responsibilities. Managers can devote their time to more vital activities rather than laborious database and analytical work because of the comprehensive database and analytical help provided by the system (Partridge & Hussain, 1992). According to Accenture's strategic assessment (2022), intelligent systems have the potential to alter the job content of managers in the areas of coordination and governance, problem resolution and collaboration, employee/community strategy, and innovation work. Automating normal yet time-consuming processes may be an advantage for managers who use AI to streamline their operations. Database and analytical support are also accessible, enabling managers to devote their attention to higher-value activities rather than repetitive, time-consuming duties. Companies utilize a variety of human resources policies and management activities to track their employees and manage their workforce.

Human resource strategy development, recruiting and selection of personnel, training and development, performance management, pay administration, employee mobility administration, employee relationship administration, employee safety and health administration are just a few of the most frequently encountered responsibilities. It is possible to raise the economic value of applying artificial intelligence in human resource management by a significant amount. In the next years, artificial intelligence (AI) is projected to play an increasingly important role in human resource management, according to industry experts.

2.4. Effect of Real-Time Route Optimization on Artificial Intelligence System in Logistics

Route optimization is a critical component of transportation planning because it ensures that deliveries are always done on time and at the lowest possible cost and energy consumption while minimizing environmental impact. Consequently, for route optimization to be of any real use, it is vital that each and every one of the many components involved in the process is operational and reliable at all times. There has never been a time when route optimization was simpler or more efficient. Autonomous artificial intelligence software, which continuously collects and learns from data, is constantly researching the most efficient routes for drivers. Take a look at the following diagram to see how it all works. Drivers may submit reports, and ELD devices can track and record the number of hours they have spent on the road. Distribution facilities may be required to record the number of trucks parked at the dock as well as the time taken to load and unload each truck. Artificial intelligence can predict how long it will take to deliver a volume to a docking station based on this information. Artificial intelligence in logistics saves time and money by optimizing delivery routes in real time, which is achieved via machine learning. To distribute items quickly and efficiently without the need for human labor, firms such as Domino and Nuro have started using autonomous delivery systems that use real-time route planning to convey their goods. AI is meant to make freight management more straightforward since it allows for more efficient logistics planning to be achieved. Shipment costs are also lowered, and the delivery time is shortened as a result.

Servers also supply traffic information to the artificial intelligence equipment. Google Maps users who are acquainted with their own particular use cases may notice a number of parallels between these and their own. It is possible to predict when a driver should be on the road using artificial intelligence in a variety of ways. If the truck geo-coordinates are known, it may be utilized to locate its precise location in respect to the route.

Once this information has been acquired, it may be used to identify possible changes to the route that might be implemented. If a driver sets a certain route or set of criteria, the system may alert them when a stop for

refueling, relaxing, eating, or parking is close by, according to the system capabilities. There is no longer a need to search for rest spots, which might waste valuable travel time if done incorrectly. Moreover, these artificial intelligence devices are capable of far more than just monitoring data. As a result, they are always learning from the data and using that information to make more accurate forecasts and plans. Using previous route data, traffic statistics, current traffic alerts, client locations, and even particular driver and vehicle information may be used to estimate the truck path from point A to point B. Transportation routes, both on and off the road, are being enhanced in every aspect through the use of artificial intelligence.

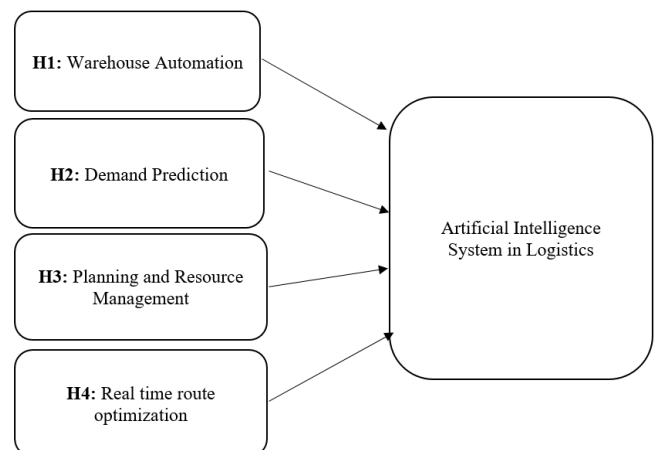


Figure 1. Conceptual framework (Developed by the authors)

3. Research Method

3.1. Research Hypotheses

Following hypotheses are suggested following previous studies on the impact of artificial intelligence system in logistics.

H1: There is a significant relationship between warehouse automation and artificial intelligence systems in logistics.

H2: There is a significant relationship between demand prediction and artificial intelligence systems in logistics.

H3: There is a significant relationship between planning and resource management and artificial intelligence systems in logistics.

H4: There is a significant relationship between real-time route optimization and artificial intelligence systems in logistics.

3.2. Pilot Study

Pilot studies are small-scale pilot investigations that attempt to determine if key components of a larger research, often a randomized controlled trial (RCT), would be viable. Pilot study reporting must be of high quality for readers to appropriately grasp the results and implications.

This pilot study was conducted using 30 questionnaires that contained important fundamental information such as demographic information, dependent factors, and independent variables. The

questionnaire was delivered to 30 targeted respondents, all of whom work in Malaysia, to ensure its reliability and validity. As a result, the acquired data will be evaluated using the SPSS reliability test.

3.3. Sampling Method

To gather samples, sampling procedures select certain individuals or groups from the population. The sampling approach was divided into two parts: probability sampling and non-probability sampling. The sample method selected will be a probability-based random sampling method. A probability-based random sampling approach ensures that all persons and the sample have an equal opportunity to participate in the research. There are several advantages to going this way. The first advantage is that it makes sampling easier and reduces the number of viruses that are predicted to affect the sampling selection process. At the same time, by offering each participant an equal opportunity to participate in the study, the sampling approach is believed to be more efficient and eliminates concerns such as selection bias.

4. Results and Discussion

4.1. Reliability Test

Table 1 shows that the Cronbach's alpha value for the artificial intelligence system in logistics is 0.793, making 0.755 for warehouse automation, 0.710 for demand prediction, and 0.777 for real-time route optimization. Although Cronbach's alpha value for planning and resource management (0.687) does not exceed 0.7, this value is still close to 0.7. Hence, it is concluded that the dependent and independent variables passed the reliability test, which is nearly and exceeded 0.7. In short, this scale indicates an acceptable level of reliability, and it is appropriate to move on to the main study.

Table 1 Reliability test for each variable (Developed by the authors)

Variables	Type	Cronbach's alpha	N of items
AI system in logistics	DV	0.793	5
Warehouse automation	IV1	0.755	5
Demand prediction	IV2	0.710	5
Planning and resource management	IV3	0.687	5
Real-time route optimization	IV4	0.777	5

4.2. Histogram

Histogram can determine the normal distribution based on the data collected from the targeted respondents. The result of the histogram in Figure 2 was derived from 200 sets from the respondents in this study.

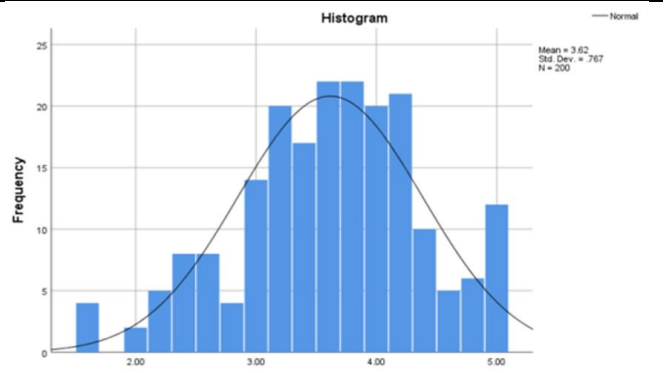


Figure 2. Histogram for the work productivity (Developed by the authors)

4.3. Normal Q-Q Plots

Normal Q-Q plots are used to describe the normal distribution of the data collected from the respondents. The data will be considered as a normal distribution if a point falls on the linear line.

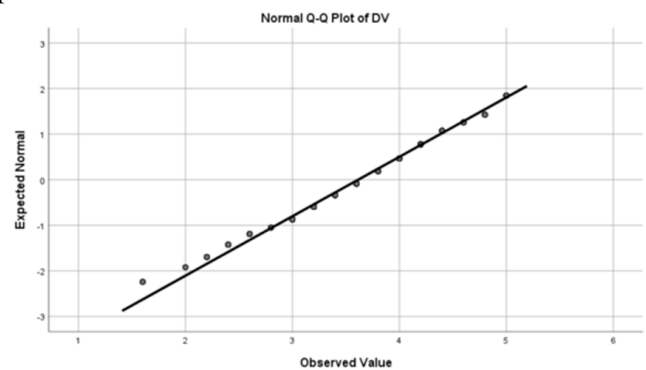


Figure 3. Q-Q plot of budgeting practices (Developed by the authors)

According to this plot, the assembly point of the dependent variable was linear. Hence, it can be concluded that the collected data were normally distributed.

4.4. Descriptive Analysis

Descriptive analysis describes the respondents' demographic information. A total of 50 respondents will be analyzed and distributed who are staying in Malaysia. Demographic information by 200 respondents was stated as follows.

Table 2 Descriptive statistics (Developed by the authors)

Descriptives		Statistic	Std. Error
DV	Mean	3.6160	.05423
	95% Confidence Interval for Mean	Lower Bound 3.5091	
		Upper Bound 3.7229	
	5% Trimmed Mean	3.6333	
	Median	3.6000	
	Variance	.588	
	Std. Deviation	.76700	
	Minimum	1.60	
	Maximum	5.00	
	Range	3.40	
	Interquartile Range	1.00	
	Skewness	-.320	.172
	Kurtosis	-.091	.342

Table 2 shows the results of the descriptive analysis of 200 respondents. Standard deviation and mean were

calculated based on 200 respondents for each demographic variable. The lowest standard deviation value is considered the most accurate demographic information compared with other demographic variables.

5. Conclusion

Due to the linked and globalized context in which we live, current supply chains are very complex and quick. Human error must be minimized and process efficiency must be increased at this pace, which is why AI has gained traction in this industry in recent years. The supply chain may benefit from AI in a number of ways, including data mining, supply and demand forecasting, self-driving cars, and warehouse management. When it comes to logistics and supply chains, the following are some of the advantages:

- Operating expenses are reduced. Using AI to automate logistics and supply chain tasks can save a significant amount of money. By implementing automated, intelligent processes throughout all areas of the business, including customer service and storage, businesses can reduce the frequency and expense of mistakes and mishaps in the workplace.

- Transit time is decreased. As these technologies reduce workloads and remove various bottlenecks that delay work across all processes inside your firm, you may increase delivery times to your clients thanks to AI. In addition, many of these AI-integrated systems can determine the quickest, most cost-effective, and safest method to move this cargo and optimize the logistics and supply chain operations further still.

- Routing efficiency and delivery logistics are optimized. AI-driven route optimization platforms and GPS tools powered by AI create the most efficient routes from all the possibilities, a task untenable with conventional approaches, which have been inadequate for fully analyzing the numerous route possibilities.

- The workplace safety is increased. It is possible to increase worker and material safety using automated AI-based technologies in the warehouse management process. Data on workplace safety may be analyzed by AI, which can then alert producers to any possible dangers. This enables manufacturers to respond quickly and decisively to maintain safe warehouses and compliance with safety regulations.

6. Limitations and Future Research

This study had some limitations. First, the limited number of targeted respondents throughout the research process. Therefore, it would be more appropriate to increase the number of respondents to conduct the questionnaire process throughout this study; this might result in a higher possibility of the respondents may not be able to comprehend the content in the questionnaire and failing to provide the expected result. As a result, the findings in this study may not reflect performance in terms of reliability and completeness, hence this study result unable to be strongly generalized.

Additionally, in future this study should have extended to other additional variables and wider scope covering more than the four independent variables: warehouse automation, demand prediction, planning and resource management, and real-time route optimization. Thus, other factors besides these independent variables that may affect the Artificial Intelligence System in Logistic are not included in this study.

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