
Applicability of the Zeroed Unitarization Method for Evaluating the Competitiveness of CEP Operators: The Case of the Polish Market

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Abstract:

Purpose: The purpose of this study is to evaluate the applicability of the zeroed unitarization method (non-pattern method) as a tool for assessing the competitiveness of courier, express, and parcel (CEP) operators in Poland. Unlike traditional one-dimensional financial rankings, the research aims to demonstrate that a multi-criteria approach, which incorporates economic, infrastructural, operational, and qualitative indicators, offers a more comprehensive and reliable perspective on the competitive position of market participants.

Design/Methodology/Approach: The study covers the leading CEP operators active in the Polish market. The analysis is based on quantitative data from 2024–2025, including revenues, employment, parcel volumes, number of out-of-home (OOH) points, service prices, and customer ratings. Due to data inconsistencies across sources, a fuzzy estimation approach was applied, followed by defuzzification to obtain coherent input values. Using the zeroed unitarization method, diagnostic indicators were normalized and aggregated into a synthetic competitiveness index. Three weighting schemes were adopted, reflecting different stakeholder perspectives: customer, operator, and investor. Comparative rankings were developed, and sensitivity analysis was conducted to test the robustness of results against changes in criterion weights.

Findings: The results confirmed the stable leadership of InPost, whose competitive advantage is multidimensional—combining scale of revenues, efficiency, extensive infrastructure, and high customer satisfaction. DPD consistently ranked second in all scenarios, reflecting its balanced competitiveness. Pocztex, despite a strong revenue position, ranked lowest from customer and operator perspectives due to weaker service quality and efficiency, though it performed moderately well from the investor viewpoint. DHL and GLS occupied middle positions, indicating stable but undifferentiated competitiveness. Sensitivity analysis revealed that rankings depend significantly on weighting schemes, highlighting the importance of stakeholder perspective in assessing competitiveness.

Practical Implications: The findings provide actionable insights for managers, investors, and policymakers. For managers, the study shows that long-term competitiveness requires not only scale and revenues but also efficiency and service quality. For investors, it emphasizes the role of adaptability and productivity in shaping enterprise value. For

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policymakers, the results suggest the need for standardized reporting and greater transparency in the CEP sector, particularly regarding service quality and sustainability indicators.

Originality/Value: *This paper contributes to logistics and competitiveness research by applying the zeroed unitarization method to the CEP sector, demonstrating its methodological usefulness and interpretative transparency. It also advances the debate on the importance of multi-criteria approaches in markets characterized by complexity, heterogeneity, and rapid growth.*

Keywords: *Logistics, competitiveness, CEP sector, zeroed unitarization method, multi-criteria decision analysis.*

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1. Introduction

The courier, express, and parcel (CEP) services market belongs to the most dynamically developing segments of the logistics sector, largely shaped by the growth of e-commerce and the changing expectations of consumers. The rapid increase in the number of handled parcels, the continuous expansion of parcel pickup points and locker networks, as well as the growing importance of customer service quality, make the competitiveness of CEP operators an increasingly complex and multidimensional phenomenon.

Up to now, the assessment of the market position of individual operators has often been based on simple, one-dimensional rankings constructed on the basis of single criteria, such as revenues, parcel volumes, or the size of the operational network.

Although such rankings are easy to interpret and attractive from the perspective of business practice, they have serious methodological limitations. By focusing exclusively on one indicator, they fail to capture the diverse aspects of company performance and may lead to erroneous or one-sided conclusions. For example, an operator generating the highest revenues does not necessarily have to be the most cost-efficient or the best evaluated by customers.

In this context, multi-criteria approaches gain particular importance, as they allow the simultaneous consideration of economic, operational, infrastructural, and qualitative indicators. Such an approach ensures a more balanced and realistic assessment of competitiveness, reflecting both business efficiency and the perceived value from the end user's perspective.

A crucial issue in applying multi-criteria methods in the study of CEP operators' competitiveness, however, is the selection of diagnostic indicators. Two main approaches can be distinguished: basing the analysis on subjective expert assessments or on objective, quantitative data.

Methods grounded in expert opinions—although often useful in situations where hard data are lacking—carry the risk of introducing biases, heuristic effects, and interpretative discrepancies between evaluators.

As a result, the findings may reflect expert perceptions rather than the actual market situation. The use of objective indicators derived from primary sources (e.g., operators' reports, regulators' data, or market rankings) minimizes this problem and enhances the replicability and transparency of research. This reduces the influence of subjectivity inherent in expert assessments and strengthens the reliability of the results.

Nevertheless, the availability of objective data remains a significant challenge. In practice, the CEP market is characterized by fragmented and heterogeneous information sources. Data originate from operators (annual reports, corporate communications), regulators (e.g., the Office of Electronic Communications), as well as industry studies and rankings published by commercial entities.

Frequently, such information is neither fully consistent nor directly comparable, differing in time frames, definitions of measures, or scope. Consequently, the analyst must prioritize selected sources and apply estimation procedures to harmonize the input data and reduce discrepancies.

The article undertakes the application of the zeroed unitarization method to assess the competitiveness of CEP operators in the Polish market using quantitative data. The essence of the method lies in the normalization of indicators expressed in different units and of varying character (stimulants and destimulants), followed by their aggregation into a synthetic measure.

This allows the creation of comparative rankings in a transparent and methodologically consistent manner. Particular attention is given to the possibility of differentiating the weights assigned to individual indicators depending on the stakeholder perspective (customer, operator, investor), which makes it possible to generate rankings tailored to diverse points of view.

2. Literature Review

The CEP market in Poland is experiencing dynamic growth, driven in particular by the expansion of e-commerce and increasing digitalization, while competition among operators continues to intensify (Mordor Intelligence, 2025). The analysis of enterprise competitiveness in the courier, express, and parcel (CEP) market requires tools that allow for a multidimensional and synthetic assessment.

Traditional rankings, based on one or two indicators such as revenue size or the number of parcels handled, are clearly insufficient in the context of the increasing complexity of the market.

Competitiveness depends simultaneously on numerous factors, including innovativeness, cost efficiency, customer service quality, scale of operations, logistics infrastructure, and adaptability to changing market conditions (Macharis *et al.*, 2015; Alvarez Gallo and Maheut, 2023). In practice, this necessitates the use of multi-criteria methods that make it possible to compare firms in a holistic manner rather than through the narrow lens of a single performance dimension.

In response to these needs, methods of Multi-Criteria Decision Analysis (MCDA) are increasingly applied in logistics and business management research. These tools enable the simultaneous assessment of multiple criteria, taking into account their varying importance and often conflicting nature.

Among the most commonly used approaches are AHP, TOPSIS, PROMETHEE, ELECTRE, and SMART/SMARTER (Edwards and Barron, 1994; Figueira *et al.*, 2005; Hwang and Yoon, 1981; Brans, 1985; Behzadian *et al.*, 2010; Govindan and Jepsen, 2016). Each of these techniques is characterized by a different approach to evaluation and aggregation, which allows researchers to tailor the method to the specific nature of the research problem.

A particularly important place among normalization methods is occupied by the zeroed unitarization method, also known as the non-pattern method. It consists in transforming all diagnostic indicators onto a common [0,1] scale and then aggregating them into a synthetic development measure (Kukuła, 2000; Malchar and Zielińska-Sitkiewicz, 2017).

This procedure eliminates differences in measurement units and absolute values, thereby allowing for the comparison of entities described by heterogeneous variables. The advantages of this approach include its relative computational simplicity and high interpretive transparency. To date, the method has been applied in regional studies, enterprise efficiency assessments, and evaluations of the service sector. Its application to the CEP market appears particularly well-justified, given the high level of competition, the diversity of business models, and the dynamic pace of development (Sikora, 2024; Wyrwa, 2017).

Existing studies on the competitiveness of CEP operators in Poland indicate that analyses are usually based on single quantitative data points—revenues, parcel volumes, or the number of outlets—supplemented by expert opinions. While valuable, such an approach is subject to significant limitations.

First, access to experts with sufficient industry knowledge is difficult and costly, and the assessments themselves are inherently subjective. Second, the dynamics of the CEP market—including changes in operator strategies, mergers and acquisitions, and the introduction of new technologies—cause expert judgments to quickly lose their relevance. As a result, the outcomes of expert-based analyses may be characterized by high variability and low reproducibility (Chejarla *et al.*, 2022; Zavadskas *et al.*, 2016).

For this reason, methods grounded in objective, quantitative indicators are gaining importance, as they offer greater transparency and replicability, despite the challenges posed by limited availability of consistent data.

The literature shows that multi-criteria analyses are applicable across a wide range of problems—from regional development assessments and investment project selection to evaluations of transport company efficiency (Figueira *et al.*, 2005; Triantaphyllou, 2000).

In logistics, particular attention has been given to research on the quality of courier services in the context of e-commerce, where operational measures (delivery time, timeliness) and “soft” factors such as trust and customer satisfaction play a central role (Ejdys and Gulc, 2020; Gulc, 2021). In the Polish context, this issue has been addressed in studies on the competitiveness of courier companies (Wyrwa, 2017; Sikora, 2024).

A fundamental challenge in evaluating the competitiveness of the CEP market, however, remains the selection of appropriate diagnostic indicators. As emphasized by Zavadskas *et al.* (2016), the effectiveness of MCDA methods depends heavily on the quality and reliability of input data. In many studies, expert assessments dominate, which, while valuable, introduce an element of subjectivity. For this reason, objective indicators based on hard financial and operational data are of particular importance.

The problem remains that such data are not always published by operators, and different sources may report varying values for the same measures. It is therefore necessary to employ estimation procedures—including fuzzy methods and hybrid approaches—in order to harmonize the data (Chejarla *et al.*, 2022; Dźwigoł, 2023).

The development of e-commerce, the automation and digitization of logistics processes, and the growing customer expectations regarding service quality pose new challenges for CEP market research. Multi-criteria analyses must therefore

incorporate indicators of innovativeness, technological investment, and enterprise adaptability (Zavadskas *et al.*, 2016; Gulc, 2021). Scholars also highlight the importance of sensitivity analyses to evaluate how changes in the weights assigned to individual criteria influence ranking outcomes (Cinelli *et al.*, 2020). In this respect, the application of MCDA provides a valuable tool for both researchers and practitioners engaged in analyzing competitiveness in the CEP sector.

3. Research Methodology

The aim of the study is to evaluate the applicability of the zeroed unitarization method in analyzing the competitiveness of CEP operators in Poland and to demonstrate that a multi-criteria approach provides more comprehensive and reliable results than traditional, one-dimensional rankings. In particular, the research seeks to show that the simultaneous consideration of economic, infrastructural, and qualitative aspects allows for a more complete picture of the competitive position of individual entities.

The scope of the study covers the leading CEP operators active in Poland. The analysis draws on data for the years 2024 and 2025, including revenues, employment, parcel volumes, the number of OOH points and lockers, declared delivery times, the price of a standard parcel, as well as customer ratings from online ranking platforms.

Due to inconsistencies across sources and the highly dynamic nature of the market, some values were estimated using a fuzzy approach, which made it possible to adjust input data while maintaining methodological consistency. For each variable where discrepancies between sources were observed, triangular fuzzy numbers (TFN) were constructed.

The minimum reported value was adopted as the lower bound, the average or most frequently reported value as the mode, and the maximum reported value as the upper bound. All fuzzy numbers were then subjected to a defuzzification process. The analysis applied the centroid (COG) method, in which the final value is calculated as the arithmetic mean of the minimum, modal, and maximum values.

In cases where discrepancies were particularly large, an additional alternative analysis was performed using pessimistic defuzzification (taking the minimum value) and optimistic defuzzification (taking the maximum value), which allowed for an assessment of the impact of the chosen variant on the final ranking results. This approach produced a dataset that reflected both the information available from multiple sources and the degree of uncertainty resulting from their inconsistency.

Consequently, the input data used in the analysis should be regarded as the best available approximations of the state of the Polish courier market in 2024–2025. This approach enables further comparative research while maintaining awareness of

the limitations arising from heterogeneous sources and variable market conditions.

In the core analysis using the zeroed unitarization method, three weighting schemes were adopted to reflect the perspectives of different stakeholders: the customer (emphasizing price and service quality ratings), the operator (focusing on operational efficiency and infrastructure), and the investor (highlighting financial indicators and productivity). This allowed not only for a general comparison of operators but also for an examination of how their relative positions change depending on the evaluative perspective.

The data used in the study are primary in nature, obtained from the official websites of the courier operators under analysis, industry reports, published rankings, and available market information. The dataset covered both economic and qualitative indicators characterizing CEP operator activities in Poland.

These included: revenues in 2024 (in million PLN), employment in 2024, the number of parcels handled in 2024 (in millions), and infrastructural elements such as the number of OOH points and lockers in Poland. In addition, the standard price of a parcel up to 5 kg (gross, in PLN) was considered, along with service quality measures such as the average GlobKurier rating (on a scale of 1–5) and the Trustpilot TrustScore (on a scale of 1–5).

Due to the high dynamism of the Polish CEP market and the dispersed nature of available sources, not all information proved to be fully consistent. This was particularly the case for parcel volumes, the number of pickup points, employment, and operator-specific revenues. Furthermore, some indicators (e.g., parcel price, the number of OOH points, and customer ratings from online platforms) reflect conditions as of 2025 rather than the values for 2024.

4. Research Results and Discussion

In the conducted study, the zeroed unitarization method—also referred to as the non-pattern method—was applied. This technique belongs to the group of linear ordering methods for multi-criteria objects. In the first stage, a set of diagnostic indicators characterizing the Polish CEP market was selected, encompassing economic aspects (revenue per parcel, parcels per employee), organizational aspects (number of parcels per OOH point, number of OOH points per 100,000 inhabitants), cost-related measures (price of a standard parcel up to 5 kg), and qualitative measures (GlobKurier rating, Trustpilot TrustScore).

Subsequently, the nature of each criterion was identified, distinguishing between stimulants (e.g., quality ratings, parcels per employee) and destimulants (e.g., parcel price). The next step involved normalizing the data using zeroed unitarization, which transformed all values into the [0,1] interval, thereby enabling direct comparison. Thereafter, the normalized indicators were aggregated, with different weighting

variants adopted to reflect the perspectives of the customer, the operator, and the investor. Finally, the values of the synthetic development index were calculated for each courier company, and the entities were ranked according to the results obtained, which made it possible to construct comparative rankings and perform sensitivity analysis regarding the influence of different weighting systems.

Despite the computational simplicity and interpretive intuitiveness of the non-pattern method, the key issue remains the significance of the selected indicators. The applied criteria may differentiate the analyzed entities to varying degrees and thus exert differing influences on the final outcome.

Therefore, measures of variability (variance and standard deviation) were calculated to assess which indicators contributed the most diagnostic information. In practice, correlation analysis between indicators and the synthetic measure is also employed, as well as sensitivity analyses based on observing ranking shifts following modifications of criterion weights.

The results of such procedures make it possible not only to verify the consistency of the adopted set of variables but also to determine whether all indicators are essential for the analysis or whether some play a supplementary role. The assessment of indicator significance is presented in Table 1.

Table 1. *The assessment of indicator significance*

Indicator	Mean (after normalization)	Standard deviation	Variance
GlobKurier rating (1–5)	0,4603	0,3914	0,1532
Revenue per parcel	0,3675	0,3475	0,1208
Parcels per OOH points	0,4025	0,3414	0,1166
TrustScore (1–5)	0,1982	0,3411	0,1164
Parcels per employee	0,3617	0,3405	0,1160
Standard parcel price up to 5 kg	0,6119	0,3206	0,1028
OOH points per 100,000 inhabitants	0,2976	0,3139	0,0985

Source: *Author's calculations.*

Table 1 presents the basic statistical measures: mean, standard deviation, and variance, calculated for each of the criteria included in the study. This made it possible to identify the indicators that most strongly differentiate the analyzed enterprises.

The highest level of variability was observed for the indicator “GlobKurier Rating (1–5)”, which points to significant differences in the perception of service quality among operators. Substantial variability was also found in economic and operational indicators such as “Revenue per Parcel”, “Parcels per OOH Point”, and “Parcels per

Employee”, reflecting diverse organizational models and varying levels of efficiency among the firms. The indicator “Trustpilot TrustScore” shows moderate but still meaningful variability, suggesting that user opinions on this platform also differentiate the analyzed entities, although to a lesser extent than the ratings from GlobKurier. It is worth emphasizing that all analyzed indicators reached the full normalization range (0–1), which means that for each criterion one can identify both a company achieving the minimum and another achieving the maximum score.

Thus, each of the applied measures provides unique information to the analysis and contributes to differentiating the objects. From a methodological perspective, this indicates that none of the indicators is redundant or superfluous – all can be considered relevant for comparative analysis, although their weight in the synthetic measure may vary depending on the adopted perspective of evaluation (e.g., customer, operator, investor).

The non-pattern method analysis was carried out in three weighting variants, reflecting the perspectives of different stakeholders:

- Customer perspective: the highest weights were assigned to delivery price (0.25) and customer opinions (GlobKurier and Trustpilot, 0.125 each). Lower weights were assigned to availability and efficiency indicators (0.10 each).
- Operator perspective: internal efficiency measures were prioritized – revenue per parcel and parcels per employee (0.20 each) as well as OOH network availability (0.15). Lower weights were assigned to price and customer ratings (0.10 each).
- Investor perspective: financial and efficiency indicators played the key role – revenue per parcel (0.30) and parcels per employee (0.20). Other criteria (price, customer ratings, network availability) received weights of 0.10 each.

The adoption of three different weighting schemes allowed for the construction of rankings corresponding to different viewpoints and for the assessment of sensitivity of the results to changes in decision-maker preferences. This approach made it possible not only to identify the leaders of the courier market but also to examine how their positions depend on the criteria relevant to different stakeholder groups. The results of the analysis in the customer weighting scenario are presented in Table 2, in the investor scenario in Table 3, and in the operator scenario in Table 4.

In the customer scenario, where the greatest importance was assigned to delivery price and user reviews, Pocztex also achieved high scores. This outcome results from its extensive network of service points and competitive pricing, which are of considerable importance from the customer’s perspective. Slightly lower positions were occupied by DPD and DHL, whose pricing and consumer ratings did not provide a comparable advantage, despite their well-developed infrastructure.

Table 2. Results of the Non-Pattern Analysis from the Customer Perspective

Compa ny	Standar d parcel price up to 5 kg	GlobKu rier rating (1–5)	TrustSc ore (1– 5)	Parcels per OOH points	OOH points per 100,000 inhabitant s	Revenu e per parcel	Parcels per employ ee	Custom er Score
InPost	0,8980	1,0000	1,0000	0,5201	1,0000	0,0000	1,0000	0,8072
DPD Poland	0,5000	0,2222	0,0000	0,5128	0,3789	0,0054	0,6600	0,3428
DHL Poland	0,8818	0,0000	0,0323	0,0650	0,2671	0,2544	0,1858	0,3352
GLS Poland	0,0000	0,8889	0,0645	0,0829	0,2050	0,1248	0,4742	0,2310
Pocztex	1,0000	0,3333	0,0000	0,0000	0,2298	0,6436	0,0000	0,4211
UPS Poland	0,4627	0,0000	0,0000	1,0000	0,0025	0,5443	0,1769	0,3200
FedEx	0,5410	0,7778	0,2903	0,6367	0,0000	1,0000	0,0349	0,4844

Source: Author's calculations.

Table 3. Results of the Non-Pattern Analysis from the Investor Perspective

Compa ny	Standard parcel price up to 5 kg	GlobKu rier rating (1–5)	TrustSc ore (1– 5)	Parcels per OOH points	OOH points per 100,000 inhabitan ts	Revenu e per parcel	Parcels per employ ee	Custom er Score
InPost	0,0000	1,0000	0,8980	1,0000	1,0000	0,5201	1,0000	0,6418
DPD Poland	0,0054	0,6600	0,5000	0,2222	0,0000	0,5128	0,3789	0,2950
DHL Poland	0,2544	0,1858	0,8818	0,0000	0,0323	0,0650	0,2671	0,2381
GLS Poland	0,1248	0,4742	0,0000	0,8889	0,0645	0,0829	0,2050	0,2564
Poczte x	0,6436	0,0000	1,0000	0,3333	0,0000	0,0000	0,2298	0,3494
UPS Poland	0,5443	0,1769	0,4627	0,0000	0,0000	1,0000	0,0025	0,3452
FedEx	1,0000	0,0349	0,5410	0,7778	0,2903	0,6367	0,0000	0,5316

Source: Author's calculations.

A different picture emerges in the investor scenario, where financial and efficiency criteria dominate, such as revenue per parcel or the number of parcels per employee. In addition to InPost and FedEx, Pocztex also performs relatively well in this perspective, as its scale of operations and volume potential enhance its competitiveness score despite lower unit profitability. In this variant, DPD and DHL occupy lower positions, which results from their more limited financial advantage compared to the market leaders.

Table 4. *Results of the Non-Pattern Analysis from the Operator Perspective*

Company	Standard parcel price up to 5 kg	GlobKurier rating (1–5)	TrustScore (1–5)	Parcels per OOH points	OOH points per 100,000 inhabitants	Revenue per parcel	Parcels per employee	Customer Score
InPost	0,0000	1,0000	0,5201	1,0000	0,8980	1,0000	1,0000	0,7178
DPD Poland	0,0054	0,6600	0,5128	0,3789	0,5000	0,2222	0,0000	0,3391
DHL Poland	0,2544	0,1858	0,0650	0,2671	0,8818	0,0000	0,0323	0,2293
GLS Poland	0,1248	0,4742	0,0829	0,2050	0,0000	0,8889	0,0645	0,2583
Poczta x	0,6436	0,0000	0,0000	0,2298	1,0000	0,3333	0,0000	0,2965
UPS Poland	0,5443	0,1769	1,0000	0,0025	0,4627	0,0000	0,0000	0,3409
FedEx	1,0000	0,0349	0,6367	0,0000	0,5410	0,7778	0,2903	0,4634

Source: *Author's calculations.*

In the operator scenario, which focuses on efficiency and infrastructure organization (density of pick-up points, parcels per employee), alongside InPost and FedEx maintaining their leading positions, DPD's standing improves noticeably, as its well-developed operational network ensures relatively high efficiency.

In the same perspective, Poczta, despite having the largest number of service outlets, ranks lower due to lower productivity of both infrastructure and workforce. DHL eCommerce Poland occupies the lowest position, reflecting its limited operational efficiency compared to competitors.

In order to assess the stability of the competitive position of individual operators in relation to changes in the weights assigned to specific criteria, a sensitivity analysis was conducted, the results of which are presented in Table 5 and Figure 1.

Its purpose was to examine the extent to which the final outcomes and resulting rankings depend on the adopted evaluation perspective (customer, operator, investor) and to identify which indicators most strongly differentiate the analyzed entities.

This approach made it possible not only to identify the overall market leaders but also to investigate how their positions vary depending on the preferences and priorities of different stakeholder groups.

Furthermore, the sensitivity analysis allowed for an assessment of the reliability and robustness of the applied research method, indicating whether the obtained results have a universal character or are strongly dependent on the weighting assumptions.

Table 5. Comparison of the rankings conducted from different perspectives

Company	Score (Revenues)	Position (Revenues)	Score (Customer Perspective)	Position (Customer Perspective)	Score (Operator Perspective)	Position (Operator Perspective)	Score (Investor Perspective)	Position (Investor Perspective)
InPost	10.919.800	1	0,8072	1	0,7178	1	0,6418	1
DPD Poland	4.373.383	2	0,4844	2	0,4634	2	0,5316	2
DHL Poland	3.385.000	4	0,4211	3	0,2965	5	0,3494	3
GLS Poland	2.780.615	7	0,3428	4	0,3391	4	0,2950	5
Pocztex	1.854.037	3	0,3352	5	0,2293	7	0,2381	7
UPS Poland	1.842.609	6	0,3201	6	0,3409	3	0,3452	4
FedEx	1.587.267	5	0,2310	7	0,2583	6	0,2564	6

Source: Author's elaborations.

Figure 1. Sensitivity of the analysis results conducted from different perspectives



Source: Author's elaborations.

The comparison of results obtained through the non-pattern analysis under three distinct weighting scenarios (customer, operator, and investor) with the ranking based solely on revenues reveals a number of important phenomena that shed new light on the competitiveness of CEP operators in Poland. The findings indicate that simple financial rankings, while intuitive and easy to interpret, fail to fully reflect the complex market reality, in which, alongside revenue scale, other factors such as

internal efficiency, infrastructure availability, and customer service quality play an equally important role.

At the forefront stands the stable leadership position of InPost. Regardless of the adopted perspective, this operator consistently ranks first. While in revenue-based comparisons its dominance stems directly from the vast scale of operations and market share, in multi-criteria analyses it is confirmed that InPost's strength lies in more than just financial results.

The company combines high efficiency in resource utilization and an extensive network of OOH points with strong customer service ratings. This indicates that InPost's competitive advantage is multidimensional, ensuring resilience to changes in stakeholder preferences and consolidating its position as the market leader.

The second key observation is the stable position of DPD as a reliable competitor. In each of the perspectives analyzed, DPD holds second place, which demonstrates the operator's consistency across different dimensions of performance. Although its revenues are significantly lower than those of InPost, the company compensates for this gap with high service quality, well-developed infrastructure, and satisfactory operational efficiency.

DPD therefore appears as a balanced player whose strength lies in the absence of major weaknesses—while it does not match the leader in terms of financial scale, it maintains stable competitiveness across all evaluated scenarios.

Against this backdrop, the case of Pocztex is particularly noteworthy. In the revenue ranking, Pocztex performs strongly, taking third place and clearly outperforming some competitors. However, multi-criteria analysis reveals the operator's weaknesses: from both the customer and operator perspectives, Pocztex falls to the bottom of the ranking. The reason lies in its inability to translate a large scale of operations and an extensive network of outlets into operational efficiency and customer satisfaction.

Low employee productivity and average service ratings mean that the advantage derived from infrastructure breadth is insufficient to sustain a high position in a multidimensional evaluation. Only in the investor scenario does Pocztex achieve a relatively better result, as its operational scale and volume potential positively influence its competitiveness. Nevertheless, low unit profitability limits its attractiveness, positioning Pocztex as a high-scale yet low-efficiency operator.

Finally, attention should be drawn to the situation of DHL and GLS, which in every scenario occupy middle positions. The absence of distinct competitive advantages prevents them from approaching the leaders, but at the same time allows them to avoid the weakest positions. Their competitiveness may therefore be characterized as stable but lacking differentiation—they achieve moderate results in financial,

operational, and qualitative dimensions alike. This positioning can be interpreted in two ways: on the one hand, it ensures relative stability and resilience to fluctuations in individual performance areas; on the other hand, it constrains their ability to achieve a clear competitive advantage in the highly contested CEP market.

In conclusion, the comparative analysis demonstrated that rankings based solely on revenues are oversimplified and fail to reveal significant differences between operators. The application of the non-pattern method enabled the identification of hidden strengths and weaknesses of individual firms, as well as the illustration of how different stakeholder groups may perceive the competitiveness of the same entities in distinct ways.

These findings clearly confirm the superiority of the multi-criteria approach, which more accurately reflects the complexity of the contemporary CEP market and allows for more precise conclusions regarding the competitive positioning of operators.

5. Conclusions, Proposals, Recommendations

The conducted study confirmed that the application of the zeroed unitarization method, also referred to as the zeroed normalization method, constitutes a useful and methodologically consistent tool for assessing the competitiveness of CEP operators in Poland. In contrast to simple financial rankings, which reduce competitiveness to a single dimension—most often revenues—the multi-criteria approach applied in this analysis revealed the complex and multidimensional nature of competitive positions.

The inclusion of economic, infrastructural, and qualitative indicators not only made it possible to identify market leaders but also to highlight operators whose position strongly depends on the adopted perspective of evaluation (customer, operator, investor). Such an approach reflects the contemporary realities of the logistics market, where competitive advantage is determined not only by scale of operations and revenue size, but also by internal efficiency, adaptability, innovativeness, and perceived service quality.

The most important conclusion drawn from the analysis of the Polish CEP market is the consolidated leadership position of InPost. Regardless of the weighting scenario applied, this operator consistently ranked first, confirming that its competitive advantage is multidimensional—encompassing high revenues and operational scale, as well as an extensive OOH infrastructure and positive customer evaluations.

DPD emerged as a stable and coherent competitor, consistently occupying the second position in all perspectives analyzed, demonstrating the balanced nature of this operator. Pocztex, on the other hand, showed significant divergence: its high position in revenue-based rankings did not translate into its standing in the multi-criteria analyses, where it ranked at the bottom from the customer and operator

perspectives.

This outcome indicates that a large operational scale and a wide branch network are insufficient to build a competitive edge without high service quality and resource efficiency. DHL and GLS were situated in the middle of the rankings, reflecting moderate but stable competitiveness—enough to avoid being positioned among the weakest operators, yet insufficient to achieve leadership advantage.

From a methodological standpoint, the study confirmed the usefulness of the zeroed unitarization method as a computationally simple and interpretatively transparent tool. Normalization and aggregation of indicators enabled the transformation of heterogeneous data into a common scale and the construction of synthetic development measures.

At the same time, sensitivity analysis demonstrated that results may significantly depend on the assigned weights, highlighting both the strengths and limitations of the method. Therefore, it is recommended that such analyses be consistently supplemented with robustness checks, comparisons with alternative weighting schemes, and correlation studies between individual indicators and the synthetic measure.

Future research should consider the application of alternative MCDA methods, such as AHP, TOPSIS, PROMETHEE, ELECTRE, or SMART. Each is based on different aggregation principles and offers distinct interpretative possibilities.

Applying several methods in parallel would enable comparison of the resulting rankings and assessment of their robustness to the choice of analytical procedure. Such triangulation could contribute to a deeper understanding of the specificity of the CEP market, where operators compete across multiple dimensions often difficult to capture with a single technique.

Another area for future research is the expansion of the set of diagnostic indicators. Beyond the variables included in the present analysis—revenues, parcel volumes, employment, parcel price, and customer ratings—it would be advisable to incorporate measures relating to:

- innovation and digitalization (e.g., investment in automation, use of artificial intelligence, customer digital platforms),
- sustainability and ecology (CO₂ emissions per parcel, share of low-emission fleets, energy efficiency of sorting centers),
- customer service quality (Net Promoter Score, retention rates, complaint resolution times),
- operational efficiency (delivery timeliness, rate of failed deliveries, average delivery times),

- strategic market position (share in cross-border e-commerce, participation in alliances, M&A projects).

A broader set of criteria would allow for a more comprehensive diagnosis of competitiveness and a deeper understanding of the challenges facing Polish CEP operators. It should be emphasized, however, that data collection poses significant challenges. While financial data are usually available in annual reports, detailed information on service quality or environmental practices tends to be fragmented, dispersed, or primarily marketing-driven.

The lack of standardized reporting hinders comparability. Consequently, analysts are often forced to rely on multiple, sometimes inconsistent sources. One solution could be the use of fuzzy estimation methods, which allow for harmonization of non-uniform data, as well as combining objective information with structured expert judgments where hard data are lacking (albeit as a last resort). In the longer term, it is desirable to strive for standardization of reporting practices in the CEP sector, particularly regarding quality and environmental indicators.

From a practical perspective, the study provides several important recommendations. For courier company managers, the results indicate that competitive advantage cannot be built solely on revenues or scale of operations—simultaneous improvements in service quality and operational efficiency are necessary.

For investors, the analysis demonstrates that a company's long-term value depends not only on current financial performance but also on adaptability and customer service quality. For policymakers and regulators, the study signals the need to support market transparency, for example, by promoting unified reporting standards and encouraging initiatives aimed at sustainable development and digital transformation in the sector.

In terms of future research, the following directions are particularly relevant:

- comparative studies applying different MCDA methods,
- longitudinal analyses capturing changes in competitive positions over time,
- international comparative studies placing the Polish market in a broader European and global context,
- integration of ESG indicators to reflect the growing importance of social and environmental responsibility,
- scenario analyses assessing the impact of technological trends (automation, blockchain in supply chains, drone logistics) on competitiveness.

In conclusion, the study demonstrated that the zeroed unitarization method allows for the identification of both strengths and weaknesses of CEP operators and shows how their evaluation varies depending on stakeholder perspectives.

This confirms the superiority of multi-criteria approaches over one-dimensional rankings, which fail to capture the complexity of the modern courier market. Future research in this field should pursue methodological pluralism, expansion of indicator sets, and improvement of data collection practices. Only through such measures will it be possible to develop reliable, transparent, and comprehensive competitiveness assessments that are valuable for both practitioners and the academic community.

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