The importance of warehouses in logistics outsourcing: benchmarking the perspectives of 3PL providers and shippers

Abstract

Purpose: An ever-increasing number of companies outsource logistics activities to third-party logistics (3PL) providers to beat the competition. From the buyer's (shippers') perspective, selecting the right 3PL provider is crucial, and from the 3PL provider's perspective, it is imperative to be attractive and to retain clients. To this aim, a potential lever can be physical assets, such as warehouses, which the literature has traditionally neglected. The objective is to benchmark the importance of warehouses for 3PL providers to attract/retain clients and for shippers to select the right 3PL provider.

Methodology: We performed an empirical investigation through interviews on dyads (3PL providers/shippers) and utilized the Best-Worst Method (BWM) to rank the criteria used in the 3PL buying process and allow the warehouse's role to emerge.

Findings: Results show that the 3PL buying process consists of four phases and three evaluation steps. The selection criteria are classified into three groups: order qualifiers, order winners, and retention factors. The warehouse has different levels of importance throughout the process. It appears that it can indirectly enhance the attractiveness and retention capability of 3PL providers through other selection criteria.

Originality: By combining the Resource-Based View and the Customer Value Theory, this research extends the theory on logistics outsourcing by studying the phases of the 3PL buying process and scrutinizing the criteria used in different evaluation steps. The research adds a double perspective of analysis (3PL providers and shippers), which is missing in the literature, and focuses on the importance of warehouses.

1. Introduction

In recent years, outsourcing has emerged as one of the most widespread strategies organizations adopt regarding logistics and supply chain management (Akbari, 2018). Logistics outsourcing is generally described as the organizational practice of sub-contracting logistics activities previously performed in-house. They are given to third parties, called 'third-party logistics' (3PL), and they are the experts who efficiently provide these services (Rintala *et al.*, 2021; König *et al.*, 2019; Liu and Lee, 2018).

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Nowadays, an ever-increasing number of companies look to externalize logistics activities to achieve higher customer satisfaction and survive in a highly competitive environment (Doratiotto *et al.*, 2022; Hofer *et al.*, 2020). To outsource their logistics activities to a 3PL provider, shippers undertake a process whereby they select a provider from a list of potential candidates. This process is called the '3PL buying process' (Marchet *et al.*, 2018). On the one hand, from the buyer's perspective, selecting the right 3PL provider is a crucial decision to gain efficiency, though it is a challenge due to the high level of competition in the market (Jovčić *et al.*, 2019). On the other hand, from the 3PL provider's perspective, it is imperative to find a way to be attractive (Andreassen *et al.*, 2008) and to improve customer retention (Wallenburg, 2009), winning the competition against other providers in an increasingly crowded market (Tontini *et al.*, 2017).

According to the literature, to build and maintain a sustainable competitive advantage and generate customer value, one of the potential leverages for 3PL providers consists of physical assets, such as warehouses (Wong and Karia, 2010). According to the Resource-Based View (RBV) theory (Penrose, 2009), physical assets, such as warehouses, are resources that create a competitive advantage. Numerous transformations to the logistics landscape, e.g., an increase in demand for logistics outsourcing services, the introduction of the Industry 4.0 paradigm and new pressure regarding sustainability, have driven innovations in the design and development of logistics buildings (Baglio *et al.*, 2020). As such, logistics facilities have gradually evolved from conventional buildings fitted out with pallet racks and forklift trucks to more complex ones equipped with technological devices (Baglio *et al.*, 2020) that have become unique and non-imitable resources that are instrumental to the generation of competitive advantage for organizations. At the same time, appropriate exploitation of these resources can generate customer value, which, according to the Customer Value Theory (CVT) introduced by Slater (1997), is measured in terms of attractiveness and customer

retention (Roy and Sengupta, 2018). However, the existing literature does not clarify if and to what extent warehouses determine the attractiveness and the customer retention capability of a 3PL provider; thus, further research on critical success factors for both shippers and 3PLs is desired (Thai et al., 2022). The literature explains how identifying and applying the proper elements are crucial for successfully implementing logistics outsourcing (Khan et al., 2022). Moreover, exploiting internal resources and assets (including warehouses) is useful to add new services to a 3PL portfolio and, therefore, remain competitive and attractive in the eyes of shippers (Barker *et al.*, 2021). For this reason, the study tries to fill the literature gap by adopting the theoretical lens of the RBV theory combined with the CVT to benchmark the importance of the warehouse in the 3PL buying process and to investigate its potential capacity of being a highly valued resource in the 3PL buying process, i.e., a unique non-imitable resource that is appropriately exploited for generating customer value.

Based on this objective, the research question investigated is the following:

R.Q. How is the warehouse regarded among the selection criteria used in the 3PL buying process to determine the attractiveness of 3PL providers and their customer retention capability, according to the perspectives of 3PL providers and shippers?

To provide an answer to this question, an empirical investigation was developed based on interviews with dyads of 3PL providers and shippers to investigate the 3PL buying process. The Best-Worst Method (BWM) was utilized to rank the considered criteria and allow the warehouse's importance to emerge.

The remainder of the paper is organized as follows. The following section includes a literature review of the study's theoretical underpinning and the 3PL buying process. Section 3 describes the adopted methodology, while Section 4 presents the findings of the empirical investigation, which are discussed in Section 5. Final remarks conclude the paper and include recommendations for further studies in the field (Section 6).

2. Literature review

2.1 Theoretical underpinning

According to the literature, the primary sources of competitive advantage for 3PL providers are capabilities and resources (Liu *et al.*, 2010). Scholars have focused more on capabilities than resources (Hofmann and Osterwalder, 2017; Chu *et al.*, 2016). Regarding resources, scholars have mainly examined the importance of human and knowledge resources (Aguezzoul, 2014; Wong and Karia, 2010). Few contributions have explored the importance of physical resources, even if the quality and quantity of these resources are recognized to have an influence on the performance and service offered by 3PL providers (Liu *et al.*, 2010; Wong and Karia, 2010). Indeed, physical resources (or 'tangible resources') are one of the dimensions of service quality measurement frameworks for logistics (Rafele, 2004), and they represent critical assets for 3PL providers (Wong and Karia, 2010), as theorized by RBV.

The RBV theory is especially useful in analyzing the competitiveness of 3PL providers (Zacharia *et al.*, 2011; Liu *et al.*, 2010; Wong and Karia, 2010). Competitive advantages result from having ownership of, or access to, valuable, rare, inimitable, and non-substitutable resources (Penrose, 2009). As far as the relationship between 3PL providers and their shippers is concerned, RBV suggests that 3PL providers enable shippers to gain access to complementary resources, achieving valuable benefits (e.g., efficiency and effectiveness) and providing them with a competitive advantage (Zacharia *et al.*, 2011).

The definition of 'critical resource' described by RBV can be applied to warehouses. The warehouse is classified as part of the tangible resources that constitute those 'critical resources' described by RBV. Still, in the service mentioned above, quality measurement frameworks for logistics have generally been skimmed over.

The literature suggests that merely possessing strategic resources is not enough to generate a competitive advantage, but it is also necessary to exploit them properly (Barney, 1991). The missing link between 'resource possession' and 'resource exploitation' is the most significant critique of the RBV theory (Sirmon *et al.*, 2007; Teece *et al.*, 1997). Several other theories were proposed to solve it (Roy and Sengupta, 2018). For example, Doriatiotto *et al.* (2022) and Thai *et al.* (2022) used the RBV together with the transaction cost economics (TCE) theory to explain the main factors that lead companies to decide to undertake the logistic outsourcing process. TCE is used in the outsourcing logistics literature since using 3PL services typically reduces transaction costs for the shipper (Zacharia *et al.*, 2011). Therefore, in the Doriatiotto *et al.* (2022) work, the TCE helped them to study the logistics outsourcing process only from the shipper's point of view. Since it is recognized that the TCE focuses on the cost impact and neglects the value effect of inter-organizational collaboration and competitive advantage (Tsai *et al.*, 2008), which are key elements for the present research, this theory has been discarded. In line with the objective of the current study, and as suggested by Premkumar *et al.* (2021), a new theory coming from another field of research has been sought out (see Swanson *et al.*, 2017).

According to Roy and Sengupta (2018), the customer value theory (CVT) is the most addressed theory in the marketing literature on 3PL, and it has recently been introduced in the logistics and supply chain management field of research. It has been used to explain why firms adopt customer-oriented strategies and the dyadic relationship between them (Chu *et al.*, 2016). The CVT explains that firms exist to satisfy customer needs through products or services to create customer value (Slater, 1997). The principles of the CVT can be combined with the RBV theory to identify and leverage resources that make it possible to understand and meet customer needs and serve them appropriately, implementing value-creating strategies (e.g., Nath *et al.*, 2010). Using the theoretical lens of the CVT, it is possible to

overcome the main critique of RBV: attractiveness and customer loyalty (in terms of customer retention) measure the ability of 3PL providers to exploit the resources to build competitive advantage, as shown by Sinkovics *et al.* (2018).

In conclusion, RBV suggests that the warehouse could be a critical resource for the 3PL provider. CVT suggests the warehouse could generate a competitive advantage when exploited as a strategic resource. While the RBV lays the theoretical foundation of the study, the CVT goes on to take the perspective of the dyadic relationships between buyers and suppliers and to give a comprehensive understanding of the importance of the warehouse as a source of competitive advantage in the 3PL buying process from both perspectives.

2.2 3PL buying process

As the variety of logistics services and the level of outsourcing logistics have grown over time, the purchasing process has become increasingly complex (Andersson and Norrman, 2002). According to the literature, the 3PL buying process is structured in several phases that present similarities to generic purchasing frameworks (Marchet *et al.*, 2018).

The first phase is the 'definition of the service outsourced'. It includes the service specification, the definition of weights/volume, and a description of standardized operations. The buyer performs these activities internally and generally by a cross-functional team (Aghazadeh, 2003). They are fundamental to building shared internal knowledge of the expected service (Sink and Langley, 1997) and to choosing the 3PL providers that respond appropriately to the service requirements that are internally shared and accepted (Halldórsson and Skjøtt-Larsen, 2004), and it gives providers a fair opportunity to develop accurate proposals (Andersson and Norrman, 2002).

The second phase is the 'screening process'. During this phase, the buyer defines the first list of potential providers through a market survey and sends a request for further details (i.e., a

request for information or RFI). The information collected is used to confirm or discard a provider from the potential list of candidates according to the fulfilment of specific criteria, which are called 'order qualifiers'; if a potential supplier fulfils these criteria, it moves into the next phase of the competition (Hwang and Lin, 2016).

The third phase consists of the 'evaluation and selection of 3PL providers' stage. The buyer sends out a request for a proposal (RFP) to qualified providers that made it through the screening process (Jazairy *et al.*, 2020). Consequently, 3PL providers are approved to submit an offer compliant with the requirements defined in the first phase. Several selection criteria (called 'order winners') are adopted in this phase.

The fourth phase is 'contracts and service implementation'. In this stage, the buyer and the winning 3PL provider discuss and negotiate the final price and service constraints (Sink and Langley, 1997). Finally, both parties draw up and sign a detailed contract, after which the service starts. At the contract's end, the shipper decides to terminate or renew the contract. In case of termination, the 3PL buying process begins again.

The existing literature describes that the 3PL buying process is long and complex and includes different phases and actors. However, even if the literature presents the different phases of the process and distinguishes between 'order qualifiers' and 'order winners', previous contributions completely overlooked the screening process (phase 2), as Rezaei et al. (2016) noted. Scholars have extensively discussed the third phase, which defined several selection criteria to determine the best 3PL provider (Aguezzoul, 2014). The present research aims to give a comprehensive view of the 3PL buying process and highlights the critical factors considered during the different phases of the 3PL buying process, not just focusing on the third phase (see, for example, Khan *et al.*, 2022). The following paragraph discusses the selection criteria mainly used in the literature to solve the 3PL selection problem.

2.3 Selection criteria in the literature

Aguezzoul (2014) provides an extensive literature review on the 3PLs selection problem. He analyzed 67 papers (from 1994 to 2013), identifying the most used selection criteria and classifying them and the methodologies applied, mainly consisting of MCDM methods. A more recent literature review on this topic has been performed by Akhtar (2023). He identified several main selection criteria: economic criteria (i.e., price/cost, financial position, and service aspects, such as on-time delivery, service quality, reputation, flexibility, etc.), social criteria (i.e., 'worker health and safety', and 'labour union and relations') and sustainability criteria (i.e., environmentally friendly services, green practices, emission minimization, green certifications, etc.). While for the first class of criteria, there is a long list of works – in line with the contribution of Aguezzoul (2014) – for social and sustainable criteria, there are few references since it is an emerging topic (Midgley and Bak, 2022; Roy *et al.*, 2020; Raut et al., 2018). According to the overviews and other recent works, the main selection criteria are 'financial position', 'quality', 'experience and reputation', 'service range', 'I.T. capabilities', 'cost', 'service quality', 'flexibility' and 'proactivity'. The main related references are: Akhtar (2023); Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019), Jovčić et al. (2019); Ecer (2018); Marchet et al. (2018); Roy and Sengupta (2018); Bianchini (2018); Raut et al., 2018; Bajec and Tuljak-Suban (2017); Hwang and Lin (2016); Aguezzoul (2014). These works are also included in Table III.

The warehouse is often mentioned as a selection criterion in the recent scientific literature on the 3PL selection problem, though it is not studied explicitly. Hwang and Lin (2016) consider six main criteria: the assets and equipment within the broader 'financial stability' criterion. However, the actual impact of assets and equipment in the selection process cannot be established. Even in Bajec and Tuljak-Suban's (2017) work, the warehouse is included in the 'technical and technological capability' criterion, embracing attributes such as a vehicle,

equipment, facility, quality of fixed assets, and asset specificity. According to the results of their work, the 'technical and technological capability' is a 'must-be' element. Still, it is analyzed in combination with other criteria, i.e., 'cost', 'accurate delivery time', and 'strategic partnership'. Hence, the specific impact of the warehouse in 3PL selection is unclear and cannot be isolated.

Similarly, Marchet *et al.* (2018) show that the 'size and quality of fixed asset' criteria (including warehouse) is a critical selection criterion for the shipper. However, they do not assess each criterion's specific importance or highlight the warehouse's weight as a selection criterion. Asian *et al.* (2019) apply the Kano Model to define what variables affect the selection of 3PL providers in the automotive sector. The managers interviewed identified warehouse ownership as a 'must be' element. In contrast, the location - a typical warehouse feature – was recognized as an 'attractive' element (i.e., an element that boosts customer satisfaction). They do not consider all the features related to the warehouse, the level of quality linked to these features, or how they affect the 3PL selection process.

In conclusion, of all the criteria usually used in literature, the warehouse's importance has scarcely been addressed, even though it seems to impact the performance of a 3PL provider (Liu *et al.*, 2010). Moreover, even though the literature indicates the existence of different phases in the 3PL buying process in which various selection criteria are adopted (see, for example, Marchet *et al.*, 2018), no discrimination between selection criteria fall in the 'order winners' or 'order qualifiers' categories, nor is there an evaluation of how the same type of criterion changes in the different phases of the 3PL buying process. Indeed, most of the contributions look up just to the selection criteria used in the third phase of the 3PL buying process (see, for example, Asian *et al.*, 2019; Raut *et al.*, 2018; Bajec and Tuljak-Suban, 2017). Hence, losing visibility over the entire evaluation process leads to partial conclusions and misleading results. Finally, the comparison of perspectives of the dyad (shipper - 3PL

provider) is scarcely addressed in the literature, as noted by Thai *et al.* (2022). The analysis of the two different points of view is an approach different from, but complementary to, prior works that have tried to identify how logistics service resources can be leveraged to create customer value. The present research advances the current literature by analyzing the importance of the warehouse in the 3PL buying process, giving a comprehensive overview, and comparing the dyad's perspectives.

3. Methodology

The research methodology was divided into two main steps, see Figure 1.

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Figure I – Methodology steps (Source: Authors' own work)

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In Step 1, semi-structured interviews with a panel of experts were conducted to validate the literature review results, especially in phases of the 3PL buying process and lists of criteria. During the semi-structured interviews, an interview protocol was used to ensure the study's reliability. It mainly contained open-ended questions on the characteristics of the 3PL buying process and closed-ended questions on the most relevant selection criteria. The interviewers' panel comprised three experts: an Italian logistics association member, a professor working in an academic observatory related to the 3PL industry, and a consultant with more than 15 years of expertise in the 3PL buying process. The interview results were recorded, transcribed, and the collected data were discussed with the team of researchers and shared with the interviewees for validation. This step's final outputs were a comprehensive analysis of the 3PL buying process, three lists of criteria (subdivided into order qualifiers, order winners and retention factors) and a formal interview protocol used in the following phase of the

methodology. The protocol obtained was validated through a pilot test that was selected with the support of experts.

In Step 2, the lists of criteria were used to rank them and assess the warehouse's importance in the 3PL buying process. The present research uses the dyad as a unit of analysis to focus on key constructs from the perspective of both sides of the buyer–seller relationship, as in Grawe *et al.* (2015). The analysis of the two perspectives is important when the study's objective concerns the relationships between companies (Jazary *et al.*, 2020). The dyad opinions were collected in semi-structured interviews, and the selection criteria were ranked with the BWM. Its application is in line with the scientific literature referring to the 3PL selection problem, which is usually solved through multi-criteria decision-making (MCDM) methods, like the BWM (Aguezzoul, 2014).

The dyads were selected using different inclusion and exclusion criteria. The research focused on the Italian 3PL industry, which is renowned for being one of the leading markets in Western Europe and consequently can be judged as representative (Evangelista and Sweeney, 2006). The research focused on two industries characterized by very high levels of logistics outsourcing, as indicated by the scientific literature (Singh *et al.*, 2016) and confirmed by the data provided by the Contract Logistics Observatory of Politecnico di Milano (Contract Logistics Observatory, 2019): the fast-moving consumer goods (FMCG) and the pharmaceutical industry. Second, large 3PL companies specialized in these two industries were contacted, and starting from their customer portfolio, shippers were selected according to these criteria: (1) the firms must implement a structured 3PL buying process (to compare similar processes) (Nevries and Wallenburg, 2021); and (2) the duration of the buyer-seller relationship must be different: long relationship (>= 5 years) versus short (< 5 years) (Johne and Wallenburg, 2021). The latter aspect allows for a deeper understanding of the impact of selected criteria on customer retention: the longer the relationship, the higher the level of

commitment will be to the relationship on either side (Huo *et al.*, 2015). Similar to Tsai et al. (2008), we selected participants in such a way so that they could offer global insights and comprehensive perception. As potential respondents, logistics or supply chain directors are chosen since they are expected to be the most appropriate professionals normally involved and responsible for the 3PL buying process. The logistics managers interviewed were selected have more than 10 years' experience (as in Marchet et al., 2018) and only if they were involved in at least the last tender, where the relationship with the actual 3PL provider started or was renewed. Data on eight dyads were gathered: four for the pharmaceutical industry and four for the FMCG industry (see Table I and Table II).

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Table I - Dyads features: relationship and service characteristics (Source: Authors' own work)

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Table II - 3PL providers and shippers features (Source: Authors' own work)

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Structured interviews were carried out with logistics managers of the companies in the dyads. They were called to (i) explain the characteristics of the 3PL buying process that involved the other member of the dyad and the characteristics of the relationship and (ii) rank the criteria used following the linear BWM. During the structured interviews, logistics managers were explicitly asked to motivate all the scores to understand the results better.

The BWM method is a comparison-based MCDM method, i.e., a methodology that chooses the best alternative considering several criteria (Rezaei, 2016), and it is widely applied in the logistics stream of literature (Paul *et al.*, 2020). The application of the BWM method is also

in line with the scientific literature referring to the 3PL selection problem, e.g., it is used by Coltman *et al.* (2011) and Pamucar *et al.* (2019). The BWM method has several benefits: it requires fewer comparisons than matrix-based MCDM methods, such as the Analytic Hierarchy Process (AHP); the pairwise comparison is a structured process that gives consistent and reliable results; it requires less data (only two vectors instead of a full pairwise comparison matrix), thereby saving time for the analyst and the decision-maker; the method uses only integer numbers to build the final weights, making it more understandable and easy to communicate; the consistency ratio is easily computed, allowing for fast revisions of the vectors (Kusi-Sarpong *et al.*, 2019; Rezaei *et al.*, 2016). The BWM method requires respondents to select from a group of criteria by choosing the 'best' (e.g., the most desirable criteria) and the 'worst' (e.g., the least important), and then compare the best criterion to the others and all the other criteria to the worst. This process generates two comparison vectors, which are then used to find the optimal weights and consistency ratio through a linear model constructed using the comparison system, as explained in Rezaei *et al.* (2016). The linear BWM is preferred since it gives a single solution directly compared with others. The technique involves several steps: (1) defining the criteria to rank; (2) the experts determining the best and worst criteria; (3) the experts defining the B.O. (best-to-others) comparative vector; (4) the experts defining the O.W. (others-to-worst) comparative vector; and (5) computing the optimal weights of the criteria from the comparative vectors. More details on the steps of the BWM technique and its formalization are reported in the online supplement and the formal protocol used to collect the data.

4. Results

4. 1 The 3PL buying process

Starting from the literature contribution and the semi-structured interviews with experts, the 3PL buying process is shown to be organized into four main phases.

In the first phase, 'service requirement definition', the buyer collects data on the specifications of the outsourced service (Sink and Langley, 1997). According to the interviewees, the information gathered regards a variety of items, including the description of any current logistics network configuration; logistics flows; products; specification/requirements for the warehouse and vehicles; logistics processes and procedures; logistics service level; legislative compliance (e.g., Good Distribution Practice (GDP), for the pharmaceutical industry); and specific areas of interest (e.g., environmental sustainability).

This phase is critical because it identifies the buyer's internal requirements (considering the needs of different departments) and the benefits that the company wants to achieve (e.g., cost reduction or higher service level). The service requirement definition activities 'can last up to one year' (Shipper B), and 'a cross-functional team is involved' (Shipper A). Planning is essential to reduce risks in the start-up period: if the potential providers underestimate or overestimate the requested service, an inappropriate company could be chosen. Consequently, the outputs of this phase are the technical specifications of the logistics services, the order qualifier criteria to adopt in the screening process, and the order winner criteria to use in the final stage of 3PL providers evaluation. Interviewees highlight that in this phase, shippers also define the methodology used to evaluate the candidates during the 3PL buying process.

In the second phase, 'screening process', the first activity is defining an extended list of potential candidates invited to the tender. Third parties may be involved in carrying out a screening of the logistics market. Otherwise, the list is drawn up using the information already possessed by the company. For instance, 'the names of the 3PL providers that have extensive experience in this industry have always been the same ones for years' (Shipper F), thus, 'you can count them on the fingers of one hand' (Shipper A). However, sometimes new providers

are added to the list to gain fresh input and inspiration. (Shipper E). Once the extended list has been defined, the buyer sends out an RFI to gather further information: customer portfolio (e.g., number of current clients, size, market share), experience in the industry, financial indicators, and description of the logistics network (e.g., warehouse location, number of warehouses available, logistics partners, etc.).

After receiving the response from 3PL providers who are willing to participate since 'some candidates decline the offer to participate' (3PL provider FCMG 1) - the buyer applies the order qualifier criteria. Thus, the buyer reduces the number of possible candidates, and the extended list becomes a shortlist of a maximum of 10 suppliers, according to the interviewees. The third phase, 'evaluation and selection process', aims to move from a shortlist of candidates to the final winner. The buyer sends out an RFP to the 3PL providers in the shortlist, to which a document is attached with all the specifications gathered in Phase 1. In some cases, the request for quotation (RFQ) is sent out together with the RFP, while in other cases the RFQ follows the RFP. During this period, the buyer and 3PL providers meet and discuss the RFP's technical specifications. Moreover, buyers can visit, or even audit, the warehouse that will host the products. Once all the proposals have been received, the suppliers are evaluated based on the order winner criteria. In the case of more than one round of proposals/quotations, buyers can meet the suppliers to discuss the proposal and provide feedback. Finally, the 3PL provider with the highest score wins the competition.

In phase 4, 'contract and service implementation', the buyer and winning supplier negotiate the contract's terms and conditions and sign it: the service is then implemented. During the on-going service, the buyer monitors the 3PL provider, keeping track of its performance in terms of service level and costs. Alignment with the service level agreement (SLA) throughout the contract period is critical to decide about contract renewal or termination. The provider in use is usually confirmed to continue if certain criteria have been met, that is, expectations have

been satisfied, the provider has demonstrated flexibility and reliability, they have respected the terms of service, and have 'proposed initiatives to improve the service' (Shipper E). These elements are considered to be 'retention factors' as they allow for renewal of the contract. On the other hand, the reasons to change a provider are related to unsatisfactory performance, higher costs, and projects being suggested but never taking off. The start of a new 3PL buying process could occur due to other reasons that are not related with dissatisfaction, e.g., revision of the logistics network, a search for cheaper providers, or the need to abide by headquarters' demands. In these cases, the current 3PL provider is invited to compete in the tender again. However, the buyer will 'switch to a new supplier only if the new candidates propose cheap enough solutions to cover disservice risks and start-up costs' (Shipper H).

4.2 The criteria used in the 3PL buying process

Building on previous literature (Section 2), nine main criteria were identified (see Table III). The experts engaged adjust the above list and classify the criteria according to their use in the three phases of the 3PL buying process (i.e., Phase 2, 3 and 4):

- 'order qualifiers' are the attributes a 3PL provider must have to participate in the process.
- 'order winners' are those criteria that determine who the winning 3PL provider will be: the higher the score in these attributes, the higher the possibility to win the competition.
- 'retention factors' are the elements that allow for contract renewal.

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Table III - List of criteria and their classification in order qualifier, order winner, and

retention factor (Source: Authors' own work)

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As described in the methodology section, the 'warehouse' criterion was added to the list and considered in all three moments of the 3PLs' provider evaluation to compare its importance to the other criteria. In this way, it was possible to isolate the importance assigned to this variable by both shippers and 3PL providers in the entire 3PL buying process.

Figure 2 reports the ranking of the order qualifier criteria based on the BWM's application.

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Figure 2 – Order qualifier criteria (Source: Authors' own work)

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The 'Expertise and reputation' criterion is the most important order qualifier for both 3PL providers and shippers. Extensive experience in the industry means that 3PL providers know how to face the daily difficulties related to these specific products (e.g., temperature range for transportation and storage, shelf-life management, meeting the standards defined by law) and can reach the standard quality level. 'Expertise and reputation' are considered to be 'quality assurance for both the service offered and the facility used by the 3PL provider' (Shipper D and 3PL Pharma 2). Looking only at the pharmaceutical industry, the second criterion is 'quality' due to the specific characteristics of the sector. The 'financial position' is ranked second by shippers, unlike 3PL providers (ranked 5th). This criterion is used as a 'filter' to include or exclude various providers by FMCG shippers since the number of 3PL providers specialized in this industry is higher than that of the pharmaceutical sector. 'Warehouse' is not seen as critical in this evaluation moment (ranked 4th) since the 3PL provider's expertise

ensures that it responds to the minimum standard required. Even though the warehouse does not emerge directly as an 'order qualifier', among the different warehouse features (e.g., location, building height and size, facilities, external areas), shippers are interested in knowing the potential warehouse location at this stage, which is a requisite needed to optimize the physical flows. Moreover, the other warehouse features can be revisited and audited in the next phases of the process.

Figure 3 reports the outcomes of the application of the BWM for the order winner criteria.

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Figure 3 – Order winner criteria (Source: Authors' own work)

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All the respondents provide a similar rating and choose 'cost' as the most important order winner criterion. According to the '3PL Pharma 1', cost determines the winner among 3PL providers where the same level of quality is provided by all (i.e., having the same score in the other criteria). This motivation seems to be consistent with the opinion expressed by shippers, the other 3PL providers, and the findings reported in the literature (e.g., Jovčić *et al.*, 2019; Pamucar *et al.*, 2019; Bianchini, 2018). The second order winner criterion is 'service quality' for shippers and 'service range' for 3PL providers. 'Service quality' is more critical for shippers: it has a direct impact on the satisfaction of the final customers even if it is not easily measurable. On the other hand, 3PL providers claim that 'service range' can prove to a potential shipper that they have the know-how and ability to manage logistics activities. 3PL providers consider 'many services as an opportunity to meet different shippers' needs' (3PL FMCG 1). Still, shippers are usually 'reluctant to remunerate for services that have not been explicitly requested' (Shipper B). Furthermore, this criterion is more important for the

pharmaceutical industry, as the pharma 3PL providers offer many specialized services, such as secondary packing activities in a 'secondary manufacturing site' (i.e., a dedicated area that respects the strict regulations and is authorized by the Ministry of Health). 'Flexibility', 'proactivity', and 'service quality' are difficult for shippers to measure directly (Ecer, 2018). Typically, they are 'proven by showing the KPI reports of other shippers and accepting the SLA in the contract linked with penalties for lower performance' (3PL FMCG 1). In the case of unknown providers, shippers ask for references to investigate the quality of the service offered. Moreover, 3PL providers are evaluated differently according to the length of the buyer-seller relationship: when the shipper is evaluating its current provider, the 'service quality' is the most important criterion and it represents the focus of the evaluation (e.g., does the current 3PL provider propose increasing the service level at the same cost?). Meanwhile, an unknown 3PL provider will be measured as based on cost (e.g., how much can the shipper save for the same service of level?). Finally, expertise and reputation are no longer relevant. Even among the order winners, 'warehouse' is not the most crucial criterion, taking third place. The warehouse is more important for shippers due to the attention and efforts they place on ensuring that the facilities they use to store and handle their products are compliant. Despite the relatively low importance assigned to them, all 3PL providers admitted that warehouses function as 'marketing tools'. During visits, 'the potential shipper can see the quality and the values of our company in our warehouses: they are clean, organized, flexible, and equipped with qualified personnel' (3PL Pharma 1). However, the evaluation of the warehouse by shippers is done according to a 'look and feel' approach: 'shippers tend to pay attention to details, such as the level of cleanliness of the warehouse or if it looks well organized, but they do not seem able to objectively assess the quality of structural features and if the building is compliant with their operating requirements' (3PL Pharma 2). The 3PL FMCG 1 agrees: 'regardless of some technical features (which in our opinion are crucial, such as the high clear

building height) a new multi-client warehouse, that is tidy, well organized and with automation is what makes a good impression on the shippers. It gives the idea of an innovative and efficient company'. Shippers confirm this feeling: 'our business does not necessarily need a recently constructed warehouse, but rather requires an organized and clean building that is equipped with modern technologies that denote the skills of a 3PL provider' (Shipper E). Moreover, according to Shipper B, warehouses have an impact on costs: 'the higher the quality of the warehouse, the higher the costs allocated'. This shows that the warehouse also has an indirect impact on other criteria, such as cost.

Figure 4 reports the outcomes on the retention factors.

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Figure 4 – Retention factors (Source: Authors' own work)

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Looking at the 'retention factors', the warehouse is not considered to be a critical factor. The interviewees motivate it by claiming that facilities are now taken for granted and 'considered part of the service quality' (Shipper A) since 'a good warehouse affects the performance of the 3PL provider positively' (3PL Pharma 1). In this case, the importance of the warehouse appears to be linked to performance and service quality.

FMCG and pharmaceutical companies have given similar scores. All the companies agree that the most important retention factors are the ones linked to service: 'service quality', 'proactivity' and 'flexibility'. 3PL providers should focus on them to improve the shipper's loyalty as the main reason to change a provider is related to dissatisfaction with the service level offered.

'Cost' plays a secondary role since a change in the provider implies additional costs that might be not covered by the savings obtained with the new rates. 'Changing the 3PL provider involves switching and set-up costs (e.g., moving cost, investments in I.T.), a lowering of the service level in the start-up phase, and use of resources (e.g., time and people) to start the new contract correctly. You must be sure to have a significant benefit to face all of this.' (Shipper G).

A wide range of services is an important criterion for 3PL providers as they consider offering multiple services as a lever to maintain the shipper. However, shippers seem to think alike. 'A wide range of services will give me the possibility to access new services, which, at this moment, I don't need. So, in the future, I could outsource everything to my provider, which makes me less eager to leave. On the contrary, if my current provider did not offer the additional services I need, the new tender could be awarded to another 3PL provider who offers a complete service' (Shipper C). As expected, well-established dyads provide scores that are more like each other compared to the scores provided by recent dyads. This is due to the higher attention that 3PL providers pay to satisfy the retention factors of long-term shippers to improve their 'loyalty', while for the newly connected shippers, their focus is to make a first good impression, focusing more on the order winner criteria.

5. Discussion

The results provide interesting insights into the 3PL buying process and the importance of the warehouse. Starting from the 3PL buying process, the results show that there are three moments in which 3PL providers are evaluated (i.e., phases 2, 3 and 4). As described in the Literature Section, scholars have mainly focused their attention on the defining and ranking of the order winner criteria (described as selection criteria) while overlooking the other phases of the 3PL buying process. Andersson and Norrman (2002) noted that one of the major

challenges in the 3PL buying process is the service definition, which involves the definition of the prerequisite for the 3PL providers (or order qualifier) since this has several impacts on all the phases of the purchasing process, as confirmed by the evidence gathered in this field study. For example, considering only the order winners, a 3PL provider could be selected but it might not be able to deliver the service requested (for example, it does not have the certifications needed to operate in a specific industry). Hence, losing visibility on the entire evaluation process leads to partial conclusions. A holistic approach that considers the entire 3PL buying process (order qualifier, order winner and retention factors) helps to reach more reliable conclusions and informed decisions.

The concurrent analysis of the ranking allows the 'warehouse' to be scrutinized in the light of its importance in the 3PL buying process. What emerges from the results is that the warehouse seems to have a relatively secondary role, according to both 3PL providers and shippers: it is not recognized as the most important criterion, but it has an indirect impact within the whole 3PL buying process on other important criteria. Several reasons lead to these results.

First, the warehouse is not an order qualifier. Still, its presence and quality are associated with the 'expertise and reputation' criterion, as a high level of expertise and a good reputation are seen as being able to ensure that buildings are compliant with a shipper's needs. In addition, according to the literature, the warehouse is also linked to the 'financial position' criterion (Hwang and Lin, 2016). Finally, it does not appear to be related to the 'I.T. capability' criterion. This latter is not even considered so important by the interviewees (it reaches the 5th position in the order winning ranking), even if the presence of a warehouse management system (WMS) and the I.T. capability are considered strategic for 3PL to optimize their costly operations in literature (Minashkina and Happonen, 2020).

Second, the results show that the warehouse can be an order winner. Even if the final score assigned by shippers and 3PL providers is similar, the reasons for such a result are different.

3PL providers are generally aware of the technical features of their buildings that drive overall better logistics performance but also leverage their warehouses for marketing purposes. Instead, shippers approach warehouses according to a 'look and feel' attitude and associate the idea of 'good quality' with how 'clean' and 'organized' a warehouse appears, without paying attention to the other technical/structural features that, according to 3PL providers, can actually make a difference. Even in the literature, there is no clear definition of 'quality' for warehouses. Marchet *et al.* (2018) presented 'size and quality of fixed asset' as a critical criterion without clarifying what features make a warehouse a 'good' quality building.

Moreover, the warehouse affects 'costs'. Both shippers and 3PL providers rate the 'cost' as the most important order winner criterion because it is 'an easy factor to measure objectively' (Shipper C). Even if shippers focus on cost, they do not consider the 3PL providers' services as a commodity (i.e., they do not decide based on costs alone). The results in fact show that 'service quality' immediately follows – or sometimes even precedes - the 'cost' criterion. 'Warehouse' is also linked to 'service quality': the higher the quality of the warehouse, the higher the performance of the 3PL provider. This explains why normally in the literature the warehouse is found associated with either 'costs' or 'service quality' criteria (e.g., Tuljak-Suban, 2017).

Third, the warehouse is not considered among retention factors. However, the quality of the warehouse affects 3PL providers' operations and, thus, the service quality provided. Shippers and 3PL providers weighed 'service quality' as the most critical factor, as it directly affects end customers' loyalty. Even 'flexibility' and 'proactivity' are fundamental because they make it possible to adapt the logistics activities according to the specific needs of the shipper and their customers. If their customers remain satisfied and loyal, there are no conditions for the shipper to terminate the contract. This result is consistent with the contributions studying the

relationship between customer satisfaction, loyalty, and service quality (e.g., Tontini *et al.*, 2017).

Looking at the overall 3PL buying process from the perspectives of the sectors that have been studied, it seems that the 'warehouse' is perceived in a similar way in terms of scores, and the slight differences are given by the peculiarities of the two industries. For example, there are differences in the rating of the 'order qualifier' criteria, where pharmaceutical shippers rate 'quality' second in importance. This is due to the specific characteristics of the sector under consideration: the legislation on distribution and conservation practices is strict with a high standard of quality.

To sum up, even if logistics is presented as a strategic function given its evolution over the last few years (Asian *et al.*, 2019), the warehouse has limited importance according to shippers and 3PL providers. The results only partially confirm the view of the RBV, showing that the warehouse is important for the 3PL buying process, but not as much as the theory would suggest. Thanks to the CVT, it was possible to identify the reasons leading to this outcome. The warehouse is not exploited well enough by 3PL providers (particularly as a retention factor): shippers are not able to recognize its 'value'.

Shippers are not able to clearly define and 'understand' the concept of warehouse quality. This is due to the loss of logistics competence: a risk when implementing outsourcing decisions (Selviaridis and Spring, 2007). Shippers look at the level of 'cleanliness' and 'organization' as warehouse features. Instead, 3PL providers observe features such as the clear building height, floor space, flexibility, and automation. Even if similar in the final evaluation in terms of outcomes of the BWM, the two perspectives are not aligned.

Instead, 3PL providers do not value and promote their warehouses well enough. Logistics buildings may not be strategic for 3PL providers because they cannot fully support 3PLs' current and prospective operative needs. In fact, warehouses are usually designed, built and

owned by real estate companies, and they have features, as described in Baglio *et al.* (2020), that could not satisfy the specific requirements of 3PL providers.

Having isolated the main potential reasons underpinning the results of the study, the strategic relevance of the warehouse could be strengthened through a dual alignment pathway. On one hand, there should be an aligning of the availability of logistics buildings in the marketplace to better fulfil the 3PL providers' needs, which in turn would help them to leverage the value generated by their warehouses. This could happen if the real estate sector were involved and informed regarding the evolving needs of 3PL providers and were able to combine this information with their policies and development strategies according to a win-win approach. On the other hand, aligning the perspectives of the shippers and 3PL providers in the 3PL buying process would help 3PL providers focus not just on the technical features but put more emphasis on what customers 'see' as value-generating factors. It would also mean assisting customers in broadening and deepening their focus, appropriately 'seeing' and evaluating the entire set of warehouse features with the aim of recognizing its capability to generate 'customer value' in a more comprehensive way.

6. Conclusions

To address the research question, this work focused on the 3PL buying process, analyzing the perspectives of both 3PL providers and shippers. The dyad opinions were collected in structured interviews, and the criteria were ranked with the BWM.

The research has theoretical and managerial implications.

From the theoretical viewpoint, the study extends the current theory on the area of logistics outsourcing, overcoming the limitations of the existing theory by deepening the study of the 3PL buying process and of the various phases composing it. This is aimed at isolating how the decision-making process might change during the various phases of the process, and what

criteria are used in the various evaluation moments, something missing in the current knowledge. The research also adds a double concurrent perspective of analysis that is missing in the traditional literature. It offers a holistic view that allows for interpreting the alignment between how 3PL providers can generate customer value and how shippers perceive the value generated. The study focuses also on the warehouse as a criterion, which was seldom addressed in the previous literature. To isolate the potential importance of the warehouse, this work adopts and combines two theories (RBV and CVT) from the strategic and marketing management field in a new way, as suggested by Premkumar *et al.* (2021), who recommend using innovative theories to contribute to 3PL literature. The use of these theories helped set the starting point of the research and drive the discussion of the results: it was possible to draw insights and generate prescriptions for 3PL providers and shippers.

The study has managerial implications, too. It offers a view on what buyers and suppliers focus on during the process and helps raise awareness of the potential misalignments of views. The research offers practitioners the opportunity to become familiar with the views of their counterparts and provides an enriched approach to the 3PL buying process, which also embraces all phases of it, as a practical outcome. This element further helps shippers and 3PL providers broaden their focus when they source or sell logistics services, paying attention to how the evaluation moments differ and to understand the different levels of importance that the various criteria might play in the selection process. Likewise, shippers and 3PL providers have been offered a detailed analysis of the criteria used and they have been given the opportunity to rethink the criticality of some resources, such as warehouses, as a leverage for 3PL providers to attract and retain their customers and as a value-generating resource for shippers.

It is possible also to underline some implications for business ethics related to the practical implications. First, this study enhances the ethical practices of organizations dealing with the

3PL buying process. It provides clear and transparent rules, phases, criteria, and mechanisms used in the selection process and negotiating between shippers and 3PL providers. This study provides clear, explicit and transparent elements that companies can use and refer to in their selection and negotiation processes, improving the confidence of stakeholders in the rigour and fairness of the entire 3PL buying process. Second, our study also emphasizes the importance of conducting audits and visits after the evaluation and selection process and before going live with the implementation phase. This contributes to making the 3PL buying process as rigorous as possible and able to provide clear and direct evidence on the scrutinized elements in the companies through the audit process. Therefore, this study suggests ways to make the 3PL buying process more efficient, effective and ethical thanks to better clarity and transparency of selection decisions made on evidence-based information.

Although this study produced interesting results and findings, limitations do exist. First, the number of dyads involved in the research should be increased to strengthen the findings. Dyads from other industries should be added to the sample to collect more insights and allow for the generalization of the results. Second, only customer retention is used as a measure of loyalty. Further studies should also consider additional dimensions of loyalty, such as customer extension and customer referrals. Finally, new studies could analyze the relationship between the warehouse and other criteria of the 3PL buying process, and their impact on elements such as performance.

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Appendix 1. Best-Worst Method

The Best-Worst Method (BWM) is a technique that involves several steps, as described by Rezaei (2015).

Step 1: Definition of the set of decision criteria $[c_1, c_2, \ldots, c_n]$, where n is the number of criteria included. In our case, the panel of experts identified three sets of decision criteria (order qualifier criteria, order winner criteria and retention factors).

Step 2: The decision-maker determines for each set the best and worst criteria among all identified criteria in step 1

Step 3: The decision-maker assigns the rating to the best criterion and all other criteria through pairwise comparison using a 9-point scale (i.e. from 1 to 9), where 1 means equal preference and 9 means extreme preference. The step provides the Best-to-Others (BO) vector that represents the preference of the best criterion over all the other criteria, and it is represented as:

$A_B = (a_{B1}, a_{B2}, \ldots, a_{Bn})$, where a_{Bj} indicates the preference of the best criterion B over the criteria j; and the preference of the best criterion over itself is obviously equal to 1 ($a_{BB} = 1$).

Step 4: Similarly, the decision-maker must compare all criteria over the worst criterion using the 9-point scale. The others-to-worst (OW) vector is represented as:

$A_W = (a_{W1}, a_{W2}, \ldots, a_{Wn})$, where a_{Wj} indicates the preference of the criteria j over the worst criterion; and the preference of the worst criterion over itself is obviously equal to 1 ($a_{WW} = 1$).

Step 5: Calculate the optimal weights ($w^*_1, w^*_2, \ldots, w^*_n$). The weight of each criterion is determined so that the maximum absolute differences for all j are minimised:
$\{|w_B - a_{Bj} w_j|, |w_j - a_{jW} w_W|\}$. The optimization model can be formulated as:

$\min \max_j \{|w_B - a_{Bj} w_j|, |w_j - a_{jW} w_W|\}$

Subject to:

$$\sum_j w_j = 1$$

$w_j \geq 0, \text{for all } j$

The model can be converted in a linear programming problem model and solved for the optimal weights of the criteria, i.e., $[W^*_1, W^*_2, ..., W^*_n]$ and optimal consistency ratio ξ^L:

Min ξ^L

Subject to:

$|w_B - a_{Bj}w_j| \le \xi^L$, for all j

$|w_j - a_{jW}w_W| \le \xi^L$, for all j

$$\sum_j w_j = 1$$

$w_j \ge 0,$ for all j

The consistency ratio means that the closer ξ^L is to a zero value, the more consistent the decision-maker's comparison system is (Rezaei et al., 2016). Finally, a simple average of each criterion's weights is then obtained for the respondents (12 in our case).

The results of Step 2 of the methodology were used to determine how important the warehouse is perceived to be in the 3PL buying process by 3PL providers and shippers.

References

Rezaei J (2015), Best-worst multi-criteria decision-making method, *Omega*, 53: 49–57.

Rezaei J, Nispeling T, Sarkis J, Tavasszy L (2016), A supplier selection life cycle approach integrating traditional and environmental criteria using the best worst method, *Journal of Cleaner Production*, 135: 577–588.

Appendix 2. Formal interview protocol

PART 1- Qualitative investigation

a) Shippers' questions:

Logistics Setup:

- What activities have you outsourced?

- What logistics providers do you have, and what are their responsibilities?

Tender Process:

- How is the logistics service procurement process structured?

- What evaluation criteria have been used?

- How important is warehouse quality in the evaluation process?

Relationship:

- How often and why is a tender issued?

- What is the duration of the contract with your 3PL?

- How long have you been working with your 3PL?

b) 3PL's questions:

Offer:

- What activities do you offer for outsourcing?

- What types of clients do you have (industry, size, etc.)?

Tender:

- What are the phases of the logistics service procurement process? What are the critical points?

- How often and why is a tender issued?

- What are the specific details of the tenders with Client 1 and Client 2? What evaluation factors were used?

- What is the role of the warehouse in the selection process?

Relationship:

- What is the average duration of contracts? In the case of Client 1 and Client 2?

- On average, how long have you been working with your clients? In the case of Client 1 and Client 2?

- What factors lead to contract renewals?

PART 2 - Questions for BWM data collection (for both shippers and 3PLs)

Order qualifier	Best criteria: _____	Worst criteria: _____
	How much better is the best criteria (from 1 to 9) than the others?	How much better are the other criteria (from 1 to 9) than the worst case?
1) Financial position		
2) Quality		
3) Experience and reputation		
4) Service range		
5) Warehouse		

Order winner	Best criteria: _____	Worst criteria: _____
	How much better is the best criteria (from 1 to 9) than the others?	How much better are the other criteria (from 1 to 9) than the worst case?
1) Quality		
2) Experience and reputation		
3) Service range		
4) IT capabilities		

5) Warehouse		
6) Cost		
7) Service quality		
8) Flexibility		
9) Proactivity		

Retention factor	**Best criteria: _____** **How much better is the best criteria (from 1 to 9) than the others?**	**Worst criteria: _____** **How much better are the other criteria (from 1 to 9) than the worst case?**
1) Service range		
2) Warehouse		
3) Cost		
4) Service quality		
5) Flexibility		
6) Proactivity		

Figure 1- Methodoloy steps

Figure 2 – Order qualifier criteria

	Financial Position	Service Range	Warehouse	Expertise and reputation	Quality
Average 3PL pharma	10,0%	13,8%	15,6%	34,4%	26,2%
Average pharma shippers	20,1%	6,8%	14,9%	31,9%	26,3%
Average 3PL FMCG	11,5%	19,7%	15,4%	41,6%	11,8%
Average FMCG shippers	28,1%	7,1%	17,4%	29,8%	17,6%

Figure 3 – Order winner criteria

	Cost	Warehouse	Service Range	IT capabilities	Expertise and reputation	Quality	Service Quality	Flexibility	Proactivity
Average 3PL pharma	22,5%	12,9%	20,4%	6,8%	7,1%	8,3%	9,1%	8,0%	4,9%
Average pharma shippers	22,7%	12,7%	8,3%	8,3%	5,4%	8,1%	17,6%	8,4%	8,5%
Average 3PL FMCG	30,7%	10,2%	10,9%	9,8%	5,1%	5,6%	17,2%	6,6%	3,9%
Average FMCG shippers	27,2%	12,0%	5,8%	7,4%	5,3%	9,3%	16,4%	6,8%	9,8%

Figure 4 – Retention factors

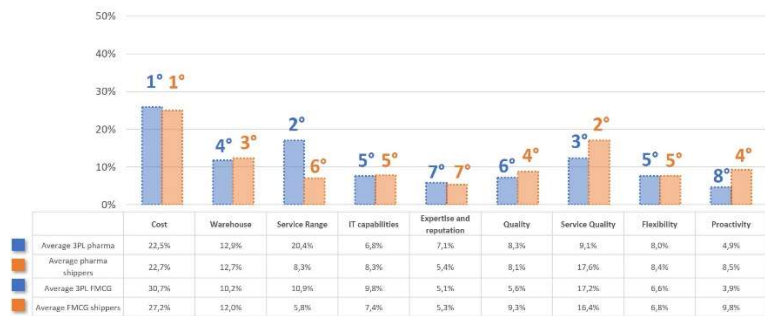|	Cost	Warehouse	Service Range	Service Quality	Flexibility	Proactivity
Average 3PL pharma	9,9%	5,8%	9,6%	33,7%	23,7%	17,4%
Average pharma shippers	12,2%	8,6%	8,3%	34,3%	18,1%	18,4%
Average 3PL FMCG	21,7%	5,3%	8,9%	27,3%	21,1%	15,7%
Average FMCG shippers	13,6%	6,5%	9,5%	32,1%	21,4%	16,9%

Table I : Dyads features: relationship and service characteristics

		Procured logistics services	Contract length	Relationship length
3PL Pharma 1	**Shipper A**	Warehousing, value-added services	6 years (3+3)	Long
	Shipper B	Warehousing, transportation, value-added services	3 years	Short
3PL Pharma 2	**Shipper C**	Warehousing, transportation, value-added services	6 years (3+3)	Long
	Shipper D	Warehousing, transportation, value-added services	3 years	Short
3PL FMCG 1	**Shipper E**	Warehousing and value-added services (only non-seasonal products)	5 years (3+2)	Long
	Shipper F	Warehousing, transportation and value-added services	4 years (3+1)	Short
3PL FMCG 2	**Shipper G**	Warehousing, transportation and value-added services	4 years (3+1)	Long
	Shipper H	Warehousing, transportation and value-added services (consumer distribution channel)	3 years	Short

Table II: 3PL providers and shippers features

3PL PROVIDERS	Revenue 2019	No. Warehouses
3PL provider Pharma 1	€50-100 m	5 warehouses (owner)
3PL provider Pharma 2	€100-200 m	2 warehouses
3PL provider FMCG 1	> €200 m	8 distribution centres, 28 transit points (rent)
3PL provider FMCG 2	€100-200 m	9 distribution centres, > 20 transit point (rent)
SHIPPERS	**Revenue 2019**	**Market**
Shipper A	€500-1000 m	Multinational company specialised in pharmaceuticals and diagnostics
Shipper B	€1-5 billion	Multinational company specialised in pharmaceuticals, cosmetics and crop protection
Shipper C	>€5 billion	Multinational company specialised in pharmaceuticals
Shipper D	€250-500 m	Multinational company specialised in pharmaceuticals
Shipper E	€100–250 m	Multinational company in beverage industry (i.e. brewing)
Shipper F	€250-500 m	Multinational company in food industry (i.e. pastry)
Shipper G	€100–250 m	Multinational company in FMCG industry (i.e. cleaning products)
Shipper H	€50–100 m	Multinational company in food industry (i.e. babycare products)

Table III: List of criteria and their classification in order qualifier, order winner, and retention factor

Selection criteria	Description	Reference	Order qualifier	Order winner	Retention factor
Financial position	Refers to the financial performance of the 3PL	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Ecer (2018); Marchet et al. (2018); Roy and Sengupta (2018); Aguezzoul (2014)	X		
Quality	Includes compliance to ISO standards, environment issues, certifications, and risk management	Khan et al., (2022); Asian et al. (2019); Ecer (2018); Marchet et al. (2018); Roy and Sengupta (2018); Hwang And Lin (2016); Aguezzoul (2014)	X	X	
Experience and reputation	Characterised by attributes such as expertise, professionalism, competence, reputation, and experience in the industry.	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Ecer (2018); Marchet et al. (2018); Bianchini (2018); Roy and Sengupta (2018); Bajec and Tuljak-Suban (2017); Hwang And Lin (2016); Aguezzoul (2014)	X	X	
Service range	Related to characterisation/ specialisation of services, geographical coverage, breadth of available services (i.e. customer services, and value-added services)	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Ecer (2018); Marchet et al. (2018); Roy and Sengupta (2018); Hwang And Lin (2016); Aguezzoul (2014)	X	X	X
IT capabilities	Corresponds to information and communication systems and includes elements such as information accessibility and security, digitalisation level, and adoption of warehouse	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Jovčić et al., (2019); Ecer (2018); Marchet et al. (2018); Roy and Sengupta (2018); Bajec and Tuljak-Suban (2017);		X	

	management systems (WMS) or tracking/tracing systems	Hwang And Lin (2016); Aguezzoul (2014)			
Cost	Refers to the total cost of logistics outsourcing, and includes attributes such as price, distribution cost, expected leasing cost, operation cost, warehousing cost	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Ecer (2018); Marchet et al. (2018); Bianchini (2018); Roy and Sengupta (2018); Bajec and Tuljak-Suban (2017); Hwang And Lin (2016); Aguezzoul (2014)		X	X
Service quality	Includes elements like availability, on-time delivery, complete orders, accurate orders, arrival of undamaged products, consistent order cycle time, delivery information	Khan et al., (2022); Asian et al. (2019); Jovčić et al., (2019); Ecer (2018); Marchet et al. (2018); Bianchini (2018); Roy and Sengupta (2018); Bajec and Tuljak-Suban (2017); Hwang And Lin (2016); Aguezzoul (2014)		X	X
Flexibility	Defined as the ability to adapt to changing shippers' requirements and circumstances	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Ecer (2018); Marchet et al. (2018); Roy and Sengupta (2018); Bajec and Tuljak-Suban (2017); Hwang And Lin (2016); Aguezzoul (2014)		X	X
Proactivity	Defined as the 3PL's ability to suggest continuous improving practises to increase the customer service level	Khan et al., (2022); Asian et al. (2019); Pamucar et al. (2019); Roy and Sengupta (2018); Hwang And Lin (2016)		X	X