Siber Journal of Advanced Multidisciplinary (SJAM)
E-ISSN: 2987-1069
P-ISSN: 2987-1018
+62 811 7404 445 https://research.e-siber.org siberpublisher.info@gmail.com
DOI: https://doi.org/10.38035/sjam.v3i3

Implementation of the Internet of Things (IoT) in Goods Tracking Systems at Freight Forwarding Companies

Muhammad Zulfikar[1], Muhammad Tohir[2]
[1]Institut Transportasi dan Logistik Jakarta, Indonesia, fikang81@gmail.com
[2]Institut Transportasi dan Logistik Jakarta, Indonesia, muhammad.tohir68@yahoo.com

Corresponding Author: fikang81@gmail.com[1]

Abstract: This study aims to evaluate the implementation of the Internet of Things (IoT) in a freight tracking system at a freight forwarding company. By connecting various physical devices such as sensors and GPS, IoT provides great potential to improve efficiency and visibility in the supply chain. The research method used is a qualitative method with a literature review. This research analyses the concrete benefits of implementing IoT, including improved tracking accuracy, route optimisation, and reduced delivery time. The results show that IoT can be an effective solution to overcome challenges in the modern logistics industry.

Keyword: Tracking system, delivery time, customer satisfaction

INTRODUCTION

The logistics industry is currently undergoing rapid digital transformation. One of the technologies driving this change is the Internet of Things (IoT). IoT enables the connection of various physical devices, from sensors to vehicles, allowing for real-time data monitoring and control. The use of the Internet of Things has great potential to improve efficiency, transparency, and service quality in the context of land freight transportation. Logistics is also related to freight forwarders. Freight forwarders offer a wide range of services for export and import operations, such as managing transportation and storage at the manufacturer's warehouse, managing customs approvals in the country of origin, and caring for and taking responsibility for goods to be loaded onto ships until they are unloaded. (Erisa et al., 2023).

freight forwarder is a company responsible for all procedures required for the shipment and receipt of goods by land, sea, or air. These procedures include receiving, storing, packing, weighing, handling, completing and issuing transport documents, calculating transport costs, claims, insurance, settling invoices, and other costs related to shipping goods to their destination (Ayu et al., 2020). Freight forwarding companies also act as intermediaries between shippers and recipients in the process of shipping goods between countries or cities on a large scale. They are responsible for managing the entire shipping process, from picking up goods at the shipper's warehouse to delivering them to the recipient's warehouse.

The goal of the integrated system known as the Internet of Things (IoT) is to increase the benefits of continuous internet connectivity. Capabilities such as data sharing, remote

control, and so on also apply to real-world objects such as foodstuffs, electronics, and equipment connected to sensors and networks. (Susanto et al., 2022) Currently, the logistics and transportation industries continue to compete to provide services that focus on safety and accuracy. Therefore, businesses are in dire need of precise data. (Gita Anggaraini, 2017)

The ever-evolving digital era certainly makes it easier for today's businesses to support all their activities. This is especially true for tracking systems. Companies also need to adopt and implement effective systems to achieve efficient results. One such application is the use of the Internet of Things (IoT) system. By utilizing IoT, companies and shippers can implement a vehicle tracking system that helps them understand the location of their goods in real time. By connecting various devices and collecting data in real time, IoT enables freight forwarding companies to gain better visibility into the entire supply chain. Through close collaboration, IoT can help optimize delivery routes, monitor the condition of goods, and improve customer satisfaction. This study aims to further examine the potential for collaboration between IoT and freight forwarding, as well as identify related challenges and opportunities.

Vehicle tracking systems typically use GPS devices to locate vehicles and are installed in vehicles so that they can be tracked by the owner or other individuals. (Rahman et al., 2019) By using GPS to determine the location of a vehicle, you can definitely find out the location of the goods inside it. The latest technology, GPS Tracker, functions as a tool to determine the position of GPS using latitude and longitude coordinates. This allows users to see the environment in which the object is moving. (Atthari, 2017)

The Global Positioning System (GPS) is like a sophisticated compass that can show your location anywhere in the world. Think of GPS as an eye that constantly monitors your movements. In the world of transportation and logistics, GPS is used to track the location of vehicles such as trucks, ships, and planes. GPS allows businesses to know the location of their vehicles in real time, so they can plan more efficient delivery routes and ensure that goods arrive at their destination safely and on time.

GPS application can also be implemented using the concept of the Internet of Things (IoT), taking advantage of advances in Internet connectivity. IoT-based GPS tracking software uses GPS and Internet of Things (IoT) technology to track the location of objects and people in real time. Data collected by GPS sensors is sent to a central server for processing.

One example is the Intellitrac GPS Tracker. By utilizing IoT technology, this device can track and monitor vehicles in real time. This is very useful for various industries such as logistics, retail, and mining. Imagine what would happen if Intellitrac enabled logistics companies to monitor daily deliveries more efficiently. Additional features such as fuel sensors, door sensors, and emergency call buttons make Intellitrac even more complete in meeting business needs.

The Intellitrac GPS tracker is an example of the application of IoT technology in vehicle tracking. It is a tool that allows you to monitor the location of vehicles directly using the Internet. This is very useful for the logistics industry, which prioritizes the timely delivery of goods. In addition, Intellitrac is also equipped with a series of sensors that provide comprehensive monitoring of vehicle health, from fuel consumption to activities inside the car. Accurate and real-time data allows companies to optimize fleet utilization and increase productivity.

The main objective of this journal is to make a new contribution to the field of logistics and information technology. In other words, the purpose of this journal is to increase knowledge about how IoT technology can be effectively utilized to improve the efficiency and effectiveness of goods tracking processes in transportation companies. In addition, it is also to explore the transformative potential of Internet of Things (IoT) technology to revolutionize the freight transportation industry. This study focuses on the collaboration

between IoT and GPS-based tracking systems, which aims to demonstrate how this technology can improve efficiency, transparency, and security in the supply chain. By providing an in-depth analysis of the benefits and challenges of IoT implementation, this journal aims to provide a more comprehensive understanding of the potential of IoT in optimizing delivery routes, monitoring product status in real time, and improving customer satisfaction. It is stated that in addition, this journal also presents concrete examples of IoT applications in the freight transportation industry to encourage wider use of the technology. Overall, the main objective of this journal is to contribute to the development of innovative solutions in an increasingly complex and competitive logistics industry.

METHOD

The type of research conducted uses qualitative methods and literature review. Qualitative research methods are designed to explore deeper meaning and understanding of a phenomenon or event. Quantitative research is systematic scientific research on these parts. Quantitative research is a systematic study that collects data that can be measured using several techniques, namely statistics, mathematics, or computation. However, most quantitative research is conducted using statistical methods, involving the use of mathematical frameworks and relevant theories. (Ph.D. Ummul Aiman et al., 2022)

In qualitative research, the "events" discovered during fieldwork determine conceptualization, categorization, and description. As a result, data collection and analysis cannot be separated. A literature review collects, evaluates, and summarizes information from various types of literature, including books, journals, articles, and research reports. The main purpose of a literature review is to build a strong theoretical foundation, find differences between previous studies, and create a relevant research framework. (Rijali, 2019)

In addition, a literature study is a collection of research on how to collect library data or research in which the subject is explored through various library sources, such as books, encyclopedias, scientific journals, newspapers, magazines, and documents. It is a literature review. However, a literature study is a type of research in which the author collects various books and magazines on the topic and purpose of the research. This methodology also discusses the type of research, population or sample, time and location of research, instruments, research procedures and techniques, and other matters related to research. It is possible to divide this section into several subsections.

The selection of qualitative methods in researching the implementation of IoT in freight forwarding companies allows for an in-depth exploration of the experiences, perceptions, and challenges faced by the actors in these companies. Literature studies play an important role as a theoretical basis and help identify research gaps. By combining these two methods, researchers can obtain rich and relevant data, thereby providing better recommendations for improving the efficiency and effectiveness of IoT-based goods tracking systems.

RESULT AND DISCUSSION

All processes involved in shipping goods from origin to final destination are managed by freight forwarding services. Freight forwarders are companies that offer these services. They act as intermediaries between shippers and various other parties involved in shipping, such as airlines, shipping companies, and land transportation companies. These organizations are responsible for all actions necessary for the shipment and receipt of goods by land, sea, or air, including receipt, storage, packing, measurement, weighing, and other costs associated with shipping goods until they are received by the rightful recipient. (Tohir & Ataupah, 2023)

Research shows that advanced technologies such as the Internet of Things (IoT), artificial intelligence, and blockchain have significantly changed the freight forwarding business. (Tohir et al., 2023) The introduction of the Internet of Things (IoT) into the goods tracking systems of land transport operators has revolutionized the logistics industry. IoT

enables companies to track goods in real time using GPS (Global Positioning System) and sensors, improving supply chain visibility. In addition, IoT also enables route optimization, improved safety, and increased operational efficiency. Examples of its application include placing sensors on containers to monitor the condition of goods, placing GPS trackers on vehicles to determine their location, and using RFID to track shipments. Despite challenges such as cost and data security, the benefits of IoT in logistics far outweigh them.

In short, IoT has changed the way goods are shipped. More accurate and real-time data enables logistics companies to better serve their customers, reduce operational costs, and become more competitive.

The Internet of Things (IoT) has revolutionized the shipping industry. By connecting various devices such as sensors and GPS, IoT enables shipping companies to track shipments in real time, from the moment the goods are picked up until they arrive at their destination. This allows businesses to provide more accurate information to customers, optimize shipping routes, and ensure the safety of goods during transport.

Companies can use sensors installed on containers to monitor product conditions such as temperature and humidity in order to maintain the quality of sensitive goods such as food and medicine. The data collected by these sensors is processed to analyze performance and identify areas for improvement. In addition, geofencing technology can help businesses accurately track the location of goods and ensure that they do not deviate from their designated routes. Geofencing technology uses GPS (Global Positioning System) to create a virtual "fence" around a specific geographical area. This virtual boundary is called a geofence. It works by first determining the geographical area to be monitored, such as an office, warehouse, or operational area. Using software or an application that supports geofencing features, a virtual boundary is then created around that area. The system monitors the movement of GPS-enabled devices, such as smartphones or vehicles. The system can be programmed to perform various actions when a device enters or exits a geofence area. For example, the system can send notifications or alerts, activate or deactivate certain features on the device, or record location and time data.

By tracking the location of goods, we can estimate their arrival time, which impacts service quality. Good service can satisfy customers, which in turn improves service quality ratings. Service is considered low quality and unsatisfactory if it meets or exceeds customer expectations. Conversely, service is considered high quality and satisfactory if it meets or exceeds customer expectations. Therefore, if the system does not work as expected, users will be dissatisfied. (Manurung et al., 2024)

Automation is also one of the main benefits of adopting IoT in the shipping industry. Automatic data collection and real-time shipment tracking reduce human error and improve operational efficiency. Data obtained from various sources can certainly be used to estimate demand, optimize vehicle capacity, and plan better delivery routes. Overall, IoT contributes significantly to improving efficiency, transparency, and safety in the shipping industry. As IoT technology advances, the industry will continue to transform to better serve customers. The shipping industry has undergone major changes as a result of the implementation of the Internet of Things (IoT). IoT can collect data in real-time and automatically by connecting various devices and sensors on ships. This data can then be analyzed to improve operational efficiency, such as inventory management, equipment maintenance, and shipping route optimization. In addition, the Internet of Things improves travel safety by detecting potential threats early and monitoring conditions consistently.

The IoT's ability to improve supply chain transparency is its main advantage. Customers can monitor the status of their goods with real-time shipment tracking, which increases customer satisfaction and trust in shipping companies. Furthermore, better planning—such as forecasting market demand and optimizing ship capacity—can be achieved with IoT data. While implementing IoT in the shipping industry has many

advantages, there are also several issues. Some of these include high investment costs in hardware and software, as well as the need for employees with adequate technical skills. Since IoT data is highly sensitive, data security is crucial.

IoT and GPS systems have revolutionized the way assets are tracked and managed. By combining IoT devices equipped with GPS sensors, accurate location data can be obtained in real-time. This data is analyzed by the system to provide valuable information such as the fastest route, asset status, and estimated time of arrival. This enables shipment route optimization, increased operational efficiency, and cost reduction. Additionally, greater transparency in asset tracking leads to increased customer satisfaction.

Amidst the industrial revolution and the advancement of today's technology systems, the need for delivery services is very high. Many people, both businesses and individuals, use courier services to send small and large items. This has led to rapid development in the field of shipping. (Studi et al., 2022)

The application of IoT in freight forwarding has brought significant changes to the logistics industry. By utilizing this technology, companies can improve efficiency, reduce costs, and provide better services to customers. As technology continues to develop, we can expect new innovations that further integrate IoT into the supply chain.

It is clear that the integration of IoT and GPS in the freight forwarding industry has brought about significant transformation. Through GPS-based real-time tracking, companies can accurately monitor the movement of vehicles and goods, enabling route optimization and increased efficiency. IoT sensors installed on containers or vehicles allow for monitoring of the condition of goods during shipment, ensuring that they arrive at their destination in good condition. Additionally, this combination of technologies also enhances shipment security with features such as theft detection and monitoring of dangerous areas. With better visibility and richer data, companies can make better business decisions, increase customer satisfaction, and build a more resilient supply chain.

The Internet of Things (IoT) has proven to be a highly effective solution to overcome various challenges faced by the modern logistics industry. IoT enables the connection of multiple devices and real-time data reception, allowing logistics companies to improve supply chain visibility, optimize delivery routes, and increase operational efficiency. In addition, IoT will also play an important role in improving customer service quality, delivery security, and inventory management. However, the implementation of IoT also comes with several challenges, including cybersecurity, investment costs, and a lack of standardization. Nevertheless, with careful planning and the right strategy, the benefits of implementing IoT in logistics far outweigh the risks.

Implementing an IoT system with GPS in freight forwarding companies offers many advantages, but also carries a number of risks. Cybersecurity is a major concern, where the risk of hacking, malware, and data leaks can threaten the integrity of a company's data and operations. Dependence on technology is also a risk factor, given that network disruptions or device malfunctions can interfere with tracking and delivery of goods. In addition, high implementation costs and technological limitations such as GPS accuracy also need to be considered. To minimize these risks, companies need to implement comprehensive security measures, such as data encryption, strong authentication, and regular system monitoring.

According to research, if freight forwarding companies do not invest in IoT technology, they risk falling far behind their competitors. Without IoT, it is difficult for companies to provide real-time tracking services, optimize delivery routes, and accurately monitor the condition of goods. This will result in low operational efficiency, poor service quality, and difficulties in managing the supply chain. In addition, companies will also face higher security risks and difficulties in adapting to rapid changes in the logistics industry. In short, IoT has become the key to success in the modern freight forwarding industry, and companies

that do not take advantage of this technology will miss out on opportunities for growth and development.

Mitigating the risks of implementing an IoT system with GPS in a freight forwarding company requires a multi-layered approach. In addition to technical aspects such as data encryption, strong authentication, and software updates, it is also important to build a strong cybersecurity culture within your organization. This includes employee training, raising awareness of risks, and developing clear incident response procedures. Furthermore, businesses need to consider the financial aspect by conducting a careful ROI analysis and choosing technology that fits their budget. Dependence on technology can be mitigated through system redundancy, data backup, and contingency plans. Return on Investment (ROI) analysis is a calculation technique used to determine the rate of profit or loss from an investment. ROI is expressed as a percentage and indicates the amount of profit generated from each unit of investment spent. By combining technical measures, risk management, and employee engagement, companies can maximize the benefits of IoT systems while minimizing related risks, improving operational efficiency, and data security.

CONCLUSION

Text analysis of the application of IoT in the freight forwarding industry shows that this technology has brought significant changes in the management of goods delivery. By connecting various devices such as sensors and GPS, IoT enables shipping companies to track shipments in real-time, optimize routes, and improve the security of goods. In addition, IoT also enables the automation of various processes, thereby increasing efficiency and reducing human error.

The potential for further development of this topic is vast. For example, we can conduct more in-depth case studies to see the concrete impact of IoT on company performance. In addition, we can also discuss the challenges faced in implementing IoT, such as data security and costs. An interesting future trend to watch is the integration of IoT with other technologies such as artificial intelligence and blockchain. This combination of technologies has the potential to create a smarter, more efficient, and more transparent supply chain. The integration of the Internet of Things (IoT) and the Global Positioning System (GPS) has brought about major changes in the freight transportation industry. This technology enables companies to improve operational efficiency, delivery security, and supply chain visibility by tracking and monitoring the status of goods in real-time. With accurate and up-to-date data, businesses can optimize delivery routes, reduce waiting times, and ensure that goods arrive at their destination in good condition. However, the implementation of IoT and GPS also brings challenges such as cybersecurity, investment costs, and technology dependence. But with careful planning and the right strategy, the benefits far outweigh the risks. The combination of IoT and GPS has great potential to enhance the competitiveness of freight forwarding companies in the face of increasingly fierce competition.

REFERENCES

Atthari, A. (2017). Sistem Tracking Position Berdasarkan Titik Koordinat GPS Menggunakan Smartphone. *Jurnal Infomedia*, *2*(1), 25–29. https://doi.org/10.30811/.v2i1.464

Erisa, Sugiarto, O. M., Tanaya, O., Kartikasari, C. Y., Djoemadi, F. R., & Sugiarto, O. M. (2023). Implementasi Business Model Canvas pada Perusahaan Jasa Freight Forwarding (Studi Kasus : PT X). *Innovative: Journal Of Social Science Research*, *3*(5), 1521–1536.

Gita Anggaraini. (2017). Manfaat INTERNET OF THINGS. *Manfaat Internet of Things Dan Potensinya Dalam Sektor Logistik Dan Transportasi*, 1–4.

Laut, T., Deros, P. T., & Prima, I. (2020). *Analisis Peranan Freight Forwarder Dalam*

Proses Pengiriman Barang Ekspor Melalui.

Manurung, M., Rahmah, H., Aziezah, N., Irmansyah, & Widodo, B. (2024). Effect of The Effectiveness of Iot-Based Forest Fire System in Detecting Forest Fires on User Satisfaction. *Jurnal Sintak*, *2*(2), 43–49. https://doi.org/10.62375/jsintak.v2i2.211

Ph.D. Ummul Aiman, S. P. D. K. A. S. H. M. A. Ciq. M. J. M. P., Suryadin Hasda, M. P. Z. F., M.Kes. Masita, M. P. I. N. T. S. K., & M.Pd. Meilida Eka Sari, M. P. M. K. N. A. (2022). Metodologi Penelitian Kuantitatif. In *Yayasan Penerbit Muhammad Zaini*.

Rahman, A. C., Arimbawa, I. W. A., & Jatmika, A. H. (2019). IMPLEMENTASI INTERNET OF THINGS PADA SISTEM INFORMASI PELACAKAN KENDARAAN BERMOTOR MENGGUNAKAN GPS BERBASIS WEB (Implementation of Internet of Things on Web-Based Motor Vehicle Tracking Information System Using GPS). *Jtika*, *1*(1), 121–130.

Rijali, A. (2019). Analisis Data Kualitatif. *Alhadharah: Jurnal Ilmu Dakwah*, *17*(33), 81. https://doi.org/10.18592/alhadharah.v17i33.2374

Studi, W., Pt, K., & Logistic, A. (2022). *1) , 2)*. *7*(2), 56–62.

Susanto, F., Prasiani, N. K., & Darmawan, P. (2022). Implementasi Internet of Things Dalam Kehidupan Sehari-Hari. *Jurnal Imagine*, *2*(1), 35–40. https://doi.org/10.35886/imagine.v2i1.329

Tohir, M., & Ataupah, A. G. (2023). Analisis Efesiensi Operasional, Intergrasi Teknologi dan Kualitas Layanan terhadap Kinerja Perusahaan Freight Forwarding Multimoda. *Jurnal Humaniora, Ekonomi Syariah Dan Muamalah*, *1*(4), 215–221.

Tohir, M., Primadi, A., & Djadjuli, K. H. (2023). *Dampak Inovasi Logistik, Kolaborasi Antar Moda, dan Regulasi Pemerintah Terhadap Daya Saing Perusahaan Freight Forwarding*. *1*(2), 82–96.