



Article

Open Innovation—Opportunities or Nightmares for the Shared Transport Services Sector?

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Abstract: Shared transport services, including short-term vehicle rentals (bike-, car-, moped-, scooter-sharing) and travel sharing systems (ride-sharing, ride-hailing), have become more and more popular forms of mobility in recent years. Their increasing availability has made them an alternative to individual transport in cities. Along with the development of the systems, a growing number of operators offering sharing services started to appear. Many of them ended their activities after the pilot period or closed the company shortly after launching the system. There are many reasons for this, from management to technical issues, but the aspects of open innovation, open data and transparency were often overlooked. This begs the question whether it is the openness of systems that is the recipe for the market success or failure of shared mobility services. The aim of this work was to evaluate the approaches to data openness and innovation in companies representing the shared mobility market. A research proposal was submitted to diagnose the approach to open innovations in the market of shared mobility services. An expert survey was carried out among representatives of shared mobility services operating in major Polish cities. The expert survey was conducted using the CAWI technique. Research results show that open innovation is a problematic aspect for operators. On the one hand, they are interested in it, but this interest does not translate into real practices. Among the entire shared transport sector, the micro-mobility service providers are the most committed to open innovation. Research indicates that in order to increase the dynamics of the development of open innovation in the shared transport industry, there is a need for education in the field of open innovation, especially in the era of the development of digitization of urban transport systems and the pursuit of sustainable transport.

Keywords: open innovation; open innovation management; open data; open innovation dynamics; shared mobility; transport resilience; mobility management; sustainable transportation



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1. Introduction

The shared transport market segment, which includes both travel sharing (ride-sharing, ride-hailing) and vehicle sharing services (bike-sharing, car-sharing, scooter-sharing), offers a real alternative to traditional car travel in recent years because of the major developments in the simplicity of operation and consequent convenience for users. This is evidenced by the constantly growing value of the market. It is predicted that in the coming years the value of the market will increase from USD 85.8 billion in 2021 and reach USD 185.1 billion in 2026 [1]. Along with the development of systems, a growing number of operators offering sharing services began to appear in the market [2]. Unfortunately, many of them ended their activities after the pilot period. Others, on the other hand, did not stay in the market for long. There are many examples of systems where a service has been permanently suspended, among these “the spectacular closure of one of the most popular car-sharing systems in Autolib” in Paris [3], the sensational Car2Go car-sharing system in San Diego [4], the failure of Uber and Ofo bike-sharing in China [5,6], and the closure of Bird’s scooter-sharing services in the Middle East, with the scrapping of 10,000 electric scooters [7].

Many problems are cited as to why transport-sharing systems failed in market conditions or have trouble functioning properly. Mainly mentioned are transport and economic issues, which can be applied to the entire industry of services offered [8–11]. For example, from the point of view of car sharing, the authors Qin et al. indicate that one of the main problems of car-sharing is the lack of an appropriate fleet relocation [12]. The same problem in the case of bike-sharing is noted by Wang et al. [13], and in the case of scooter-sharing by Osorio et al., who emphasize its impact on customer demand [14]. In contrast, a second set of indicated and analyzed problems which point to economic issues are those of price lists, offers and appropriate operating policies [15–18]. There is also much discussion about the inadequate management of systems, focusing mainly on business model issues and their impact on achieving sustainable urban development [19,20]. Among the many reported potential problems that may result in system shutdown, one important issue relating to the sharing economy is omitted—the matter of actual “sharing”. The sharing economy is derived from the collaborative economy. Collaborative consumption is “an economic model based on sharing, swapping, trading, or renting products and services, enabling access over ownership” [21]. The sharing economy is an economic model based on sharing underutilized assets from spaces to skills to items and equipment for monetary or non-monetary benefits [21]. Little is mentioned about it, but since the sharing economy and the collaborative economy are based on assumptions of transparency and openness [22–26], this indicates that they should also support openness of data and openness of innovation. However, are companies from the sharing mobility industry ready to share data and implement open innovations? Are these issues even considered in their companies? Could the lack of openness of enterprises translate into a lack of market success? The aim of this work was to evaluate the approaches to data openness and innovation in companies representing the shared mobility market.

The research was carried out for the market of shared mobility services in Poland, Europe. The Polish market is a very interesting area from the point of view of shared mobility services. Although vehicle sharing services appeared relatively late compared with other European countries, e.g., bike-sharing in 2008 [27–29], car-sharing in 2016 [30], moped-sharing in 2017 [30], and scooter-sharing in 2018 [30], this market is characterized as dynamic and valuable [31]. In 2020, the market value in Poland was USD 701 million, while the number of users of shared mobility systems was 9.1 million people [32]. A detailed timeline of shared mobility services in Poland is presented in Figure 1.

Shared Mobility Services timeline

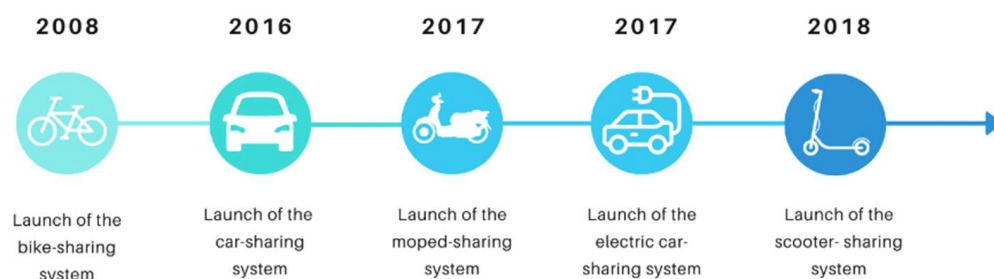


Figure 1. The timeline of shared mobility services in Poland.

There was a significant development in shared mobility services in Poland since 2017, when an increasing number of car-sharing service operators appeared in the market [33]. At the peak of the shared mobility systems development, 17 car-sharing operators offered such systems, available in 250 cities, and 14 scooter-sharing operators [34]. The market boom in sharing services did not last long, however. After many systems were opened, they then rapidly disappeared from the market. The most spectacular closures included,

among others, closure of the Vozilla electric car-sharing system with a fleet of 240 cars [35], closure of the Innogy Go! system with a fleet of 500 electric cars [36], the Mevo bike-sharing system, which was planned for a fleet of 4099 bikes [37], including electric bikes, and CityBee scooters with a fleet of 800 scooters [38]. There were also many other smaller-scale closures and the abandonment of pilot schemes. An interesting example is the city of Katowice which, in 2018, was a city of electric car-sharing with four systems operating in its area; at the time of writing, none of them is in operation. Currently, in 2022, there are ten car-sharing operators on the market, twelve electric scooter-sharing operators, eight bike-sharing operators and five moped sharing operators [33].

The significant difference in the number of systems in the Polish market raises many questions concerning the proper functioning of companies in Poland. While there was much research on technical or transport issues [39–41], research on approaches to open innovation is not popular at present. The only research on open innovation in Poland, focused on the development of Mobility-as-a-Service systems, was conducted by the authors in one of the previous publications [2]. Noting that one of the research gaps is the issue of open innovation in shared mobility systems, this study was conducted among operators in the Polish market.

2. Openness of Data and Innovation and the Sharing Economy

Open innovation is a model of practices used by enterprises, consisting in the integration and application of internal and external ideas, as well as the processes of implementing innovations to the market [42]. It represents the idea of a deliberate flow of knowledge, ideas and technologies that accelerate the innovation process [43–45]. The concept assumes an open and partnership approach to creating innovation [46]. The open innovation approach directly influences the company because it changes the interaction between the company and the environment in which it operates [47]. It also suggests possible rules of conduct to better manage a company's approach to openness and accessibility to the external environment [48–50]. Under these circumstances, the boundaries of the company become permeable both from the inside and the outside. Research shows that companies that follow an open business model are actively looking for new ways to work with suppliers, customers, or general partners to open and expand their business [49,50]. The company, therefore, becomes stronger and more accessible to society [39,42]. As a result, it can implement innovations internally based on external and internal ideas and technologies [49,50]. However, the company can also allocate ideas to external entities that commercialize them through their own innovation projects [42].

In the case of the sharing economy, the essence of the company's openness and its transparency should constitute the basis for the company's functioning [51]. Issues of responsibility, cooperation, and complementarity are at the heart of the idea [52–57]. Moreover, sharing is unequivocally associated with collaboration [39,58–71]. It can, therefore, be argued that the sharing economy is strongly related to open innovation and data sharing. It is worth mentioning that the shared mobility market, like the entire sharing economy market, is changing very dynamically. Moreover, it is a digitization-based market and system users are able to exchange their opinions about services at a very fast pace. Appropriate use of this fast pace can directly translate into the dynamics of open innovation [52,53].

The open innovation trend is clearly visible in scientific publications and more often indicated as an opportunity for enterprises [72–80]. Thus, it may seem inevitable; however, it is important to determine whether a company is ready for open innovation or is already embracing this approach.

3. Methods and Stages of Research

To identify the approach to open innovations in companies providing shared mobility services, the authors proposed their own research. The study was conducted in Poland, from August 2021 to March 2022, on a sample of $n = 25$ diverse groups of shared mobility services operator representatives. The research sample consisted of the following

representatives: bike-sharing providers (4 companies), scooter-sharing providers (10 companies), moped-sharing providers (3 companies), and car-sharing providers (8 companies). The respondents' sharing services operated in the four largest urban transport systems in Poland, i.e., Warsaw, Katowice, Gdańsk, and Wrocław. The research sample used in the study was purposive, in that people in the studied population had specific industry knowledge regarding the functioning of shared mobility systems in Poland. The size of the target sample was determined in accordance with Mishin's guidelines for constructing expert research [81]. The survey was attended by managers representing shared mobility operators, who were indicated by companies as having knowledge and competences in the field of innovations used in their companies. The survey was developed via the Internet using the Computer-Assisted Web Interview (CAWI) technique.

The expert research questionnaire included the following questions:

Q0: What is your company size?

Q1: Are open innovations implemented in your company?

Q2: Who in your company is responsible for creating innovations (both open and closed)?

Q3: Have users reported to you their ideas to improve or change the services offered?

Q4: Have you analyzed the innovations implemented by your competitors?

Q5: Have you collaborated with other entities offering shared mobility services?

Q6: Have you made your vehicle or rental data publicly available?

Q7: Was your organization a fully transparent company?

Q8: Have you been involved in public–private partnerships?

Q9: Would you engage in the open innovation of your competitors?

Q10: Would it be a problem for your company to share your data, e.g., about vehicles rentals in open access?

Q10: Would it be a problem for you to share your data (e.g., vehicle rentals) in open access mode?

Q11: What are the key benefits of open shared mobility systems compared with closed shared mobility systems, in your opinion?

Q12: Do you agree that open shared mobility systems facilitate more innovative ways of services development than closed systems?

Q13: What are the reasons that open shared mobility systems facilitate more innovative ways of services development than closed systems?

Q14: Do you agree that open innovations in shared mobility systems facilitate more ways of selling their services than closed innovations?

Q15: Do you agree that open innovations attract more diversified customers than closed?

The applied research process is presented in Figure 2.

The obtained results are presented in the next section.

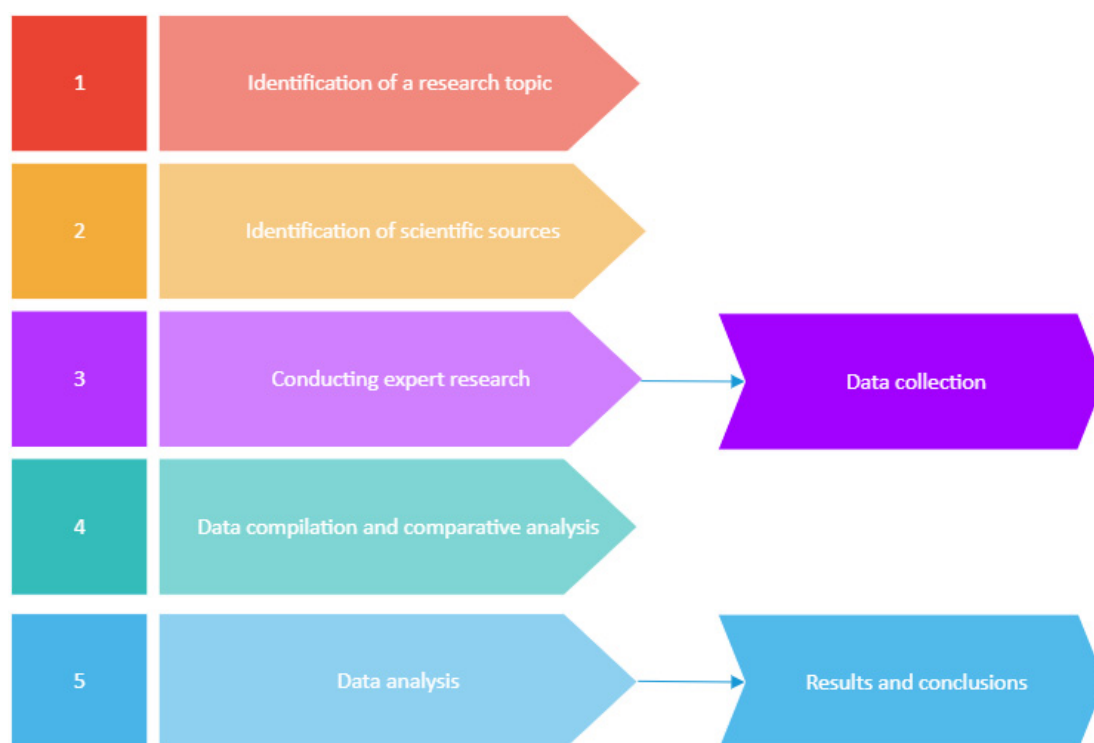


Figure 2. Research method process.

4. Results

As a result of the analyses conducted, detailed answers were obtained regarding open innovations used in shared mobility systems.

The survey was completed by 25 experts representing 25 shared mobility companies from the Polish market, which is 71% of the Polish shared mobility services market. In terms of the size of companies, the respondents represented both micro, small, and medium-sized enterprises. Large companies were the least represented group. Detailed data are presented in Figure 3.

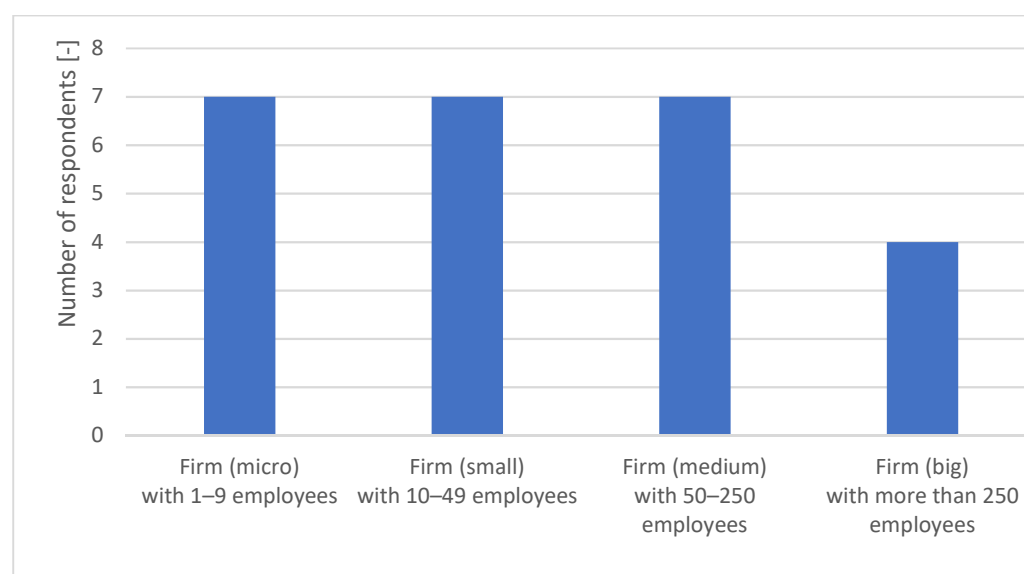


Figure 3. The size of the respondents' companies.

Among the surveyed respondents, only 40% of the respondents stated that they had implemented open innovations in their companies. The overwhelming group of shared

mobility systems that have implemented open innovations are bike-sharing operators. Interestingly, the group of car-sharing representatives did not implement open innovations. Detailed data are presented in Figures 4 and 5.

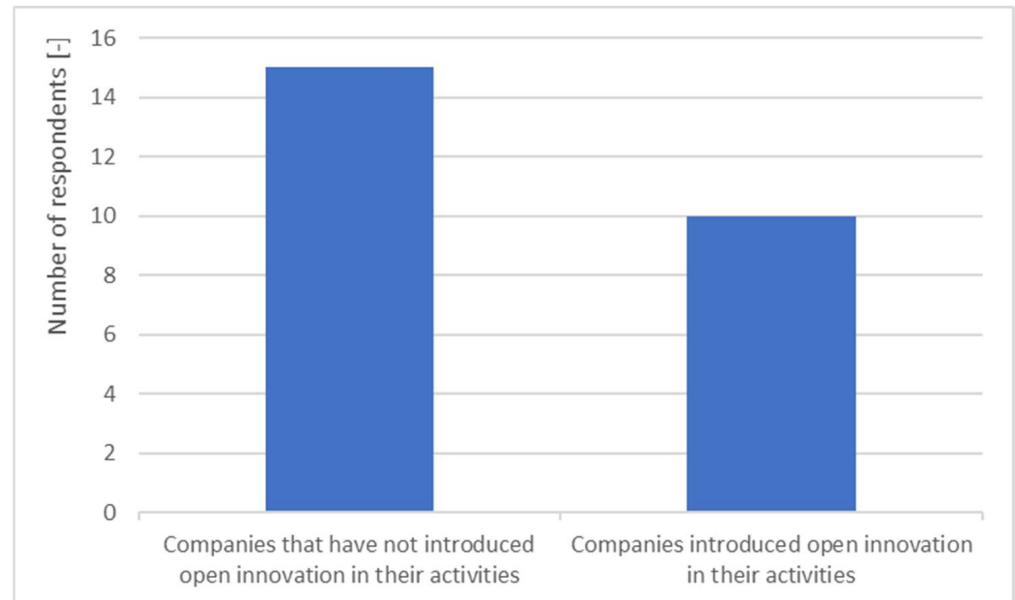


Figure 4. The ratio of companies with implemented open innovations to those not implemented.

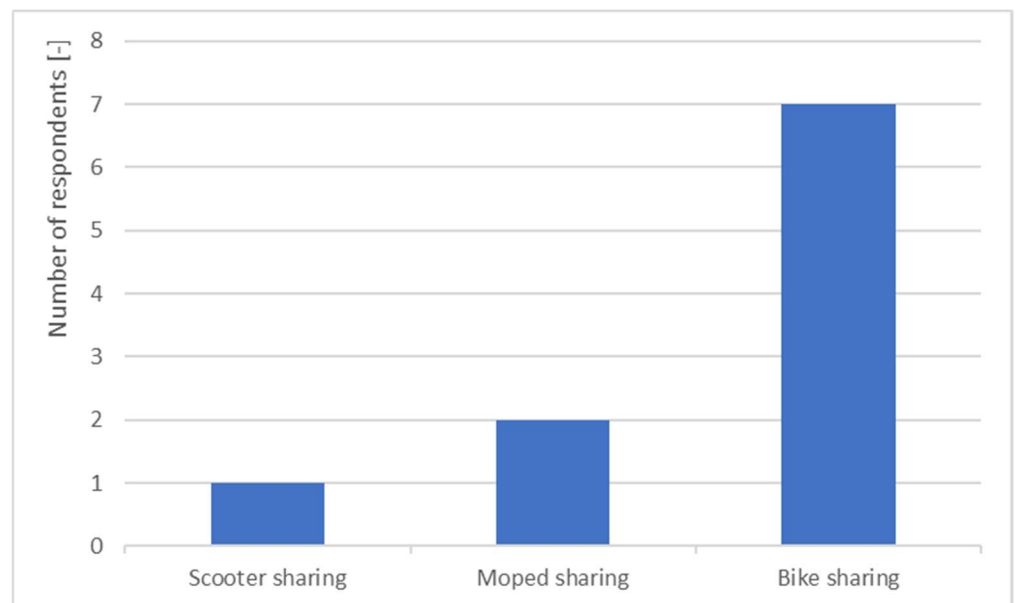


Figure 5. Companies with open innovation in the shared mobility market.

Despite little interest in implementing open innovations, all of the companies indicated that they implemented closed innovations. Therefore, it was important to find out who was responsible for creating innovations, both open and closed. The answers of the respondents show that the management (32% of respondents) was most involved in creating innovations, followed by employees (28% of respondents). Only a small percentage of innovation was influenced by users and external stakeholders. It is worth emphasizing that 20% of respondents were not able to identify people responsible for creating innovations. Detailed data are presented in Figure 6.

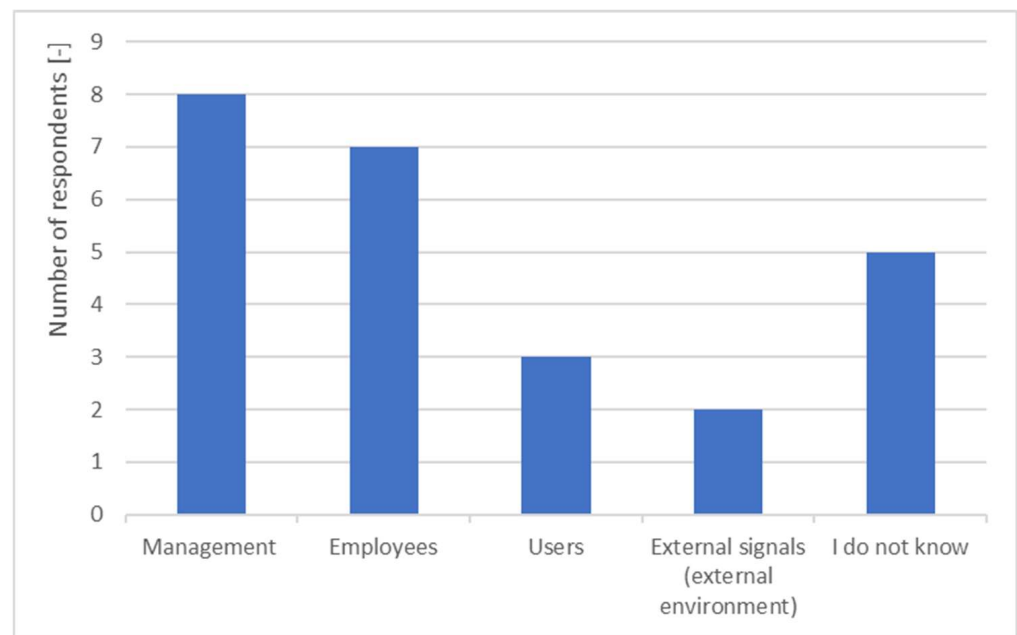


Figure 6. People responsible for creating open innovations in companies in the shared mobility market.

Drilling down into the topic of innovation, respondents were asked to indicate whether system users had any opportunity to report their opinions of the services they use. The results show that in 21 out of 25 analyzed enterprises, users could express their opinions. Detailed results are presented in Figure 7.

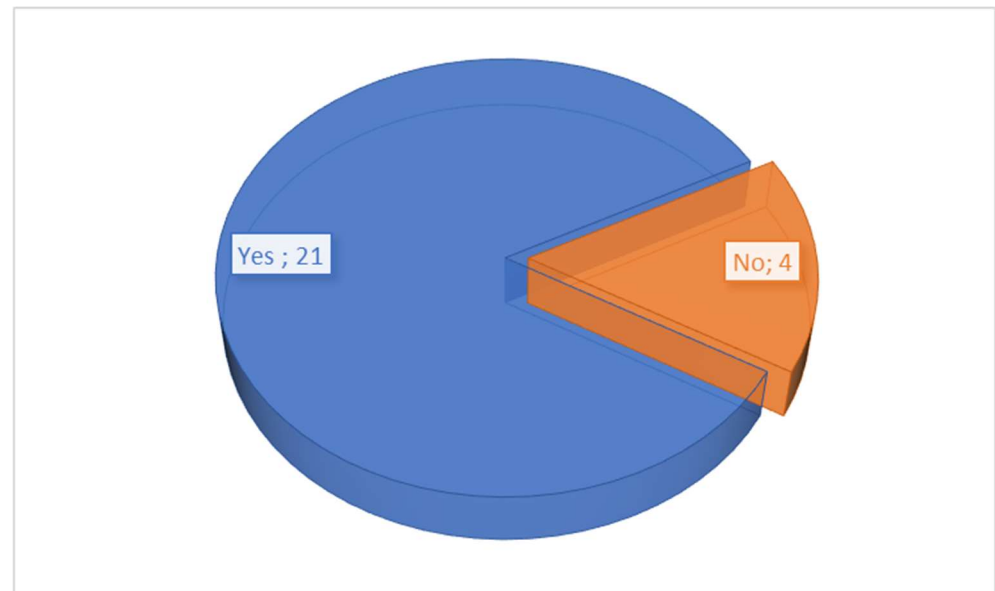


Figure 7. Companies with the possibility of expressing opinions by users.

In terms of tracking the activities of competitors by shared mobility companies, 76% admit that they analyze innovative activities implemented by competitors. Detailed results are presented in Figure 8.

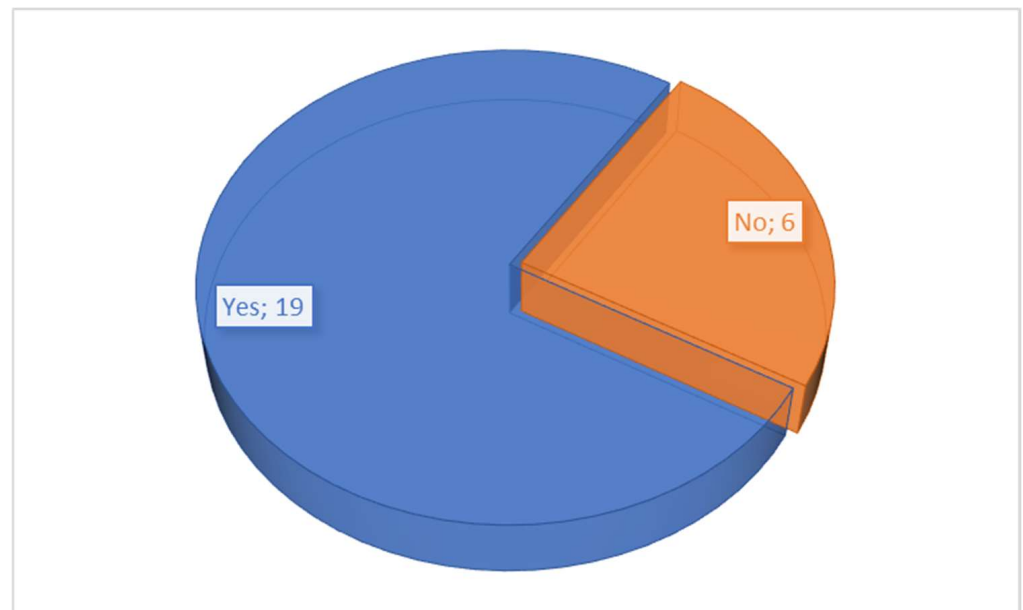


Figure 8. Analyzing innovations implemented by competitors.

Despite the fact that the respondents track the activities of competitors, only 8% of respondents cooperate with competitors from the shared mobility industry. Detailed results are presented in Figure 9.

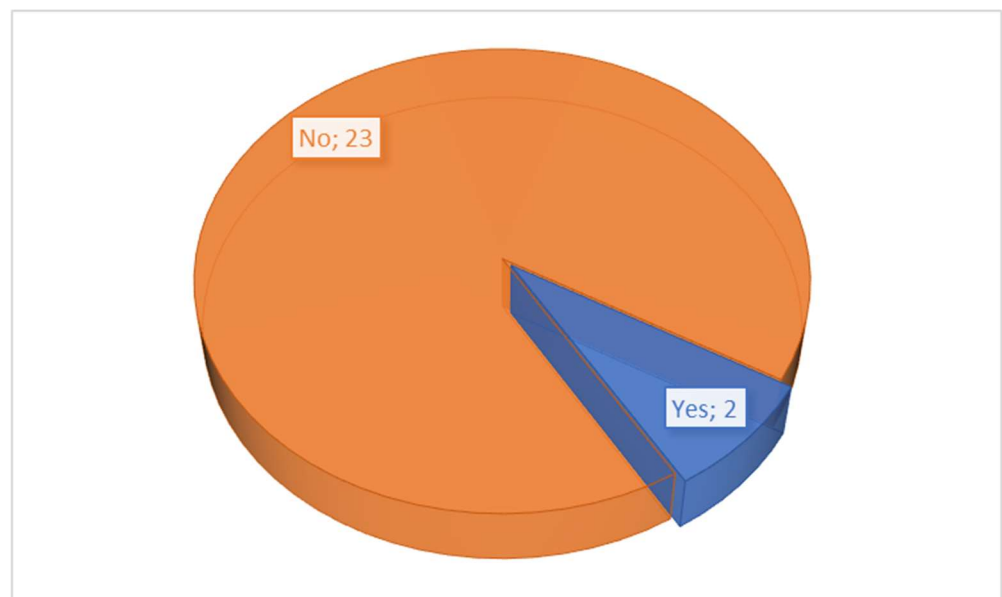


Figure 9. Collaboration with competitors in the shared mobility market.

Another issue was the companies' approach to data openness. The results indicate that 84% do not provide data on vehicles or their rentals. Detailed results are presented in Figure 10.

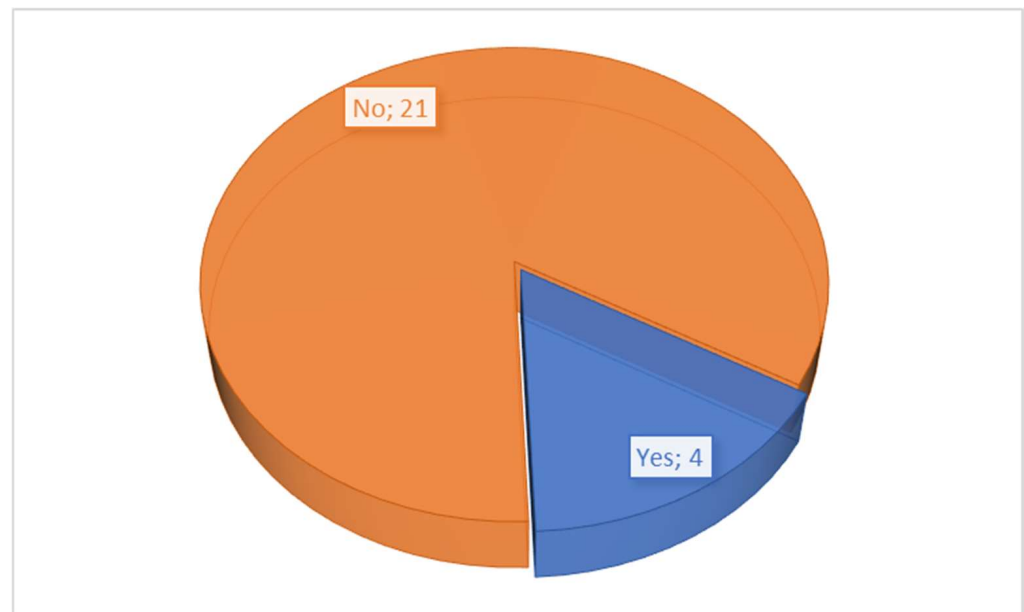


Figure 10. Sharing of data by operators of shared mobility services.

The issue of data openness is also a company's transparency. The obtained results show that only 12% of the respondents consider their company transparent. Detailed results are presented in Figure 11.

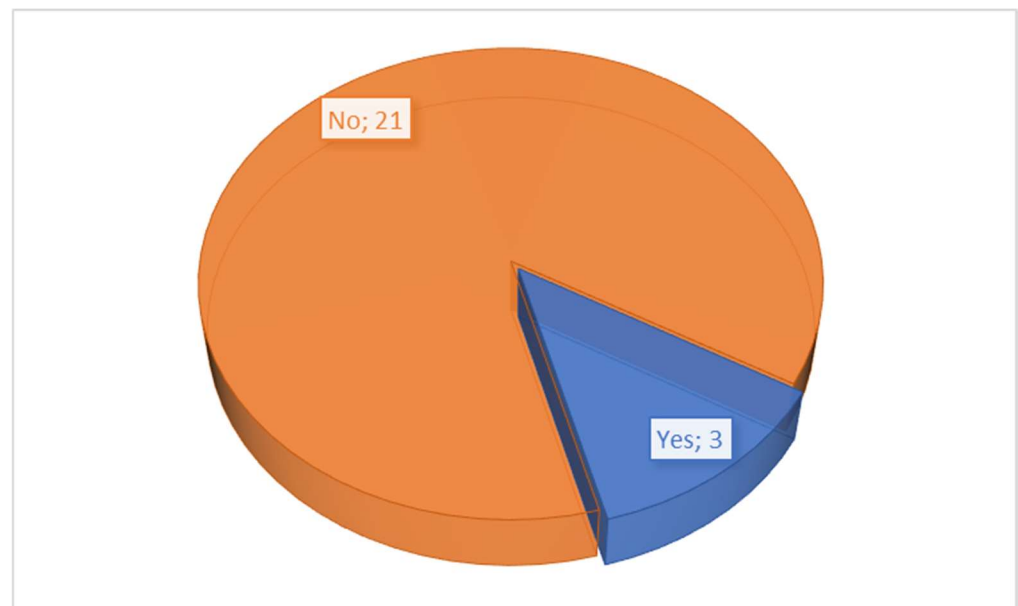


Figure 11. Transparency operators of shared mobility services.

An important aspect from the point of view of open innovations is cooperation with the socio-economic environment. The results show that only 24% of enterprises cooperate with the public-private environment. Detailed results are presented in Figure 12.

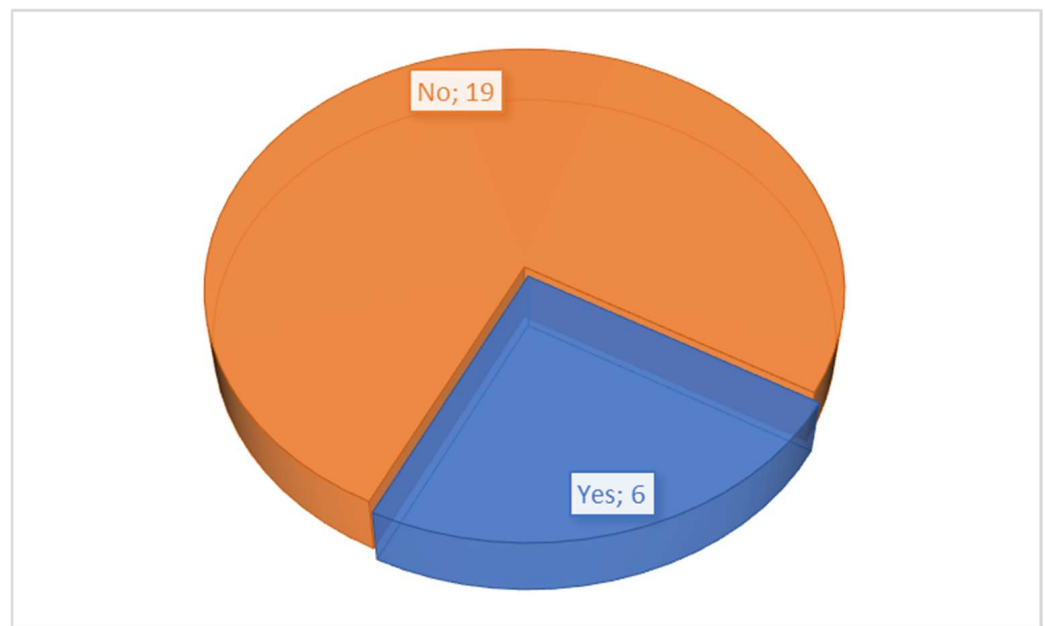


Figure 12. Public–private partnership in shared mobility systems.

Despite the lack of cooperation with the socio-economic environment and competition, the results indicate that 96% of respondents would like to be involved in the open innovations of their competitors. Detailed results are presented in Figure 13.

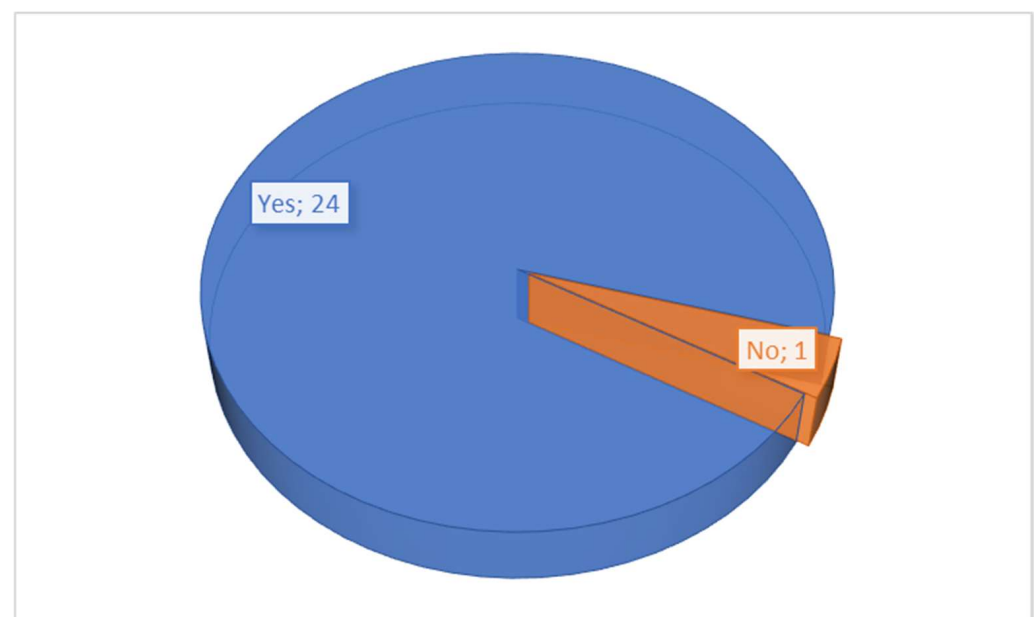


Figure 13. Willingness to engage in open innovations of the competition.

An essential aspect in sharing data is the operator's actual approach to sharing its own data with other users in this competition. The results of the research indicate that only 28% of respondents would not see a problem with sharing data about their company. Specific results are presented in Figure 14.

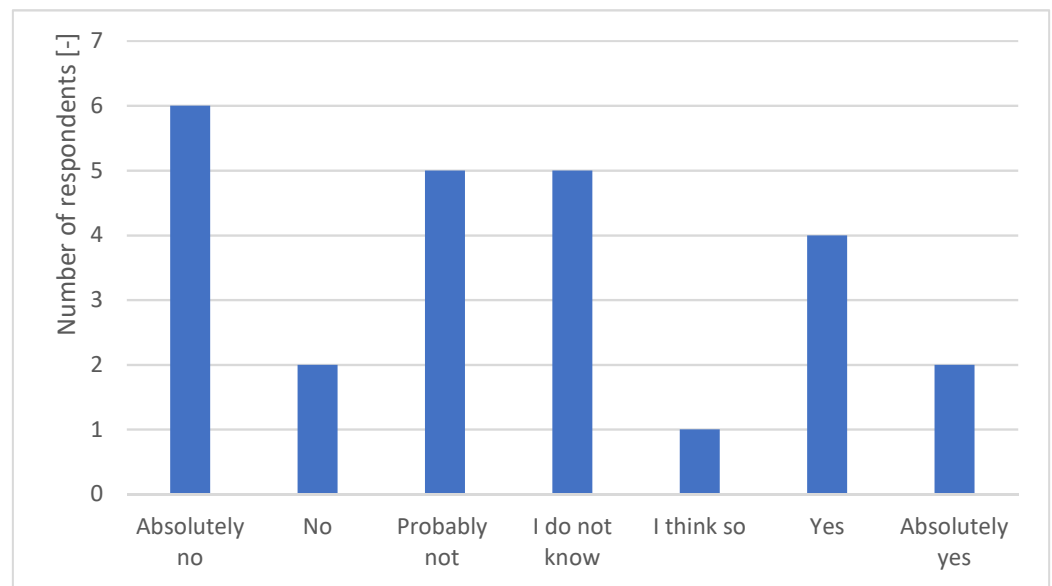


Figure 14. Perception of data sharing as a problem.

It is also important to see open innovation as a benefit. The respondents were asked to indicate detailed benefits that, in their opinion, are related to the possible implementation of open innovations. Specific results are presented in Figure 15.

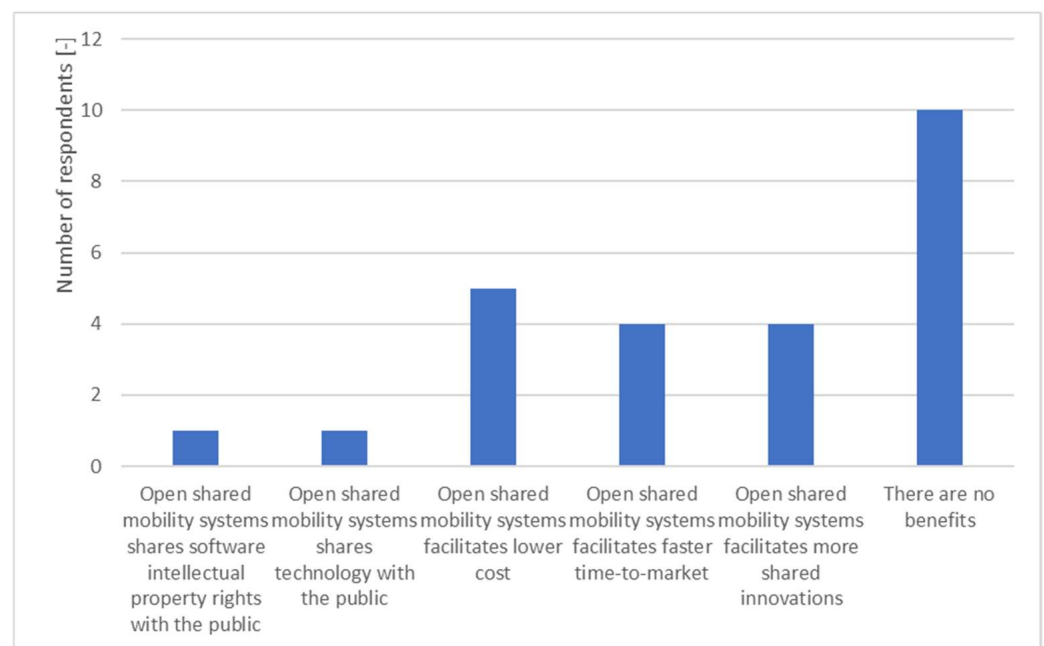


Figure 15. Benefits of open innovation.

Subsequently, respondents were asked for their opinion on whether open systems of shared mobility facilitate more innovative ways of developing services than closed systems. According to the respondents, 64% agree with the above statement. Specific results are presented in Figure 16.

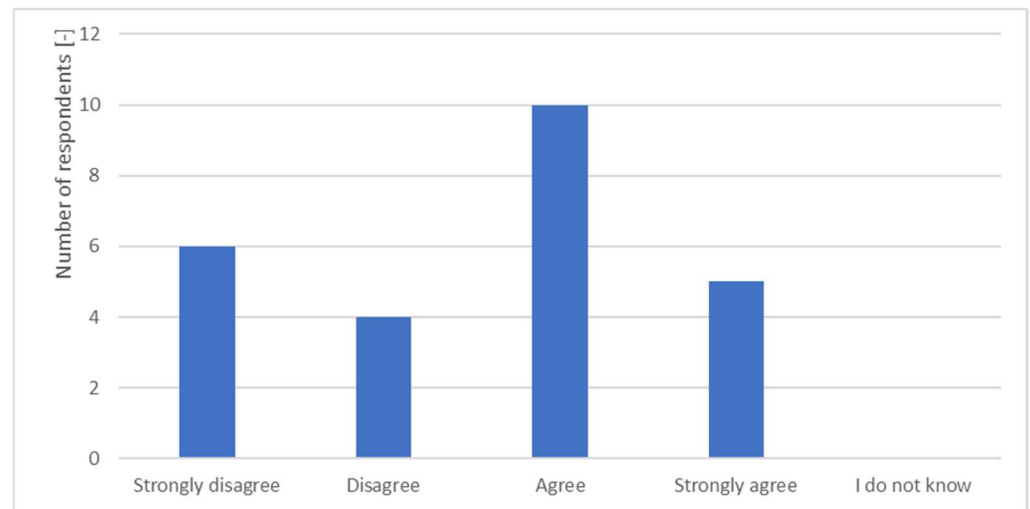


Figure 16. The link between open shared mobility systems and service development.

Respondents were asked to identify the reasons why open shared mobility systems are more innovative than closed ones. Specific results are presented in Figure 17.



Figure 17. The reasons for the advantages of open systems of shared mobility over closed ones.

The aspect related to open innovations is their direct translation into the sale of products or services. Therefore, respondents were asked to state their opinion on the impact of open innovation on the sale of services. Specific results are presented in Figure 18.

The final question was designed to discover what respondents think about the impact of open innovation on customer acquisition. Detailed results are presented in Figure 19.

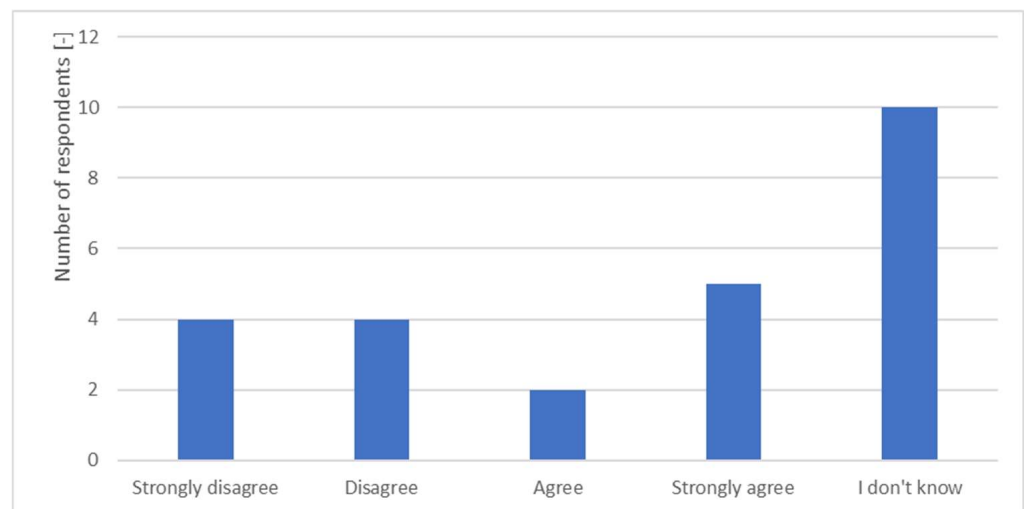


Figure 18. The impact of open innovation on the sale of services.

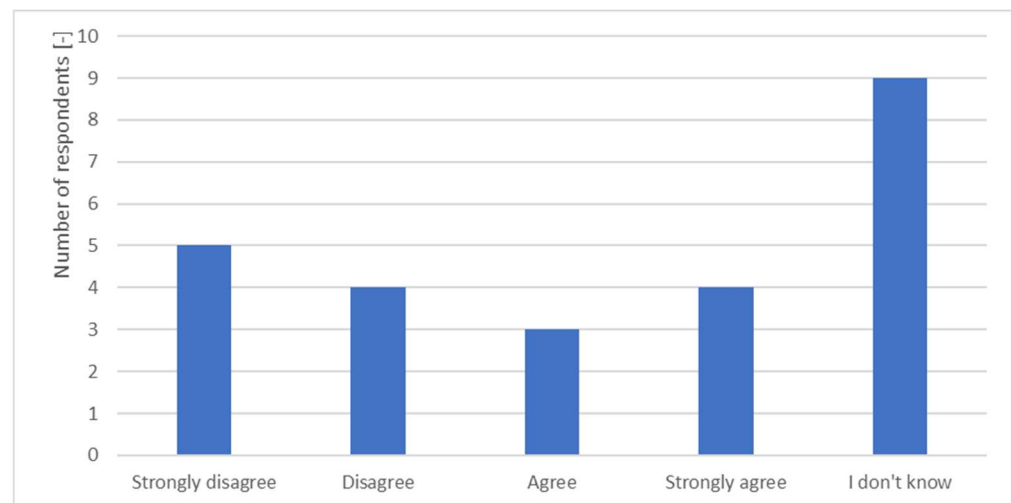


Figure 19. The impact of open innovation on acquiring more diverse customers.

5. Discussion

The results obtained from this research show that open innovation is still a distant topic for shared mobility services. Even though the respondents willingly participated in the survey and declared their high level of knowledge about open innovations, only 40% of them admitted that they have actually implemented open innovation practices in their company's operations. Interestingly, micro-mobility service providers—bike-sharing, scooter-sharing and moped-sharing providers—are the most involved in open innovation. This may be related to high market competitiveness or the target customers. Micro-mobility services are mainly used by young people [82], which may contribute to the need for companies to create innovative services.

Despite little interest in implementing open innovations, all of the respondents indicated that they implemented closed innovations. When analyzing who is responsible for creating various types of innovations, it can be noticed that it is the company's management or employees. A small percentage are innovations suggested to the company by users or the socio-economic environment. Such behavior underlies the great closure of the shared mobility industry. Interestingly, despite the lack of involvement of users in the process of creating innovation, 84% of respondents state that their clients have the opportunity to express their opinions through various types of surveys or forums. There is much discussion in the industry about services closing and the emergence of only short-term pilot projects [83,84]. Many practitioners and scientists wonder why this happens. Management

issues or inappropriate adjustment of services are cited as problems [83,84]. The results of this study indicate the involvement of a very small percentage of people who use the systems in how they function. Perhaps this aspect is the cause of the many failures in the shared mobility market.

From the perspective of involvement in the activities of competitive enterprises in the shared mobility industry, the results of the research indicate that 76% of respondents analyze the activities and innovations implemented by competing enterprises. Interestingly, despite such great interest among the respondents in tracking the activity of their competitors, only 8% cooperate with competitors. The strangest finding is that 96% of respondents would engage, as a partner, in open innovation by their competitors. However, to be closer to this phenomenon, it is necessary to share your data and be a transparent company. The results show that only 16% of the respondents share their data, while only 12% of the respondents consider their enterprise to be transparent. 28% of respondents believe that sharing data would be a problem for them. It is interesting, however, that the remaining 28% of respondents do not know what their opinion would be on this matter. To better illustrate open innovation, respondents were asked about their attitude towards open systems of shared mobility. According to the respondents, open innovations are able to contribute to increasing the development of enterprises. Moreover, they believe that open systems can lead to greater diversification of partners and their skills, sharing technology and cooperation with the external environment. For the most part, however, they do not have an opinion on whether open systems can bring a company a more diverse customer group. This means that companies are not aware of the possibilities offered by data sharing so education on the subject should be a key factor when trying to spread open innovation.

It is, therefore, difficult to talk about any dynamics of the development of open innovation in shared mobility systems when companies do not want to be transparent and open to other enterprises. Research shows that entrepreneurs have a huge problem with their actual approach to open innovation. On the one hand, some elements of open innovation interest them and are perceived as benefits, while others are treated as a threat to their systems. Thus, the dynamics of the development of open innovations in systems is strongly disturbed. This condition is also confirmed by research conducted by other scientists on the global market. For example, Valor noticed that in car-sharing systems there is considerable resistance to implementing innovations, especially those that are social [85]. Shui and Szeto noticed similar problems with innovations in bike-sharing systems [86]. Referring directly to the Polish market, it is not possible to make an exact comparison of the obtained results with the results of other scientists because such studies have not been published by anyone so far. This indicates that open innovation in shared mobility services is an unexplored area that requires in-depth analysis.

6. Conclusions

In conclusion, the conducted research has shown that Polish collaborative mobility enterprises are only at the beginning of the road to open innovation. The results show that most operators lack detailed knowledge of the opportunities offered by open innovation and the open systems of shared mobility that can be obtained through them. The lack of knowledge is characterized by the fact that, on the one hand, enterprises are skeptical about e.g., data sharing, and on the other hand, they would be willing to become an open innovation partner. There are, therefore, many contradictions in the results obtained. It can be concluded that the dynamics of the development of open innovations is disturbed, and open innovations are considered more within the category of a problem than a profit. It is, therefore, particularly important to pay attention to these disruptions in the industry, especially in an era of digitization and transportation automation [87], the progressive development of industry 4.0 [88], and the implementation of mobility accelerators (MaaS systems), where open data and partnership are the basis for efficient and profitable operation.

This research made it possible to achieve the aim of the work in the form of indicating the attitude of enterprises toward the issue of implementing open innovations. Moreover, it indicates which aspects should be considered in order to properly educate enterprises about open innovations.

As with every study, this article also has its limitations. The main limitation is its area, which applies only to the Polish market of shared mobility systems. Moreover, due to the operators' lack of openness to sharing their data, it was not possible to study the full market. Finally, due to the assurance of the confidentiality of the respondents, the authors were not able to enter the specific names of the companies that took part in the survey.

On the implication side, the results obtained in the study may constitute an interesting study, primarily for scientists, and educators and enterprises involved in the popularization of, and education about, the implementation of open innovations. The study shows that the Polish shared mobility market requires operators to be provided with relevant knowledge, which is also an interesting area for further research. In addition, this research also supports providers operating in Poland. The research results can show them the trends towards open innovation among their competitors. This type of knowledge can certainly be used to build a market advantage and increase the demand for services by opening up to the external environment and building an engaged customer network.

In conclusion, due to the lack of similar research on open innovations in shared mobility services in the Polish market, these studies constitute an important, preliminary analysis that may constitute the basis for extended research for other scientists.

In further research, the authors plan to carry out analyses related to customer perception in terms of the legitimacy of open innovations in the Polish shared mobility market. They also wish to extend their analysis to other countries in Europe and the world, to obtain market comparisons for the European and world markets in the development of open innovation.

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Institutional Review Board Statement: According to our University Ethical Statement, following, the following shall be regarded as research requiring a favorable opinion from the Ethic Commission in the case of human research (based on document in polish: <https://prawo.polsl.pl/Lists/Monitor/Attachments/7291/M.2021.501.Z.107.pdf> (accessed on 21 March 2022): research in which persons with limited capacity to give informed or research on persons whose capacity to give informed or free consent to participate in research and who have a limited ability to refuse research before or during their implementation, in particular: children and adolescents under 12 years of age, persons with intellectual disabilities persons whose consent to participate in the research may not be fully voluntary prisoners, soldiers, police officers, employees of companies (when the survey is conducted at their workplace), persons who agree to participate in the research on the basis of false information about the purpose and course of the research (masking instruction, i.e., deception) or do not know at all that they are subjects (in so-called natural experiments); research in which persons particularly susceptible to psychological trauma and mental health disorders are to participate mental health, in particular: mentally ill persons, victims of disasters, war trauma, etc., patients receiving treatment for psychotic disorders, family members of terminally or chronically ill patients; research involving active interference with human behavior aimed at changing it research involving active intervention in human behavior aimed at changing that behavior without direct intervention in the functioning of the brain, e.g., cognitive training, psychotherapy psychocorrection, etc. (this also applies if the intended intervention is intended to benefit (this also applies when the intended intervention is to benefit the subject (e.g., to improve his/her memory); research concerning controversial issues (e.g., abortion, in vitro fertilization, death penalty) or requiring particular delicacy and caution (e.g.,

concerning religious beliefs or attitudes towards minority groups) minority groups); research that is prolonged, tiring, physically or mentally exhausting. Our research is not done on people meeting the mentioned condition. Any of the researched people: any of them had limited capacity to be informed, any of them had been susceptible to psychological trauma and mental health disorders, the research did not concern the mentioned-above controversial issues, the research was not prolonged, tiring, physically or mentally exhausting.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the authors.

Conflicts of Interest: The author declares no conflict of interest.

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