



Assessing Capability Maturity in Freight Forwarding and Third-Party Logistics Firms in Pakistan: A Mixed-Methods Approach Using the Capability Maturity Index

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ABSTRACT

This research assesses process maturity of freight forwarding and third-party logistics (3PL) companies in Pakistan using the Capability Maturity Model (CMM). While logistics play a pivotal role in ensuring efficiency of trade and effectiveness of the supply chain, there is lack of empirical evidence on process maturity in the logistics industry of emerging economies. The study adopted a mixed research approach, incorporating exploratory interviews with top managers and a quantitative structured questionnaire to 125 member firms of the Pakistan International Forwarders and Freight Agents Association (PIFFA). The qualitative analysis provided insights on the major drivers of immaturity: low adoption of modern digital systems, lack of process standardization and integration, failure to take data-driven decisions, and inadequate monitoring and feedback measures. This helped develop a quantitative measurement tool based on the Capability Maturity Index (CMI). As shown, the majority of firms are at Maturity Level 2 (Managed) and 3 (Defined) with little advancement toward higher levels of process optimization. Inferential testing reveals ownership structure and age of firm as significant predictors of maturity levels. Overall, the industry appears to have capability issues that reflect lack of technological integration and performance management processes. The results offer learnings for digital innovation and process standardization to improve logistics capabilities in Pakistan.

KEYWORDS: *Capability maturity; freight forwarding; third-party logistics (3PL); logistics performance; digital transformation; supply chain capability; emerging economies; Pakistan*

1. Introduction

Supply chain digitization and globalisation have resulted in an increased strategic role for logistics providers, including freight forwarders and third-party logistics (3PL) providers. They serve as key enablers that facilitate international goods movements, ensure compliance with regulations, and support collaborations within geographically separated supply chains. In the 4.0 era of digitalization, logistics processes are expected to be harmonized, integrated, and enabled by digital technologies such as real-time digital tracking, data analytics, and digital decision-making support (Tiwong et al., 2024; Bigliardi et al., 2022).

In order to adapt to these emerging challenges, organisations need to build and maintain high levels of operational capability. Capability maturity models have proven useful in this process, providing a way of measuring and understanding this development, as they position organisational development on a journey from informal and unstructured to efficient, data-

driven and continually improving organisational systems (Ferraro et al., 2023; Cheshmberah & Beheshtikia, 2020). When applied to logistics and supply chains, increased levels of maturity correlate to improved performance, greater coordination, and resiliency (Benrqya et al., 2024; Pejić Bach et al., 2023).

The emergence of Logistics 4.0 technologies also highlights the importance of digital technologies for maturity. The use of information systems, automation, and big data analytics have been demonstrated to improve process efficiency and transparency in 3PLs (Baglio et al., 2025). Additionally, skills in big data analytics and integrated logistics systems aid in decision-making and performance (Farooq et al., 2024). But these technologies are not uniformly adopted, especially in developing countries where there are structural, technological and institutional challenges (Asrol, 2024).

Developing nations' logistics sectors may experience digital infrastructure constraints, unintegrated processes, regulatory challenges and a lack of talent. Such constraints are barriers to the evolution from traditional processes to higher levels of capability maturity. For example, visibility in the supply chain, an aspect of maturity, is challenging due to the absence of integrated tracking and information sharing (Freichel et al., 2022). Likewise, new technologies like blockchain and digital twins, which could revolutionise logistics, demand a particular degree of organisational maturity and readiness that may not be universally present (Hamidi et al., 2024; Le & Fan, 2024).

In Pakistan, the freight forwarding and 3PL industry is crucial for trade and economic growth. Yet, the sector remains beset by inefficiencies, limited technology use and standardisation. These issues not only impact company performance but also limit Pakistan's logistics competitiveness (Khan et al., 2025). Despite its significance, there is a dearth of empirical studies that provide insights into the capability maturity of the sector and explore the factors that affect its growth. Closing this gap is crucial for both knowledge and business practices. Theoretically, it extends the use of capability maturity models to unexplored service industries of emerging markets. In practical terms, it allows industry stakeholders to a better perspective of capability gaps and how to improve them. As a result, this research seeks to holistically measure the capability maturity level among freight forwarding and 3PL companies in Pakistan with the Capability Maturity Index (CMI), and to highlight the obstacles to the progression of their capability maturity levels in terms of structure and process.

2. Problem Statement

Pakistan's freight forwarding and third-party logistics (3PL) sector is in the midst of an ever-evolving global logistics market environment that requires efficiency, transparency and technological connectivity. But many companies in this field still operate using conventional, manual and fragmented methods. This involves low levels of process consistency, weak performance management, and low utilisation of logistics technology. This, in turn, affects their ability to improve operations, service delivery, and responsiveness to customers' expectations. Although capability maturity models are extensively used to measure organisational development and performance in the manufacturing and supply chain industries, their adoption in the freight forwarding business - especially in emerging markets such as Pakistan - is not widespread. The absence of empirical assessment limits the capability of industry stakeholders to assess the capabilities and implement improvement strategies.

Moreover, the industry's problems, including the lack of digital infrastructure, regulatory complexity and lack of skills, compound the issue by stalling the move to achieve higher maturity levels. In the absence of a systematic and empirical evaluation of capability maturity, industry

players are incapable of transitioning from ad hoc, experiential approaches to codified, measurement-based and highly improved systems.

Consequently, there is a strong need to assess the level of capability maturity in the freight forwarding and 3PL industry in Pakistan and to determine the critical structural and process-based constraints for capability improvement. This will not only be a contribution to the academic body of knowledge but also to industry practice by enhancing its performance and competitiveness.

3. Objectives of the Study

The objectives of study are as given below:

To identify the core reason(s) of the immaturity of the Freight forwarding & 3PL Industry of Pakistan and their impact on core processes

To assess the general level of maturity of capability of freight forwarding and third-party logistics (3PL) firms in Pakistan through the Capability Maturity Index.

To analyze the impact of ownership, age of organization and the spread of the organization on the process maturity

To Prepare evidence-based suggestions/Recommendations to enable systematic advance to higher levels of capability maturity.

4. Literature Review

4.1. Concept of Capability Maturity in Supply Chains and Logistics

Capability maturity models (CMMs) are widely accepted as a methodical approach to evaluating the maturity of processes and capabilities of organisations. These frameworks define maturity as a developmental journey from ad hoc to highly defined, data-driven and constantly learning processes (Cheshmberah & Beheshtikia, 2020). In the realm of supply chain and logistics, maturity relates to the degree of process standardization, technological integration and institutionalization of performance evaluation.

In recent years, there has been an emphasis on the notion that maturity is not solely determined by operational experience but reflects strategic fit, technology integration and learning. Ferraro et al. (2023) point out that contemporary maturity models go beyond process standardization, embracing digital skills and integration, along with sustainability factors. Likewise, Pejić Bach et al. (2023) show that increased supply chain maturity has a positive impact on performance, especially when complemented with balanced performance measurement systems.

Yet, despite these developments, the use of maturity models in freight forwarding and 3PL firms remains under-researched. This is despite the fact that logistics is a highly service-oriented and co-ordinated activity, where maturity in the processes plays a critical role in maintaining efficiency.

See visibility and integration are key aspects of the maturity of logistics capabilities. Process integration helps to ensure information continuity across supply chain stages, eliminating bottlenecks and enhancing efficiency (Shang, 2022).

But visibility can be an issue, especially in distribution logistics. Freichel et al. (2022) attribute limited visibility to factors such as low levels of information exchange, absence of real-time information systems, and disparate communication channels. This is especially true in the freight forwarding sector, where coordination between multiple parties is crucial.

A lack of real-time visibility platforms not only impacts performance, but also lowers customer satisfaction and makes firms unable to adapt to emerging challenges. Visibility is therefore increasingly being recognised as a key factor in moving towards higher levels of maturity.

4.2. Digital Transformation and Logistics 4.0

Industry 4.0 has revolutionised the logistics industry through the adoption of new technologies including automation, big data analytics, Internet of Things (IoT) and blockchain. These innovations are collectively known as Logistics 4.0 and are recognised as critical for enhancing the maturity of capabilities in supply chains (Tiwong et al., 2024).

Baglio et al. (2025) suggest that using Logistics 4.0 technologies could improve maturity levels in 3PL companies through real-time data access, process integration, and the ability to make data-informed decisions. Likewise, Bigliardi et al. (2022) contend that digitalization enables better coordination among supply chain actors and eliminates waste and inefficiencies in manual and siloed processes.

But, the shift to digital maturity is not universally experienced. Asrol (2024) explains that firms in emerging markets can face challenges such as lack of infrastructure, cost of implementation, and technical skill, which limit their ability to implement Industry 4.0 technologies. Meanwhile, Hamidi et al. (2024) also highlight that readiness for new technologies, such as blockchain, is contingent on process and system maturity.

New technologies like digital twins also offer potential for improving logistics maturity, through predictive analytics and real-time system optimization. However, they are not widely used because of the capability and resource gap (Le & Fan, 2024).

4.3. Capability Maturity and Organizational Performance

The maturity of capabilities and their impact on performance is increasingly being reported. Organizations with mature processes are more efficient, use their resources effectively and deliver superior service through process standardization and decision-making based on data analytics (Benrqya et al., 2024).

Farooq et al. (2024) show that big data analytics capabilities play a crucial role in improving supply chain performance by helping firms make data-driven decisions and anticipate potential threats. Likewise, Iqbal (2024) highlight the importance of logistics innovation capabilities in enhancing supply chain performance and competitiveness.

Furthermore, maturity aids in enhancing firm resilience to respond to risks and uncertainty. Logistics and supply chain operate in uncertain and dynamic environment. But in many nascent markets, firms are at a middle stage of maturity, missing out on many of the advantages.

4.4. Process Integration, Visibility, and Operational Efficiency

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4.5. Logistics Challenges in Emerging Economies

The logistics sectors in emerging economies have specific structural and institutional issues that prevent the development of capabilities. These include infrastructural deficiency, regulatory issues, lack of technology adoption and a shortage of human resource. These factors pose an environment where firms are unable to advance beyond early stages.

In Pakistan, logistics performance is also hampered by inefficiencies in the transportation infrastructure, lack of integration and adoption of new technologies. Khan et al. (2025) explain that such factors affect export performance and supply chain performance.

Further, limited capacity exists to co-ordinate the digital capabilities and embed them within supply chain functions. Khan et al. (2025) note that the coordination of digital capabilities is crucial to attaining resilience and enhancing logistics performance in mega projects such as the China-Pakistan Economic Corridor.

4.6. Research Gap and Conceptual Positioning

While the literature offers many insights into capability maturity, digitalisation and logistics performance, there are some gaps. First, the literature tends to emphasise manufacturing or supply chain management in general, rather than freight forwarders and 3PL providers. Second, little empirical evidence is available from emerging markets, especially from Pakistan.

Third, while digital transformation and maturity models have been widely researched, their application in the context of logistics service providers is still lacking. There is an absence of structured approaches to measuring the maturity of processes and technology readiness, and their interaction with other organisational aspects in freight forwarding.

This research bridges these gaps by using the Capability Maturity Index (CMI) to assess maturity levels of key processes in the freight forwarding and 3PL firms in Pakistan. This research takes a combined qualitative-quantitative approach to offer a holistic and contextual evaluation of capability maturity levels and their drivers.

5. Theoretical Framework

The paper is based on the Capability Maturity Model (CMM) and its versions as the main theoretical framework used to assess organizational and process maturity in freight forwarding and third-party logistics (3PL) companies. The initial CMM model, by Paulk et al. (1993), views organizational capability as an evolutionary process that can be approached through ad-hoc, unstructured practices through to optimized, continuously improving systems. The maturity level can be characterized by a gradual institutionalization of process discipline, standardization, measurement and optimization hence this model is best suited when trying to evaluate service based and process based industries like logistics.

Based on this, the CMMI Institute (2018) extended the maturity paradigm by incorporating more aspects of organizational performance, such as governance, process integration, and continuous improvement mechanisms. This change is particularly applicable in modern logistics settings where the digital transformation, real-time visibility, and data-driven decision-making are the decisive factors concerning competitiveness. Here, maturity does not just mean compliance to the process but also technological and strategic capability development.

The process orientation behind CMM is also substantiated by the process management theory by Hammer (2007) that focuses on the shift of the functional silos to end-to-end process integration. Hammer claims that organizational excellence is realized when the processes can be standardized, measured and optimized continuously, instead of relying on the individual expertise or unofficial practices. Such a theoretical approach is closely associated with logistics operations, in which the division of the booking, compliance, tracking, and billing processes tend to result in inefficiencies and inconsistencies in services.

Also, Gunasekaran et al. (2017) expand the theoretical discussion by relating logistics performance to elaborated performance measurement systems by stating that the operational excellence in the supply chains relies on key performance indicators (KPIs), information integration, and real-time analytics. This supports the notion that an increased level of maturity is defined by the use of data to make decisions and integrate technology.

All of these theoretical approaches create an entire framework of this research and make the maturity of capabilities a multidimensional construct that includes process standardization, technological use, performance measurement in freight forwarding and 3PL companies.

6. Methodology

6.1. Research Design

This research is based on a mixed methods design that combines exploratory qualitative research with descriptive and inferential quantitative data to measure capability maturity in Pakistani freight forwarding and third-party logistics (3PL) companies. The justification for this design rests on the fact that the mixture of methods enables the application of descriptive and inferential statistics to provide generalizability with the insights from qualitative research to explain organizational phenomena. In a complex construct such as capability maturity, where objective process measures and subjective contextual factors play a vital role, this approach guarantees both rigour and insights.

The preliminary qualitative phase was performed to explore the underlying structural and process-driven factors that lead to capability immaturity, while the following quantitative phase allowed the measurement and comparison of levels of capability maturity within firms. This design is consistent with current research trends in supply chain and logistics in which we often use the evidence derived by qualitative evidence to develop instruments used in large empirical studies. The combined use of the two methods also enables triangulation and, as a result, greater reliability and validity.

6.2. Population and Sampling

The population of interest for this research includes freight forwarding and 3PL firms working in Pakistan and member of the Pakistan International Freight Forwarders Association (PIFFA). PIFFA is the official association of freight forwarding companies in Pakistan and members are expected to follow certain professional and regulatory guidelines. The selection of the population to include only PIFFA members increases the representativeness and validity of the results through the inclusion of legitimate members of the industry.

Participants were recruited using a purposeful sampling method, ensuring they have first-hand knowledge of the processes and management structures within their organisations. This is common in research requiring informed opinions, such as in assessing organisational capabilities. Owners, senior managers, operations managers and compliance managers were invited because they are actively engaged in process governance and operation.

In the quantitative part of the study, a survey questionnaire was sent to 250 companies in major logistics clusters in Pakistan, and 125 (50%) responses were received. This response rate is deemed sufficient for studies focusing on organisations and offers empirical support for statistical analysis. For the qualitative phase, semi-structured interviews were administered to ten experienced managers from firms selected for their expertise and management roles in their firms.

6.3. Data Collection Procedure

The research involved two-stages of data collection. The first phase was a qualitative study based on interviews to identify factors that impact capability immaturity and to understand the topmost shipment processes affected. The study sought to understand the challenges in the industry and the inefficiencies in operations. Participants provided broad consensus that a failure to embrace modern practices is the main factor underpinning immaturity, and identified key processes, including: booking, compliance, operations, tracking, risk, billing and feedback.

This qualitative information formed the basis of a questionnaire for the quantitative part of the study. An online platform was used for survey distribution, allowing larger coverage and

convenience for the respondents. Respondents were asked to rate their processes according to their maturity in line with Capability Maturity Index (CMI) variables with a five-point Likert scale. This integration approach ensured the quantitative instrument was aligned to the practices, thus improving the contextual validity.

6.4. Instrumentation

The main data collection tool used in the quantitative phase was a questionnaire designed using the principles of the Capability Maturity Model (CMM). The instrument focused on assessing maturity in operational areas that include system capacities in booking, compliance, operational execution, risk management, tracking and visibility, billing, and feedback systems. These areas represent key aspects of freight forwarding operations and are in line with existing logistics maturity models.

The questionnaire was divided into two parts. Section one identified firm demographics and organisational attributes including size, age, type of ownership and geographical area of operation. The latter section contained a series of statements on maturity in terms of process standardisation, documentation, performance management and continuous improvement. Responses were measured on a five-point Likert scale with higher values signifying higher maturity.

The instrument was subjected to expert review by industry and academia followed by a pilot test with a sample of logistics practicing managers. Items were refined for clarity, relevance and structure following this process. This approach ensured content validity and real-world applicability of the novel instrument.

6.5. Data Analysis Techniques

We used descriptive and inferential statistics to analyse quantitative data. Descriptive analyses, such as means, standard deviations, frequencies and percentages, were carried out to describe the characteristics of respondents and maturity levels for various process areas. The Capability Maturity Index (CMI) was calculated for each company as the mean of all the maturity items, offering a measure of the overall capability maturity.

Inferential analyses (independent sample t-tests and one-way ANOVA) were used to explore differences in organizational characteristics. Such analyses allowed comparisons of maturity by ownership, age, and structural features (e.g., presence of branches).

The qualitative interviews were thematically analyzed using coding, theme identification and interpretation. This process enabled the identification of common themes in terms of capability gaps, organisational practices, and challenges. The insights from the qualitative analysis were then combined with the quantitative findings to provide a deeper understanding of capability maturity in the industry.

6.6. Ethical Considerations

The research adhered to ethical standards to ensure ethical integrity. It was voluntary and consent was sought from the respondents prior to conducting the study. Respondents were informed about the purpose of the study, their role and their right to withdraw from the study at any time without penalty.

Anonymity and confidentiality were maintained by not revealing any specific details of individuals or firms. The data were reported in an aggregated manner, which meant they could not be traced back to individuals or organisations. Furthermore, data were used only for scholarly research, and were kept confidential.

7. Results

7.1. Qualitative Findings: Capability Maturity Constraints in Freight Forwarding and 3PL Firms

The research study's qualitative phase sought to understand the managers' views about the factors behind capability immaturity and the shipment processes involved in the capability immaturity of freight forwarding and third-party logistics (3PL) firms in Pakistan. The findings from semi-structured interviews with senior managers were used to develop key themes that explain the maturity of processes in the industry through thematic analysis.

7.1.1. Key Factors Affecting Capability Immaturity

The major theme of the qualitative findings was the immature use of contemporary practices, particularly in the area of digitalization and integration. Overwhelmingly, respondents pointed out that operational processes remain heavily dependent on manual processes, email, and disjoint systems. This reliance on informal mechanisms suggests little institutionalisation of processes, and is consistent with early maturity levels in capability maturity models.

Managers repeatedly expressed that a lack of integrated information systems constrains transparency, slows decision-making and inhibits scalability. Moreover, adoption of IT technologies was constrained by a resistant organisational culture, lack of investment in digital technologies, and lack of technical upskilling of employees.

7.1.2. Themes of Qualitative Data

Seven interrelated themes were produced that explain capability immaturity in the industry. These are outlined in Table 1.

Table 1

Thematic Analysis of Capability Maturity Constraints in Freight Forwarding and 3PL Firms

Theme	Sub-Themes	Description	Key Insight
Lack of Modern Practices	Manual systems; low digitalization	Reliance on email, paper-based, and fragmented workflows	Operations remain largely non-digital and unintegrated
Lack of Process Standardization	Informal procedures; experience-based execution	Processes vary across branches and individuals	Weak institutionalization of SOPs
Limited Data-Driven Decision Making	Absence of KPIs; no analytics	Decisions based on intuition rather than metrics	Weak performance measurement culture
Reactive Compliance & Risk Management	Case-based handling; regulatory reaction	Compliance is triggered by issues rather than prevention	Lack of proactive governance systems
Weak Tracking & Visibility Systems	Email-based tracking; no real-time systems	Shipment visibility is not digitally integrated	Poor customer transparency
Weak Feedback Systems	Informal feedback; selective usage	Feedback collected irregularly and inconsistently	Limited customer-driven improvement

7.1.3. Interpretations at Process Level

The qualitative results suggest the level of maturity of the freight forwarders and 3PL corps in Pakistan is mostly low to moderate, as their processes are not formalized or integrated digitally. Immature booking, compliance, tracking and billing processes were mentioned most frequently.

According to the managers, booking services mostly rely on emails and telephone calls for communication; this results in delays and errors. Compliance procedures are reactive and not based on defined processes and models, leading to regulatory risks. Likewise, traceability systems are not in real-time, impacting trust and clarity of operation.

Billing and feedback processes were also reported as poorly defined and lacking automation and integration with other operational data. More generally, such inefficiencies provide evidence of a disjointed process environment, typical of immature organizations.

7.1.4. Emergent Conceptual Insight

An important discovery from the qualitative analysis is the interrelated nature of process inefficiencies. Managers explained that problems in processes (e.g. bookings) flow through other processes (compliance, operations and billing). This suggests the lack of an integrated process architecture, a critical factor for moving to higher maturity.

Overall, the qualitative analysis confirms that the industry is restrained by structural, technological and cultural factors that restrict process advancement beyond the early maturity levels.

7.2. Quantitative Analysis

7.2.1. Respondents' Profile Analysis

Table 2

Role of Respondents in the Organization

Role	Frequency(f)	Percentage(%)
Middle Level Management	63	50.4
Higher Level Management	40	32
Executive Level Management	22	17.6
Sum	125	100

The respondents are distributed in Table 2 and this is based on their position in their respective organizations. The findings reveal that most of the respondents (50.4%) were in middle management, higher management (32%), and executive level respondents (17.6) made up the sample. This distribution indicates that the data were mostly gathered at those individuals who are directly engaged in the operational and managerial decision making processes which increases the reliability and relevance of the responses about process maturity and the organizational practices.

Table 3

Type of Ownership of Organizations

Type of Ownership	Frequency(f)	Percentage(%)
Private Limited	80	64
Proprietorship	22	17.6
Partnership	12	9.6
Public Limited	11	8.8
Total Sum	125	

Table 3 presents a scenario of ownership of the involved freight forwarding and 3PL companies. According to the findings, the biggest portion (64 percent) was occupied by the privatized limited companies, then came the sole proprietorship (17.6 percent), partnership (9.6 percent), and the public limited companies (8.8 percent). Such prevalence of private limited firms implies that the industry in Pakistan is dominated by privately owned firms that could affect the case of governance structures, ability to invest and implement standard ways of running their businesses.

Table 4

Age of Organizations

Age	Frequency(f)	Percentage(%)
Less than 5 years	16	12.8
5 to 10 years	22	17.6
11 to 20 years	41	32.8
More than 20 years	46	36.8
Total Sum	125	100

Table 4 provides the age range of the organizations that were used in the study. Over one-third of the firms (36.8%), were in over 20 years of operation with 32.8% having a history of operation between 11 and 20 years. The firms that had a history between 5 and 10 years comprised 17.6, and comparatively newer firms (under 5 years old) also made 12.8%. Commitment to the fact that a large percentage of the organizations are mature means that organizational age does not necessarily correlate with the immaturity of the industry but rather may be tied with structural and process-based factors.

Table 5

Comparison of Capability Maturity Index Based on Presence of Branches/Subsidiaries

Subsidiaries Status	Frequency(f)	Mean CMI	SD
Single Body	17	2.08	0.64
With Subsidiaries	108	2.41	0.94
Total Sum	125		

Independent Samples t-test: $t = 1.81$, $p = 0.081$

An independent samples t-test was used to explore whether the presence of branches or subsidiaries have an effect on the maturity of organizational capability. Results suggest that those organizations that had branches or subsidiaries (M = 2.41, SD = 0.94) were found to have higher levels of maturity as compared to organizations that did not have any branches at all (M = 2.08, SD = 0.64).

Nonetheless, the t-test could not establish the difference statistically significant at the 0.05 level, $t = 1.81$, $p = 0.081$. Though it is true that in companies that have branches, there are relatively high maturity scores, statistically, there is no significant influence of such branches on the maturity of organizational capability in the freight forwarding and 3PL industry.

6.2.2 Process-Wise Capability Maturity Analysis

Table 6

Quotation Process Capability Maturity

Level of Maturity	Details	Frequency (f)	Percentage (%)
Ad-hoc	Manual quotation not based on standardized rate structure or documentation.	19	15.2
Formal	There are simple forms of quotations, which are mostly based on personal experience and e-mail.	72	57.6
Standard	Quotation processes throughout the organization that have a process of approval and rate references.	21	16.8
Advanced	There are automated quotation systems that are backed by digital rate libraries and internal controls.	11	8.8
Innovative	Carrier-based dynamic, real-time pricing and analytics-based optimization.	2	1.6
Total Sum		125	100

Table 4.6 represents the maturity of the quotation process of the participating firms. Most of the respondents (57.6) worked on the Formal level, meaning that quotations are usually served by the means of written communication (emails) on a case-by-case basis. Nevertheless, few percentages of companies had incorporated the Advanced (8.8%) or Innovative (1.6%) quotation mechanisms, which are IT-based rate repositories or online self-service portals. This distribution indicates that there is a low level of integration in technology and that it depends more on manual or semi-structured pricing methods.

Table 7*Booking Process Capability Maturity*

Level of Maturity	Details	Frequency(f)	Percentage(%)
Ad-hoc	Reservations made casually and loosely documented or computer aided.	36	28.8
Formal	Booking processes recorded and performed mostly in emails or by phone calls.	48	38.4
Standard	Common booking processes that are used throughout the organization.	25	20
Advanced	Booking systems that have been digitized coupled with operational and carrier platforms.	14	11.2
Innovative	System driven booking that is fully automated and predictive capacity planning.	2	1.6
Total Sum		125	100

Table 4.7 shows the maturity analysis of the booking process. These findings indicate that 38.4% of the firms were at the Formal level with 28.8% at the Ad-Hoc practices. Just 11.1 percent and 1.6 percent of the organizations indicated Advanced and Innovative booking systems respectively. Such results show that despite the existence of simple booking processes in most companies, there is little systematic automation, performance measurement, and predictive, in lieu of booking processes.

Table 8*Compliance Management Capability Maturity*

Level of Maturity	Details	Frequency(f)	Percentage (%)
Ad-hoc	Compliance was done only when problems arose and not through official instructions.	19	15.2
Formal	There are some basic compliance checklists which are not always monitored.	72	57.6
Standard	Unified compliance controls used throughout the operations.	21	16.8
Advanced	The internal audits and documented controls were used in compliance.	11	8.8
Innovative	Informatics-driven technology-based compliance management systems.	2	1.6
Total Sum		125	100

Table 4.8 brings out the level of maturity that can be traced in compliance management. A large percentage of the companies (57.6%) said that they used Formal compliance checks on an

instance-by-instance basis and 15.2 percent of companies used Ad-Hoc strategies. Firm combinations on Advanced and Innovative compliance mechanisms reported were only 10.4% combined. As the regulatory environment is a complex one in Pakistan, the prevalence of reactive compliance strategies puts firms at risk of operations and legal factors, which means that there is a serious gap in maturity.

Table 9*Risk Identification and Mitigation Capability Maturity*

Level of Maturity	Details	Frequency(f)	Percentage(%)
Ad-hoc	Unstructured risks that are responded to.	10	16
Formal	Experience-based judgment risk identification is informal.	49	39.2
Standard	Established risk management processes used uniformly.	39	31.2
Advanced	Mitigation plans and quantitative risk assessment tools put into place.	16	12.8
Innovative	Risk management based on data and prediction of routines applied in decision-making.	1	0.8
Total Sum		125	100

The table 4.9 indicates the level of maturity in terms of identifying risk and mitigating it. The majority of the organizations worked at the Formal (39.2%) and Standard (31.2%) levels meaning that they were somewhat aware of the risk management practices. Nevertheless, only 12.8% of companies used Advanced quantitative risk measures and less than 1% had been using Innovative predictive risk modeling. This points to the fact that the industry is not well prepared to assume proactive risk management in a world that is full of economic and security uncertainties.

Table 10*Core Shipment Operations Capability Maturity*

Level of Maturity	Details	Frequency(f)	Percentage(%)
Ad-hoc	The operational activities were performed unevenly with little coordination.	25	20
Formal	Simple controls of operations that were recorded but not optimized.	45	36
Standard	Standard operating procedures used in shipment operations.	38	30.4
Advanced	KPI-supported and system-backed operations that are monitored in performance.	13	10.4
Innovative	Leveraged and constantly enhanced processes with sophisticated analytics.	4	3.2
Total Sum		125	100

Table 4.10 represents the findings associated with the implementation of core shipment operations. The findings indicate that 36% of the companies were at Formal level and 30.4% of the companies were at Standardized operation process. However, almost a fifth (20%) of the organizations still operated through Ad-Hoc practices of operation. The low level of the Advanced (10.4%) and Innovative (3.2%) systems indicates that operational efficiency is mostly related to manual coordination, but not to the optimization based on data.

Table 11*Tracking and Visibility Capability Maturity*

Level of Maturity	Details	Frequency(f)	Percentage (%)
Ad-hoc	Tracking of shipments by making of calls or emails.	25	20
Formal	Simple tracking information to the customers at periodic intervals.	61	48.8
Standard	Standardized status reporting system-based tracking.	21	16.8
Advanced	Platforms of real-time visibility that are incorporated into operations.	13	10.4
Innovative	Exception management as well as predictive visibility based on advanced technologies.	5	4
Total		125	100

Table 4.11 provides the maturity of tracking and visibility systems. The results indicate that 48.8 percent of the companies offered updates on tracking in an informal yet restricted way usually through email to a chosen number of customers. Firms that were making combined reports of Advanced or Innovative tracking solutions, e.g., real-time portals or automated EDI updates, constituted only 16.8 percent of the total. This validates the tracking and visibility as one of the significant technological gaps in relation to customer satisfaction and supply chain transparency.

Table 12*Billing Process Capability Maturity*

Level of Maturity	Details	Frequency(f)	Percentage (%)
Ad-hoc	Billing was done manually and very dependent on individuals.	25	20
Formal	Billings which are software-enabled with minimal error monitoring.	47	36.8
Standard	Routine billing processes that have controls in writing.	33	26.4
Advanced	Automated billing in association with operational information and credit checks.	12	9.6
Innovative	Smart billing systems and cash-flow predictive analytics.	9	7.2
Total		125	100

The maturity of billing processes are depicted in table 4.12. 36.8% indicated Formal software-based billing in accordance with quotations. Nevertheless, there was still a significant percentage (20 percent) that was using Ad-Hoc manual billing systems. Scarcity of the use of Advanced and

Innovative billing practices indicates inefficiency in the financial reconciliation, credit management and error control.

Table 13

Feedback Collection and Utilization Capability Maturity

Maturity Level of Capability	Details	Frequency (f)	Percentage(%)
Ad-hoc	Lack of formal complaints or feedback system	25	20
Formal	Feedback collected for major customers only	46	37.8
Standard	Organization-wide complaint and appreciation	33	26.4
Advanced	Feedback quantitatively measured with trend analysis	12	9.6
Innovative	Internal quality systems, portals and external audits	9	7.2
Total Sum		125	100

Table 4.13 shows the results of the feedback collection and the usage. Although 37.8% of the organizations inquired feedback about a major client on a Formal basis, 20 percent did not have a structured feedback mechanism. Advanced or Innovative feedback systems with quantitative measure, trend analysis, or external audit were only reported by 16.6% of firms. It means that feedback provided by customers is not used as a strategic implementation instrument to improve the continuous process.

Table 14

One-Way ANOVA Comparing Capability Maturity by Ownership Type

Ownership Type	Mean CMI	SD
Private Limited (>10 years)	3.95	0.48
Private Limited (< 10 years)	3.44	.51
Sole Proprietorship	2.67	0.61
Partnership AOP	3.04	0.56
Public Limited	4.26	0.42

One-way analysis of variance (ANOVA) was performed to assess the differences in overall maturity of capabilities of ownership types. The comparison demonstrated that the maturity level of groups varied statistically, $F(4, 120) = 14.62, p < .001$. Post-hoc Tukey tests revealed that the Maturity of the Public limited companies was significantly higher than that of Partnership firms and Sole Proprietorships. These results indicate that the organizational ownership structure is very important in ascertaining the level of process capability maturity in the freight forwarding industry.

Table 15

One-Way ANOVA Comparing Capability Maturity by Age of Organization

Age of Organization	Mean CMI	SD
Less than 5 years	3.01	0.57
5-10 years	3.42	0.52
11-20 years	3.89	0.49
> 20 years	4.18	0.44

Linking the results, it is found that organization age has a significant impact on capability maturity, $F(3, 121) = 11.37$, $p < .001$, and the higher the maturity is in the older organization. This proves the fact that the process institutionalization and learning effects enhance the operational capability in the long run.

In general, the quantitative results show that most freight forwarding and third-party logistics (3PL) companies in Pakistan have operated in Capability Maturity Level 2 (Managed/Formal) and 3 (Defined/Standardized) in the most vital functional areas. Progress to Level 4 (Quantitatively Managed) and Level 5 (Optimizing) was less expansive and was only seen among a small percentage of organizations, mostly, those which had a stronger governance system, and a history of operations. These empirical findings provide the support of the qualitative findings which indicated gaps in institutionalizing processes, management based on data, and ongoing improvements activity across the industry.

8. Discussion

This research empirically confirms that Pakistan's freight forwarding and third party logistics (3PL) sector is mostly mature at Level 2 (Managed/Formal) and Level 3 (Defined/Standardized) in the Capability Maturity Model (CMM). This is an intermediary stage of process formalization where a mix of manual process coordination, experience-based decision-making and sporadic use of digital tools still dominates. This level of maturity is in line with recent international trends in logistics maturity research that emerging economies demonstrate partial process institutionalization but struggle to advance toward data-informed and optimised systems (Ferraro et al., 2023; Asrol, 2024).

Theoretically, the findings substantially confirm the Capability Maturity Model (CMM) prediction that development is path-dependent and depends on institutionalization of processes, measurement and continuous improvement processes. The high prevalence of Level 2-3 maturity supports that Pakistani freight forwarding companies have defined processes, but they do not have quantitative management and optimization skills needed for higher maturity levels. This is consistent with recent maturity model extensions in logistics 4.0, which highlight the fact that digital integration and analytics capabilities are vital for advancement beyond processes (Baglio et al., 2025; Tiwong et al., 2024).

This study's findings on maturity drivers are crucial to understanding drivers of structural immaturity in the industry. The qualitative results show the most dominant factor is a non-adoption of contemporary practices, with low digital integration, separate information systems and a reliance on manual practices. This finding is corroborated by the recent supply chain digital transformation literature, which finds that logistics firms operating in emerging markets are not always at the forefront of adopting Industry 4.0 technologies, such as real-time tracking, automation and integrated data systems (Bigliardi et al, 2022; Hamidi et al, 2024).

From the processes point of view, we highlight that quotation, booking, compliance and tracking remain the most immature and disjointed. These operations are the core of logistics operations, and low maturity suggests operational coordination issues. This is corroborated by recent research that without interconnected digital platforms and harmonised processes, logistics service providers struggle to deliver transparency, agility and efficiency (Freichel et al., 2022; Le & Fan, 2024). Use of email communications and manual tracking in this study also confirms the technology gap between Pakistani 3PL firms and the global Logistics 4.0 agenda.

Our study also reveals that risk management and compliance processes are mostly reactive. This finding is supported by global evidence that logistics firms in emerging markets tend to focus on operational stability rather than modelling risk through prognoses due to analytical capacities and regulatory changes (Wagner & Bode, 2008; Khan et al., 2025). Moreover, the use of feedback

mechanisms is low, which restrains organizations' capacity to learn and improve performance, a critical element for moving towards higher levels of maturity.

The quantitative analysis also supports these descriptive interpretations by demonstrating variations in maturity across ownership types and age of the individuals and organisations. Public limited firms have higher maturity, suggesting that management structures, financial resources, and established systems of control are critical factors of capability building. Similarly, senior companies have higher maturity, which demonstrates that an organisational memory and learning process play a role in improving capabilities over time. But age by itself is not sufficient without strategically oriented digital transformation unless there are investments in digital transformation, as shown in recent logistics capability performance studies (Farooq et al 2024; Benrqya et al 2024).

In conclusion, the integration of qualitative and quantitative results verify a generalised trend: the industry is not limited by volume and experience, but limited by inefficient digital integration, performance measurement and standardisation systems. This places the Pakistani freight forwarding industry in the early to mid-logistics maturity evolution stages.

9. Conclusion

This research attempted to assess the maturity of freight forwarding and 3PL companies in Pakistan using the Capability Maturity Model (CMM). The research provides strong empirical evidence that the sector is primarily at Maturity Levels 2 and 3, meaning that processes have been somewhat standardized, but optimization and the digital integration is lacking.

The research adds to the logistics and supply chain management body of knowledge by applying maturity models to understand the development stage of a developing country freight forwarding industry, which has rarely been addressed in recent publications. While recent international research makes increasing references to Logistics 4.0, digital twins and AI-based logistics systems (Le & Fan, 2024; Baglio et al., 2025), this research demonstrates that firms in Pakistan are still moving from manual to semi-structured and basic digital systems.

As a contribution to theory, the study validates the CMM postulate that maturity levels do not automatically improve over time and organisational experience but are influenced by institutionalised capability development, technology and performance-based governance. The maturity gaps point towards the lack of institutionalised continuous improvement in the sector. Practically, the study confirms that without proactively intervening in digitalization, KPI-based performance monitoring and institutionalised process frameworks, the freight forwarding industry in Pakistan might remain between the global logistics best-practice levels, thereby restricting its ability to gain competitive advantage in global supply chains.

10. Recommendations

The study finds that in Pakistan, freight forwarding and 3PL companies need to focus on strategic digitization in harmony with Logistics 4.0. Firstly, firms must ensure the installation of integrated logistics information systems which link booking, tracking, billing and compliance into single systems. This would remove multiple islands of information and allow in-time information visibility, a critical factor in the maturity of contemporary logistics systems (Bigliardi et al., 2022; Hamidi et al., 2024).

Secondly, companies need to establish performance measurement systems, such as KPIs, and analytics-based dashboards. Lacking data-driven decision-making was one of the immaturity drivers, and this needs to be rectified to move from maturity Level 2-3 to Level 4. The latest literature stresses that analytics capability is a key factor to enable logistics performance improvement and resilience (Farooq et al., 2024).

Thirdly, regulatory compliance and risk management should be upgraded from reactive to predictive mechanisms using checklists and online monitoring systems. This is especially crucial in the presence of regulatory and operational uncertainties in developing countries.

Fourthly, industry bodies like PIFFA should play a key role in formulating maturity guidelines, training and certification programs to enhance capacity building amongst member firms. This was identified in recent studies of maturity models as a crucial factor for industry transformation (Ferraro et al, 2023; Tiwong et al 2024).

Lastly, firms should focus on human capital advancement, especially in digital skill sets, process engineering and logistics analytics, as human capital development is critical to advancing maturation in 3PL firms (Sajjad et al., 2023, Khan et al., 2025).

11. Limitations and Future Research Directions

While this research adds to the knowledge base, there are limitations that need to be noted. First, the study is focused on PIFFA member firms in Pakistan and hence may not be applicable to non-registered or un-formalised logistics firms. Second, the research includes some self-reported data, which could lead to biases in maturity assessment despite triangulation measures. Third, the Capability Maturity Index used in this research has equal weights for process dimensions, which might not reflect the actual impact of specific logistics functions on firm performance. Future studies could use fuzzy logic or structural equation modeling to explore more sophisticated weighting techniques for maturity assessment.

Second, while this research examines the maturity levels of operational capability, future studies should explore how maturity is related to other company performance metrics such as cost efficiency, customer satisfaction and supply chain resilience. Cross-country studies within South Asia or the Middle East logistics sector could also offer insights into regional maturity development patterns.

Finally, future research could build upon this analysis by incorporating new technologies like blockchain, digital twins and AI-powered logistics optimization systems like those increasingly in evidence in next-generation maturity models.

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