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The Influence of Human Resources Competence, Utilization of Digital Tracking, and Road Infrastructure Conditions on Cargo Delivery Timeliness

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Abstract: On-time cargo delivery is a key indicator of service quality in the rapidly growing logistics industry. This study aims to analyze the influence of human resource (HR) competency, the use of digital tracking, and road infrastructure conditions on on-time cargo delivery. The method used was a literature review based on a Systematic Literature Review (SLR), examining various scientific literature related to logistics, supply chain management, and digital technology. The study results indicate that HR competency, including technical skills, team coordination, technology adaptation, and workload management, significantly improves on-time delivery. The use of digital tracking allows for real-time monitoring of fleet and cargo status, thus minimizing delays. Good road infrastructure, including surface conditions, capacity, and smooth traffic flow, also directly impacts delivery efficiency. Based on the literature synthesis, these three factors positively influence on on-time cargo delivery. This study formulates a hypothesis for further study: HR competency, digital tracking, and road infrastructure conditions each positively influence on on-time cargo delivery. These findings provide a conceptual basis for more effective operational strategies to improve logistics performance and customer satisfaction.

Keyword: HR Competence, Digital Tracking, Road Infrastructure, Cargo Delivery Timeliness

INTRODUCTION

Background of the problem

The development of the logistics industry currently shows a very significant increase along with the increasing domestic and international trade activities, the rapid growth of the *e-commerce* sector, and increased mobility of goods distribution between regions. Logistics is no longer viewed merely as a supporting activity, but has become a strategic part of the supply chain, determining the speed and accuracy of goods movement from producers to consumers (Zega et al., 2025). In this context, the timeliness of cargo delivery is a key indicator of logistics service quality because it is directly related to customer satisfaction, operational efficiency, and company competitiveness amidst increasingly fierce industrial competition. Delayed deliveries not only result in financial losses, such as fines and increased operational costs, but also have the potential to damage a company's reputation and reduce customer trust in the long term.

The timeliness of cargo delivery is influenced by various interacting factors, both internal and external. A crucial internal factor is the competence of the human resources (HR) involved in the entire logistics process. Qualified HR requires not only technical skills in operating logistics systems, but also analytical, communication, and rapid and accurate decision-making skills (Hidayatullah, 2018). In practice, HR plays a role in planning delivery routes, managing administrative documents, coordinating with transportation partners, and handling operational constraints in the field. When HR possesses adequate competence, the potential for operational errors can be minimized, and the delivery process can run more efficiently and on time.

Along with advances in information technology, the use of digital technology has become another important factor in determining the success of cargo delivery. One technology widely adopted by logistics companies is the digital tracking system, a technology-based monitoring system that allows companies to track the position of goods in real-time (Agdtia Ambystisela, 2024). Through digital tracking, companies can monitor cargo movement, identify potential delays early, and take corrective action quickly. Furthermore, this technology also increases service transparency for customers because delivery status information can be accessed directly (Renaldi et al., 2023). Thus, the use of digital tracking not only improves operational efficiency but also strengthens customer trust in the logistics services provided.

On the other hand, external factors such as road infrastructure conditions significantly influence the smoothness of cargo delivery processes. Adequate road infrastructure, such as good quality roads, adequate capacity, and low congestion levels, will facilitate the distribution of goods and reduce the risk of delays (Iskhaq Al-Farizi, 2025). Conversely, damaged, narrow, or frequently congested roads can hinder distribution flows, increase travel times, and increase operational costs. Although logistics companies have limited control over infrastructure conditions, this factor remains a crucial variable that must be considered in delivery planning. Therefore, this study comprehensively examines how human resource competency, the use of digital tracking, and road infrastructure conditions collectively influence the timeliness of cargo delivery in an effort to provide a more comprehensive picture of the determinants of logistics performance.

METHOD

This research uses a *literature review*-based article writing method with a *(Library Research)* and *Systematic Literature Review* (SLR) approach. This method was chosen to gain a comprehensive understanding of the influence of human resource (HR) competency, the use of digital tracking, and road infrastructure conditions on the punctuality of cargo delivery based on the results of relevant previous research. The literature review was conducted by exploring and collecting various sources of scientific literature, including national and international journal articles, reference books, proceedings, and research reports related to the fields of logistics and supply chain management. The obtained literature was then analyzed to identify concepts, theories, and empirical findings related to the research variables.

In addition to the literature review, this research also employed a *Systematic Literature Review* (SLR) approach, conducted systematically, structured, and transparently. The SLR process began with the formulation of research questions, followed by a literature search through various scientific databases such as Google Scholar, Scopus, ScienceDirect, and Garuda using keywords relevant to the research topic. The literature found was then selected based on inclusion and exclusion criteria, namely topic suitability, methodological quality, and the relevance of the findings to the research objectives. The selected articles were then evaluated and synthesized descriptively and qualitatively to identify patterns of relationships between variables, research gaps, and trends in existing research findings. The results of this synthesis served as the basis for discussion and drawing conclusions regarding factors influencing the timeliness of cargo delivery.

RESULT AND DISCUSSION

Result

Based on the background, objectives and methods, the results of this article are as follows:

Human resource (HR) competence reflects the workforce's ability to carry out tasks effectively through mastery of knowledge, skills, and professional attitudes. In the logistics industry, the quality of HR is a key factor in determining operational smoothness, as the entire delivery process—from route planning to field implementation—is highly dependent on the skills of the individuals involved. Competent HR is able to respond to obstacles quickly and appropriately, thereby minimizing the risk of delivery delays (Marselina, 2024). Effective HR management includes a balance between workforce size and work volume, adaptive HR needs planning to respond to fluctuations in demand, and equitable workload distribution among employees. *Workload analysis* is a systematic tool for determining the number of HR needed based on task volume, completion time, and worker competency level. Comprehensive HR planning, including workforce identification, needs projection, gap analysis, and recruitment strategies, ensures that the number and quality of the workforce match job demands, both in the short and long term. Furthermore, balanced workload distribution, task rotation, and real-time monitoring help improve performance, maintain job satisfaction, and reduce employee stress. Therefore, continuous development of HR competencies and systematic management are important strategies to support the timeliness of cargo delivery, operational efficiency, and improvement of the overall service quality of logistics companies.

Digital Tracking

Digital tracking is a technology-based monitoring system that allows logistics companies to track the location and status of goods shipments in real time. Through this technology, every movement of cargo can be accurately monitored from the start of the shipping process until the goods arrive at their destination. Digital tracking systems not only help companies control distribution flows but also enable early detection of potential delays so that corrective action can be taken immediately. (Kencana et al., 2025)

In addition to improving operational efficiency, digital tracking also enhances service transparency, allowing customers to access direct and accurate delivery information. This boosts customer trust and the overall quality of logistics services. Therefore, digital tracking is a crucial component in supporting timely delivery, logistics efficiency, and company competitiveness in the digital era.

Road Infrastructure

Transportation infrastructure is the primary foundation for supporting the mobility of goods and people, as well as the sustainability of a region's economic activity. Modern urban planning emphasizes the importance of integrated land use, such as mixed-use development and vertical residential development, to ensure easy access to community activities without heavy reliance on private vehicles. This concept is also supported by the development of transit-based areas that efficiently connect activity centers with public transportation networks, thus encouraging the creation of a pedestrian- and cyclist-friendly environment.

The existence of a well-planned transportation network, such as roads, terminals, ports, and airports, not only facilitates logistics movement but also drives regional economic growth. Adequate infrastructure enables more efficient distribution of goods, lowers logistics costs, and increases productivity and community income. Therefore, transportation infrastructure can be understood as a physical and functional system that plays a vital role in supporting smooth distribution, logistics efficiency, and sustainable economic growth.

Delivery Timeliness

Delivery speed reflects the time it takes from when an order is processed until the item arrives at the recipient's door. In logistics and e-commerce, this speed is a key indicator of

service quality, as it is considered an added value that enhances the customer experience. Fast delivery ensures that items are received within the estimated timeframe, resulting in a smooth distribution process and customer satisfaction. This satisfaction ultimately drives positive feedback and loyalty to the delivery service company.

Besides speed, delivery is also required to be on time. Punctuality demonstrates a company's ability to ensure goods arrive on time, both upon departure and arrival. This aspect is a measure of the professionalism of logistics services and significantly determines customer trust in the delivery provider.

In consumers' decisions to use expedition services, timeliness and speed of delivery are not independent factors, but are also influenced by other factors such as price, security, service coverage, company reputation, and service quality. Affordable, competitive prices, and discounts can increase consumer interest, while responsive service and the ability to resolve issues quickly strengthen customer satisfaction. Therefore, delivery speed can be considered a key performance indicator in the logistics industry because it plays a crucial role in operational efficiency and in building customer trust and satisfaction.

Review Article Relevan

Reviewing relevant articles as a basis for establishing research hypotheses by explaining the results of previous research, explaining similarities and differences with the research plan, from relevant previous research such as table 1 below.

Table 1: Relevant Research Results

No	Author (Year)	Previous Research Result	Similarities To This Article	Differences With This Article	H
1	(Gantari & Purtanto2, 2025)	Availability of human resources (X4) and supporting facilities has a significant positive effect on cargo handling productivity	X4 (HR competency) influences the timeliness of delivery	The focus of this research is on cargo productivity at airports, not general delivery timeliness	H1
2	(Sadoth & Myamba, 2025)	Human Resource Competence (HRC) has a positive and significant effect on Cargo Clearance Performance (CCP) (β = 0.34, t = 5.98, p < 0.001)	Human Resources Competence (HRC) influences the timeliness of cargo delivery	This research focuses on cargo clearance performance at ports, while your article emphasizes the timeliness of cargo delivery in general	H1
3	(Mery Wulandari, 2024)	Online Tracking System (X1) and Timely Goods Delivery (X2) have a positive and significant effect on Customer Satisfaction (Y)	X1 has an effect on the timeliness of delivery	The focus of this research is on customer satisfaction, not on timeliness of cargo delivery	H2
4	(Azzahra Damayanti et al., 2025)	The use of GPS Tracker (X2) has a positive effect on the timeliness of delivery	X2 has an effect on the timeliness of delivery	The DEA method is used to assess route effectiveness, not customer perception analysis	H2
5	(Tamazur, 2023)	Transportation infrastructure, information technology, and environmental policies have a positive impact on delivery speed	X3 (transportation infrastructure) influences the timeliness of delivery	This study uses library research, not a direct survey	H3
6	(Dwi Ayuningtias, 2025)	The movement of vehicles and container transportation affects road conditions which impacts travel time	X3 (transportation infrastructure) influences the timeliness of delivery	The focus of this research is on specific road conditions in Cikarang	H3

Discussion

The Influence of Human Resources Competence on Delivery Timeliness

Human resource competence is the ability of the workforce to manage knowledge, skills, and professional attitudes to carry out tasks effectively. The main principle of HR competence is that competent human resources are able to plan, make decisions, and resolve operational obstacles quickly so that the cargo delivery process can run smoothly. HR competence affects the timeliness of delivery because if HR competence is perceived as good, the timeliness of delivery will also increase. Indicators of delivery timeliness include the achievement of delivery schedules, the speed of handling goods, and the minimization of delays. (Marselina, 2024)

Human resource (HR) competence is one of the main factors influencing operational smoothness and timely cargo delivery. Factors influencing HR competence include several important aspects, namely the ratio of workforce to work volume, flexible and adaptive HR planning to fluctuating demand, balanced workload distribution, and HR's ability to adapt to technology and coordinate effectively across teams (Hidayatullah, 2018). The ratio of workforce to work volume determines whether the number of HR is sufficient to complete all operational tasks; an imbalance, whether a shortage or excess of workforce, can reduce productivity and slow the delivery process. Adaptive HR planning allows companies to adjust the number and competence of the workforce according to seasonal needs or changes in demand, thus maintaining the efficiency of the delivery process. Even workload distribution ensures that each team member can work optimally without experiencing excessive stress, while the ability to adapt to technology and team coordination ensures HR can use operational support tools effectively and quickly respond to obstacles in the field.

To improve on-time delivery through human resource competency, management needs to take comprehensive strategic steps. First, provide ongoing training to ensure human resources have adequate technical and non-technical skills, ranging from document management and route planning to operational control in the field. Second, conduct periodic competency evaluations to identify skills gaps and adjust training programs accordingly. Third, implement a real-time performance monitoring mechanism so management can detect operational bottlenecks more quickly and provide appropriate guidance.

This finding aligns with previous research (Sadoth & Myamba, 2025) that showed that human resource competency has a positive and significant impact on cargo handling performance at Dar es Salaam Seaport; competent human resources can improve the speed, accuracy, and efficiency of the clearance process. Furthermore, (Gantari & Putranto, 2025) found that improving the quality and availability of human resources significantly contributes to cargo handling productivity at the airport, indicating that investment in human resource competency is an important strategy in supporting operational effectiveness and on-time delivery.

Thus, HR competency is not merely an internal operational factor, but a strategic element that connects planning, technology, and team coordination to ensure on-schedule deliveries. Effective HR management will impact logistics efficiency, customer satisfaction, and company competitiveness in the increasingly competitive cargo shipping industry.

The Impact of Digital Tracking Utilization on Delivery Timeliness

Digital tracking is the use of technology-based monitoring systems, such as GPS trackers or digital tracking applications, to monitor the position of goods and fleets in real time. The principle of *digital tracking* is to increase transparency and operational efficiency, thereby minimizing delays. Digital tracking impacts on delivery timeliness because if *digital tracking* is well-perceived, companies can predict and address delivery obstacles, thereby improving on-time delivery. Related indicators of delivery timeliness include adherence to delivery schedules, delay detection capabilities, and communication with customers (Renaldi et al., 2023).

The use of digital tracking is a crucial factor in improving the timeliness of cargo deliveries. Factors influencing the effectiveness of digital tracking include the quality of the digital system used, the ability of human resources to operate and interpret data from the system,

and the level of integration of the tracking data with all company operational processes. Digital system quality includes response speed, location accuracy, and monitoring features that support real-time decision-making (Angel Caroline Billan & Tata Sutabri, 2024). Human resource capabilities determine how technology can be optimally utilized, from accurate data input and accurate information interpretation to coordinated follow-up actions in the event of potential delays. Furthermore, the integration of digital tracking data with other operational systems, such as route management, delivery schedules, and customer information, ensures that every operational decision is based on comprehensive and accurate data.

To improve delivery timeliness through digital tracking, management needs to take several strategic steps. First, strengthen digital infrastructure with a reliable system capable of processing data quickly and providing real-time information to all involved parties. Second, provide ongoing training for human resources to equip them with the technical and analytical competencies needed to use the tracking system, enabling them to promptly respond to any challenges that arise in the field. Third, conduct regular and consistent fleet monitoring through the tracking system, allowing management to evaluate route performance, detect potential delays, and take corrective action before problems escalate.

Previous research has shown that the use of digital tracking has a positive and significant impact on delivery timeliness and customer satisfaction. (Mery Wulandari, 2024) found that online tracking systems enable companies to monitor the position of goods in real time and anticipate delays, so that deliveries can be completed on schedule. This increases customer satisfaction because they receive transparent and timely information. Similarly, (Azzahra Damayanti et al., 2025) showed that the use of GPS trackers in distribution fleets can significantly support delivery timeliness. Tracking systems not only help monitor fleet movements but also provide analytical data for route performance evaluation and more efficient delivery planning.

Thus, digital tracking is not just a monitoring tool, but a strategic instrument that connects technology, human resources, and operational processes. Optimal implementation of digital tracking can reduce the risk of delays, improve logistics efficiency, and strengthen customer satisfaction. In other words, a company's ability to effectively utilize digital technology is a crucial factor in ensuring on-time cargo delivery and enhancing competitiveness in the increasingly competitive logistics industry.

The Influence of Road Infrastructure Conditions on Delivery Timeliness

Road infrastructure encompasses the physical quality and network of roads used for the distribution of goods, including road surface conditions, road width, and congestion levels. The principle of road infrastructure is that good transportation infrastructure enables faster and safer cargo movement. Road infrastructure influences delivery timeliness because adequate road conditions shorten delivery times and predict schedule accuracy. Indicators of delivery timeliness include vehicle speed, the number of delays, and delivery schedule consistency.

Factors affecting road infrastructure include road maintenance, road capacity relative to vehicle volume, weather, and traffic density. To improve the timeliness of deliveries via road infrastructure, management and government need to collaborate on optimal route planning, road condition monitoring, and regular infrastructure repairs.

Previous research has shown that the quality of transportation infrastructure has a positive and significant impact on delivery speed. Chen, L., Yang, H., & Zhou, J. (2018) emphasized that improving road and rail networks significantly accelerates the delivery process while reducing logistics costs, as distribution flows become smoother and the risk of delays decreases. Popya Siska (2025) in their study on global supply chains found that investment in transportation infrastructure directly improves operational efficiency and delivery timeliness, enabling companies to respond more quickly to market demand. Furthermore, Iskhaq Al-Farizi (2025) showed that the quality of roads and other transportation facilities contributes significantly to logistics performance; improving infrastructure quality not only accelerates delivery of goods but also increases customer satisfaction due to more reliable services. This is

in line with research by Tamazur (2023) which shows that transportation infrastructure has a positive effect on delivery speed, and by Dwi Ayuningtias (2025) which emphasizes that road conditions affect travel time and the potential for delays in cargo distribution.

Conceptual Framework of the Research

Based on the problem formulation, relevant research and discussion, the conceptual framework for this article is obtained as shown in Figure 1.

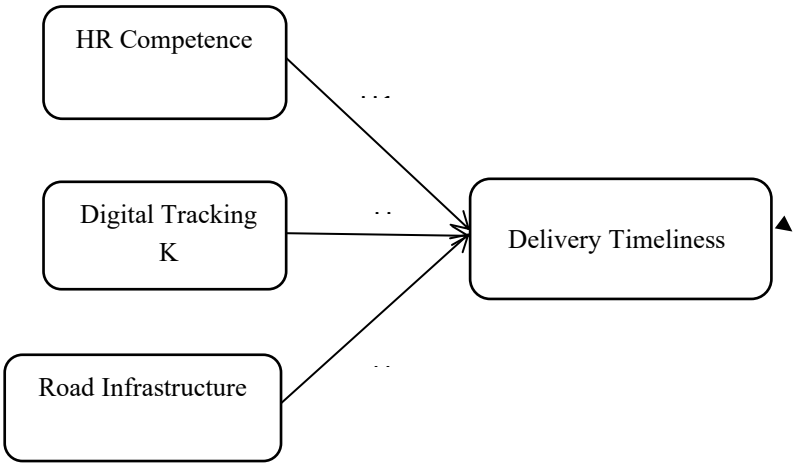

Figure 1: Conceptual Framework

Based on the conceptual framework above, HR competency, digital tracking, and infrastructure influence delivery timeliness. In addition to these three exogenous variables, there are many other variables, including:

1. Quality Control: (Hariani & Ramdany, 2022)
2. Quality of Service: (Ade Andriani Renouw, 2023)
3. Operational Performance: (Lailatul Syifa Tanjung, 2024)

CONCLUSION

Based on the objectives, results and discussion, the conclusion of this article is to formulate a hypothesis for further research, namely:

1) HR competency has a positive influence on the punctuality of cargo delivery.
2) The use of digital tracking has a positive impact on the timeliness of cargo delivery.
3) Road infrastructure conditions have a positive effect on the punctuality of cargo delivery.

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