



International Journal of Logistics Research and Applications

A Leading Journal of Supply Chain Management

ISSN: 1367-5567 (Print) 1469-848X (Online) Journal homepage: www.tandfonline.com/journals/cjol20

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To cite this article: Michael Wang, Mukesh Kumar & Naoum Tsolakis (01 Apr 2025): Exploring the role of job satisfaction in enhancing logistics performance in the era of Industry 5.0, International Journal of Logistics Research and Applications, DOI: [10.1080/13675567.2025.2486645](https://doi.org/10.1080/13675567.2025.2486645)

To link to this article: <https://doi.org/10.1080/13675567.2025.2486645>



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Published online: 01 Apr 2025.



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Exploring the role of job satisfaction in enhancing logistics performance in the era of Industry 5.0

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ABSTRACT

This paper presents an empirical study exploring how job satisfaction influences logistics performance in Industry 5.0, focusing on the key logistics capabilities of innovation and customer responsiveness. Although the logistics business is evolving rapidly, emerging technologies have been applied in the logistics business, human jobs cannot be completely replaced. Based on the High-Performance Work Systems theory and resource-based view, it is crucial to exploit internal resources and capabilities to achieve sustainable competitive advantage and performance. The empirical data were collected in the Australian courier sector, and a total of 161 valid responses were used in the data analysis. We conducted partial least squares structural equation modelling to validate models and test the research hypotheses. The findings suggest a significant impact of job satisfaction on logistics performance, with logistics capabilities playing a mediating role in the relationship between job satisfaction and logistics performance.

ARTICLE HISTORY

Received 23 October 2024
Accepted 25 March 2025

KEYWORDS

Job satisfaction; innovation; customer responsiveness; logistics performance; Industry 5.0; human-centred operations

1. Introduction

The logistics and delivery service sectors are essential for driving economic growth and achieving the objectives of Industry 5.0 (I5.0) (Grosse et al. 2023; Karaman, Kilic, and Uyar 2020). This sector is inherently labour-intensive (Winkelhaus, Grosse, and Glock 2022), and despite the extensive integration of advanced technologies in logistics (Davies and Wang 2021; Wang et al. 2021; Wang and Prajogo 2024), human jobs cannot be entirely supplanted (Leng et al. 2023; Winkelhaus, Grosse, and Glock 2022). People remain an indispensable component of future logistics service roles (Grosse et al. 2023; Kadir, Broberg, and da Conceição 2019).

In response to the recognised gaps in human-centricity, resiliency, and sustainability within Industry 4.0, the European Commission introduced the I5.0 vision in 2021. This vision emphasises harmonising human and machine roles, aiming to create production and logistics systems that deliver benefits to both companies and society (Huang et al. 2022). The I5.0 framework underscores worker well-being, integrating advanced technologies to enhance job satisfaction, societal prosperity, and environmental sustainability (Grosse et al. 2023; Leng et al. 2022; Rzepka 2023).

Human-machine reconciliation lies at the heart of I5.0, focusing on leveraging the strengths of humans alongside advanced systems to address complex operational challenges (Lu et al. 2022).

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This reconciliation is especially critical in labour-intensive logistics and supply chain operations (Grosse et al. 2023; Winkelhaus, Grosse, and Glock 2022), where labour-related issues can cause significant delays and shortages (Jiang, Baker, and Frazier 2009; Min 2007). Work-related human factors, often encountered in service occupations, add further complexity to achieving optimal logistics performance (Johnston et al. 2021).

From the resource-based view (RBV), human resources are recognised as a vital firm resource contributing to superior performance (Barney 1991; Easa, Wang, and Abdul-Al 2023). This study integrates theories from Human Resource Management (HRM) and organisational theory to develop a framework examining how job satisfaction impacts logistics performance through key I5.0 logistics capabilities: innovation and customer responsiveness (Grosse et al. 2023; Rzepka 2023).

Building on the High-Performance Work Systems (HPWS) theory, which highlights employees' roles in driving superior performance, this framework extends beyond HRM into logistics and operations management (Boxall and Macky 2009). By combining HPWS and RBV perspectives, the study argues that employees are essential for organisations to develop capabilities and achieve sustainable competitive advantage (Barney 1991; Boxall and Macky 2009; Wernerfelt 1984). Although prior research has examined human well-being, compensation, retention, and turnover in logistics and transport (Kadir, Broberg, and da Conceição 2019; Min 2007), little attention has been given to human factors' impact on logistics system performance within the I5.0 context (Grosse et al. 2023; Wei, Nan, and Wei 2020).

In this study, innovation and customer responsiveness – regarded as important organisational capabilities – are identified as key mediators in the relationship between job satisfaction and logistics performance. Innovation drives the continuous transformation of knowledge and ideas into practical logistics solutions (Gligor, Russo, and Maloni 2022; Wang 2020; Wang et al. 2020), aligning with I5.0's emphasis on integrating human capabilities with advanced systems (Grosse et al. 2023; Rzepka 2023). In the I5.0 era, the focus is shifting towards a more human-centric approach, where innovation, agility, and resilience play central roles in shaping logistics performance (Lu et al. 2022). This study explores the critical relationship between job satisfaction, logistics performance, and customer responsiveness, emphasising the human element in driving organisational success. In the face of increasing environmental volatility – including trade wars, geopolitical tensions, and extreme weather events – resilience and agility are crucial for navigating uncertainties in the post-COVID-19 I5.0 era (Grosse et al. 2023; Wang, Childerhouse, and Abareshi 2024). Customer responsiveness, derived from agility (Wang and Wang 2024), enables firms to deliver customised, high-quality products efficiently, fostering resilience and adaptability (Gligor, Holcomb, and Feizabadi 2016; Walter 2021).

This paper addresses the gaps in the literature by exploring the impact of human factors on logistics performance through logistics innovation and customer responsiveness. Focusing on the courier logistics sector – a critical area driven by the rapid growth of e-commerce, this study examines how job satisfaction influences logistics performance and highlights the importance of human factor and human-machine integration in achieving the I5.0 vision. For example: DHL has implemented AI-driven robotics (e.g. LocusBots) in its fulfilment centres to assist human workers (DHL 2024). DHL's ability to integrate AI and robotics into daily operations represents its innovation capability. These robots reduce manual workload, automate repetitive tasks, and create a safer working environment. Employees who feel cared and valued are more willing to collaborate with technology rather than resist it. A satisfied workforce is more likely to engage in innovation, such as suggesting process improvements for better human-robot interaction. As a result, operational efficiency improves, order fulfilment speeds increase, and error rates decrease, enhancing overall logistics performance.

FedEx has implemented predictive analytics and SenseAware technology, allowing employees to track shipments in real time and provide proactive updates to customers (FedEx 2012). Such technology can deliver significant value to both internal and external customers. When internal customers, such as employees feel empowered and supported, they are more engaged in problem-solving and ensuring smooth delivery operations. A satisfied workforce leads to quicker responses to

shipment delays, proactive issue resolution, and better communication with customers. External customers, such as customers receive real-time notifications, allowing them to adjust their supply chain operations accordingly. This enhanced customer responsiveness strengthens customer trust, reduces supply chain disruptions, and improves FedEx's overall logistics performance.

The remainder of the paper is structured as follows: the next two sections provide a literature review and hypothesis development. Section 4 details the data collection and analysis methods used in the research. In Section 5, the research models are validated, hypotheses are tested, and a multi-group analysis is conducted. Section 6 discusses the research findings, and the paper concludes with a summary of the results and implications.

2. Theoretical background

Grounded in the RBV, this study conceptualises innovation and customer responsiveness as logistics capabilities that drive competitive advantage. I5.0 represents a forward-thinking vision for the future of the industry, emphasising a human-centric, sustainable, and resilient manufacturing system (Asif, Searcy, and Castka 2023). Building upon Industry 4.0, I5.0 integrates advanced technologies with human factors to foster adaptability and sustainability (Huang et al. 2022). This research develops a comprehensive framework that links human factors, I5.0 capabilities, and logistics outcomes, with job satisfaction as a pivotal human-centric construct. The core capabilities including logistics innovation and customer responsiveness, serve as drivers of logistics performance, a key outcome in this framework.

2.1. Job satisfaction

Human resources are widely acknowledged as the most valuable asset within an organisation (Easa, Wang, and Abdul-Al 2023; Edmans 2012; McGuirk, Lenihan, and Hart 2015). Human capital encompasses the skills, judgement, relationships, experience, intelligence, and insights of managers and employees (Barney 1991; Rich, Lepine, and Crawford 2010). Job satisfaction is a critical indicator in the field of HRM (Bisht et al. 2023; Mobley 1977), and is characterised by an individual's positive or negative feelings towards their job (Gligor, Russo, and Maloni 2022). Wright and Cropanzano (2000) argue that job satisfaction is a relatively narrow construct, typically operationalised cognitively, but widely utilised organisationally through measures of worker happiness. Weiss, Nicholas, and Daus (1999) define job satisfaction as the overall evaluation an individual makes regarding their job. It often reflects the degree of contentment an individual feels towards their job (Parvin and Nurul Kabir 2012). HPWS highlight the potential of job satisfaction to enhance productivity and improve organisational outcomes (Boxall and Macky 2009). Grosse et al. (2023) advocate for human-centric approaches in production and logistics system design, emphasising the integration of human factors to foster job satisfaction.

Job satisfaction is intricately linked to various organisational phenomena, though its relationship with business operations is context-dependent and varies by industry and organisational factors (Pang and Lu 2018; Tsai and Yen 2020). In I5.0, job satisfaction is an important parameter for assessing human-centric digitalisation (Grosse et al. 2023; Leon 2023). Notably, there is a well-established relationship between job satisfaction and labour turnover (Jiang, Baker, and Frazier 2009; Min 2007; Mobley 1977). Mobley's model of employee turnover decision-making suggests that job dissatisfaction typically prompts thoughts of quitting, positioning it as a precursor to employee turnover (Mobley 1977). Weiss, Nicholas, and Daus (1999) explore the combined effects of affective and cognitive factors on job satisfaction. Min (2007) highlights that enhancing job satisfaction among warehouse employees can mitigate turnover rates.

Low levels of job satisfaction can signal underlying labour issues, resulting in workforce shortages and delays across logistics and supply chains (Jiang, Baker, and Frazier 2009; Maloni et al. 2019; Wang, Wood, and Wang 2022). Conversely, high job satisfaction is critical for

organisational effectiveness (Fitzsimmons, Fitzsimmons, and Bordoloi 2014; Wei, Nan, and Wei 2020; Williams and Anderson 1991). Judge et al. (2001) provide a comprehensive review of the various models explaining the relationship between satisfaction and performance, synthesising qualitative and quantitative insights.

Recent studies have further contextualised job satisfaction within the I5.0 framework. For instance, Frutos-Bencze et al. (2022) examined the impact of the COVID-19 pandemic on job satisfaction, noting the influence of gender differences and firm size. Leon (2023) underscores the importance of job satisfaction and employees' psychological profiles in ensuring the success of teamwork, online communities of practice, and enterprise social networks in I5.0.

2.2. Logistics innovation

The emerging paradigm of I5.0 necessitates that companies evolve towards a more sustainable, human-centric, and resilient industry, with innovation serving as a core driver (European Commission 2024; Rzepka 2023). Logistics innovation is a crucial business capability for organisational success (Gligor, Russo, and Maloni 2022; McGuirk, Lenihan, and Hart 2015; Tsai and Yen 2020; Wang et al. 2020). It is not solely about entering new markets but also about enhancing service delivery in established markets. According to Tidd and Bessant (2021), innovation is driven by the ability to identify connections, recognise opportunities, and capitalise on them. Østergaard, Timmermans, and Kristinsson (2011) describe innovation as an interactive process involving communication and collaboration among employees at various levels within an organisation, leveraging their diverse skills and perspectives. Tsai and Yen (2020) stress that fostering an environment encouraging employees to develop new products and services is pivotal to achieving innovation excellence.

Innovation encompasses both incremental innovation, which focuses on improving existing processes, and radical innovation, involving the introduction of entirely new approaches (Tidd and Bessant 2021). The synergy between innovation and I5.0 lies in the latter's paradigm shift, integrating technological advancements with human-centric values and sustainability (Asif, Searcy, and Castka 2023; Grosse et al. 2023). In an era marked by rapid environmental changes and heightened market turbulence, logistics innovation has become increasingly vital (Wang et al. 2024; Wang, Tae-Woo Lee, and Chan 2023). It involves the integration of new technologies, services, processes, and ideas to address emerging challenges and adapt to evolving conditions (Wang, Kim, and Chan 2022), encompassing innovations in delivery methods, logistics processes, and operational systems (Amling and Daugherty 2020). Wang et al. (2025) highlight the importance of innovation in shaping the relationship between supply chain digitalisation and supply chain agility.

Technology plays a pivotal role in enabling logistics innovation (Wang et al. 2025). Key applications include information systems, tracking and tracing technologies, proof of delivery mechanisms, and transportation information sharing (Wang et al. 2021), all of which are heavily reliant on technological advancements (Pagano and Liotine 2020; Wang 2016; Wang, Childerhouse, and Abareshi 2024). McGuirk, Lenihan, and Hart (2015) advocate for focusing on internal human resources and capabilities to drive innovation, underscoring the importance of organisational talent. Moreover, Morash and Clinton (1997) highlight the dual importance of standardisation and customisation as key innovative capabilities in transportation. For instance, logistics operations often involve diverse value-added tasks, with both standardised and customised activities representing tailored innovations to meet specific customer needs.

2.3. Customer responsiveness

Customer responsiveness refers to a firm's ability to respond promptly to customers' needs and wants (Chen, Paulraj, and Lado 2004; Johnston et al. 2021; Tunc and Gupta 1993; Wang, Jie, and Frederico 2024). Christopher and Towill (2002) highlight the need for organisations to pivot from viewing cost as the primary order winner to recognising responsiveness as a critical market

differentiator, especially given the prevalence of extremely short product life cycles. Just-in-time (JIT) practices, as noted by Fullerton and McWatters (2001), can enhance customer responsiveness by reducing response times. Superior responsiveness delivers significant advantages, such as fostering customer loyalty, facilitating continuous improvements in operational systems, and effectively aligning with strategic objectives (Chen, Paulraj, and Lado 2004). This makes customer responsiveness a cornerstone of effective service operations (Johnston et al. 2021).

Courier companies, as service-oriented organisations, exemplify the importance of customer responsiveness in logistics (Johnston et al. 2021; Wang, Wang, and Chan 2021). Conceptually, responsiveness can be viewed as an element of organisational climate, reflecting the organisation's capability to deliver exceptional service (Johnston et al. 2021; Salanova, Agut, and Peiró 2005; Schneider and Bowen 1993). Organisational resources, including employee perceptions and motivation, play a critical role in shaping this service climate (Johnston et al. 2021; Salanova, Agut, and Peiró 2005).

In the logistics service context, the customer is a pivotal stakeholder (Fawcett and Cooper 1998; Wang, Wang, and Chan 2021). Ensuring customer satisfaction remains a fundamental objective in logistics service delivery (Fawcett and Cooper 1998; Fugate, Mentzer, and Stank 2010; Mentzer, Flint, and Kent 1999). Customer service can be assessed through metrics such as lead time, average transit time, and transit time variability (Fawcett and Cooper 1998; Johnston et al. 2021). Additionally, Mentzer, Flint, and Kent (1999) argue that customer service and physical distribution service are integral components of logistics service.

Quick response capabilities are increasingly recognised as vital for securing a competitive advantage and achieving sustainability (Christopher and Towill 2002; Wang, Jie, and Frederico 2024). To remain competitive, companies must swiftly adapt their operations to both internal and external changes (Gligor, Esmark, and Holcomb 2015; Wang and Wang 2024). Customer responsiveness encompasses the ability of a service to address customer requests promptly and ensure rapid throughput (Johnston et al. 2021). This ability enhances business resilience, aligning with the key principles of I5.0 (Huang et al. 2022; Wang, Wang, et al. 2024).

2.4. Logistics performance

Logistics performance is a critical metric within the supply chain domain, underscoring its importance for organisational success (Green, Whitten, and Inman 2008; Lambert and Pohlen 2001; Wang 2018). The maxim 'if you cannot measure it, you cannot manage it' highlights the necessity of performance measurement in achieving operational excellence (Fawcett and Cooper 1998; Wang 2018). Logistics performance measurement involves quantifying the efficiency and effectiveness of logistics operations, with significant implications for organisational behaviour (Kalaiaresan et al. 2022; Neely, Gregory, and Platts 1995).

Traditional approaches to logistics performance measurement focus on five key areas: cost, asset management, customer service, productivity, and logistics quality (Fawcett and Cooper 1998; Zhou et al. 2023). However, balancing efficiency and effectiveness remains a core challenge for logistics managers (Fugate, Mentzer, and Stank 2010). Green, Whitten, and Inman (2008) and Fugate, Mentzer, and Stank (2010) demonstrate that effective logistics performance positively impacts overall organisational performance. Liu and Lyons (2011) have explored the link between service capabilities and the performance of third-party logistics providers. In recent years, the focus has shifted towards sustainability and digitalisation in logistics. Abbasi and Nilsson (2016) identify the challenges in developing environmentally sustainable logistics practices, while Karaman, Kilic, and Uyar (2020) examine the relationship between green logistics performance and sustainability reporting. Kalubanga and Namagembe (2022) explore the role of trust in logistics performance, demonstrating that trust indirectly affects performance through its impact on commitment, logistics outsourcing relationship quality (LORQ), and relationship satisfaction. Improvements in LORQ further enhance the positive effects of relationship satisfaction on logistics performance.

Zhou et al. (2023) illustrate how digitalisation in logistics enhances both financial and service performance for 3PL providers by improving customer collaboration. Additionally, government support amplifies the positive impact of customer collaboration on service performance, though its influence on financial performance is limited.

Performance measurement systems typically comprise multiple measures tailored to the organisational context (Gunasekaran and Kobu 2007; Neely, Gregory, and Platts 1995; Schmitz and Platts 2004). Logistics performance pertains to firm-level outcomes rather than individual employee performance, necessitating the collection of relevant information to evaluate activities at appropriate levels. Lambert and Pohlen (2001) emphasise that performance measures must align with organisational strategic goals, as they enable management to assess activities and maintain competitiveness.

Effective logistics performance measurement incorporates both internal and external metrics within the supply chain (Lambert and Pohlen 2001; Wang, Jie, and Abareshi 2018a). Morash and Clinton (1997) emphasise the importance of considering both internal and external customers. Internal metrics may include lead time, operating costs, on-time performance, delays, and data accuracy (Lambert and Pohlen 2001; Wang, Jie, and Abareshi 2015), while external metrics encompass customer satisfaction, reputation, and complaints (Neely, Gregory, and Platts 1995; Wang, Jie, and Abareshi 2015). Mentzer, Flint, and Kent (1999) highlight that customer satisfaction is a vital component of logistics performance measurement. Historically, logistics performance has focused predominantly on internal metrics such as lead time, costs, and non-financial measures (Lambert and Pohlen 2001). However, I5.0 necessitates the inclusion of external metrics that reflect the perspectives of diverse stakeholders, including customers, suppliers, government bodies, and communities (Wang and Easa 2024). Wang, Jie, and Abareshi (2015) propose a measurement model that integrates both internal and external performance measures.

The research gap lies in the limited exploration of the relationship between job satisfaction and logistics performance. The role of logistics capabilities, such as logistics innovation and customer responsiveness, as mediators in this relationship, has not been adequately addressed. This study makes several contributions to the existing literature. It examines the impact of job satisfaction on logistics performance in the context of I5.0, a rapidly developing area that involves the integration of advanced technologies while recognising the continued importance of human resources in logistics operations. The study also investigates the mediating role of key logistics capabilities, including logistics innovation and customer responsiveness, in the relationship between job satisfaction and logistics performance. By providing empirical evidence from the Australian courier sector, this study offers insights into how human factors can enhance logistics capabilities and overall performance. Additionally, the study extends the application of HPWS theory and RBV theory to the logistics field, particularly in an environment shaped by I5.0. To further clarify the contributions of the study, Table 1 illustrates the key research gaps and the study's contributions.

Table 1. Research gaps and study contributions.

Research Gap	Contribution of the Study
Limited studies on job satisfaction's impact on logistics performance.	Examines the impact of job satisfaction on logistics performance, considering the integration of logistics capabilities and the role of human resources.
Insufficient understanding of the mediating role of logistics capabilities (logistics innovation and customer responsiveness) in the job satisfaction-performance relationship.	Investigates the mediating role of logistics capabilities, including logistics innovation and customer responsiveness, in the relationship between job satisfaction and logistics performance.
Lack of empirical evidence regarding the application of HPWS and RBV theories in logistics	Applies HPWS and RBV theories to the logistics field, exploring how internal resources and capabilities contribute to sustainable competitive advantage and logistics performance.
Limited research on how human resource practices can enhance logistics performance through capabilities in the logistics industry.	Provides empirical evidence from the Australian courier sector, demonstrating how job satisfaction can improve logistics performance by enhancing logistics capabilities.

3. Research hypotheses

This section outlines the development of hypotheses and proposes a series of hypotheses to investigate the relationships between human factors in operations, capabilities in I5.0, and logistics outcomes. This model extends the current understanding within human resource literature and logistics research by integrating elements of HPWS and RBV with organisational behaviour theory. The conceptual model, illustrated in Figure 1, is discussed in detail below.

3.1. The relationship between job satisfaction and logistics innovation

Job satisfaction refers to the overall contentment employees feel with their work conditions (Parvin and Nurul Kabir 2012). Based on HPWS, job satisfaction indicates the level of employee engagement, motivation, and commitment, which are critical for enhancing individual performance and contributing to overall organisational success. Innovation often relies on individuals in the organisation (Wei, Nan, and Wei 2020). The composition and engagement of employees play a critical role in driving innovation processes. Østergaard, Timmermans, and Kristinsson (2011) argue that innovation is inherently an interactive process where employees collaborate in groups to develop, discuss, modify, and realise new ideas. Moreover, human factors are closely linked to innovation outcomes, with job satisfaction emerging as a key determinant (Wang and Gligor 2024). Tsai and Yen (2020) highlight that higher levels of job satisfaction can enhance employees’ commitment to innovation, fostering a supportive environment for creative initiatives. McGuirk, Lenihan, and Hart (2015) find that managers with high job satisfaction are more inclined to engage in innovative activities. Shipton et al. (2006) identify job satisfaction as a significant predictor of subsequent organisational innovation.

Lambert and Hogan (2010) also report significant positive associations between job satisfaction and innovation. Akdol and Arikboga (2015) emphasise that high levels of job satisfaction are essential for cultivating an innovative workplace culture. Wei, Nan, and Wei (2020) emphasise that improving employee satisfaction can substantially boost corporate innovation by enhancing employee motivation. Additionally, Gligor, Russo, and Maloni (2022) provide an intriguing perspective, showing that both high and low levels of job satisfaction among men can lead to increased logistics innovation. Based on this evidence, we propose the following hypotheses:

H1: There is a positive relationship between job satisfaction and logistics innovation.

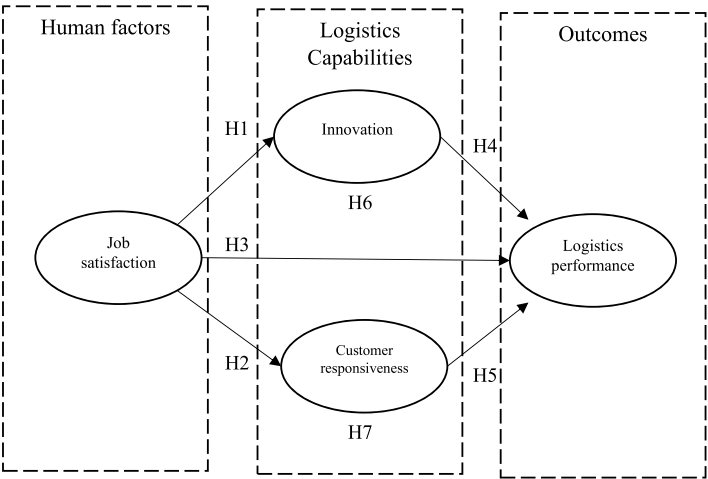


Figure 1. Conceptual framework.

3.2. The relationships between job satisfaction and customer responsiveness

In service organisations, frontline employees play a pivotal role in customer engagement (Fitzsimmons, Fitzsimmons, and Bordoloi 2014). Frequent and direct interactions between employees and customers mean that the quality of employees' work experiences often influences their service delivery (Salanova, Agut, and Peiró 2005; Schneider and Bowen 1993). Consequently, customer responsiveness defined as the ability to meet and adapt to customer needs promptly, can be significantly affected by employees' effort, competence, and satisfaction at work.

Schneider and Bowen (1993) highlight the significance of human resource management in achieving superior service quality. Hartline and Ferrell (1996) demonstrate that job satisfaction impacts customers' perceptions of service quality. Edmans (2012) suggests that job satisfaction contributes positively to firm value. Additionally, Auh et al. (2016) show that service employees' job satisfaction affects their level of job engagement. Rich, Lepine, and Crawford (2010) argue that satisfied employees are more likely to engage in behaviours that enhance organisational effectiveness, including responsiveness to customer needs. These findings suggest that positive work experiences, such as high job satisfaction, are reflected in improved service delivery, including enhanced customer responsiveness. Based on this understanding, we propose the following hypothesis:

H2: There is a positive relationship between job satisfaction and customer responsiveness.

3.3. The relationships between job satisfaction and logistics performance

Although job satisfaction is recognised as a crucial factor in the workplace (Grosse et al. 2023; Wright and Cropanzano 2000), research predominantly focuses on its relationship with individual performance (Edmans 2012), with limited exploration into its impact on logistics performance. The broader human resource literature presents a contested view on the link between job satisfaction and performance (Judge et al. 2001; Lyubomirsky, King, and Diener 2005; Wang, Hill, and Hwang 2023; Wright and Cropanzano 2000). For instance, Wright and Cropanzano (2000) found no significant association between job satisfaction and job performance, highlighting the need for further investigation. Similarly, Rich, Lepine, and Crawford (2010) reported no statistically significant relationship between job satisfaction and key outcomes such as task performance and organisational citizenship behaviour. On the other hand, Pushpakumari (2008) identified a positive correlation between job satisfaction and employee performance, while Akdol and Arikboga (2015) demonstrated that higher job satisfaction leads to improved workplace performance.

Logistics performance, as an aggregate measure of organisational job performance, reflects both direct and indirect employee contributions. Metrics such as customer satisfaction often mirror the overall job satisfaction of employees. Judge et al. (2001) argue that various theoretical models suggest a relationship between job satisfaction and performance. Edmans (2012) posits that job satisfaction enhances firm value, and a positive work environment can foster improved performance. Wang, Hill, and Hwang (2023) suggest that improving job satisfaction can contribute to organisational sustainability, particularly in logistics operations. Based on this evidence, the following hypotheses are proposed:

H3: There is a positive relationship between job satisfaction and logistics performance.

3.4. The relationships between logistics innovation, customer responsiveness, and logistics performance

Based on the RBV, logistics innovation and customer responsiveness are key capabilities that contribute to enhanced logistics performance by leveraging unique organisational resources and fostering competitive advantages (Barney 1991; Wang 2020). Previous studies have consistently highlighted the significant impact of logistics capabilities on logistics performance (Bag, Gupta,

and Luo 2020; Richey, Stefan, and Daugherty Patricia 2005; Shang and Marlow 2005). These capabilities are especially crucial for courier companies, where advanced logistics capabilities are essential for efficient and reliable delivery operations.

Innovation capability also plays a pivotal role in logistics performance. Wang (2016) suggests that innovation capability has a positive influence on logistics performance. Additionally, Richey, Stefan, and Daugherty Patricia (2005) find that innovative reverse logistics capabilities are positively associated with logistics performance. Bag, Gupta, and Luo (2020) also emphasise that improvements in responsiveness can lead to better logistics performance. Wang et al. (2020) also reveal that logistics innovation helps mitigate supply chain risks, ultimately contributing to improved logistics performance. Based on these findings, the following hypotheses are proposed:

H4. There is a positive relationship between logistics innovation and logistics performance.

The logistics management literature widely supports a positive relationship between logistics capabilities and logistics performance (Grawe, Daugherty, and Roath 2011; Jay Joong-Kun, John, and Harry 2008; Shang and Marlow 2005; Wang and Wang 2024). Chen, Paulraj, and Lado (2004) reveal that customer responsiveness has a direct positive impact on financial performance. Fullerton and McWatters (2001) argue that reducing customer response time, a key indicator of customer responsiveness can enhance operational performance. Building on these insights, we propose the following hypotheses:

H5. There is a positive relationship between customer responsiveness and logistics performance.

3.5. Mediating role of logistics innovation and customer responsiveness

Logistics innovation and customer responsiveness serve as mediating variables that elucidate the relationship between job satisfaction and logistics performance in I5.0. These factors are crucial logistics capabilities (Wang 2020). Firms achieve sustainable competitive advantage by cultivating resources and capabilities that are valuable and challenging for competitors to replicate (Wernerfelt 1984). Such advantages can result in superior firm performance (Barney 1991). Enhanced job satisfaction may reflect the adoption of industry-standard HR practices. Additionally, employees with high job satisfaction are more likely to demonstrate commitment to their organisation, thereby improving organisational capabilities and overall performance (Pang and Lu 2018; Pettit, Goris, and Vaught 1997). Therefore, we propose the following hypotheses:

H6. The relationship between job satisfaction and logistics performance is mediated by logistics innovation.

H7. The relationship between job satisfaction and logistics performance is mediated by customer responsiveness.

4. Methodology

4.1. Data collection and sample

Empirical data for this study were collected via a cross-sectional survey targeting the Australian courier industry. The survey for this study was conducted within the Australian courier sector during May and June 2014. This sector was chosen due to its relevance in the context of logistics performance, job satisfaction, and the application of digital technologies, which were emerging at the time. The survey period allowed for adequate data collection from a wide range of respondents, ensuring a comprehensive understanding of the relationships between job satisfaction, logistics performance, and the mediating role of logistics capabilities. The sample was drawn from the Australian Business Register database using purposive sampling and included companies of varying sizes, encompassing small, medium, and large courier firms operating within Australia. Purposive sampling is a non-random sampling technique where researchers deliberately select specific individuals or groups based on particular characteristics or criteria relevant to the study. This approach

is used when researchers need to focus on a particular subset of a population that has specific attributes or experiences pertinent to the research question (Bryman and Bell 2011). In this case, the criteria for participant selection were as follows: Only employees within the Australian courier sector were included, with a focus on individuals in logistics-related roles. Participants were specifically chosen for their direct involvement in logistics operations, including positions such as operations managers and customer service representatives, ensuring that the sample consisted of individuals with relevant, hands-on experience in the field.

The sample included courier companies from across all states and territories of Australia: New South Wales, Queensland, South Australia, Tasmania, Victoria, Western Australia, the Australian Capital Territory, and the Northern Territory (Table 2). We invited employees with relevant experience from these companies to participate in the survey. Participation was entirely voluntary and anonymous.

An introductory cover letter, outlining the study's objectives, was included with the online questionnaire. The survey link was distributed via email to potential participants, with one respondent invited from each company. Given the structure of the courier industry, each branch was treated as a separate entity, thus one respondent per branch was surveyed.

The majority of respondents, over 75%, were in managerial roles. Incomplete surveys were excluded from the dataset. A total of 161 completed questionnaires were gathered, representing an approximate response rate of 25%. In structural equation modelling (SEM), a sample size of at least 100–150 is generally considered appropriate for obtaining reliable results, especially when using techniques such as Partial Least Squares SEM (PLS-SEM), which is more flexible with smaller sample sizes compared to covariance-based SEM (Hair, Ringle, and Sarstedt 2011). Based on the '10-times rule' in SEM, which recommends a sample size of at least 10 times the maximum number of observed variables (9 in our case) (Bentler and Chou 1987), our sample size of 161 exceeds this minimum requirement, ensuring sufficient power for reliable analysis.

Ethical approval for this study was obtained from the relevant ethics committee, prior to the commencement of the research. All participants provided informed consent, and the study was conducted in accordance with the ethical guidelines and regulations set forth by the institution. Table 1 presents the key characteristics of the respondents.

4.2. Non-response bias and common method bias

The non-response bias was tested in this study. This bias that occurs due to significant differences between respondents and non-respondents (Sheikh and Mattingly 1981). The difference in

Table 2. Characteristics of respondents (n = 161).

Characteristics	%
Job position	
CEO / Senior Management	49
Managers / middle-level management	17
Supervisor / Team leader	10
Staff/drivers	24
Location	
Victoria	41
New South Wales	25
Queensland	9
Western Australia	7
South Australia	7
Northern Territory	5
Australian Capital Territory	4
Tasmania	4
Number of employees	
1–19	33
20–199	25
200 or more	42

outcome between early and late respondents, and the demographic or other basic characteristics may reveal non-response bias (Armstrong and Overton 1977; Sheikh and Mattingly 1981). We compared the early and late responses and different demographic variables. The results did not show any significant differences between respondents and non-respondents. This illustrates that non-response bias is not a major concern in the data.

Common method bias may occur when data are mainly gathered from a single respondent research design (Podsakoff et al. 2003). We conducted Harman's single factor test, which is a popular method to test the common method bias in survey research, to examine the possibility of common method bias in our data (Podsakoff, Mackenzie, and Podsakoff 2012). The principal axis factoring method was applied in the factor analysis. Our results show that the first of these extracted factors accounted for 39% of the variance, less than the threshold value of 50%. Thus, the factor did not explain the majority of the variance. These results indicate that common method bias is not a significant concern in this study.

4.3. Instrument

A comprehensive literature review was conducted to establish the constructs for measurement, with all measures being adapted from existing research. To ensure the validity and reliability of the questionnaire, we sought feedback from several academics and practitioners. Based on their comments, minor revisions were made, including the removal of redundant wording and the addition of clarifying information about the questionnaire.

Participants were asked to rate their responses on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree), with the exception of the job satisfaction measure. For job satisfaction, a single-item measure was employed to capture overall job satisfaction. Single-item measures are often more effective and preferable for assessing job satisfaction compared to multiple-item measures (Dolbier et al. 2005; Nagy 2002). The constructs for logistics capabilities, including innovation and customer responsiveness, were derived from prior studies (Fawcett and Cooper 1998; Fawcett and Stanley 1997; Morash 2001; Wang 2020). Logistics performance, the dependent variable in this study, was assessed using both internal and external measures at the organisational level (Green, Whitten, and Inman 2008; Lambert and Pohlen 2001). Multiple indicators were used to evaluate the overall performance of logistics operations within an organisation (Fawcett and Cooper 1998; Wang, Jie, and Abareshi 2015).

A reflective measurement model is applied to measure all constructs in the survey. This approach is standard in management sciences, where changes in the observed variables are indicative of changes in the latent constructs (Coltman et al. 2008). The survey measures used in this study are detailed in Appendix A.

5. Data analysis and result

5.1. Measurement model

We employed confirmatory factor analysis (CFA) to validate the factor structure of the observed variables, given that all measures were adapted from existing literature. To ensure the robustness of the measurement model, we assessed both its reliability and validity, following the guidelines established by Fornell and Larcker (1981).

Construct reliability was evaluated using Cronbach's alpha and Composite Reliability (CR). Convergent validity, which supports construct validity, was also examined (Campbell and Fiske 1959). The results of the CFA are presented in Table 3. The factor loadings for all items exceeded the recommended threshold of 0.70. Additionally, Cronbach's alpha for all constructs surpassed the acceptable threshold value of 0.70, and the Average Variance Extracted (AVE) for all constructs was above the threshold of 0.50. These findings confirm the convergent validity of the measurement model.

Table 3. Construct reliability and validity ($n = 161$).

Construct	Item	Mean	Standardized Estimate	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Job satisfaction	JS	6.00	1*	1*	1*	1*
Logistics Innovation	I1	5.83	0.75	0.87	0.90	0.65
	I2	5.72	0.81			
	I3	5.80	0.83			
	I4	5.78	0.85			
	I5	5.91	0.78			
Customer Responsiveness	C1	6.36	0.84	0.76	0.86	0.67
	C2	6.15	0.84			
	C3	6.06	0.78			
Logistics Performance	L1	5.15	0.70	0.93	0.94	0.66
	L2	5.53	0.76			
	L3	5.73	0.85			
	L4	5.60	0.86			
	L5	5.73	0.87			
	L6	5.85	0.91			
	L7	5.81	0.79			
	L8	6.17	0.73			
	L9	5.83	0.80			

Note: *Single item.

Discriminant validity was assessed using the Fornell and Larcker criterion, as outlined by Ab Hamid, Sami, and Mohmad Sidek (2017). According to Fornell and Larcker (1981), this method helps to evaluate discriminant validity and mitigate potential multicollinearity issues within the research. Additionally, construct validity tests enhance the understanding of the quality of the measures employed (Hair et al. 2019). Table 4 presents the results of the discriminant validity analysis. We compared the correlations between constructs with the square roots of their AVE values. The findings reveal that the square roots of the AVEs were greater than the correlations between constructs, thereby confirming the establishment of discriminant validity in this study.

5.2. Path model

Before validating the path model, we first evaluated the measurement models, ensuring that they met satisfactory levels of validity and reliability. We employed the Partial Least Squares Structural Equation Modelling (PLS-SEM) method for path model validation and hypothesis testing. The PLS-SEM method is advantageous due to its statistical power, which is particularly useful for exploratory research involving less developed theories and for testing single-item constructs (Hair et al. 2019). Additionally, the distributional assumptions differ significantly from those required in covariance-based SEM (CB-SEM). PLS-SEM is particularly advantageous because it does not require strict adherence to normal distribution assumption (Hair et al. 2014).

To test the hypotheses, we conducted a path model analysis using PLS-SEM to examine the relationships among the constructs. The results of the hypothesis tests (H1-H5) are summarised in Table 5. Figure 2 presents the findings from the PLS-SEM path analysis. The hypotheses linking job satisfaction to logistics innovation and customer responsiveness (H1 and H2) were both statistically significant and in the anticipated direction. Specifically, the path from job satisfaction to

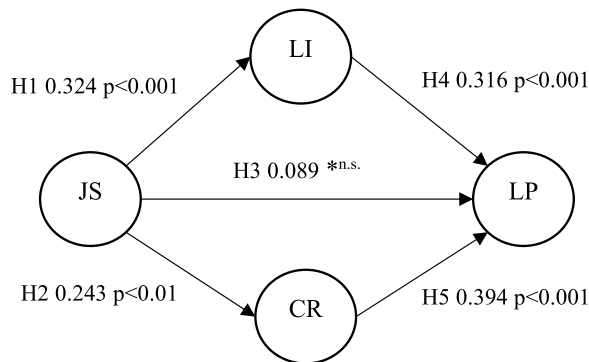
Table 4. Discriminant validity.

	JS	LI	LP	CR
Job satisfaction (JS)	1			
Logistics Innovation (LI)	0.32	0.80		
Logistics Performance (LP)	0.29	0.53	0.81	
Customer Responsiveness (CR)	0.24	0.48	0.57	0.82

Note: the diagonal numbers are the square roots of AVEs.

Table 5. Hypotheses test.

Hypothesis	Path	Path Coefficients	T-value	P-Value	Note
H1	JS → LI	0.324	3.73	0.000	Supported
H2	JS → CR	0.243	3.15	0.002	Supported
H3	JS → LP	0.089	1.32	0.184	Not supported
H4	LI → LP	0.316	3.74	0.000	Supported
H5	CR → LP	0.394	4.10	0.000	Supported

**Figure 2.** PLS-SEM Path analysis. Note: *n.s.=not significant.

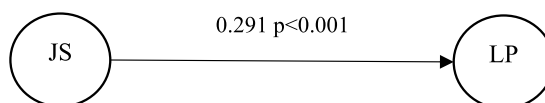
logistics innovation was significant ($b = 0.324$; $p < 0.001$), as was the path from job satisfaction to customer responsiveness ($b = 0.243$; $p < 0.01$). Additionally, we observed significant positive relationships between logistics innovation and logistics performance (H4) ($b = 0.316$; $p < 0.001$) and between customer responsiveness and logistics performance (H5) ($b = 0.394$; $p < 0.001$). However, the direct relationship between job satisfaction and logistics performance (H3) was not found to be significant in this model.

5.3. Mediation test

We conducted mediation analyses to test hypotheses H6 and H7, focusing on logistics innovation and customer responsiveness as mediators in the research model. According to Baron and Kenny (1986) mediation testing approach, three regression equations must be evaluated to assess mediation effects: (1) the independent variable must significantly affect the mediator; (2) the independent variable must significantly affect the dependent variable; and (3) the mediator must significantly affect the dependent variable. Perfect mediation is indicated when the independent variable no longer directly affects the dependent variable upon the inclusion of the mediator.

Using the PLS-SEM method, we examined the mediation effects of logistics innovation and customer responsiveness separately.

In Model 1 (Figure 3), we assessed the direct effect of job satisfaction on logistics performance without including any mediators. The results showed a significant direct effect ($b = 0.291$, $p < 0.001$).

**Figure 3.** Path model 1.

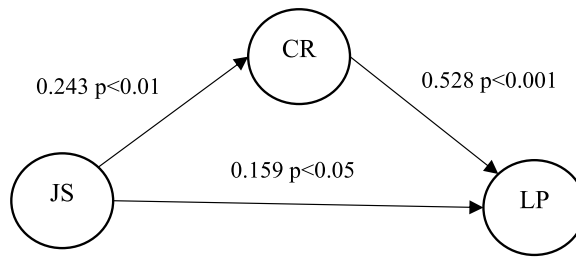


Figure 4. Path model 2.

In Model 2 (Figure 4), we incorporated customer responsiveness as a mediator. The analysis revealed significant paths: job satisfaction to customer responsiveness ($b = 0.243, p < 0.01$), job satisfaction to logistics performance ($b = 0.159, p < 0.05$), and customer responsiveness to logistics performance ($b = 0.528, p < 0.001$). This indicates partial mediation. Sobel’s test confirmed the statistical significance of the mediation effect of customer responsiveness (Test statistic: 2.79, Std. Error: 0.045, $p < 0.01$), supporting the presence of partial mediation (H7).

In Model 3 (Figure 5), we tested the mediation effect of logistics innovation. The results indicated that job satisfaction significantly impacts logistics innovation ($b = 0.324, p < 0.001$), and logistics innovation significantly affects logistics performance ($b = 0.493, p < 0.001$). However, job satisfaction did not have a direct significant impact on logistics performance ($b = 0.127, p = 0.083$). Sobel’s test confirmed the significance of the mediation effect of logistics innovation (Test statistic: 3.33, Std. Error: 0.047, $p < 0.001$), indicating a complete mediation effect with logistics innovation as the mediator (H6).

Overall, the mediation analysis provides evidence that customer responsiveness partially mediates the relationship between job satisfaction and logistics performance, while logistics innovation fully mediates this relationship.

5.4. Multi-group analysis

The size of a company serves as a crucial control variable, significantly distinguishing between companies. In the Australian courier industry, companies are categorised into small and medium-sized (SM) firms, with 200 or fewer employees, and large companies, with more than 200 employees. To analyse the associations within different company sizes, we divided our data into two groups: one comprising 68 large companies and the other consisting of 93 SM companies.

Table 6 displays the path coefficients from the structural model in the multi-group analysis. Several key findings emerge from this analysis:

Logistics Innovation: Large courier companies are more likely to see improvements in logistics performance as a result of logistics innovation compared to SM courier companies. This can be attributed to the greater resources and research and development capabilities available to large

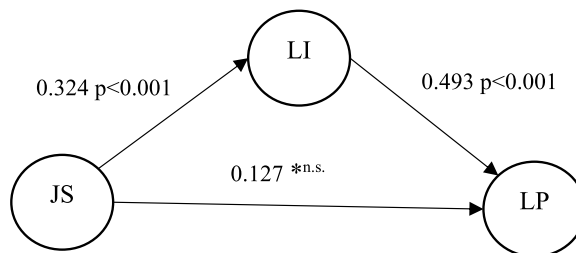


Figure 5. Path model 3. Note: *n.s.=not significant.

Table 6. Results of multigroup analysis.

Hypothesis	Path coefficients				MGA results	p-value
	Large	p-value	SM	p-value		
H1 JS → LI	0.42**	0.002	0.29*	0.012	Insignificant	0.468
H2 JS → CR	0.23	0.067	0.25*	0.023	Insignificant	0.066
H3 JS → LP	−0.08	0.412	0.16	0.105	Insignificant	0.900
H4 LI → LP	0.65**	0.000	0.09	0.400	Large > SM	0.000
H5 CR → LP	0.18	0.194	0.59**	0.000	Large < SM	0.017

Notes: *p-value <0.05, **p-value <0.01.

firms, such as DHL and FedEx, which enable them to leverage global resources and expertise more effectively. In contrast, SM courier companies may face challenges in fostering the same level of innovation. This highlights the need for SM companies to focus on enhancing their logistics innovation strategies in Australia.

Customer Responsiveness: SM courier companies demonstrate a more significant impact of customer responsiveness on logistics performance compared to large courier companies. Large firms often manage extensive delivery networks and serve a larger customer base, which can complicate their ability to respond swiftly and effectively. To improve their logistics performance, large courier companies should refine their customer service strategies, potentially by reducing internal operational lead times and optimising business processes.

Job Satisfaction: The influence of job satisfaction on logistics innovation, customer responsiveness, and logistics performance is consistent across both large and SM courier companies. We did not observe any significant differences between the two groups, supporting the robustness of our hypothesis testing results.

These findings underscore the varying impacts of company size on logistics capabilities and performance and suggest targeted strategies for both large and SM courier companies to enhance their operations.

5.5. Robustness tests

To ensure the robustness of the results and address potential concerns raised by reviewers, several robustness tests were conducted on the model. These tests are designed to confirm the reliability and stability of the findings and mitigate the influence of any potential issues that could undermine the results.

Variance Inflation Factor (VIF) analysis was conducted to evaluate the presence of multicollinearity among the predictor variables. Multicollinearity can distort regression coefficients and inflate standard errors, which in turn affects the reliability of the model. VIF values greater than 5 suggest significant multicollinearity (Hair et al. 2019). In our analysis, all VIF values for the independent variables were well below this threshold (<5), indicating no concerns regarding multicollinearity and confirming the stability of the model estimates.

A bootstrapping procedure with 5,000 resamples was applied to assess the stability of the estimated model parameters. Bootstrapping is a non-parametric technique that helps in evaluating the significance of the path coefficients by providing bias-corrected confidence intervals (Hair 2010). The findings showed that all path coefficients were statistically significant, and the confidence intervals did not include zero, indicating that the relationships in the model are robust.

To further assess the robustness of the results, alternative model specifications were tested. These included modifications to the model's paths and relationships based on theoretical reasoning and empirical evidence from previous studies. The results from these alternative specifications were consistent with the main model, supporting the robustness of the original findings.

Common Method Bias was also assessed using the marker variable technique (Lindell and Whitney 2001). A non-substantive marker variable was introduced into the model to control for

Table 7. The robustness test results.

Robustness Test	Method	Key Findings
Multicollinearity	Variance Inflation Factor	All values <5, no multicollinearity concerns
Bootstrapping (5,000 resamples)	Bias-corrected confidence intervals	All path coefficients significant, CI does not include zero
Alternative Model Specifications	Testing different path relationships and mediation models	Results consistent with the main model
Common Method Bias (CMB)	Marker Variable Technique	No significant impact on relationships

potential CMB. The results indicated that CMB did not significantly impact the relationships among the constructs, confirming that the findings are not biased due to common method variance.

Table 7 summarise the results of the robustness test. By conducting these robustness tests, we ensure the reliability and stability of the empirical results, addressing potential concerns about the validity and generalizability of the findings. These tests confirm that the relationships identified in the study are robust and consistent, contributing to the overall validity of the research.

6. Discussion and implications

The I5.0 has highlighted the pivotal role of human factors in logistics operations (Grosse et al. 2023; Lu et al. 2022). The results of this study strongly support the human-centric approach in the context of I5.0. As I5.0 emphasises the integration of human intelligence with advanced technologies (Huang et al. 2022; Ivanov et al. 2023; Leng et al. 2023), our findings highlight the critical role that human factors, such as job satisfaction, play in enhancing logistics performance. Employees are fundamental to the service sector, including logistics, where both front-line and back-office staff are essential for delivering high-quality service (Johnston et al. 2021). While job satisfaction has been extensively studied within organisational behaviour research, its specific impact on logistics remains relatively underexplored (Grosse et al. 2023; Winkelhaus, Grosse, and Glock 2022). Existing studies suggest that the effects of job satisfaction vary depending on the organisational context. Grounded in HPWS and the RBV, this study investigates how job satisfaction influences logistics innovation, customer responsiveness, and logistics performance. Our findings confirm that satisfied employees exhibit positive job attitudes that enhance organisational outcomes (Pushpakumari 2008). As seen with DHL and FedEx, a satisfied workforce may drive innovation, improving human-robot interaction, operational efficiency, order fulfilment, and reducing errors. This leads to faster response times, proactive issue resolution, and better customer communication, strengthening trust, reducing disruptions, and enhancing overall logistics performance.

This research illustrates that employees play a critical role in business logistics, contributing significantly to the development of logistics capabilities and the improvement of logistics performance. Job satisfaction positively influences employee motivation, engagement, and productivity, which are fundamental to fostering innovation and agility in logistics operations. A satisfied workforce is better equipped to embrace change, drive innovation, and respond swiftly to challenges, enhancing operational resilience and customer responsiveness (Wang and Gligor 2024; Wang, Hill, and Hwang 2023). Customer responsiveness, a core dimension of agility, has become increasingly important in today’s dynamic and unpredictable business environment (Wang, Hill, and Hwang 2023). Companies must adapt rapidly to evolving customer needs while anticipating potential disruptions to maintain flexibility and competitiveness. Responsiveness is vital for achieving high performance in logistics and sustaining a competitive edge (Wang, Jie, and Frederico 2024).

Our findings reveal that employee job satisfaction positively impacts logistics innovation and customer responsiveness, which, in turn, significantly enhance logistics performance. The consistent impact of job satisfaction across both large and SM companies highlights its universal relevance in driving organisational capabilities and performance. Notably, this study is the first to empirically

explore the relationship between job satisfaction and logistics performance, demonstrating the potential of employee satisfaction to improve logistics operations' efficiency and effectiveness.

In this study, we examined two critical logistics capabilities in the I5.0 era: innovation and customer responsiveness. The post-COVID-19 era has heightened the importance of moving closer to customers to address supply chain disruptions and respond swiftly to their demands (Ivanov and Dolgui 2021). Christopher and Towill (2002) argue that firms that can adapt to emerging trends and customer preferences are more likely to succeed. Customer responsiveness has become a critical success factor in service sectors (Johnston et al. 2021), requiring the effective implementation of responsive strategies. Concurrently, logistics innovation has gained prominence as companies navigate internal and external challenges. Incorporating new knowledge, technologies, and ideas into logistics processes is essential for designing high-quality services and improving operational efficiency (Wang et al. 2020).

Our study supports the theoretical framework linking job satisfaction to organisational outcomes, particularly within the logistics sector. Mediation analysis reveals that logistics innovation and customer responsiveness mediate the relationship between job satisfaction and logistics performance. This indicates that higher job satisfaction levels drive improvements in logistics capabilities, which ultimately enhance overall performance. Furthermore, our findings show that logistics innovation has a more pronounced impact on logistics performance in large courier companies than in SM courier companies, likely due to the former's extensive resources and advanced R&D capabilities. Large firms, such as DHL and FedEx, leverage global resources and technological expertise to foster innovation more effectively. Conversely, customer responsiveness exerts a greater impact on logistics performance in SM courier companies, which benefit from agility and simpler delivery networks. These results highlight the varying effects of logistics capabilities based on company size and emphasise the need for tailored strategies that align with the unique characteristics of different organisations.

6.1. Theoretical implications

This interdisciplinary study explores the intersection of HRM and business logistics operations, offering significant contributions to both fields. The study extends the HPWS into the logistics system and integrates HPWS and the RBV by demonstrating that job satisfaction enhances logistics performance through improved capabilities. This offers a comprehensive perspective on how human factors and organisational capabilities collectively impact logistics performance in I5.0 (Ivanov 2023; Leng et al. 2022; Lu et al. 2022; Rzepka 2023). It underscores the importance of aligning employee satisfaction initiatives with organisational capabilities to achieve optimal outcomes (Lu et al. 2022; Wang, Wood, and Wang 2022). By providing empirical evidence on enhancing logistics capabilities and performance, the research extends the HPWS in logistics management and enriches the logistics literature. The study emphasises the critical role of job satisfaction in refining logistics capabilities, highlighting the importance of employee well-being for sustainable logistics management, especially in the post-COVID-19 context. HPWS emphasises the importance of engaging and developing employees to achieve high performance (Boxall and Macky 2009). The consistent influence of job satisfaction across company sizes underscores the need for HPWS practices, such as training, development, and employee involvement, to enhance logistics capabilities. By fostering a positive work environment and investing in employee development, both large and SM courier companies can improve job satisfaction, which in turn supports innovation, responsiveness, and overall performance. The mediation analysis reveals that logistics innovation and customer responsiveness serve as key mechanisms through which job satisfaction impacts logistics performance. Based on the RBV, the study confirms that key logistics capabilities including innovation and customer responsiveness, are crucial for enhancing logistics performance. This finding supports the RBV argument that organisational capabilities are instrumental in translating positive employee attitudes into performance outcomes. Furthermore, it enriches the theoretical discourse on how

human-machine reconciliation mechanisms interact to drive performance, offering valuable insights for both researchers and practitioners navigating the evolving logistics landscape in I5.0.

6.2. Managerial implications

Employee satisfaction is key to running a successful and profitable business, as high performance often relies on a highly satisfied workforce (Pushpakumari 2008). Managers should prioritise initiatives aimed at enhancing employee satisfaction within logistics companies. High job satisfaction aligns with HPWS principles that advocate for creating a supportive organisational culture. Companies should focus on aligning their human resource with strategic goals to ensure employees are motivated and capable of driving logistics innovation and responsiveness. Satisfied employees are more likely to positively impact logistics capabilities.

According to HPWS, organisations can achieve high employee satisfaction through regular feedback, recognition programmes, career development opportunities, and a supportive work environment (Boxall and Macky 2009). Regular assessment of employee satisfaction via surveys and feedback mechanisms is essential for identifying issues early and implementing corrective actions to sustain high levels of job satisfaction. It is vital for HR practices to be aligned with logistics goals. Recruiting individuals with not only the necessary skills but also positive job attitudes can significantly contribute to improved logistics performance. Given that low job satisfaction can lead to high staff turnover and diminished service quality, managers must collaborate closely with HR to ensure ongoing employee satisfaction, particularly in the post-COVID-19 context.

Managers should also focus on investing in capabilities that drive innovation within logistics processes under I5.0. This includes adopting new technologies, enhancing operational efficiencies, and fostering a culture of continuous improvement. Additionally, implementing practices that improve responsiveness to customer needs, such as better employee training, streamlined communication channels, and more efficient logistical processes, can reduce response times and enhance service quality. Using the examples of DHL and FedEx, we illustrate how technology drives innovation and enhances logistics capabilities. Managers should leverage technologies to optimise logistics operations. Managers should also focus on human-centric design solutions that facilitate effective collaboration between humans and cobots within a shared working environment (Huang et al. 2022; Lu et al. 2022). Overall, logistics firms must be aware of the importance of human factors in logistics operations, logistics managers should work closely with the Human Resources department to keep their employees happy and satisfied in I5.0.

6.3. Limitation and future research

The study acknowledges several limitations that present valuable opportunities for future research. These limitations can guide improvements in measurement tools, the inclusion of multiple informants to reduce bias, and the expansion of research into diverse contexts and variables. Firstly, the focus on the courier sector in Australia may limit the generalizability of the findings. To enhance the applicability of the results, future research should aim to validate the research models across different industries and geographic locations. Secondly, while this study concentrated on job satisfaction, it did not explore other aspects of human capital. Future studies could investigate a broader range of factors that influence job satisfaction in logistics operations. Additionally, although the study examined a human-centric approach, the relationship between job satisfaction and logistics innovation may vary across different organisational contexts. Further research could explore how these relationships evolve in different sectors or countries to provide more generalisable insights. Moreover, the use of single-item measures, while efficient, may not capture the full complexity or nuances of the constructs as effectively as multi-item measures. This limitation could impact the robustness and reliability of the results. Future research might benefit from employing multi-item scales to provide a more comprehensive understanding of the constructs and enhance the

validity of the findings. Thirdly, while the research emphasised logistics innovation and customer responsiveness, it did not examine other potential logistics and organisational capabilities. Future studies could explore a wider range of these factors to develop a more holistic understanding of Industry 5.0. Lastly, the study relied on soft measures to assess logistics performance, which could introduce potential bias. Future research should consider using objective metrics to evaluate key performance indicators, thus enhancing the accuracy and reliability of the findings. Furthermore, emerging technologies such as AI, blockchain, IoT, and 3D printing are transforming the logistics landscape. Future research could focus on specific technologies and examine their impacts in more detail.

Acknowledgement

The authors sincerely thank the editors and anonymous reviewers for their valuable feedback and suggestions. Their insightful suggestions and detailed guidance have significantly enhanced the quality and clarity of this paper.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data supporting the findings of this study are available from the corresponding authors upon reasonable request.

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Appendix A

Survey measures

Item	Statements
Job Satisfaction	
(Dolbier et al. 2005; Nagy 2002)	
Please indicate how overall job satisfaction in your firm on a 7-point scale. (Range: Very dissatisfied, Very satisfied)	
JS	How satisfied are employees with their current job roles and responsibilities in the company?
Innovation	
(Fawcett and Stanley 1997; Morash 2001; Wang 2016).	
Please indicate the degree to which you agree or disagree with each of the statements presented below by ticking on the most appropriate option on a 7-point scale. (Range: Strongly disagree, Strongly agree)	
I1	My company applies creative techniques in freight movement and distribution
I2	My company regularly improves company's operational systems
I3	My company adopts technologies and innovative solutions for problem-solving
I4	My company applies simplification of operations
I5	My company applies standardisation of operations
Customer responsiveness	
(Fawcett and Stanley 1997; Morash 2001).	
Please indicate the degree to which you agree or disagree with each of the statements presented below by ticking on the most appropriate option on a 7-point scale. (Range: Strongly disagree, Strongly agree)	
C1	My company is capable of responding to customers' requests
C2	My company's service flexibility is capable of meeting customers' needs
C3	My company offers customised logistics services
Logistics Performance	
(Fawcett and Cooper 1998; Wang, Jie, and Abareshi 2018b).	
Please indicate the degree to which you agree or disagree with each of the statements presented below by ticking on the most appropriate option on a 7-point scale.	
L1	My company maintains low operating costs
L2	My company has a low frequency of disruptions/delays
L3	My company has less damaged/lost freight
L4	My company has a low rate of customer complaint
L5	My company has on-time and accurate delivery
L6	My company has higher customer satisfaction
L7	My company has a short customer response time
L8	My company has a reputation in the industry
L9	My company has accurate billing/transit/ delivery information