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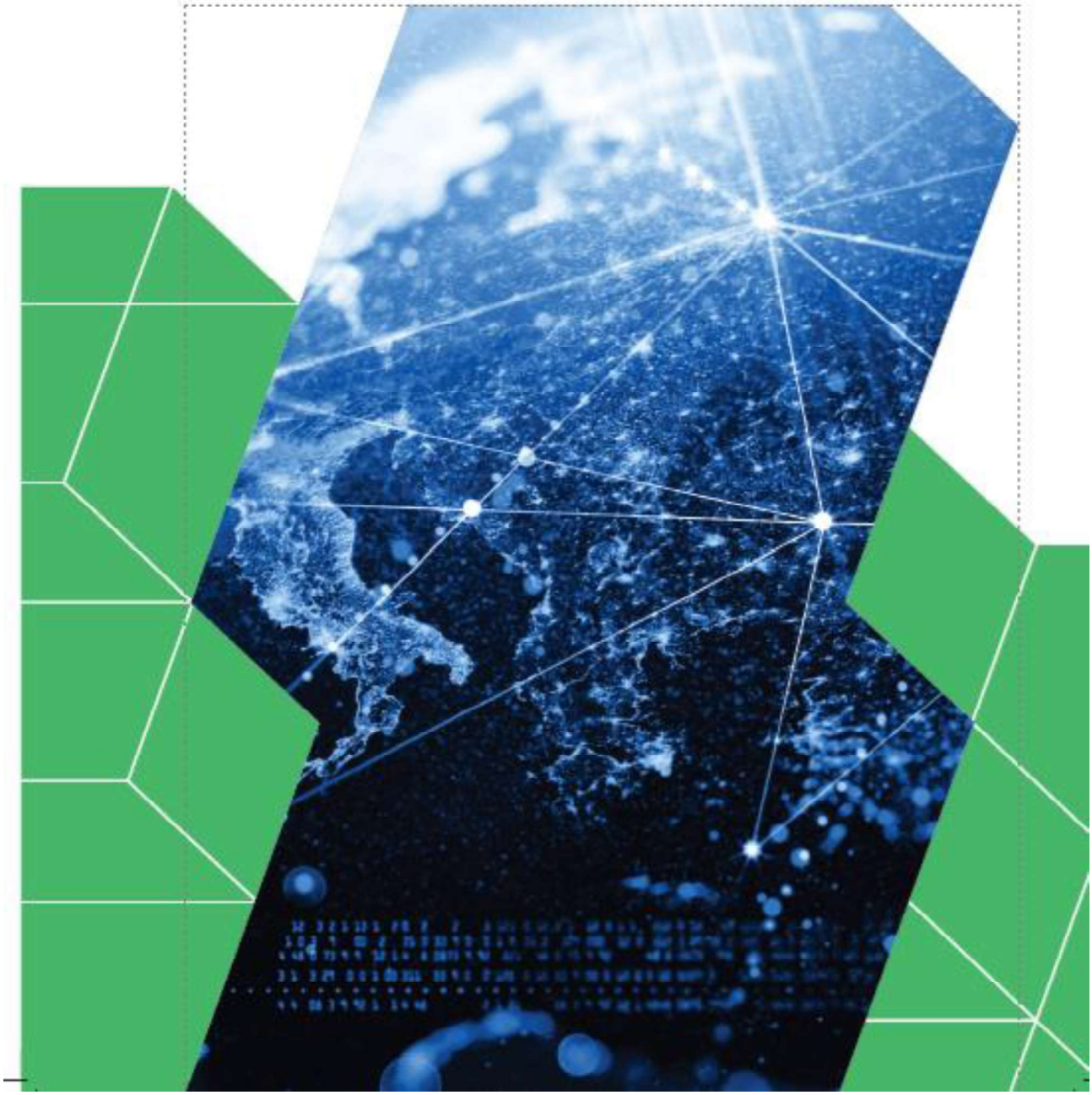

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Segmentation of Ride-Sharing Consumers: The case of BlaBlaCar Users From the Republic of Serbia

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Abstract. *Shared mobility can be defined as transportation services and systems that allow individuals to access and use vehicles or means of transportation on a shared basis rather than owning them. Forms of shared mobility encompass ride-sharing, carpooling, bike-sharing, car-sharing, and others. The question that tackles practitioners in the field is how users of these services can be segmented. Therefore, this study aims to segment Serbian users of a ride-sharing platform, BlaBlaCar. The data utilised in the paper was collected through an empirical study conducted from May to December 2023. Employing the k-means clustering algorithm, the resulting segments provide insights into the differences in behaviour, experience, and satisfaction with the BlaBlaCar platform and service among users. This research serves as a potential catalyst for further exploration of segmentation analysis in the fields of sharing economy and shared mobility.*

Keywords. *Shared mobility, ride-sharing, BlaBlaCar, segmentation analysis, quantitative research*

1 Introduction

In the past decades, the world market and the global economy have experienced significant transformations, which resulted in the formation of new and flexible forms of economic activity, instead of classic business models (Muñoz & Cohen, 2017). One of the key trends that has emerged is the sharing economy, which uses digital technologies to enable individuals and groups to share goods, services and experiences. This evolution has not only changed the way people live and work, but has also fuelled the emergence of innovative business models(Richter et al., 2017).The sharing economy takes many forms, such as accommodation sharing (like Airbnb), mobility sharing (like BlaBlaCar and Uber), workspace sharing (like WeWork), clothes sharing (like PopSwap), and many others (Bojković et al., 2022). In this model, the value is the ability to access and use a resource that is needed and not owned for a predetermined period of time at a defined price(Belk, 2014).

A particularly interesting and rapidly growing segment of the sharing economy is shared transportation(Cohen & Kietzmann, 2014), and this research will focus on the experiences of users of shared rides in Serbia. The concept of shared transport enables the multiple use of transport resources by different individuals, organisations or clients. This approach aims to achieve economic efficiency, reduce costs and improve the overall sustainability of the transport system. In addition, traffic congestion and greenhouse gas emissions are reduced, positively impacting the environment. So far, different forms of shared transport have been devised: Carpooling, Ride-sharing, Bike/Scooter/Car-sharing Services, Peer-to-Peer Car Rental, and more. The particular sharing mobility practice that caught our attention is ride-sharing and the platform BlaBlaCar. Ride-sharing platforms connect drivers with passengers heading in the same direction, thus contributing to cost-sharing and reducing the number of single-occupancy vehicles on the road. BlaBlaCar has operated in the Republic of Serbia since 2015. Based on the report after the first operating year, the users shared as much as 3 million km (Živojinović et al., 2022), which was a good signal that the users in the Republic of Serbia accepted this platform. This study aims to segment the users of the BlaBlaCar platform in Serbia, explore their socio-demographic background and their level of satisfaction with the platform.

The data was collected using a survey, while as a segmentation algorithm, k-means clustering was applied.

The paper is organised in the following way. The second section provides an overview of the segmentation studies done in the field of sharing economy, particularly in shared mobility. In the subsequent section, we present our research methodology, the overview of the data collection process and the segmentation algorithm applied. The results of the segmentation analysis are outlined in section four. The paper concludes with a synthesis of our key findings, encapsulating our contributions to the broader academic discourse.

2 Literature review

This literature review reviews several relatively recent papers regarding the segmentation of users of shared mobility services. The study by Wang et al. (2022) explores latent shared mobility preferences in low-income communities, particularly regarding the adoption of Mobility-on-Demand (MOD) transit services. Conducted in Detroit and Ypsilanti, Michigan, the research utilises latent class cluster analysis (LCCA) to examine the attitudes of 825 survey respondents towards various transit options, including ride-hailing services, fixed-route transit, and MOD transit. It identifies three latent segments among respondents: *shared-mode enthusiasts, shared-mode opponents, and fixed-route transit loyalists*. The study suggests that shared-mode enthusiasts, primarily prevalent in areas with limited transit access, may serve as early adopters of MOD transit services. In contrast, shared-mode opponents predominantly comprise vehicle owners with minimal interest in shared mobility. Moreover, it highlights demographic trends associated with preferences for MOD transit services, emphasising the importance of user perspectives in developing tailored policy interventions to enhance accessibility and equity in urban mobility solutions.

The study of Mohiuddin et al. (2024) explores bike-share dynamics and equity in Sacramento through user surveys, revealing insights into perceptions, socio-economic factors, and usage patterns. By categorising users into *"disgruntled," "satisfied," and "transit"* segments, the research unveils the complex interplay between these variables. Despite less favourable views, the "disgruntled" segment comprises frequent bike-share users facing vehicle access constraints and lower incomes. In contrast, despite positive perceptions, the "satisfied" group, with higher incomes and car ownership, engages more moderately with bike-share. Similarly, the "transit" segment, akin demographically to the "disgruntled" group, exhibits lower bike-share usage, indicating a reliance on transit. These findings underscore the importance of considering socio-economic factors alongside user attitudes, presenting opportunities to enhance bike-share accessibility and usage, particularly among transit-dependent populations. The study contributes to fostering sustainable urban transportation solutions.

Authored by Soto et al. (2021), this study emphasises the need to tailor sustainable transport policies to diverse population preferences. Through a survey of 1,041 car owners across Colombian cities like Bogotá and Medellín, the research employs a Multiple Indicators Multiple Causes (MIMIC) model to assess attitudes towards environmental issues, green transport policies, car usage, and technology. Cluster analysis identified three groups - *Traditionalists, Green Conscious, and All Matters* - revealing the interplay between car attachment and environmental concern. The study suggests customised strategies for each segment, advocating for personalised actions and marketing approaches to promote sustainable transport policies effectively. By examining the Colombian context, the research sheds light on modal shift preferences among car owners, highlighting the importance of understanding individual behaviours in shaping inclusive and impactful sustainable mobility policies.

These studies indicate interest in segmentation analysis in shared mobility, that different algorithms are applied, and that the analysis is done in multiple spheres of shared mobility.

3 Case study setting

To address the research question and gain insight into how users of ride-sharing in Serbia can be clustered, an empirical survey was conducted using the Google Forms platform from May 2nd to December 2nd, 2023. The structured questionnaire encompassed a wide range of factors related to

different aspects of shared mobility usage. The survey was targeted exclusively at individuals who had previously utilised shared mobility services, specifically the BlaBlaCar company's services. The devised survey comprised of 25 questions covering demographic information such as year of birth, gender, education level, place of residence, monthly income, and number of cars in the household, providing insight into the socio-demographic profile of service users. The subsequent segment of the survey focused on investigating respondents' personal experiences and attitudes towards the BlaBlaCar service. Participants were asked to express their views on statements using a Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree), including satisfaction with the service price, perception of the price-quality ratio, ease of app use, ease of communication with drivers, usefulness of the review system, competency and adherence of drivers to agreements, safety concerns, and potential data misuse. Additionally, respondents were given the opportunity to express their views on future service usage, including the possibility of reusing the BlaBlaCar application and their preference for this service over other transportation methods in the future.

To segment the respondents, we used the k-means algorithm (Hartigan & Wong, 1979). This algorithm has been widely acknowledged in the literature for its effectiveness in producing high-quality clustering results across different domains (Maričić et al., 2019). While k-means clustering offers several advantages, including its simplicity and computational efficiency, it is important to acknowledge its limitations. One significant downside is its sensitivity to initial cluster centroids, which can lead to varying results with different starting points. Additionally, k-means clustering assumes spherical clusters of similar sizes, which may not always align with the underlying data distribution.

4 Results

4.1 Sample description

In the conducted research, we had 116 participants, comprising 78 female respondents (67.2%) and 38 male respondents (32.8%). This gender imbalance indicates a higher representation of female BlaBlaCar users among the surveyed participants. When analysing the distribution of participants by place of residence, the majority (78.4%) were from Belgrade, with others scattered across various cities in Serbia, including Novi Sad, Niš, and others. Concerning birth years, most respondents belong to younger generations, with the highest number born in the years 2000 and 2001. However, the sample was diverse, encompassing participants born between 1972 and 2010, thus representing older demographics, albeit to a lesser extent. Regarding education, the largest number of respondents indicated current enrolment in studies (51.7%), while a significant portion had completed vocational school or college (22.4%). Considering the economic characteristics of the participants, there was a diversity of monthly incomes, with a significant number of respondents choosing not to disclose their incomes (19.8%) and others having personal monthly earnings up to 40,000 RSD (32.8%). Looking at the respondents' employment status, 43.1% reported being students, while 27.6% were employed full-time, and 11.2% were employed temporarily. Regarding the number of cars in the household, most families owned two cars (41.4%), followed by those with one car (31%). A noticeable number of respondents indicated not owning a car in their household (17.2%). This sample encompassed various demographic groups and provides a diverse picture of BlaBlaCar users in Serbia. However, it is essential to mention a bias towards younger, more educated individuals, predominantly from urban areas, which may affect the generalisation of results to the overall population.

4.2 Segmentation analysis results

We performed cluster analysis in R using the "cluster" package. Before proceeding with the clustering analysis, it was essential to determine the optimal number of clusters that best represent the underlying structure of the data. This was achieved through the "Elbow Method" which identifies the point of maximum curvature in the plot of evaluation metrics versus the number of clusters (Maricic et al., 2022). We iterated the K-means algorithm for cluster numbers ranging from 2 to 8. A visual examination of the metrics plot confirmed this observation, with a clear "elbow" at 3 clusters. The resulting clusters were as follows.

Cluster 1 or *Trusting Enthusiasts* (6 respondents). All six respondents in this cluster provided a rating of 5 for the following statements: "I was not afraid for my safety when using the BlaBlaCar platform", "I am afraid that the driver will misuse my personal data", and "I will use the BlaBlaCar platform again." This indicates that respondents in Cluster 1 have a high level of trust in the BlaBlaCar platform regarding safety and are confident that they will use it again, despite significant concerns about the misuse of personal data by drivers. However, some of them reported receiving spam messages with an average rating of 3 and high dispersion, which likely impacted their overall sense of security. Furthermore, respondents in Cluster 1 expressed satisfaction with the price-quality ratio and demonstrated trust in the review system. They are notably inclined to prefer BlaBlaCar for future travel over other means of transportation, as evidenced by the high average rating of 4.83 (std = 0.41) for the statement "In the future, I will prefer travelling with BlaBlaCar over other means of transportation."

Cluster 2 or *Apprehensive Sceptics* (21 respondents). Individuals assigned to the second cluster demonstrate the lowest satisfaction levels regarding service pricing and the perceived relationship between service pricing and quality. Additionally, they expressed a pronounced fear during the application's usage, as evidenced by their average rating of 2.62 (standard deviation = 0.97) in response to the statement, "I was not afraid for my safety while using the BlaBlaCar platform." This indicates a notable level of apprehension and discomfort experienced by respondents within this cluster while utilising the BlaBlaCar service. Unlike respondents in the first cluster, individuals belonging to the second cluster exhibit a notable absence of concern regarding the misuse of their personal data. However, this lack of apprehension does not translate into a strong intention to reuse the BlaBlaCar platform, as evidenced by their average rating of 3.67 (std = 1.02). Additionally, they demonstrate the weakest inclination towards preferring BlaBlaCar services over alternative means of transportation, with an average rating of 2.71 (standard deviation = 1.06). From these observations, we can infer that the presence of apprehension regarding personal safety and dissatisfaction with service pricing exerts a stronger influence on the willingness to reuse the application than concerns about the misuse of personal data.

Cluster 3 or *Satisfied Advocates* (89 respondents). The largest cluster comprised highly satisfied users who found the application user-friendly and trusted the review system. They felt safe during rides, and their satisfaction with the pricing of the service appears to be the highest among all clusters (4.51, standard deviation = 0.61). Responses to specific questions provided further insights into their attitudes. For instance, when asked about their experience with the BlaBlaCar application not meeting their expectations, respondents in this cluster provided considerably lower average ratings compared to those in the first two clusters, with scores of 1.67 (standard deviation = 1.04). Similarly, their concerns about the misuse of personal data were expressed with notably lower average ratings. Interestingly, respondents in this cluster reported the lowest average rating for receiving spam messages after using the application, indicating a minimal presence of spam messages in their experience (average rating of 1.15 with a standard deviation of 0.51). This absence of spam messages could contribute to their overall satisfaction and trust in the platform. Furthermore, their strong intention to reuse the BlaBlaCar platform is evident from their responses to the statements: "I will use the BlaBlaCar platform again." and "In the future, I will prefer travelling with BlaBlaCar over other means of transportation.", where they provided high average ratings of 4.7 (standard deviation = 0.68) and 4.18 (standard deviation = 1.03), respectively. These ratings indicate a clear preference for using BlaBlaCar for future travel over other transportation means.

5 Discussion and conclusions

This study aimed to segment users of the BlaBlaCar platform in Serbia to understand their behaviour, experiences, and satisfaction levels. Three distinct user segments emerged: *Trusting Enthusiasts, Apprehensive Skeptics, and Satisfied Advocates*. The segmentation analysis revealed notable differences in user attitudes and preferences. *Trusting Enthusiasts* demonstrated high trust in the platform's safety features but expressed concerns about data misuse. *Apprehensive Skeptics* exhibited apprehension about safety and dissatisfaction with pricing but showed less concern about data misuse. *Satisfied Advocates* emerged as the largest segment, showcasing high satisfaction levels across various platform aspects, including safety, pricing, and user experience. These findings provide valuable insights for BlaBlaCar and similar platforms to tailor their services effectively and

address specific user concerns. For instance, efforts to enhance safety features and mitigate data misuse concerns could bolster user trust and satisfaction. Moreover, strategies to improve pricing transparency and address safety apprehensions may help attract and retain users, particularly those in the *Apprehensive Skeptics* segment. In conclusion, this research contributes to the understanding of user segmentation in the context of shared mobility platforms. By identifying distinct user segments and their preferences, stakeholders can develop targeted interventions to enhance user experience, foster trust, and promote sustainable shared mobility solutions. Also, identifying distinct segments within the market could allow BlaBlaCar to develop targeted marketing strategies addressing the specific needs and characteristics of different segments, leading to increased user acquisition and retention. Future research could explore additional factors influencing user segmentation and examine the long-term impact of tailored interventions on user satisfaction and platform usage.

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