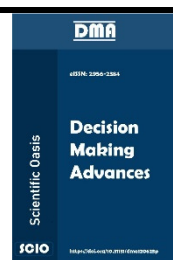




SCIENTIFIC OASIS

Decision Making Advances

Journal homepage: www.dma-journal.org
ISSN: 2956-2384

Postal Operators as Providers of Shared Mobility Concept – An Analysis by Combined SWOT and AHP

Momčilo Dobrodolac^{1,*}, Dragan Lazarević¹, Stefan Jovčić²

¹ Faculty of Transport and Traffic Engineering, University of Belgrade, Belgrade, Serbia

² Faculty of Transport Engineering, University of Pardubice, Pardubice, Czech Republic

ARTICLE INFO

Article history:

Received 3 May 2024

Received in revised form 13 June 2024

Accepted 14 June 2024

Available online 14 June 2024

Keywords:

Shared Mobility; Postal Companies;
Universal Service Provider; Influencing
Factors

ABSTRACT

The paper proposes integrating the concept of shared mobility into the postal delivery system, by that expanding the existing assortment of services. The basic tasks and prerequisites that a postal company should fulfill to function successfully as a provider of shared mobility are highlighted. The results of the A'WOT analysis, which combines SWOT and AHP approaches, are presented in the paper. Based on interviewing eight experts from the transportation industry, and implementing the proposed methodology, the most significant influencing factors of the introduction of the considered concept into the system of the public postal operator in Serbia are singled out.

1. Introduction

The postal and courier companies represent an important part of the service sector, where they provide services from the corresponding assortment for a wide range of business and private users. Service providers strive to meet the needs of users and at the same time make as much profit as possible. The technological process of postal items transfer consists of several steps, while the final one – last-mile delivery is considered the most demanding, both organizationally and in terms of exploitation [1-3]. Organizing the last-mile delivery involves managing requirements and available resources while striving to make subsequent exploitation as efficient as possible. Numerous studies can be found in the literature, which deal with improving the functioning of postal systems. They are mainly based on the analysis of the current situation and directions for further improvement [4,5]. The modern business environment implies developed competition, as well as constant changes in the market. This greatly affects the way postal companies operate and the range of services they offer to users. To remain competitive, innovations in the field of service assortment are necessary, which in some cases also means entering new markets. Some examples are various electronic services, shops within postal systems, etc.

* Corresponding author.

E-mail address: m.dobrodolac@sf.bg.ac.rs

<https://doi.org/10.31181/dma21202447>

Today's environment generates complex requirements for providers of shipping services, as well as a multitude of criteria for their operation. One of the criteria that stands out in particular is ecologically responsible business, as one of the dimensions of the concept of sustainability. In the territory of the European Union (EU), transport is the source of about 30% of total CO₂ emissions, of which over 70% comes as a product of road transport. The EU has defined a long-term goal, which implies that by 2050 emissions from transport should be reduced by 60% compared to the level of 1990. Following that, as well as the fact that the delivery of consignments is mainly realized by road transport, a large number of researches are related to the development of concepts, the application of which will contribute to the reduction of negative impacts on the environment. The focus of these studies relates to the formation of an environmentally responsible transport system, which is based on the use of renewable, alternative, and "clean" energy sources, as well as electric and hybrid vehicles [6].

Technological development has given rise to numerous solutions, the application of which makes it possible to improve operations in the segment of the efficiency of the realization of business activities, as well as to find a balance with their impact on the environment. The use of means of transport that more closely match the transport requirements is a necessity on the way to this goal. Numerous studies have as their subject the choice of the most suitable model, that is, the means for carrying out the delivery and distribution of goods in a certain territory [7-9]. They are mainly based on the application of multi-criteria analysis and cooperation with experts.

In parallel with technological development, different concepts of sustainable mobility were also developed. One of the most famous concepts is based on the sharing economy – shared mobility. It implies short-term access to one of the different modes of transport, i.e. means of transport, as needed, while taking into account the reduction of inefficient driving. It is often the case that an individual as a driver travels daily in his/her own car from one part of the city to another. A more effective alternative would be to connect with other people, who have the same or similar need for driving, through the appropriate platform, and realize it together by sharing the costs. Depending on the circumstances, in some situations, it is more efficient to use a car for one part of the route, a bicycle for another part, and then public transport. In this case, it is extremely convenient to rent unmanned vehicles. The concept itself can be said to have existed in various forms for a long time, but only in recent years has become increasingly present around the world. Over time, different concept models have been developed, such as sharing: cars – car sharing; bicycles – bike sharing; rides – ride-sharing, etc., as well as approaches to improve mobility through the integration of transport services such as MaaS - Mobility as a Service [10-12]. As the concept implies the existence of a developed network and resources for sharing, the field of shared mobility can be recognized by postal companies as an opportunity to enter a new market. In this way, companies would improve their operations and provide additional income, but also positively influence the sustainability of the transport system within the territory of operation.

The paper proposes the integration of the concept of shared mobility into the postal system through a range of services. The results of the A`WOT analysis carried out in cooperation with experts, are presented, which refers to the selection and prioritization of influential factors for the introduction of the concept of shared mobility in the system of the public postal operator in Serbia.

2. Shared Mobility in the Postal and Courier Systems

When it comes to the introduction of shared mobility as one of the services offered by postal operators, it implies the existence of an adequate fleet of vehicles, appropriate infrastructure such as stations for taking over the transport means, but also the formation of a service that will deal with

organization and monitoring. Also, the postal operator can take the role of MaaS - Mobility as a Service provider, whose role is to coordinate and integrate the work of transport operators, so that users can realize their journey as efficiently as possible by combining different types and modes of transport.

As a rule, postal companies have a developed network, which is especially characteristic of public postal operators. This is an important characteristic of every entity that acts as a service provider in the shared mobility system. Namely, the basic concept implies that the means of transport can be picked up at a certain location, and after the end of the ride, returned to the same or another location, which is part of the system. It is clear that postal network units, with appropriate adaptation, can take on the role of shared mobility stations.

Another characteristic of postal companies is the possession of means of transport, some of which can be used in the shared mobility system. Certainly, the integration of this concept would imply the acquisition of additional resources within the vehicle fleet. What is important to emphasize is that these means of transport, depending on the need and circumstances, can also be used to perform the primary activities of postal companies.

2.1 Basic Prerequisites for the Functioning of the Concept of Shared Mobility in Postal Systems

One of the basic questions for the company, before introducing the concept of shared mobility, is what is necessary to provide for its functioning. Below are just some of the primary requirements:

- i. *Resources for sharing* – Means of transport from the existing fleet and procurement of new ones.
- ii. *Shared mobility stations* – Locations for picking up and leaving vehicles. The existing infrastructure of the network of the postal operator can be used with appropriate adaptation, which would mainly involve the arrangement of garages and parking spaces, as well as the provision of facilities for charging the batteries of electric vehicles, which would be used within the concept. Additionally, following the events at the global level caused by the pandemic of the COVID-19 virus, it is necessary to provide facilities for adequate disinfection of the used means.
- iii. *Shared mobility service* – Formation of a sector that will deal with organizational activities within the shared mobility system.
- iv. *Information system* – The creation of an information system (or a module within the existing one), which will be used for operational and system monitoring activities. Namely, it is necessary to have a system through which the service will be organized, manage resources and monitor their status, provide information and support for users, etc.
- v. *Contact center* – Providing support for users.
- vi. *Professional workforce and management* – As the employees of postal companies are specialized for work in their primary activity, it is necessary to implement training and education in the field of shared mobility and means of transport that will be used.
- vii. *Maintenance of means of transport* – It is necessary to ensure an adequate way of maintaining means of transport, whether through one's own system or by engaging third parties.

In addition to these basic requirements, the provision of which is a prerequisite for the integration of the concept of shared mobility in postal companies, it is necessary to solve certain tasks. Some of the basic tasks are highlighted below:

- i. *Determining the locations of shared mobility stations* – Involves the analysis of numerous criteria, which relate primarily to the traffic requirements and conditions of a certain territory, primarily taking into account the company's existing network, that is, the existing locations of postal network units.
- ii. *The choice of means of transport* – Implies the selection of alternative means of transport, which are the most suitable and for which there is a need in the analyzed territory of operation.
- iii. *Defining the working hours of the service* – Analysis of the required time availability in a certain territory; i.e. the period in which the service would be available to users.
- iv. *Connection with other business entities* – It is necessary to ensure cooperation with other business entities in the field of shared mobility, such as companies whose primary activity is this, then with business and shopping centers, other postal companies, etc.
- v. *Implementation of marketing activities* – Familiarizing the environment with the new service, implementing educational activities about the concept, and raising awareness of its benefits both locally and globally.
- vi. *Application for users* – In addition to the information system, which represents one of the requirements, following modern trends and habits of the population, it is necessary to provide a user mobile application. Through this users could monitor the state of free resources, find the locations of the nearest stations, reserve a means of transport, and pay for the service.

2.2 Shared Mobility Alternatives

Depending on the characteristics of the city and the population, different models of shared mobility have developed over time in the world. Some of the most famous and most used are car-sharing, bike-sharing and ride-sharing. Numerous cities across Europe have developed good and efficient shared mobility practices. Of the countries in the region, Slovenia stands out. In the international competition Carshare City Award, Ljubljana won second place in the competition of cities with up to 750,000 inhabitants. In 2016, a car-sharing concept based on electric car sharing and a corresponding user application for access and payment was introduced in this city. The service became very popular, so the number of accesses to the system in 2019 was 200% higher than in 2018. Shared mobility systems, most often car and bicycle sharing, have been successfully operating in almost all major world and European cities for years. In this way, this market has already developed to a large extent, and an even greater increase is expected in the future (Figure 1). An additional contribution to the sustainability of the concept can be provided by the use of environmentally "cleaner" means of transport.

As it was emphasized, in the previous period the most frequently used means of transport in shared mobility systems were bicycles and cars. In addition to them, the use of electric bicycles and scooters has increased significantly recently. Below are some of the main features of the selected modes of shared mobility:

- i. *Car-sharing* – It includes a service that provides users with the possibility of using cars from the service provider's fleet for a certain period, with appropriate compensation, and after the end of using the service, they can leave them, that is, park them at the designated locations. In this way, the necessity of owning the own car is eliminated.

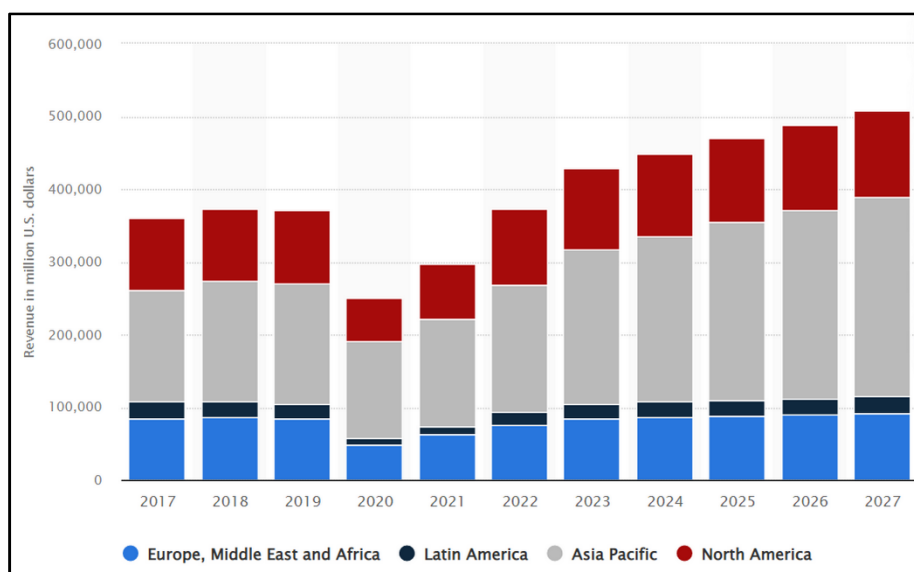


Fig. 1. Shared mobility market forecast from 2017 to 2027 [15]

- ii. *Ride-sharing* – This approach aims to bring together passengers with similar transportation needs, i.e. routes, in the same trip. Effective functioning is based on the use of specialized platforms.
- iii. *Bike-sharing* – It is one of the first forms of shared mobility, which involves renting bicycles and using them, after which they are returned to the station from where they were picked up or to another, which is an integral part of the networked system. A more technologically advanced version of this alternative is the use of electric bicycles – E-bike sharing, which offers the possibility of easier overcoming hilly terrain.

Sharing electric scooters implies an almost identical concept of functioning as sharing bicycles. One of the alternatives, which is particularly popular in the East, is shared rickshaws, or electric rickshaws. The use of this means of transport provides additional comfort compared to bicycles (e-bicycles), and they also have the possibility of storing luggage, so in some ways they can be compared to a cargo bike (cargo bike) [13, 14].

When it comes to postal companies, another resource is particularly interesting, which is not a classic means of transportation for natural persons, but indirectly affects their mobility. We are talking about post machines, that is parcel lockers. Namely, their application in postal systems is very widespread in the world, primarily because it implies the concept of maximum time availability for users. Namely, the parcel that is in the cell (compartment) of the parcel locker can be picked up by the recipient at any time during the day, of course with the appropriate security protocol. From the point of view of the sharing economy, parcel lockers can be interesting both for individuals and companies that deal with the transfer of postal items and other types of delivery. Namely, a postal company that owns a network of parcel lockers can rent a certain part of resources in the form of cells to interested parties. In this way, natural persons, in addition to using postal services through a post machine, could rent a compartment and use it for their needs in different ways, such as short-term storage (like lockers in shopping centers) or leaving a package for another person, which will take it from the same cabinet at some point. Sharing parcel machine resources could be very useful for other shipping companies that don't own them. In this way, the indirect influence of the post machine on the mobility of its users is clear, with a note that the application of mobile parcel lockers is also present in practice.

3. A`WOT analysis of the introduction of the shared mobility concept into the system of the public postal operator

A`WOT analysis implies the combined application of the SWOT analysis and the AHP method. In this particular case, SWOT analysis was used to generate a matrix (strengths, weaknesses, opportunities, and threats) of influential factors of the introduction of the considered concept into the system of the public postal operator, while the AHP method was applied to define relative importance, based on the comparison of pairs according to Saaty scale [16].

Eight experts participated in the research, namely four experts from the field of postal traffic and four experts from the field of road transportation. First, opinions on influential factors were collected, on the basis of which a SWOT matrix was formed. After that, the experts evaluated the relationships between the SWOT groups, and then the relationships between the factors in each of the groups. The following table (Table 1) shows the influential factors in introducing the concept of shared mobility into the system of the public postal operator.

Table 1
SWOT matrix of influential factors

S - Powers	W - Weaknesses
S1. Developed network	W1. No experience in the field of shared mobility
S2. Brand	W2. Low level of flexibility
S3. Manpower	W3. Infrastructure adapted to the primary activity
S4. Owning own fleet	W4. Necessary acquisition of additional resources and training of employees - increasing costs
S5. Cooperation with state structures	W5. Limited working hours of postal units
A - Chances	T - Threats
O1. Experience in working with the population	T1. Going out to a new, different market
O2. Own IT sector	T2. Experienced competition
O3. The existence of a business information system	T3. Flexibility of competition
O4. Implemented GIS	T4. Impact on the primary business
O5. There will be cooperation with other companies	T5. Level of acceptance of the concept

The influencing factors that belong to the first group represent, above all, internal factors that reflect the strength of the company, which has built a recognizable brand in 180 years of tradition. Following the obligation to provide universal postal service, as well as other services within its assortment, the Serbian public postal operator has a branched network at the level of the entire country with over 1,900 access points and close to 3,600 delivery areas, as well as its own fleet and about 15,000 employees.

As a rule, the influencing factors of the group of weaknesses require certain improvements, to reduce or eliminate their negative impact [17]. The public postal operator represents a system with a low level of flexibility, which is specialized in providing postal services, without experience in the field of shared mobility [18]. By that, the expertise of the employees, working hours, as well as the infrastructure and resources it owns, have been adjusted to the traditional services. It is clear that when it comes to the introduction of the concept of shared mobility, there is a need for corrective activities within the aforementioned factors.

Chances represent a combination of external factors and the company's ability to realize a corresponding advantage [19]. When it comes to the Serbian postal operator, it has several decades of experience in working with the population, as well as cooperation with numerous companies in the area [20]. In modern business circumstances, the level of computerization is very important, so

it is important to mention that the company has its own IT sector, information system, and an implemented system for spatial data management GIS. All of the above is very important for dynamic activities that rely on modern technologies.

The threat group includes influential factors that come primarily from the environment and can threaten the success of a business. By introducing shared mobility, the public postal operator would enter a new, different market, where innovative and flexible companies have been operating for some time. It is important to point out that business expansion must not negatively affect the primary activity of the company. An additional risk is the state of the market, in terms of the need and interest of the population in using the considered concept.

In Table 2 and Figure 2 there are the results of the application of the AHP method; i.e. the results of the comparison of pairs of groups, influential factors, as well as the global importance of the factors at the level of the entire matrix, noting that the consistency is within satisfactory limits.

Table 2

Comparison results

Groups	Group importance	Factors	Importance factors	Global importance factors
S	0.316311	S1	0.315693	0.099857
		S2	0.203985	0.064523
		S3	0.154702	0.048934
		S4	0.244924	0.077472
		S5	0.080697	0.025525
W	0.19519	W1	0.180076	0.035149
		W2	0.160922	0.031410
		W3	0.233100	0.045499
		W4	0.291899	0.056976
		W5	0.134003	0.026156
O	0.281363	O1	0.129234	0.036362
		O2	0.270426	0.076088
		O3	0.210042	0.059098
		O4	0.233901	0.065811
		O5	0.156398	0.044005
T	0.207136	T1	0.149718	0.031012
		T2	0.133678	0.027690
		T3	0.133089	0.027567
		T4	0.265966	0.055091
		T5	0.317550	0.065776

Based on the obtained results, it can be concluded that the influential factors that belong to the strengths and opportunities of the public postal operator stand out. The most important factor is S1. A developed network certainly has a foothold in the very functioning of the concept of shared mobility, where the existence of a network of shared mobility stations for picking up and leaving vehicles is necessary. The network of the public postal operator with about 2,000 access points in the territory of the entire country represents a significant potential for the introduction of the concept. Another factor from the same group represents significant potential; "owning own fleet" (S4). Namely, the company has a developed vehicle fleet, the vehicles of which could be combined with additional resources if necessary.

The existence of its own IT sector (factor O2) certainly represents a significant item when it comes to services related to the use of appropriate information systems, platforms and applications, as is the case with the considered concept. The use, maintenance, and development of IT solutions require the daily activity of experts in this field. As we are talking about services that involve the exploitation

of vehicles in a certain territory, the use of automatic vehicle tracking systems and spatial data management systems is extremely useful, which is also confirmed by the importance of factor “implemented GIS” (O4).

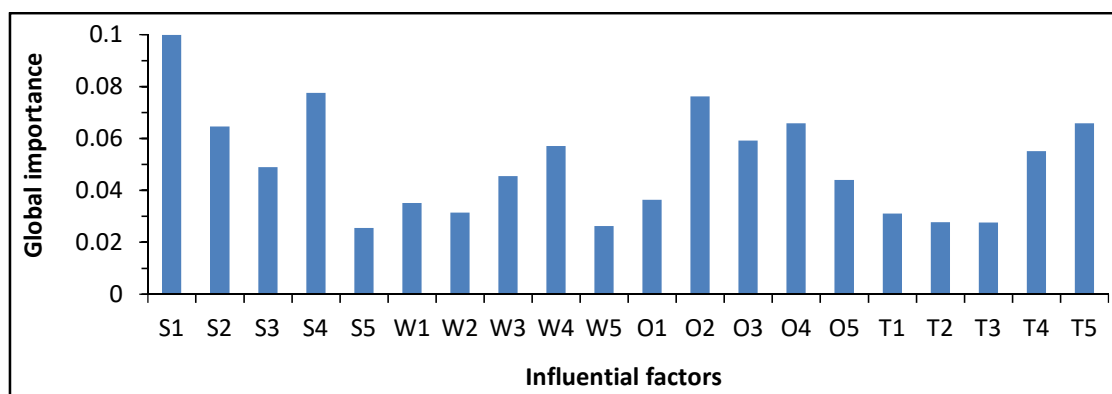


Fig. 2. Relationship of global importance of influencing factors

The most significant threats were singled out. The obtained results indicate that there is concern to what extent the considered concept will be accepted and used (i.e. “level of acceptance of the concept” (T5)) because the profitability of service provision directly depends on it. At the same time, the management should carefully plan the organizational structures and procedures, so that the introduction of the concept of shared mobility does not threaten the primary business of the public postal operator. In the modern field of postal services, which primarily involves the transfer of express mail, there is developed competition, so improvement of quality is almost necessary.

When it comes to weaknesses, the influential factors “necessary acquisition of additional resources and training of employees - increasing costs” (W4) and “infrastructure adapted to the primary activity” (W3) are of particular importance. The reason may be primarily the fact that the business system of the public postal operator is fully adapted to the primary activity – the delivery of postal items. This implies primarily a specialized workforce, postal network units, technical equipment, and vehicle fleet. The introduction of the concept of shared mobility certainly means certain adjustments at this level, which entail additional costs. This primarily refers to the education of employees, the provision of garages and parking spaces, and the acquisition of a fleet for shared mobility. As already mentioned, the selection of the fleet is a special task that needs to be solved for each unique territory following the relevant criteria.

4. Conclusions

The integration of the concept of shared mobility into the postal delivery system is proposed to improve business, expand activities, and have a positive impact on sustainable development. It can be concluded that companies from this activity have the potential to appear on the market as providers of shared mobility. This can be especially emphasized for the public postal operator, as indicated by the results of the conducted A`WOT analysis.

It was shown that the greatest potential in this regard is represented by the developed network, vehicle fleet, and the company's own IT sector. The concept of shared mobility is a market that is experiencing significant growth in the world, which is also projected for the future. Postal companies, primarily public postal operators, have a real chance to figure in the field of shared mobility as providers, which would increase their income in the long run, strengthen their brand, and take a step forward towards promoting sustainable development both locally and globally.

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] Dobrodolac, M., Markovic, Cubranic-Dobrodolac, M., & Cicevic, S. (2012). A model for the allocation of limited resources for technological improvement: A case of courier service. *Engineering Economics*, 23(4), 348–356. <https://doi.org/10.5755/j01.ee.23.4.1502>.
- [2] Aurambout, J.P., Gkoumas, K., & Ciuffo, B. (2019). Last mile delivery by drones: an estimation of viable market potential and access to citizens across European cities. *European Transport Research Review*, 11(30). <https://doi.org/10.1186/s12544-019-0368-2>.
- [3] Moshref-Javadi, M., Lee, S., & Winkenbach M. (2020). Design and evaluation of a multi-trip delivery model with trucks and drones. *Transportation Research Part E: Logistics and Transportation Review*, 136, 101887. <https://doi.org/10.1016/j.tre.2020.101887>.
- [4] Lazarević, D., & Dobrodolac, M. (2020). Sustainability trends in the postal systems of last-mile delivery. *Perner's Contacts*, 15(1). <https://doi.org/10.46585/pc.2020.1.1547>.
- [5] Lazarević, D., Dobrodolac, M., Švadlenka, L., & Stanivuković, B. (2020). A model for business performance improvement: a case of the postal company. *Journal of Business Economics and Management*, 21(2), 564–592. <https://doi.org/10.3846/jbem.2020.12193>.
- [6] Lazarević, D., Švadlenka, L., Radojičić, V., & Dobrodolac, M. (2020). New Express Delivery Service and Its Impact on CO2 Emissions. *Sustainability*, 12(2), 456. <https://doi.org/10.3390/su12020456>.
- [7] Jamshidi, A., Jamshidi, F., Ait-Kadi, D., & Ramudhin A. (2019). A review of priority criteria and decision-making methods applied in selection of sustainable city logistics initiatives and collaboration partners. *International Journal of Production Research*, 57(15-16), 5175–5193. <https://doi.org/10.1080/00207543.2018.1540892>.
- [8] Assmann, T., Lang, S., Müller, F., & Schenk, M. (2020). Impact assessment model for the implementation of cargo bike transshipment points in urban districts. *Sustainability*, 12(10), 4082. <https://doi.org/10.3390/su12104082>.
- [9] Dobrodolac, M., Bošković, S., Jovčić, S., & Lazarević, D. (2024). Sustainable Delivery Model Selection using AROMAN Approach. *Decision Making Advances*, 2(1), 73–82. <https://doi.org/10.31181/dma21202429>.
- [10] Ferrero, F., Perboli, G., Rosano, M., & Vesco, A. (2018). Car-sharing services: An annotated review. *Sustainable Cities and Society*, 37, 501-518. <https://doi.org/10.1016/j.scs.2017.09.020>.
- [11] Švadlenka, L., Simić, V., Dobrodolac, M., Lazarević, D., & Todorović, G. (2020). Picture fuzzy decision-making approach for sustainable last-mile delivery. *IEEE Access*, 8, 209393–209414. <https://doi.org/10.1109/ACCESS.2020.3039010>.
- [12] Mulley, C. (2017). Mobility as a Services (MaaS)—does it have critical mass? *Transport Reviews*, 37(3), 247–251. <https://doi.org/10.1080/01441647.2017.1280932>.
- [13] Das, D., & Mandal, P. (2021). Comparative evaluation of commuters' preferences and expectations for sharing auto-rickshaw. *Case Studies on Transport Policy*, 9(4), 1567–1581. <https://doi.org/10.1016/j.cstp.2021.08.006>.
- [14] Nadimuthu L.P.R., & Victor K. (2021). Performance analysis and optimization of solar-powered E-rickshaw for environmental sustainability in rural transportation. *Environmental Science and Pollution Research*, 28(26), 34278–34289. <https://doi.org/10.1007/s11356-021-12894-x>.
- [15] Statista Research Department. (2023). Global shared mobility market size forecast from 2017 to 2027, by region. <https://www.statista.com/statistics/1229470/shared-mobility-market-size-worldwide-by-region/>.
- [16] Saaty, T.L. (1977). A scaling method for priorities in hierarchical structures. *Journal of Mathematical Psychology*, 15(3), 234–281. [https://doi.org/10.1016/0022-2496\(77\)90033-5](https://doi.org/10.1016/0022-2496(77)90033-5).
- [17] Broomell, S. B., & Davis-Stober, C. P. (2024). The strengths and weaknesses of crowds to address global problems. *Perspectives on Psychological Science*, 19(2), 465–476. <https://doi.org/10.1177/17456916231179152>.
- [18] Garus, A., Mourtzouchou, A., Suarez, J., Fontaras, G., & Ciuffo, B. (2024). Exploring Sustainable Urban Transportation: Insights from Shared Mobility Services and Their Environmental Impact. *Smart Cities*, 7(3), 1199–1220. <https://doi.org/10.3390/smartcities7030051>.
- [19] Correia, R. J., Dias, J. G., Teixeira, M. S., & Campos, S. (2023). Building competitive advantages and business success: the role of learning orientation, reward systems and entrepreneurial orientation. *European Business Review*, 35(1), 92–119. <https://doi.org/10.1108/EBR-03-2022-0051>.
- [20] Milutinović, J., Marković, D., Stanivuković, B., Švadlenka, L., & Dobrodolac, M. (2020). A model for public postal network reorganization based on dea and fuzzy approach. *Transport*, 35(4), 401–418. <https://doi.org/10.3846/transport.2020.13741>.