

Crowd Logistics Capabilities in Malaysia: A Literature Review

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Abstract

Purpose: This review paper will define crowd logistics and associated concept. It also will highlight the crowd logistics capabilities in Malaysia environment.

Design/methodology/approach: This paper uses systematic searching strategy and content analysis to comprehensively locate and synthesize relevant studies for this review paper. A total of 89 articles were selected which deemed relevant to this review paper.

Findings: The findings cumulate the theoretical lenses of crowd logistics and its capabilities with the applications in the Malaysia logistics industry. The review reveals that the available logistics capability in the sector can improve logistics performance by focusing on specific capabilities, namely innovation capabilities, customer response capabilities, delivery capabilities and flexible capabilities.

Research limitations/implications: This review focuses only on the logistical capabilities that can influence performance in Malaysia logistics industry. Future research should also emphasis on implementation of crowd logistics with the integration of emerging technologies such as Internet of Things (IOT).

Practical implications: With the available crowd logistics capabilities: innovation capabilities, customer response capabilities, delivery capabilities, flexible capabilities, companies can plan to execute appropriate resources, skills and knowledge that provide significant improvement to the company. Additionally, the overview of this paper could assist the expert and industry practitioners in improving their logistics services by prioritizing the logistics capabilities available.

Originality/value: This paper provide insight on the crowd logistics understanding and its available capabilities in the logistics sector in Malaysia.

Keywords: Crowd logistics, On-demand logistics, Crowd logistics capabilities, Last-mile delivery

Introduction

Logistics management is an essential component of an organization. It is primarily helpful in managing transportation usage to ensure the availability of goods, services, and related information (Rutner & Langley Jr., 2000). The Council of Supply Chain Management Professionals (2013) stated that logistics is a crucial component of supply chain management that facilitates the movement of goods or services from one place to another. It also includes planning, implementing, and managing efficient and effective inbound and outbound movement within a supply chain. Logistics service capability is defined as the capabilities of the firm logistics service to create and manage resources in providing customer satisfaction and service performance (Lai, 2004). The critical logistics capabilities are demand-driven, on-time delivery, problem-solving skills, and assisting the customer in making decisions with accurate storage and delivery information throughout the logistics chain (Mohd Zawawi & Abdul Wahab, 2018). The e-commerce sectors can benefit from improved logistics capabilities and organizational logistics performance.

Due to this, the emergence of e-commerce companies in this sector is also rising (Mordor Intelligence, 2020). It is primarily due to most businesses being willing to take risks in exchange for greater transparency in the logistics process, technological advancement, and the short lead time required to conduct activities related to logistics (Reinartz et al., 2019). Increase in Malaysia internet users has taken up to 27.43M, which equals 84.2% of the population (Kemp, 2021). This increase has shaped Malaysia's e-commerce sector and digital technology growth. The e-commerce sector is evaluated to be equivalent to USD 3.7 billion in 2019, growth rate to be anticipated by 11.4% and is forecasted to reach USD 5.7 billion in 2023 (Mordor Intelligence, 2021). The projected growth is a result of the introduction of programmes in accordance with the National eCommerce Strategic Roadmap's (NeSR) six thrust areas in 2016. The roadmap was designed to double the growth rate for e-commerce in Malaysia to contribute to a GDP of \$53 billion by 2020 Malaysian Digital Economic Corporation (MDEC, 2020). Freeman (2020) remarked that Malaysia has the right resources to position itself as a regional logistics gateway due to its geographic location, increasing economy, strong regional links and reliable transport infrastructure.

The last-mile delivery (LMD) function has become an important topic in logistics management due to the increase in e-commerce sector. LMD is defined as the supply chain's final link that involves the distribution of goods to end customers on a frequent, low-volume, and short-distance basis (Zelin, 2018). LMD is essential because it ensures consumers receive their goods on time. In recent years, demand for LMD has been increasing, subject to urbanization and e-commerce (Boysen et al., 2021). The growth of LMD results from a complex and dynamic population, besides the changing demand for logistics and supply chains (Zelin, 2018). According to Olsson et al. (2019), the rising trend of LMD research in academia is most likely related to population and urbanization growth (Boysen et al., 2021; Cárdenas et al., 2017), as well as the evolution of e-commerce (Lim et al., 2018; Rai et al., 2019), the changing of customer behaviour (Chen et al., 2018; Rai et al., 2019), innovation (Ranieri et al., 2018), application of new technology (Verri et al., 2020) and growing attention to sustainability (Aljohani & Thompson, 2019; Rai et al., 2019). Furthermore, recent research identifies LMD as the most expensive (Seghezzi & Mangiaracina, 2021), inefficient, and highly polluting link in a supply chain (Gevaers et al., 2014), which cost of total supply chain takes up to 12-75% (Gevaers et al., 2011). This phenomenon has become an industry-wide issue that must be resolved.

In a traditional logistics setting, most parcel deliveries in the LMD currently rely on dedicated and specialized couriers and vehicles for their service. Due to the increasing complexity of online transactions, LMD issues are anticipated to increase soon. More research on solving LMD issues by using crowd logistics has been studied, such as in a systematic literature review by Olsson et al. (2019). According to a review of 155 peer-reviewed journal publications, the author determined that the literature on last-mile logistics provides a more coherent view of the concept and avenues for future research. This review doesn't define LMD as it would add complexity to the existing research. Thus, the study only focuses on covering different disciplines and methodologies into five themes, including emerging trends and technologies, operational optimization, supply chain structures, performance measurement, and policy. Moreover, the author is more focused on building the interrelationship around the LMD itself. In the same vein, another systematic literature review by Gläser et al. (2021) studies the influence of crowd logistics in the LMD for parcel delivery especially for courier, express and parcel (CEP) service providers to assess the opportunities and challenges faced by crowd logistics. This research focuses on crowd local delivery on the last mile on CEP. According to the findings, incorporating a crowd component offers a promising possibility of generating value in the chain. This research explains crowd local delivery solves the LMD issues.

The emergence of logistics and e-commerce services filled the need for innovative logistics providers, including crowdsourcing firms. The development of the logistics sector influences consumers to have their goods and services delivered at their convenience, using the fastest available logistics. This circumstance is challenging and pushes the company to enter a new market using the sharing economy basis or crowdsourcing logistics (Mladenow et al., 2016; Toy et al., 2020). Introductory, crowdsourcing comes from the word 'crowd' (Howe, 2006), which refers to a large group of individuals and 'sourcing' refers to hiring a third party to perform the process and functions. Thus, crowdsourcing defines the act of delegating processes or functions to a third party using a group of ordinary people. Crowdsourcing is also one of the synonyms of crowd logistics, which also known as crowd logistics, crowdsourced delivery, crowd shipping and collaborative logistics (Rai et al., 2018).

With the abovementioned concept, this paper will investigate two research questions: (1) What is crowd logistics? (2) What are the crowd logistics capabilities available in Malaysia? A review of the concept of crowd logistics and crowd logistics capabilities is introduced to answer these questions. The definition and understanding of crowd logistics are presented in the following section to analyze the view and application of crowd logistics in the logistics industry. The paper will then discuss the conceptualization of crowd logistics capabilities and their implementation in the Malaysia logistics industry.

Literature Review

Crowd Logistics

In recent years, crowd logistics and crowdsourcing concepts have garnered growing attention. Carbone et al. (2017) among the pioneered in exploratory investigation and proposed an initial crowd logistics conceptualization. Crowd logistics is portrayed as a novel concept in which travellers use their excess carrying capacity to transport packages for others (Carbone, Rouquet, & Roussat, 2017). In general, crowd logistics aims to link people with specific logistical resources with those who require logistics services (Andreji & Jeremic, 2019). This

concept has exclusively enhanced the logistics service to become more efficient and provide more reliable services.

Error! Reference source not found. tabulate the crowd logistics concept from significant authors. Crowd logistics and crowdsourcing concepts have emerged in recent years, starting in 2014, when Ranard et al. (2014) performed a systematic review on crowdsourcing through collective data and data analysis from the internet in health and medicine research. The author outlines four types of crowdsourcing used in the literature: problem-solving, data processing, surveillance, or monitoring and surveying. Mehmman et al. (2015) first review the crowdsourcing literature in the logistics area by providing a review and maturity model. The author concludes that more research should be investigated, especially in environmental impact, personal transport, last-mile delivery, and resource optimization. The crowd logistics research then expanded by Frehe et al. (2017), where the concept of crowd logistics is adapted and expanded to include additional technological platform data to be monitored by crowd logistics providers. The technological platform serves as medium of communication via various devices, including mobile phones, iPads, and web browsers. Moving forward, Carbone et al. (2017) finds crowd logistics as an initiative using available resources to provide logistical services to customers in need. While in Europe, Buldeo Rai et al. (2017) initiated a comprehensive and appropriate definition of crowd logistics based on sharing economy basis. This definition concept is similar to Frehe et al. (2017) and Saglietto (2021), where the primary aim is to achieve economic benefit from the crowd and give the carrier or rider monetary incentive for the job undertaken.

Table 1 Crowd Logistics Concept from Prominent Authors

Author	Concept
Ranard et al. (2014)	Internet-based outsourcing of the logistics operation to individuals
Mehmann et al. (2015)	<ol style="list-style-type: none"> 1. Outsourcing of logistics services to a number of actors 2. Facilitated by technical infrastructure 3. Focus on achieving economic benefit for all stakeholders
Carbone, Rouquet, Roussat, et al. (2017)	Utilized logistical capabilities to perform logistics services
Rai et al. (2017)	<ol style="list-style-type: none"> 1. Efficient use of physical assets supported by information and communication technology (ICT). 2. Focus on sharing economy
Frehe et al. (2017)	<ol style="list-style-type: none"> 1. Outsourcing of logistics services to a number of actors 2. Supported by a technical platform that is hosted and managed by crowd logistics provider
Le and Ukkusuri, (2019b)	<ol style="list-style-type: none"> 1. Application based platform 2. Connecting couriers and requesters for last-mile urban deliveries
Saglietto (2021)	Involve ordinary people in low-cost carriers

Crowd Logistics in Malaysia

In Malaysia, the use of crowd logistics is still in its early stage. Although most courier and delivery services have been used extensively, the application of crowd logistics concept in academia is still developing. With crowd logistics expanding in Malaysia, several researchers have studied the application of crowdsourcing and crowd logistics. Habbal et al. (2015) suggest using the Web of System Performance (WOSP) to conduct performance evaluation of crowdsourcing platforms in four Malaysia companies. The WOSP application further improves a Technology Acceptance Model (TAM), where WOSP offers more system-based oriented metrics for the system performance. The findings reveal that the platform for WOSP provides more enhanced insight into the system performance compared to the standard usability requirement. A room for improvement for the crowdsourcing platform can be added by prioritizing the critical system requirement in the industry. This research can thus be a guide to measuring the platform's efficiency and ease of use (Varpio et al., 2020).

Furthermore, a study that explored crowdsourcing practices among three SME business owners in Malaysia was conducted by Mansor et al. (2018) have provided qualitative findings on the benefit of using crowdsourcing practices. The result shows crowdsourcing can serve many benefits, such as operational cost reduction, acquiring new skills, knowledge and expertise, shortening delivery time, brand recognition, organizational innovation, and problem-solving tools. According to the qualitative data, all SME business owners strongly agreed that crowdsourcing improves their business performance. Likewise, a study by Janom et al. (2020) reported that crowdsourcing had been recognize as one of the innovative way for the company to allow individuals outside the organization to apply their expertise and make the best use of their time by participating in available jobs. This research explores and ranks the multi-perspectives of the crowdsourcing ecosystem in Malaysia using the analytical hierarchy process (AHP) method. The ecosystem in this study can be categorized into job provider, platform use, micro worker, and industry. The result of the AHP weightage of each factor can assist in prioritizing factors based on their level of importance. Players in the crowdsourcing industry can use the findings to develop a more strategic approach to crowdsourcing in Malaysia. All in all, the study on crowdsourcing in Malaysia is still developing and it is expected grow within years to come.

Method

This paper uses a systematic searching strategy to answer the research question and retrieve relevant articles for reviewing process. This systematic search enabled authors to comprehensively locate and synthesise relevant studies for this paper (Shaffril et al., 2021). This technique is a part of the method used in developing a systematic literature review, which was then adapted into this paper. Based on the research question's formulation, the author identifies the main keywords: crowd logistics, on-demand logistics and logistics capabilities. The author also selected synonyms, related terms and word variations to further enrich the keywords by making use of online thesaurus such as thesaurus.com. Based on this process, the author checked crowd logistics' synonyms, such as collaboration logistics, crowdsourcing logistics, on-demand delivery, and on-time delivery. Various search tools were used to process the combination of keywords, including phrase searching, wildcards, and boolean operators in the database. After the selection of keywords, the list of articles in the database is being

handpicked, which is a manual selection by reviewing the abstract and some part of the articles. After consideration, a total of 89 articles were selected which are relevant to this paper.

Findings

Crowd Logistics Capabilities

Logistics capability has emerged as a critical concept in the logistics supply chain. Capability is a complex bundle of resources, skills and knowledge that allows firms to coordinate activities and use their assets accordingly (Day, 1994; Hafeez et al., 2002; Morash et al., 1996). Several studies have begun to examine the definition of logistics capability. The definition of logistics capability varies based on the perspective and types of industries. Wang (2016a) concludes that the logistics capability of companies varies depending on their business, customers, and services. Thus, it is challenging to define logistics capability independently without a specific context. As explained in this study, logistics capability refers to the capability of the service provider to conduct and coordinate logistics-related activities and use related resources and skills to meet customer requirements.

According to Resource Based View (RBV), each firm utilizes a distinct set of resources and capabilities that serve as the foundation for its competitive advantage (Grant, 1991; Wernerfelt, 1984). Logistics capabilities are expected to improve firm efficiency and effectiveness, thereby ensuring long-term firm profitability and survival (Mentzer et al., 2004). Logistics capability or operation capabilities are derived based on the RBV theory to achieve competitive advantages. Also, Fawcett et al. (1997) supported the study by mentioning that logistics capabilities focus on delivery speed, quality service, flexibility, cost, and innovation to achieve optimal operations performance in the case of the courier industry (Wang, 2020).

According to Barney (1991), logistics capability is a part of firm resources, including assets, competencies, organizational processes, firm attributes, information, and knowledge. This phenomenon allows capabilities to develop and implement strategies to improve efficiency and effectiveness. Logistics capability can significantly contribute to superior performance and long-term competitive advantage (Joong-Kun Cho et al., 2008; Wang, 2016a). In the case of Lu and Yang (2010), the crucial logistics service capabilities and firm performance based on empirical evidence of an international distribution centre in Taiwan are being investigated. The result indicates customer response and innovation capabilities-oriented firms outperformed customer response and flexible operation capabilities-oriented firms and customer response capability-oriented firms. This research is vital as it provides a distinct view of choosing customer response, innovation, and flexible capabilities. According to Liu et al. (2010), a study of 13 LSP capabilities is conducted to determine how these capabilities can help Chinese LSPs remain competitive. The study revealed that most critical construct is service quality in determining a company's competitive advantages. Furthermore, a study on measuring the logistics capabilities in the service, innovation and flexibility is done by Huang and Huang (2012), where logistics capabilities refer to a logistics service provider's ability to manage and integrate processes throughout the supply chain, thereby improving competitive advantage and firm performance. Also, a study by (Wang, 2020) on courier industry indicate logistics capabilities such as delivery speed, quality service, flexibility, cost and innovation is crucial to achieve optimal operations performance. This also has been supported by Fawcett et al. (1997) by mentioning similar items in the study.

Thus, this study uses four significant factors of logistics capabilities: innovation capabilities, customer service, responsiveness, and flexible operation. Likewise, Fawcett et al. (1997), Hayes et al. (1988); Huang and Huang (2012); Lu and Yang (2010); Wang (2016b); Wang et al. (2015) also adapt similar capabilities in measuring the logistics performance. Additionally, a delivery capability is a newly adopted capability from empirical evidence by Joong-Kun Cho et al. (2008); Wang (2020), whereas in the article, the authors chose to examine the reliability of service delivery and the measures taken to ensure service delivery, particularly in the courier service. Likewise, Morash and Lynch (2002) and Wang (2020) posit that the attribute suitable for the delivery capabilities can include on-time delivery, delivery speed, and reliability. Thus, the new capabilities that have been added to this present study enhance the crowd logistics performance, especially in the last-mile delivery in Malaysia perspective.

Most logistics capabilities are being measured to enhance the logistics performance of an organization. Consistence with the research question, this paper explores the available logistics capabilities in Malaysia's logistics industry. The following section will explain the logistics capabilities available in Malaysia, focusing on the service industry. For instance, innovation, customer response, delivery, and flexible capabilities.

Innovation Capabilities

Innovation capability (IC) has a long history of research, which was developed from the resource-based view (RBV) theory (Penrose, 1959). It recognizes that an organization is a bundle of resources and capabilities, which through the development of strategies, will assist the organization in achieving competitive advantages (Barney, 1991). Knowledge, for example, is a valuable strategic resource that, when combined with organizational competence, can drive innovation (Kogut & Zander, 2009). Wang (2016b) asserts that IC is a dynamic capability capable of extending, modifying, or creating the firm's standard capabilities and resources. As a result, it is critical to understand the IC in logistics and transportation firms.

It is not new to use logistics innovation to solve logistics and transportation problems (Daniel and Fredrik, 2011; Flint et al., 2005; Scott, 2009). Similarly, in his literature review, Mendoza-Silva (2020) mentions that organisations currently need to adapt quickly and effectively to constant market changes through product and process innovation. The complexity of innovation capability has driven the definition to be related to the different theories in the previous study, namely dynamic capabilities, innovation management, and organizational learning (Mendoza-Silva, 2020). In view of dynamic capabilities, Lawson and Samson (2001) postulate IC refers to the knowledge and ideas that can be continuously transformed into new products, processes, and systems for the benefit of the firm and its stakeholders. Similarly, Romijn and Albaladejo (2002) considers IC through the lens of dynamic capability as the skills and knowledge required to absorb, master, and improve existing technologies and create new ones. Then, through an organizational capabilities lens, the IC is defined as the openness to new ideas as an aspect of a firm's culture (Calantone et al., 2004), consisting of the firm's intangible that will produce value in the future (Saunila et al., 2014). Ngo and O'Cass (2013) define IC as the application of knowledge and skills embedded in routines and processes of the firm to perform technical and non-technical innovation activities. This present research defines IC as the ability to transform information and ideas into new products, processes and systems for the company's benefit (Joong-Kun Cho et al., 2008; Lawson & Samson, 2001; Wang, Asian, et al., 2020).

Innovation capabilities in the organization can provide different types of technological problem solving based that can assist organizations in competitive advantage (Fawcett & Closs, 1993; Ralston et al., 2013) and provide a positive impact on logistics performance (Kara, 2021) and better customer service for customers (Lin, 2006). Several logistics-related studies that demonstrated the effect of logistics capabilities, in this case, IC have been adapted to suit the crowd logistics organizational capabilities in Malaysia are shown in Table 2. (Lu & Yang, 2010) have extensively reviewed logistics capabilities in their quantitative article. The findings stipulate that IC comprises eight items that account for 50.31% of the total variance and are considered important IC attributes. The items are good techniques in cargo movement and distribution, regularly improving the company's operational systems, good after-sales service, using new technology and innovation, providing cargo tracing service, modern information control system, implementing total quality management, and good protection for cargo safety and risk. Similarly, Wang (2020) also acknowledges IC as a crucial logistics capabilities dimension. In this research, the author has classified IC into five significant attributes: innovation in service, innovation solution, advanced packaging technology, process improvement, and web-based order handling. To bolster this, Wang (2016b) examined IC as a critical structure in his SEM analysis, concluding that IC can coordinate with operational capability to influence logistics performance. Another significant attribute of this present study is from Klumpp (2017b). The author discusses case studies involving cooperative transportation and logistics in order to increase crowdsourcing's sustainability, flexibility, and security as a possible enabler in dynamic processes and concepts. The findings indicate significant relationships between the dynamic capabilities and the potential of crowdsourcing solutions and concepts in the case studies. Lastly, Zhao et al. (2001) study the IC in the view of customer-focused capabilities where an analysis of the impact of unique logistics service strategies for a different customer is used as one attribute.

Table 2 Innovation Capabilites (IC) Attribute

Author	Innovation Capabilities (IC) Attribute
Lu & Yang (2010)	<ol style="list-style-type: none"> 1. Good techniques in cargo movement and distribution 2. Regularly improving the company's operational systems 3. Good after-sales service 4. Using new technology and innovation 5. Providing cargo tracing service 6. Modern information control system 7. Implementing total quality management 8. Good protection for cargo safety and risk
Wang (2020)	<ol style="list-style-type: none"> 1. Innovation in service 2. Innovation solution 3. Advanced packaging technology 4. Process improvement 5. Web-based order handling
Klumpp (2017b)	Cooperative transportation and logistics in order to increase crowdsourcing's sustainability, flexibility, and security
Zhao et al. (2001)	Customer focused capabilities

Customer Response Capabilities

Today, supply chains face increasingly high demands for logistics customer service (LCS). Prior research in logistics posits that customer service is one of the critical business functions and an essential logistics capability, especially in last-mile delivery and courier services (Fawcett & Cooper, 1998; Kim, 2006; Lu & Yang, 2010; Morash & Lynch, 2002; Wang, 2016a; Zhao et al., 2001). Logically, customer response capability (CRC) relates to customer service (Daugherty et al., 2019), as CRC is associated with customer satisfaction regarding delivery operations in the crowd logistics environment.

Customers nowadays demand prompt goods and services, which impacts the overall e-commerce and omnichannel industry. Jayachandran et al. (2004) have divided CRC into two dimensions: customer response expertise and customer response speed. The author studies the relationship between CRC and company performance and how customer knowledge influences the CRC. The quantitative result shows a significant relationship between CRC and company performance, supported by the qualitative outcome in the mixed method analysis. Similarly, Wang (2020) identified responsiveness as one of the operations in the IC dimension that can be assessed in logistics and transport. The author deploys a starting point to investigate further the relationship between IC and logistics performance. The way the author sees it, IC provides a significant relationship and supports the prior literature by Morash et al. (1996). Additionally, another attribute discussed by Lu and Yang (2010) is crucial where the author studies CRC, IC and flexible capabilities as the logistics capabilities using cluster analysis. The findings indicated that CRC and IC have the best firm performance compared to flexible capabilities.

Delivery Capabilities

Courier companies relied heavily on their delivery capability (DC) to carry out their daily operations. According to Douglas (2017), in customer experience, the most critical logistics service is delivery, where the focus is still on last-mile delivery and delivery speed. This also has been supported by Daugherty et al. (2019), where the author summarized customer service in omnichannel and online retailing. The author highlights the importance of refocusing and reimagining customer service as the logistics service in distribution and delivery, where it has become more important these days. Similarly, Bhattacharjya et al. (2016) posit shipping and delivery are the two most critical post-purchase services that most customers are concerned about during the purchasing process.

Delivery is an essential component of logistics capability and has been discussed in previous studies. According to Wang (2020), delivery capability (DC) is a part of operational capability. Thus, it is closely related to logistics capability and a crucial factor in maintaining service delivery in the courier industry (Joong-Kun Cho et al., 2008; Morash, 2001; Wang, 2016a). Wang (2016a) uses attributes such as timely delivery, delivery speed, and capability to measure delivery capabilities in this article. An extension of the capabilities is studied in the empirical evidence by (Wang, 2016b) posits that the significant role of operational logistics capabilities in generating competitive advantages is in line with the RBV concept. The findings demonstrate how innovation capability can influence logistics performance in tandem with operational capability. While Joong-Kun Cho et al. (2008) measure logistics service levels in terms of delivery speed and delivery reliability in the e-commerce market, which align with the attributes in the present study. The findings reveal positive correlations between logistics capability and firm performance in the e-commerce market.

Flexible Capabilities

In a business context, flexibility refers to an organization's ability to respond and adapt to change effectively (Jafari, 2015; Naim et al., 2010; Zhang et al., 2005). While Soon and Udin (2011) define logistics flexibility as the organization's capacity to align, adapt, or adjust its logistic network to maximize competitive value.

In the empirical study of an international distribution center by Lu and Yang (2010), the logistics capabilities in the flexible capability (FC) dimension characterize by the flexible operation space, employee knowledge of warehousing and logistics, and flexible operational procedures and systems. The result indicates a significant relationship between FC and logistics performance, and the highest factor of FC is the flexible operational space leading to 7.26% of total variance between the three. Zhao et al. (2001) focus on flexibility in customer-focused capabilities, where flexibility is defined as the adaptation to unexpected operational circumstances (Bowersox et al., 1999). The findings found a positive relationship between customer-focused capabilities and firm performance. In the same vein, Wang (2020) conduct a purposive sampling in Australia to identify and measure the logistics capabilities. The author uses attributes such as customized logistics, flexible delivery scheduling and routing, extensive operation hours, and improved operational systems. The findings indicate that the Australian courier industry has a strong logistics capability which one of the capabilities is FC. Comparably, a flexibility study in reverse logistics carried out by Bai and Sarkis (2013) introduces a reverse logistics framework in the FC that can set further investigation in the flexibility dimension. Wagner et al. (2018) also examine 336 manufacturing firms in Europe and the US on sourcing flexibility, supplier evaluation and selection, and information system integration at the buyer-supplier interface. The results indicate that sourcing flexibility is curvilinearly related to delivery performance, implying that it has a beneficial effect on the financial performance of the products.

Conclusion

This paper reviews the definition of crowd logistics and crowd logistics capabilities in the Malaysia logistics industry. A crowd logistics defines as the use of crowd to perform on-demand logistics activities such as delivery services, by using a platform or application in order to meet customer requirements. The crowd can be from ordinary people, amateur, professional, service providers, movers and also couriers. The aim of crowd logistics is to connect people that need logistics resources with the correct and required logistics services.

The growing number of last-mile delivery services in Malaysia require companies to seek attention in particularly improving their delivery and customer services. With the available crowd logistics capabilities: innovation capabilities, customer response capabilities, delivery capabilities, flexible capabilities, companies can plan to execute appropriate resources, skills and knowledge that provide significant improvement to the company. Additionally, the overview of this paper could assist the expert and industry practitioners in improving their logistics services by prioritizing the logistics capabilities available. They also can initiate to maximize performance and, at the same time reducing operating costs (Hua et al., 2020).

Apart from the logistics capabilities, the organization should also focus on determining other aspects that can impact the logistics performance. For instance, technological advancement that

can influence decision making and transparency of business in the supply chain. Future research on the crowd logistics also can emerge with the implementation of logistics based internet of things (IOT) and blockchain. For instance the use of sensors attached with different parts of the mail infrastructure can also be one of the future technology (Golpîra et al., 2021). Also, with the emerging technologies, the transparency and customizable logistics services also can be added advantage and improving company performance.

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References

- Aljohani, K., & Thompson, R. G. (2019). A stakeholder-based evaluation of the most suitable and sustainable delivery fleet for freight consolidation policies in the inner-city area. *Sustainability (Switzerland)*, *11*(1). <https://doi.org/10.3390/su11010124>
- Andreji, M., & Jeremic, M. (2019). Crowd logistics - a new concept in realization of logistics services. *4th Logistics International Conference*, 170–179.
- Bai, C., & Sarkis, J. (2013). Flexibility in reverse logistics: a framework and evaluation approach. *Journal of Cleaner Production*, *47*, 306–318. <https://doi.org/10.1016/j.jclepro.2013.01.005>
- Barney, J. B. (1991). Firm Resources ad Sustained Competitive Advantege. In *Journal of Management* (Vol. 17, pp. 99–120).
- Bhattacharjya, J., Ellison, A., & Tripathi, S. (2016). An exploration of logistics-related customer service provision on Twitter: The case of e-retailers. *International Journal of Physical Distribution and Logistics Management*, *46*(6–7), 659–680. <https://doi.org/10.1108/IJPDLM-01-2015-0007>
- Bowersox, D. J., Closs, D. J., & Stank, T. P. (1999). *21st century logistics: making supply chain integration a reality*.
- Boysen, N., Fedtke, S., & Schwerdfeger, S. (2021). Last-mile delivery concepts: a survey from an operational research perspective. In *OR Spectrum* (Vol. 43, Issue 1). Springer Berlin Heidelberg. <https://doi.org/10.1007/s00291-020-00607-8>
- Calantone, R. J., Tamer, C. S., & Yushan, Z. (2004). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, *31*, 515 citation_lastpage=524.
- Carbone, V., Rouquet, A., & Roussat, C. (2017). The Rise of Crowd Logistics: A New Way to Co-Create Logistics Value. *Journal of Business Logistics*, *38*(4), 238–252. <https://doi.org/10.1111/jbl.12164>
- Carbone, V., Rouquet, A., Roussat, C., & Carbone, V., Rouquet A., R. C. (2017). The rise of crowd-logistics: a new way to co-create logistics value? In *Journal of Business Logistics*, *38*(4), (pp. 238–252). Journal of Business Logistics.
- Cárdenas, I., Beckers, J., & Vanelslander, T. (2017). E-commerce last-mile in Belgium: Developing an external cost delivery index. *Research in Transportation Business and Management*, *24*(January), 123–129. <https://doi.org/10.1016/j.rtbm.2017.07.006>

- Chen, Y., Yu, J., Yang, S., & Wei, J. (2018). Consumer's intention to use self-service parcel delivery service in online retailing: An empirical study. *Internet Research*, 28(2), 500–519. <https://doi.org/10.1108/IntR-11-2016-0334>
- Council of Supply Chain Management Professionals. (2013). *Supply Chain Management* (Issue August).
- Daugherty, P. J., Bolumole, Y., & Grawe, S. J. (2019). The new age of customer impatience: An agenda for reawakening logistics customer service research. *International Journal of Physical Distribution and Logistics Management*, 49(1), 4–32. <https://doi.org/10.1108/IJPDLM-03-2018-0143>
- Day, G. S. (1994). The Capabilities of Market-Driven Organizations. *Journal of Marketing*, 58(4), 37–52. <https://doi.org/10.1177/002224299405800404>
- Douglas, M. (2017). The customer experience: the last mile gets the royal treatment: in e-commerce, how you deliver is nearly as important as what you sell. *Inbound Logistics*.
- Fawcett, S. E., & Closs, D. J. (1993). Coordinated global manufacturing, the logistics/manufacturing interaction, and firm performance. *Journal of Business Logistics*, 14(1), 1.
- Fawcett, S. E., & Cooper, M. B. (1998). Logistics Performance Measurement and Customer Success. *Industrial Marketing Management*, 27(4), 341–357. [https://doi.org/10.1016/S0019-8501\(97\)00078-3](https://doi.org/10.1016/S0019-8501(97)00078-3)
- Fawcett, S. E., Stanley, L. L., & Smith, S. R. (1997). Developing a logistics capability to improve the performance of international operations. *Journal of Business Logistics*, 18(2), 101.
- Freeman, O. (2020). *The ASEAN Logistics Industry is Turning the Tide on COVID-19 / Logistics / Supply Chain Digital*. <https://www.supplychaindigital.com/logistics-1/asean-logistics-industry-turning-tide-covid-19>
- Frehe, V., Mehmman, J., & Teuteberg, F. (2017). Understanding and assessing crowd logistics business models – using everyday people for last mile delivery. *Journal of Business and Industrial Marketing*, 32(1), 75–97. <https://doi.org/10.1108/JBIM-10-2015-0182>
- Gevaers, R., Van de Voorde, E., & Vanelander, T. (2011). Characteristics Of Innovations In Last Mile Logistics-Using Best Practices, Case Studies And Making The Link With Green And Sustainable Logistics. *City Distribution and Urban Freight Transport*, 56–75. <http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=A0994C74D69269E4E869F48E76A18EFB?doi=10.1.1.676.5843&rep=rep1&type=pdf>
- Gevaers, R., Van de Voorde, E., & Vanelander, T. (2014). Cost Modelling and Simulation of Last-mile Characteristics in an Innovative B2C Supply Chain Environment with Implications on Urban Areas and Cities. *Procedia - Social and Behavioral Sciences*, 125, 398–411. <https://doi.org/10.1016/j.sbspro.2014.01.1483>
- Gläser, S., Jahnke, H., & Strassheim, N. (2021). Opportunities and challenges of crowd logistics on the last mile for courier, express and parcel service providers—a literature review. *International Journal of Logistics Research and Applications*, 0(0), 1–29. <https://doi.org/10.1080/13675567.2021.2005005>
- Golpîra, H., Khan, S. A. R., & Safaiepour, S. (2021). A review of logistics Internet-of-Things: Current trends and scope for future research. *Journal of Industrial Information Integration*, 22(April 2020). <https://doi.org/10.1016/j.jii.2020.100194>
- Grant, R. M. (1991). Grant_1991. *Knowledge and Strategy*, 3–24.
- Habbal, A., Chit, S. C., & Ahmad, R. (2015). Assessing malaysian crowdsourcing platforms using web of system performance (wosp) model. *Proceedings of the 5th International Conference on Computing and Informatics, ICOCI 2015*, 231, 495–500.

- Hafeez, K., Zhang, Y. B., & Malak, N. (2002). Determining key capabilities of a firm using analytic hierarchy process. *International Journal of Production Economics*, 76(1), 39–51. [https://doi.org/10.1016/S0925-5273\(01\)00141-4](https://doi.org/10.1016/S0925-5273(01)00141-4)
- Hayes, R. H., Hayes, R. H., Wheelwright, S. C., Wheelwright, S., & Clark, K. B. (1988). *Dynamic manufacturing: Creating the learning organization*. Simon and Schuster.
- Howe, J. (2006). The Rise of Crowdsourcing. *Wired Magazine*, 14(06), 1–5. <https://doi.org/10.1086/599595>
- Hua, L., Md Isa, F., & Noor, S. (2020). An Empirical Study on Logistics Performance of Ningxia Region, China. *International Review of Management and Business Research*, 9(1), 87–101. [https://doi.org/10.30543/9-1\(2020\)-7](https://doi.org/10.30543/9-1(2020)-7)
- Huang, C.-J., & Huang, K.-P. (2012). The logistics capabilities scale for logistics service providers. *Journal of Information and Optimization Sciences*, 33(1), 135–148. <https://doi.org/10.1080/02522667.2012.10700139>
- Jafari, H. (2015). Logistics flexibility: a systematic review. *International Journal of Productivity and Performance Management*, 64(7), 947–970. <https://doi.org/10.1108/IJPPM-05-2014-0069>
- Janom, N., Azhani, R. N., Syed Aris, S. R., Bashah, N. S. K., Arshad, N. H., & Nadir, M. H. (2020). Multi-perspectives crowdsourcing ecosystem in Malaysia. *Indonesian Journal of Electrical Engineering and Computer Science*, 19(1), 435. <https://doi.org/10.11591/ijeecs.v19.i1.pp435-441>
- Jayachandran, S., Hewett, K., & Kaufman, P. (2004). Customer response capability in a sense-and-respond era: The role of customer knowledge process. *Journal of the Academy of Marketing Science*, 32(3), 219–233. <https://doi.org/10.1177/0092070304263334>
- Joong-Kun Cho, J., Ozment, J., & Sink, H. (2008). Logistics capability, logistics outsourcing and firm performance in an e-commerce market. *International Journal of Physical Distribution & Logistics Management*, 38(5), 336–359. <https://doi.org/10.1108/09600030810882825>
- Kara, K. (2021). *The Impact of Logistics Innovativeness on Perceived Organizational Performance Application in The Logistics Indu ...*
- Kemp, S. (2021). Digital 2021 Malaysia .pdf. In *DataReportal*. <https://datareportal.com/reports/digital-2021-malaysia>
- Kim, S. W. (2006). Effects of supply chain management practices, integration and competition capability on performance. *Supply Chain Management*, 11(3), 241–248. <https://doi.org/10.1108/13598540610662149>
- Klumpp, M. (2017). *Crowdsourcing in Logistics: An Evaluation Scheme*. 401–411. https://doi.org/10.1007/978-3-319-45117-6_35
- Kogut, B., & Zander, U. (2009). Knowledge of the firm. Combinative capabilities, and the replication of technology. *Knowledge in Organisations*, August 2015, 17–36. <https://doi.org/10.3280/so2008-002005>
- Lai, K. hung. (2004). Service capability and performance of logistics service providers. *Transportation Research Part E: Logistics and Transportation Review*, 40(5), 385–399. <https://doi.org/10.1016/j.tre.2004.01.002>
- Lawson, B., & Samson, D. (2001). Developing Innovation Capability In Organisations : A Dynamic Introduction Review Of The Literature. *International Journal of Innovation Management*, 5(3), 377–400.
- Le, T. V., & Ukkusuri, S. V. (2019). Modeling the willingness to work as crowd-shippers and travel time tolerance in emerging logistics services. *Travel Behaviour and Society*, 15(April 2018), 123–132. <https://doi.org/10.1016/j.tbs.2019.02.001>

- Lim, S. F. W. T., Jin, X., & Srari, J. S. (2018). Consumer-driven e-commerce: A literature review, design framework, and research agenda on last-mile logistics models. *International Journal of Physical Distribution and Logistics Management*, 48(3), 308–332. <https://doi.org/10.1108/IJPDLM-02-2017-0081>
- Lin, C.-Y. (2006). Determinants of organizational innovation for logistics service providers in Taiwan. *Journal of Statistics and Management Systems*, 9(3), 613–631. <https://doi.org/10.1080/09720510.2006.10701226>
- Liu, X., Grant, D. B., McKinnon, A. C., & Feng, Y. (2010). An empirical examination of the contribution of capabilities to the competitiveness of logistics service providers: A perspective from China. *International Journal of Physical Distribution and Logistics Management*, 40(10), 847–866. <https://doi.org/10.1108/09600031011093232>
- Lu, C. S., & Yang, C. C. (2010). Logistics service capabilities and firm performance of international distribution center operators. *Service Industries Journal*, 30(2), 281–298. <https://doi.org/10.1080/02642060802123392>
- Malaysian Digital Economy Corporation (MDEC). (2020). *MDEC: National eCommerce Strategic Roadmap (NeSR)*.
- Mansor, M. F., Abdul Halim, H., & Hazlina Ahmad, N. (2018). Leveraging crowdsourcing practices in small and medium enterprises (Smes). *Journal of Entrepreneurship Education*, 21(4).
- Mehmann, J., Frehe, V., & Teuteberg, F. (2015). Crowd Logistics – A Literature Review and Maturity Model. In *Innovations and Strategies for Logistics and Supply Chains* (Issue November).
- Mendoza-Silva, A. (2020). Innovation capability: a systematic literature review. *European Journal of Innovation Management*. <https://doi.org/10.1108/EJIM-09-2019-0263>
- Mentzer, J. T., Min, S., & Michelle Bobbitt, L. (2004). Toward a unified theory of logistics. *International Journal of Physical Distribution & Logistics Management*, 34(8), 606–627. <https://doi.org/10.1108/09600030410557758>
- Mladenow, A., Bauer, C., & Strauss, C. (2016). “crowd logistics”: The contribution of social crowds in logistics activities. *International Journal of Web Information Systems*, 12(3), 379–396. <https://doi.org/10.1108/IJWIS-04-2016-0020>
- Mohd Zawawi, N. F., & Abdul Wahab, S. (2018). Information Technology, Logistics Performance and Moderating Effect of Firm Size: Empirical Evidence From East Coast Region of Malaysia. *Journal of Nusantara Studies (JONUS)*, 3(1), 87. <https://doi.org/10.24200/jonus.vol3iss1pp87-102>
- Morash, E. A. (2001). Supply Chain Strategies , Capabilities , and Performance. *Transportation Journal*, 41(1), 37–54.
- Morash, E. A., Droge, C. L. M., & Vickery, S. K. (1996). Strategic logistics capabilities for competitive advantage and firm success. *Journal of Business Logistics*, 17(1), 1.
- Morash, E. A., & Lynch, D. F. (2002). Public policy and global supply chain capabilities and performance: A resource-based view. *Journal of International Marketing*, 10(1), 25–51. <https://doi.org/10.1509/jimk.10.1.25.19529>
- Mordor Intelligence. (2020). Malaysia Freight And Logistics Market. In *MarketResearch.com*. <https://www.absolutereports.com/malaysia-freight-and-logistics-market-14275377>
- Mordor Intelligence. (2021). *Malaysia Freight and Logistics Market - Growth , Trends , Covid-19 Impact and Forecast (2021-2026)*.
- Naim, M., Aryee, G., & Potter, A. (2010). Determining a logistics provider’s flexibility capability. *International Journal of Production Economics*, 127(1), 39–45. <https://doi.org/10.1016/j.ijpe.2010.04.011>

- Ngo, L. V., & O’Cass, A. (2013). Innovation and business success: The mediating role of customer participation. *Journal of Business Research*, 66(8), 1134–1142. <https://doi.org/10.1016/j.jbusres.2012.03.009>
- Olsson, J., Hellström, D., & Pålsson, H. (2019). Framework of last mile logistics research: A systematic review of the literature. *Sustainability (Switzerland)*, 11(24), 1–25. <https://doi.org/10.3390/su11247131>
- Penrose, E. T. (1959). The Theory of the Growth of the Firm. In *John Wiley & Sons* (Vol. 1). New York: John Wiley & Sons Inc.
- Rai, H. B., Verlinde, S., & Macharis, C. (2018). Shipping outside the box. Environmental impact and stakeholder analysis of a crowd logistics platform in Belgium. *Journal of Cleaner Production*, 202, 806–816. <https://doi.org/10.1016/j.jclepro.2018.08.210>
- Rai, H. B., Verlinde, S., & Macharis, C. (2019). The “next day, free delivery” myth unravelled: Possibilities for sustainable last mile transport in an omnichannel environment. *International Journal of Retail and Distribution Management*, 47(1), 39–54. <https://doi.org/10.1108/IJRDM-06-2018-0104>
- Rai, H. B., Verlinde, S., Merckx, J., & Macharis, C. (2017). Crowd logistics: an opportunity for more sustainable urban freight transport? *European Transport Research Review*, 9(3), 1–13. <https://doi.org/10.1007/s12544-017-0256-6>
- Ralston, P. M., Grawe, S. J., & Daugherty, P. J. (2013). Logistics salience impact on logistics capabilities and performance. *The International Journal of Logistics Management*, 24(2), 136–152. <https://doi.org/10.1108/IJLM-10-2012-0113>
- Ranard, B. L., Ha, Y. P., Meisel, Z. F., Asch, D. A., Hill, S. S., Becker, L. B., Seymour, A. K., & Merchant, R. M. (2014). Crowdsourcing--harnessing the masses to advance health and medicine, a systematic review. *Journal of General Internal Medicine*, 29(1), 187–203. <https://doi.org/10.1007/s11606-013-2536-8>
- Ranieri, L., Digiesi, S., Silvestri, B., & Roccotelli, M. (2018). A review of last mile logistics innovations in an externalities cost reduction vision. *Sustainability (Switzerland)*, 10(3), 1–18. <https://doi.org/10.3390/su10030782>
- Reinartz, W., Wiegand, N., & Imschloss, M. (2019). The impact of digital transformation on the retailing value chain. *International Journal of Research in Marketing*, 36(3), 350–366. <https://doi.org/10.1016/j.ijresmar.2018.12.002>
- Romijn, H., & Albaladejo, M. (2002). Determinants of innovation capability in small electronics and software firms in southeast England. *Research Policy*, 31(7), 1053–1067. [https://doi.org/10.1016/S0048-7333\(01\)00176-7](https://doi.org/10.1016/S0048-7333(01)00176-7)
- Rutner, S. M., & Langley Jr., C. J. (2000). Logistics Value - definition, process and measurement ano 2000.pdf. In *The International Journal of Logistics Management* (Vol. 11, Issue 2, pp. 73–82).
- Saglietto, L. (2021). Bibliometric analysis of sharing economy logistics and crowd logistics. *International Journal of Crowd Science*. <https://doi.org/10.1108/IJCS-07-2020-0014>
- Saunila, M., Pekkola, S., & Ukko, J. (2014). The relationship between innovation capability and performance: The moderating effect of measurement. *International Journal of Productivity and Performance Management*, 63(2), 234–249. <https://doi.org/10.1108/IJPPM-04-2013-0065>
- Seghezzi, A., & Mangiaracina, R. (2021). Investigating multi-parcel crowdsourcing logistics for B2C e-commerce last-mile deliveries. *International Journal of Logistics Research and Applications*, 0(0), 1–18. <https://doi.org/10.1080/13675567.2021.1882411>
- Shaffril, H. A. M., Samah, A. A., & Kamarudin, S. (2021). Speaking of the devil: a systematic literature review on community preparedness for earthquakes. *Natural Hazards*, 108(3), 2393–2419. <https://doi.org/10.1007/s11069-021-04797-4>

- Soon, Q. H., & Udin, Z. M. (2011). Supply chain management from the perspective of value chain flexibility: An exploratory study. *Journal of Manufacturing Technology Management*, 22(4), 506–526. <https://doi.org/10.1108/17410381111126427>
- Toy, J., Gesing, B., Ward, J., Noronha, J., & Bodenbenner, P. (2020). Logistics Trend Radar 5th edition. In *DHL Customer Solutions & Innovation*.
- Varpio, L., Paradis, E., Uijtdehaage, S., & Young, M. (2020). The Distinctions between Theory, Theoretical Framework, and Conceptual Framework. *Academic Medicine*, 989–994. <https://doi.org/10.1097/ACM.0000000000003075>
- Verri, F. A. N., Marcondes, C. A. C., Loubach, D. S., Sbruzzi, E. F., Marques, J. C., Pereira, L. A., De Albuquerque Maximo, M. R. O., & Curtis, V. V. (2020). An analysis on tradable permit models for last-mile delivery drones. *IEEE Access*, 8, 186279–186290. <https://doi.org/10.1109/ACCESS.2020.3030612>
- Wang, M. (2016a). *Logistics Capability , Supply Chain Uncertainty and Risk , and Logistics Performance : An Empirical Analysis of the Australian Courier Industry*.
- Wang, M. (2016b). The Role of Innovation Capability in the Australian Courier Industry. *International Journal of Innovation Management*, 20(7), 1–18. <https://doi.org/10.1142/S1363919616500705>
- Wang, M. (2020). Assessing logistics capability for the Australian courier firms. *International Journal of Logistics Systems and Management*, 37(4), 576–589. <https://doi.org/10.1504/IJLSM.2020.111827>
- Wang, M., Asian, S., Wood, L. C., & Wang, B. (2020). Logistics innovation capability and its impacts on the supply chain risks in the Industry 4.0 era. *Modern Supply Chain Research and Applications*, 2(2), 83–98. <https://doi.org/10.1108/mscra-07-2019-0015>
- Wang, M., Jie, F., & Abareshi, A. (2015). Evaluating logistics capability for mitigation of supply chain uncertainty and risk in the Australian courier firms. *Asia Pacific Journal of Marketing and Logistics*, 27(3), 486–498. <https://doi.org/10.1108/APJML-11-2014-0157>
- Wernerfelt, B. (1984). A Resource-based View of the Firm. *Strategic Management Journal*, 5, 171–180. <https://doi.org/10.1177/1056492611436225>
- Zelin, J. (2018). The Future of Last-Mile Delivery: a Scenario Thinking Approach. In *Canadian Medical Association Journal* (Vol. 190, Issue 47). <http://www.cmaj.ca/lookup/doi/10.1503/cmaj.180710>
- Zhang, Q., Vonderembse, M. A., & Lim, J. S. (2005). Logistics flexibility and its impact on customer satisfaction. *The International Journal of Logistics Management*, 16(1), 71–95. <https://doi.org/10.1108/09574090510617367>
- Zhao, M., Droge, C., & Stank, T. P. (2001). The effects of Logistics Capabilities on Firm Performance: Customer-Focused versus Information-Focused Capabilities. *Journal of Business Logistics*, 22(2), 91–107.