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Exploring the Attitudes of Couriers in Crowdsourced Delivery Systems: A Study on Operational Challenges and Platform Dynamics

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Abstract: Crowdsourced delivery, a pivotal component of crowd logistics, represents a transformative model for optimizing logistics resources through the efficient allocation of available capacities, thus responding to the flexibility demands of contemporary businesses. At the heart of this model are digital platforms that facilitate the coordination of activities between couriers, users, and service providers. In Serbia, several prominent platforms stand out due to their advanced functionalities, extensive product offerings, and rapid delivery capabilities. Simultaneously, smaller platforms face significant challenges in maintaining competitiveness within an increasingly saturated market. Despite the numerous advantages offered by the crowdsourcing model, couriers engaged in this sector encounter a variety of obstacles that undermine its full potential. These challenges encompass issues related to working conditions, contractual arrangements, and the stability and security of courier incomes, all of which are essential to the sustainability of the system. A survey was conducted to gain an in-depth understanding of the couriers' perspectives on the operational dynamics of crowdsourced delivery. The study aimed to gather empirical data on the daily challenges faced by couriers, their working conditions, job satisfaction, and relationships with platform companies. Additionally, insights were sought into the overall functioning of crowd logistics systems from the perspective of the couriers, with a particular focus on identifying areas where improvements could be made to enhance the working conditions and status of couriers. The findings are expected to inform strategies that could mitigate the current challenges, thereby contributing to a more equitable and efficient model of crowdsourced delivery. This research highlights the importance of addressing the couriers' concerns as a critical step toward the optimization of crowdsourcing logistics systems and the enhancement of their long-term viability.

Keywords: Crowdsourcing logistics; Crowd platforms; Delivery; Distribution; Couriers; Attitudes

1 Introduction

The diversity of modern technologies has transformed numerous industries, including logistics. These kinds of advancements have also contributed to the development of crowdsourcing logistics, which is facilitated through collaborative platforms and mobile applications connecting individuals and companies with various contributors (travelers, movers, certified drivers, owners of unused storage spaces, etc.). The goal of this logistics approach is to maximize the utilization of available, idle logistics resources and capacities, thereby achieving greater efficiency in delivering logistics services. The primary role of technology in this delivery model is the creation of a centralized platform for managing deliveries. Applications provide real-time visibility throughout the supply chain, enabling communication, delivery tracking, and contactless payment solutions for drivers while allowing customers to track their products and provide feedback.

In Serbia, platforms apply crowdsourcing principles to offer a more flexible way of performing logistics services. These companies engage numerous independent workers who use their own resources and time to complete delivery tasks for various restaurants and supermarkets. This approach brings several advantages, including increased service availability, reduced costs, and faster deliveries. However, it also raises concerns about working conditions, safety, and the stability of couriers' incomes. Despite existing challenges, crowd distribution demonstrates significant potential to enhance delivery efficiency and sustainability. This model, as part of the sharing economy, enables modern solutions for home delivery and provides opportunities to optimize resource utilization. Further research

and development of this concept could help overcome current challenges and increase the success of crowd logistics in the future.

This paper explores how crowd distribution operates in Serbia through its digital platforms and examines the role of couriers, without whom this strategy could not be successfully implemented. A survey was conducted to understand couriers' perspectives on crowd distribution. The survey included 26 questions, with a sample size of 36 respondents, consisting of couriers. It was designed to cover various aspects of their work experience, such as time spent on the job, the average number of daily deliveries, working conditions, flexibility, logistics costs, and communication with the company. Analyzing these factors is essential to evaluate the current system's functionality and identify its strengths and weaknesses. The research aims to gain insight into couriers' experiences, better understand the practical functioning of the crowd logistics model, and define the main factors influencing couriers' satisfaction and efficiency.

The primary objective of this study was to gather information through a survey of couriers working for the mentioned companies about their daily challenges, job satisfaction, working conditions, and perspectives on the future of crowd logistics. The paper is organized as follows: Section 2 defines the concept of crowd distribution and provides a relevant literature review. Section 3 describes the crowd distribution platforms. The significance and role of couriers in crowd distribution is the focus of Section 4. The courier attitudes towards crowd distribution study, detailed in nine subsections, constitutes the core of Section 5. The paper concludes with final remarks in Section 6.

2 Crowd Distribution and Literature Overview

Crowdsourcing has gained a significant role in logistics, enabling companies to outsource logistics processes to individuals through the internet. This type of outsourcing is based on the idea that, on one side, certain individuals possess resources - financial, material, or intellectual - while, on the other, companies have specific needs, particularly in logistics activities such as transportation and storage. The connection between these two sides is facilitated by IT platforms in the form of websites and mobile applications. Crowd logistics relies on leveraging resources owned by large groups of individuals and firms, supported by digital platforms. It encompasses four primary types, distinguished by the services provided by their participants: crowd storage, crowd distribution (local delivery), crowd freight within a country or continent, and crowd freight as global delivery [1].

Crowd delivery operates through digital platforms that coordinate activities between service providers and users. Various courier engagement models exist, including self-scheduling models, centralized models, and models where couriers make deliveries as part of their planned movements. These models enable varying levels of flexibility and control, allowing for more efficient adaptation to the needs of both users and couriers. Crowd distribution relies on the transportation resources accessible to individuals and their logistics capabilities, such as picking up goods, driving, and delivering. These resources may include vehicles such as bicycles, e-bikes, scooters, motorcycles, cars, vans, public transportation, or even walking.

This strategy is particularly prevalent in highly populated urban areas, where dense city environments make it feasible to offer affordable, fast delivery services. Such services are especially attractive for delivering packages and distributing consumer goods like flowers, groceries, or meals prepared in restaurants. Crowd delivery connects sellers and private individuals with others who have free delivery capacity, creating a "win-win" scenario [1–6].

Crowdsourcing, the sharing economy, and the gig economy are interconnected and often overlap. The sharing economy is a modern socio-economic model that provides digital management of activities through which users gain temporary access to specific products or services. Key characteristics of this model include: sharing of limited-capacity resources, temporary access to resources instead of permanent ownership, direct engagement of large groups as part of both supply and demand, digitally coordinated economic activities with online platforms acting as intermediaries, reuse and activation of underutilized resources [7].

The gig economy, on the other hand, refers to a labor market reliant on temporary, contract-based, and freelance work. Platforms enable workers to offer their services to a broad audience, providing them with the flexibility to choose when and how much they work, one of the gig economy's key advantages. Essentially, food delivery platforms utilize crowdsourcing to organize deliveries, which form part of the gig economy, while simultaneously allowing users to share resources (e.g., vehicles) within the framework of the sharing economy. Together, these models contribute to creating a more flexible and efficient labor market and distribution network [2, 5, 7].

Crowdsourcing in distribution represents a model with numerous advantages and challenges, yet it holds significant potential for overcoming these challenges. The primary benefits of crowd delivery include real-time tracking of shipments and a high degree of flexibility for both delivery and pick-up of goods. This model is generally characterized by lower costs compared to traditional courier services, postal operators, and other logistics providers, as it eliminates the need for investments in vehicle fleets, employees, and warehouse spaces. Moreover, it offers high scalability, as the number of couriers can be easily adjusted to meet demand. Another noteworthy advantage is the wide range of couriers, including pedestrians, cyclists, car drivers, and even truck drivers [2–6].

In addition to cost efficiency, this model supports sustainability principles. From an environmental perspective,

crowd delivery can help reduce traffic congestion and emissions, contributing to environmental preservation. Socially, it creates employment opportunities for people who struggle to find full-time jobs or wish to earn additional income. Furthermore, crowd delivery facilitates the inclusion of local and smaller businesses in the logistics sector. However, the model also faces various challenges. General issues may include implementation difficulties due to inadequate technologies, poor planning, or execution failures. External factors, such as frequent changes in market conditions or unforeseen events, can negatively impact the success of crowdsourced operations [2–6]. For users, common concerns include service reliability (e.g., theft, loss, damage to goods, delays) and privacy risks, as personal information is shared with unknown individuals. For couriers, the most pressing challenges are related to safety and the lack of clear legal frameworks regulating their work [6].

Different aspects of crowd distribution are highlighted as key to its success, ranging from the people involved and the wide variety of products distributed to flexibility and fast delivery times [6]. These factors collectively enable the successful implementation of this concept, despite its challenges. Nevertheless, this model would not function without its core participants, platforms and couriers, who are essential to its operation.

A review of available studies on crowd distribution over the past five years reveals that while some still focus on basic characteristics of the concept, such as its advantages and disadvantages, more contemporary topics are increasingly being explored. These include sustainability, delivery performance, economic or financial aspects, scheduling, routing, and management. Table 1, presented below, provides examples of studies covering selected trends in crowd distribution.

Table 1. Literature review

Aspect	Paper Title	Reference	Year
Sustainability	A crowdsourcing renewable energy delivery framework with dynamic pricing and routing policy	[8]	2022
	Investigating crowd delivery businesses for sustainability	[9]	2023
	Crowdsourcing logistics in B2C e-commerce: A sustainability perspective	[10]	2023
Planning	Service and capacity planning in crowd-sourced delivery	[11]	2019
	Challenges and opportunities in crowdsourced delivery planning and operations	[12]	2022, 2024-update
	Strategic selection of crowd logistics platforms: A multi-criteria decision-making approach	[13]	2024
	Human resource dynamics in urban crowd logistics: A comprehensive analysis	[14]	2023
	Crowd logistics: A survey of successful applications and implementation potential in northern Italy	[15]	2022
	A novel survey-QFD-WASPAS methodological approach for designing crowd storage platforms: A case study of Serbia	[16]	2023
	Crowd logistics - A new concept in realization of logistics services	[17]	2019
Delivery Performance	Performance analysis of crowd-shipping in urban and suburban areas	[18]	2020
Scheduling	Optimal scheduling scheme for urban crowdsourcing distribution task based on path planning	[19]	2020
	A prescriptive machine learning method for courier scheduling on crowdsourced delivery platforms	[20]	2023
	Rolling optimal scheduling for urban parcel crowdsourced delivery with new order insertion	[21]	2024
Financial	Hybrid last mile delivery fleets with crowdsourcing: A systems view of managing the cost-service trade-off	[22]	2022
	A data-driven compensation scheme for last-mile delivery with crowdsourcing	[23]	2023
	Courier payout cash-flow prediction in crowdsourced e-commerce logistics: A hybrid machine learning approach	[24]	2024

It is evident that delivery personnel and couriers are rarely the main focus of research studies. For this very reason, the present study was conducted to examine their role and perspective.

3 Crowd Distribution Platforms

Platforms are a crucial tool for the success of the crowd distribution concept. Their role is to connect users with couriers and businesses, such as restaurants, supermarkets, pharmacies, and other companies offering their products via applications and websites. These platforms provide the technology enabling ordering, real-time tracking of deliveries, and route optimization. They also manage payments and offer support to both customers and couriers. The success of platforms primarily relies on mobile devices. By leveraging GPS technology, users can enjoy real-time tracking of their deliveries, while digital payment infrastructure ensures seamless and fast transactions on one hand and secures private information, such as bank card details, on the other. Introducing verification and review options further enhances the safety and transparency of digital crowd distribution platforms.

The use of various algorithms brings additional benefits. Some platforms utilize algorithms to assign orders to the closest available couriers, thereby enabling more efficient delivery, while API interfaces facilitate communication between users and couriers (e.g., through messaging or calls). Another notable feature of crowd platforms is their clusters, with B2C (business-to-consumer) and P2P (peer-to-peer) being the most prominent. At the time of this research, the B2C cluster dominates; however, as the market continues to develop, it is expected that these platform types will increasingly overlap and integrate [6].

3.1 Leading Crowd Distribution Platforms in Serbia

The leaders in the crowd distribution market in Serbia are Company 1, Company 2, and Company 3, as they possess more advanced platforms compared to their competitors in the Serbian market. Notably, Company 1 and Company 2 are international companies operating in multiple countries, while Company 3 is a young Serbian company. Company 1 was founded in 2014 and operates in over 170 cities across 25 countries, primarily in Europe, along with Japan. It has been active in Serbia since 2019 and is present in 27 cities nationwide [25]. Company 2, established in 2015, operates in 23 countries, primarily in Southern and Eastern Europe, as well as in Africa (Morocco, Uganda, Kenya, Côte d'Ivoire, Ghana, and Nigeria) [25]. Company 3, founded in Serbia in 2022, offers food delivery from over 1,200 restaurants and supermarkets. Although its platform is more modest in terms of features compared to Company 1 and Company 2, it competes equally in terms of business volume [25].

In addition to these leading platforms, Serbia hosts a variety of smaller companies engaged in crowd distribution. This raises the question of whether these smaller firms can operate successfully and sustain themselves in the market or eventually fall into the shadow of the dominant leaders. A quick internet search for food delivery services from restaurants or supermarkets reveals numerous platforms. Many of these platforms share similar features, including delivery price calculators, which allow users to select starting points and destinations within Belgrade municipalities.

Some platforms maintain highly updated websites with clear service offerings, while others are outdated, non-functional, or never fully launched. Some give the impression of being in the early stages of development. Compared to market leaders, these platforms are simpler, with fewer features and options. However, analyzing their offerings reveals that each platform has its strengths and weaknesses. Larger cities, with higher populations, enjoy the advantage of having more platforms available, providing users with more choices. Most platforms are relatively new and have room for improvement.

3.2 Courier Employment

Each platform includes a courier application form. The basic information required by every form includes the applicant's name, surname, phone number, location (the city where they will work), and the mode of transport they will use. Table 2 below presents the specific details requested in the application forms of these platforms.

Table 2. Application forms for couriers

Required Information	Company 1	Company 2	Company 3
Name and surname	✓	✓	✓
Phone number	✓	✓	✓
E-mail	×	✓	✓
Location (country/city)	✓	✓	✓
Date of birth	✓	×	✓
Mode of transport	✓	✓	✓
Previous experience	×	×	✓
Language	✓	×	×

Based on the provided table, it can be concluded that Company 2 requires the least amount of information to be filled out (as shown in Figure 1). Company 1 is the only one offering a language selection option, while Company 3 is the only platform that requests previous experience to be specified.

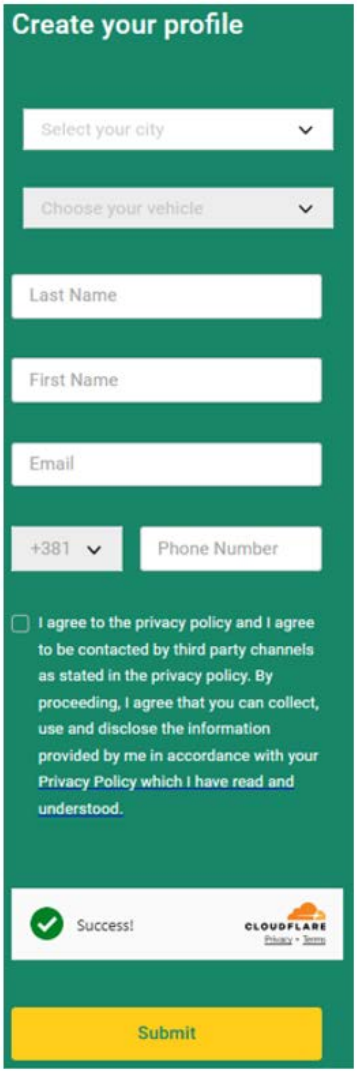

Figure 1. Application form for couriers [25]

Figure 2 illustrates how Company 1 highlights the benefits of working as a courier for their company. The key advantages they emphasize include competitive pay, flexible working hours, and excellent support during work.

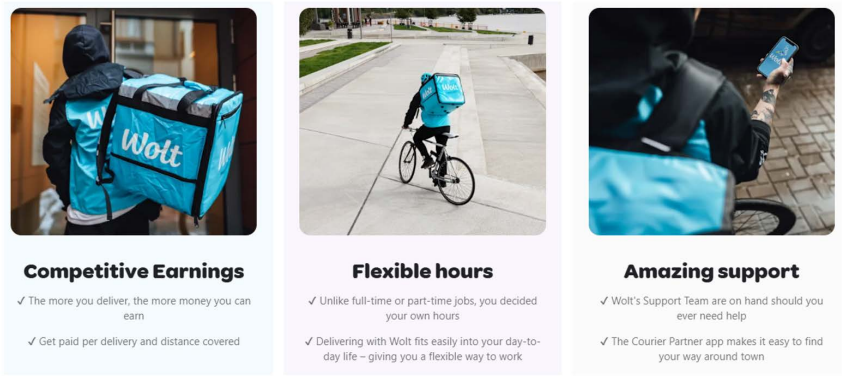

Figure 2. Some company benefits [25]

Additionally, Company 1's website provides information on the requirements for courier applications, which include the possession of:

- A car/bicycle/motorcycle,

- A valid driver's license,
- An ID card and proof of work permit,
- A smartphone with mobile internet access.

Moreover, a requirement is that couriers must be of legal age. As mentioned earlier, a significant advantage of Company 1 and Company 2 is that they have dedicated FAQ sections for courier applications (Figure 3). Company 1 has addressed questions regarding the duration of the application process, how their app works, any additional requirements, and what sets Company 1 apart from traditional delivery services. On the other hand, Company 2 has created a "Help Center" for couriers, which includes searchable FAQs categorized under: basic, profile, earnings, quality and achievement assessment, delivery with Company 2, problems, and benefits.

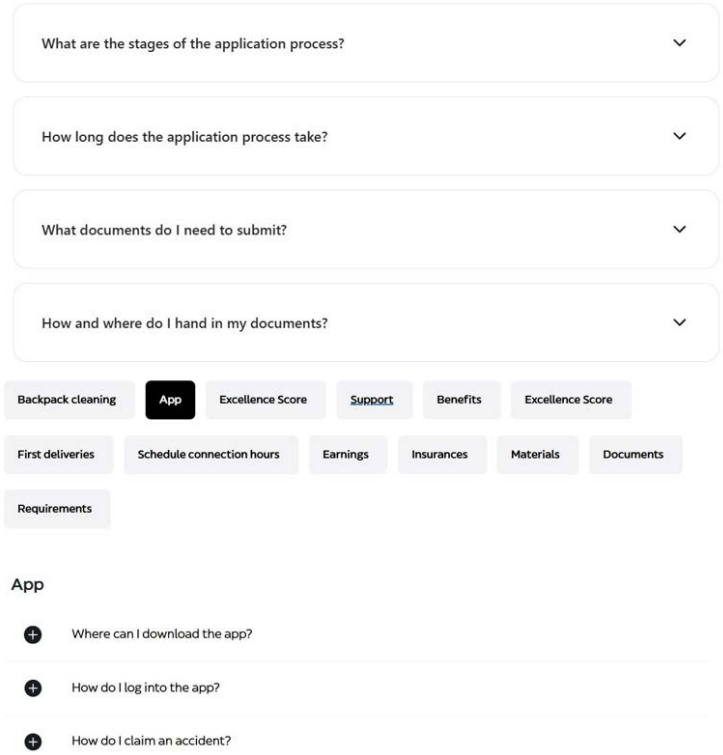

Figure 3. Company 1 and Company 2 FAQ for couriers [25]

It should be noted that couriers are actually referred to intermediary agencies and are not considered employees of Company 1, Company 2, or Company 3. As such, they can also be employed directly by the agencies. Figure 4 shows the application form for Company 4, which was founded in 2023 in Belgrade. Company 4 offers courier employment opportunities for Company 1, Company 2, Company 3, and Company 5 in the following cities: Belgrade, Novi Sad, Niš, Kragujevac, Subotica, Zrenjanin, Čačak, Kraljevo, Pančevo, Smederevo, and Smederevska Palanka.

Company 2 Campster is a digital platform where couriers from around the world can access online courses. This platform offers a wide range of training programs, related to the job, personal skills, or language knowledge. Additionally, couriers can learn how to use the Company 2 app, learn about road safety, participate in webinars, and more. The main categories of courses available to couriers are:

- Productivity,
- Management and Teamwork,
- Digital Skills,
- Personal Skills,
- Communication and Languages,
- Business Development,
- Wellbeing and Safety.

All companies offer some form of training, but this is often limited to certain teams or departments ("non-operational" employees), excluding workers such as couriers. It is crucial to focus attention on couriers and work on their development, training, and career advancement. They are also employees, and every company must prioritize ensuring the satisfaction of all employees. After all, it is they who enable the platforms to function successfully by connecting them with real users in the real world.

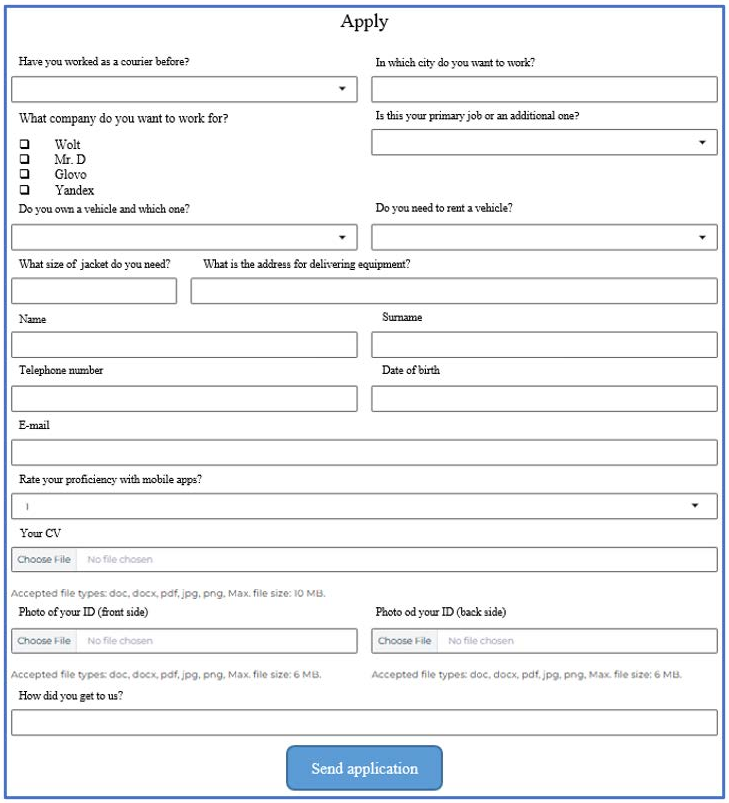

Figure 4. Company 4 application form for couriers [25]

4 The Importance and Role of Couriers in Crowdsourced Distribution

Companies that hire workers through crowdsourcing platforms do not consider them as permanent employees, but rather as independent contractors hired for short-term tasks ("gigs"). Couriers' earnings from working on platforms are monetary compensation for services rendered, but companies often refer to them as "work benefits." The majority of workers on these platforms have unclear or unregulated employment status, as their classification is not covered by clear legislation. They are typically categorized as independent contractors, which allows companies to avoid obligations that come with standard employment relationships, thus reducing labor costs. By doing so, companies avoid providing health insurance, paid vacations, or severance in the case of termination, while workers are left without protections. Although couriers are formally treated as independent workers, they are expected to work under conditions similar to regular employment, but without the rights that would come with a traditional employment relationship. This situation is consistent globally, regardless of the development level of individual countries [26].

A number of crowdsourcing platforms strictly control their couriers' work, setting service prices, routes, and providing detailed instructions. In order to meet desired standards, they also interview potential couriers. Conversely, some platforms give couriers the ability to create their own routes, pricing, working hours, and scope of work. While this flexibility is highly appealing to couriers, it also comes with a high level of financial uncertainty, as couriers are required to invest in work equipment, such as company jackets and backpacks. Additionally, couriers are responsible for securing and maintaining their own transportation, and their earnings depend on the number of completed deliveries, market demand, and the efficiency of the platform [2].

Given the issues outlined, the position of couriers remains a current problem that has been growing alongside the development of crowdsourced distribution. On the positive side, the fight for dignified work for couriers has already begun. Considering the specific nature of this employment relationship, an increasing number of initiatives are being launched worldwide to introduce a new category for couriers and similar positions. This would ensure that these workers receive a certain degree of legal and social protection (less than permanent employees, but more than the unemployed). Couriers would retain the flexibility offered by the sharing economy, but would also have security in case of injury, illness, or other unforeseen circumstances, representing initial steps in the fight for fairness for couriers [2].

One of the most recent developments, which promises progress on the issue, is that the International Labour Organization (ILO) published a report in January 2024 on achieving decent work in the digital platform sector. The report marks a key milestone in a process that could lead to a new international labor standard on decent work

in the platform economy. This will be discussed at the International Labour Conference in 2025 and 2026. The report provides up-to-date information on how countries are dealing with the opportunities and challenges created by the rise of this type of work, presenting an overview of existing regulations and practices worldwide. The report also includes a questionnaire through which governments are asked to provide their views on the shape, scope, and content of future labor standards [27].

This global issue is also present in Serbia, and the most significant project addressing this issue since 2021 is the Fairwork project. This research initiative aims to shed light on how modern technological changes are affecting working conditions worldwide. By evaluating platforms and employers based on fairness measures, the project participants seek to shape a more equitable future of work. The project is led by the Oxford Internet Institute and the WZB Berlin Social Science Center, and is present in 38 countries. For the past three years, Fairwork has submitted an annual report on fair work on platforms. In addition to analyzing the current situation, it is also useful to compare these reports to create a picture of potential improvements year by year. Platforms are evaluated based on five criteria/principles, each containing two components, as shown in Table 3. Each component carries one point, meaning that a total of 10 points can be earned.

Table 3. Principles and conditions of assessment

Principles	Evaluating Conditions		Points
1. Fair pay	1.1 Ensuring that couriers earn at least the minimum wage after delivery costs	1.2 Ensuring that couriers earn a wage that guarantees a dignified standard of living	2
2. Fair working conditions	2.1 Mitigating the risks specific to courier work	2.2 Providing a safety net to protect couriers' wellbeing	2
3. Fair contracts	3.1 Providing clear andtransparent terms and conditions	3.2 Ensuring that unfair contract terms are not imposed on couriers	2
4. Fair management	4.1 Ensuring proper procedures are in place for decisions that impact couriers	4.2 Ensuring fairness in the management processes and decision-making	2
5. Fair representation	5.1 Ensuring freedom of association and the expression of collective voice of couriers	5.2 Supporting democratic governance	2

For comparison purposes, the penultimate report from 2022 included Company 1, Company 2, and Company 3, with the following results [28]:

a) Company 1: 6/10 (points: 1.1, 1.2, 2.1, 2.2, 4.1, 4.2);
b) Company 2: 3/10 (points: 1.1, 2.1, 4.1);
c) Company 3: 0/10.

Company 1 was selected as the overall winning platform for 2022, due to its clearly dominant scores. The most recent report from 2023 considered the following platforms: Company 1, Company 2, and Company 3, with the following results [29]:

d) Company 1: 3/10;
e) Company 2: 3/10;
f) Company 3: 0/10.

Company 1 and Company 2 both received 3 points. Company 2 met the following criteria: 1.1, 1.2, 1.4, while Company 1 earned 2 points for fair management and 1 point for fair payments. Company 2 took the title of winning platform this year. Perhaps the biggest issue is that for the third consecutive year, no platform has managed to earn a point under the principle of fair representation, indicating that platform workers in Serbia lack a formal collective bargaining mechanism to represent and protect their rights. Another principle that platforms fail to comply with is fair contracts. Fair management earned a point because both Company 1 and Company 2 provided various communication channels between couriers and employees for support, such as apps, phone numbers, email, and in-person contact. Additionally, the complaint process regarding fines and disciplinary measures was improved and standardized. Company 2 is the only platform in 2023 to have taken steps to mitigate risks specific to couriers by providing safety equipment to workers, either through intermediary agencies or directly via the platform, without additional costs, and focused on other practices to reduce risks. Company 1 and Company 2 have demonstrated that their couriers earn at least the minimum wage, but they have not proven that they earn a living wage for a dignified life [28, 29].

It would be expected that platform scores would at least slightly improve year on year. However, the results show the opposite, which is highly discouraging. A major disappointment is that Company 3 has not earned a single point, the same result as in 2022 and 2021. Company 2 maintained its score from the previous year, not falling behind but also not advancing, leaving much room for improvement. Company 1 should urgently analyze why its score is

half of what it was the previous year. The question arises as to whether any platform deserves a passing grade. The main problem is that no platform can prove it respects labor conditions and employment contracts. This is because, in reality, no company employs digital workers. All companies shift their employment obligations onto employees, who are either falsely self-employed, hired by intermediary partner companies, or formally unemployed. These are some of the main causes of courier strikes in Serbia, such as the one in April 2023 [30].

To resolve the main issues, legal reform is necessary, but it is not the only solution. "Digital workers should be granted the right to form collective associations, which can be achieved through three different scenarios: the first, the expansion scenario, involves traditional unions expanding into new segments of the labor market through vertical or horizontal integration; the second, the community scenario, refers to the creation of parasindical organizations to protect the specific interests of this population; and the third, or corporatist scenario, involves the direct participation of digital workers in management without any form of collective action" [31].

5 Research on Courier Attitudes Toward Crowd Distribution

For the purposes of this paper, a survey was conducted consisting of 26 questions. The sample included 36 respondents, who are couriers working for leading platforms in crowd distribution in Serbia. It is important to note that while 40 couriers participated in the survey, 4 responses were not accepted due to validity concerns. The survey was created using Google Forms, and the couriers filled it out online. The research was conducted in the spring of 2024. The survey was designed to cover various aspects of their work experience, including time spent on the job, average number of deliveries per day, working conditions, flexibility, logistical costs, and communication with the company. Analyzing these factors is necessary to understand the functioning of the current system and identify its advantages and disadvantages from the couriers' perspective.

5.1 Demographics of Respondents

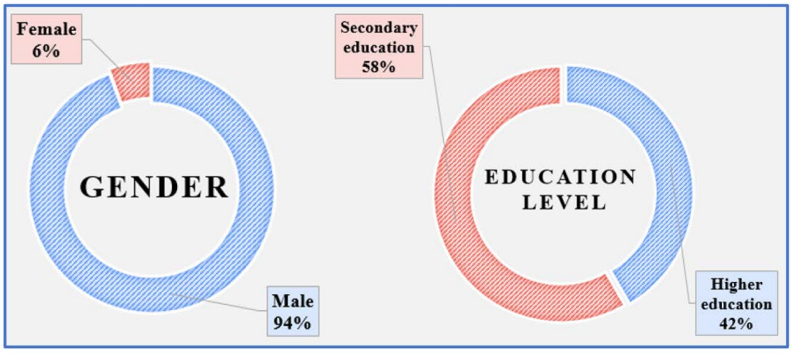

Figure 5. Gender and education level of respondents

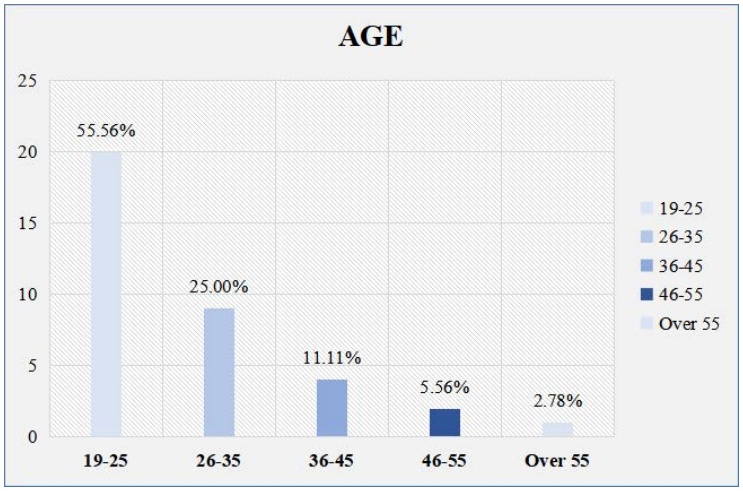

Figure 6. Age of respondents

Out of the total 36 respondents, only two were female (Figure 5). Notably, the majority of those working in this field are men. The largest group of respondents is between 19 and 23 years old, comprising just over half of

the respondents (55.56%). On the other hand, only one respondent belongs to the age group over 55 years (2.78%), while two respondents belong to the 46-55 age range (Figure 6). This supports the assumption that younger male individuals are more likely to engage in this type of work. When asked about their level of education, three options were provided: basic, secondary, and higher or university-level education. All respondents have at least a secondary level of education, and 58% of respondents have higher or university education.

The largest number of respondents works for Company 1, with couriers from Company 1 making up 67% of the sample. 5% of respondents are employed by Company 3. Couriers from Company 2 represent the remaining percentage of respondents, as shown in Figure 7.

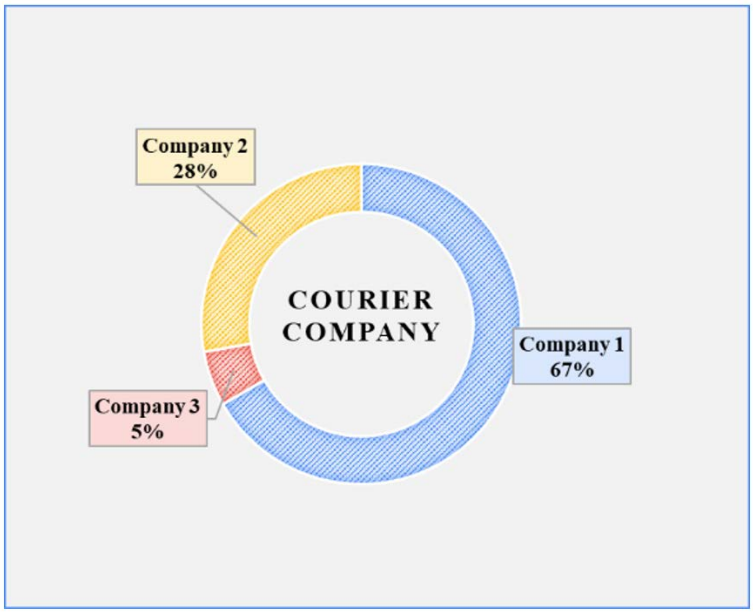

Figure 7. Share of courier companies

More than half of the respondents, specifically 53%, perform this job as their primary source of income without additional jobs or revenue streams. Six respondents are students who engage in this job alongside their studies, while five times more (30%) have another job in addition to this one, as shown in Figure 8.

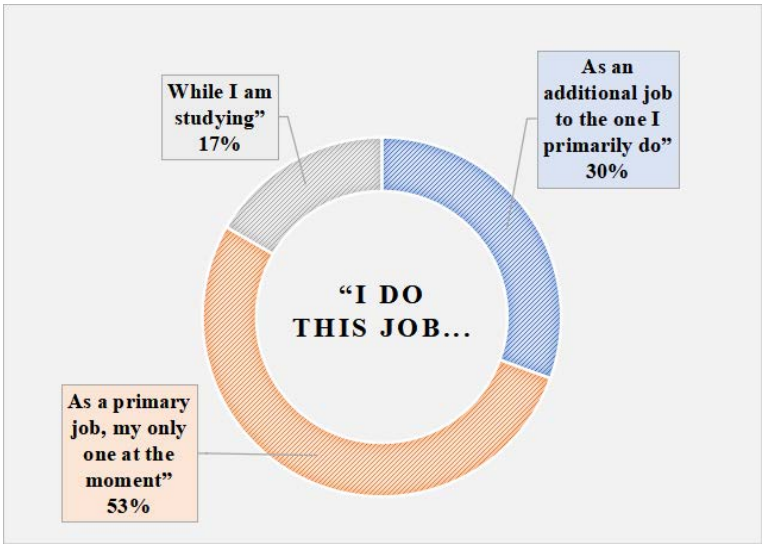

Figure 8. Courier employment

5.2 Skills and Training for Couriers

Figure 9 shows how long the respondents have been working as couriers. The smallest group consists of "newcomer" couriers who have been working for less than a month, while the largest group includes those who have

been working for over 6 months but less than a year. Interestingly, a quarter of the respondents, or 9 individuals, have been doing this job for more than 3 years. These 9 respondents come from all age groups: two are between the ages of 19-25, four are between 26-35, and one respondent is from each of the other age groups.

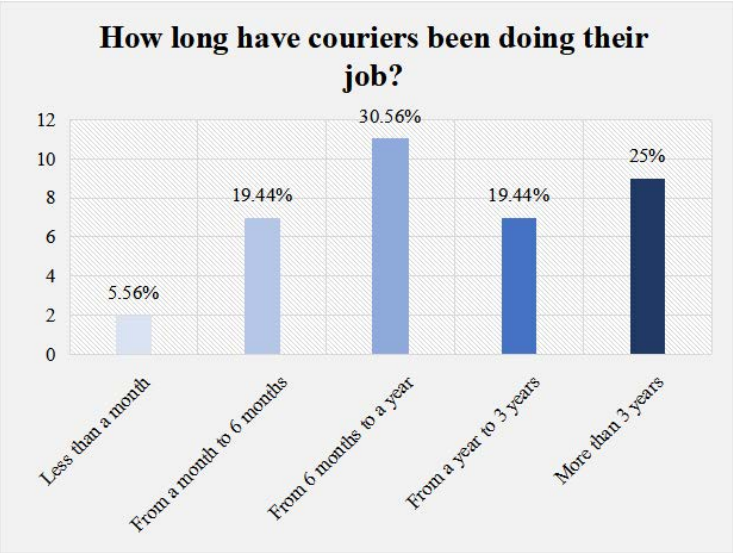

Figure 9. Employment duration

The purpose of the following two questions was to understand whether performing this job requires specific skills, and if so, which skills are necessary. As many as 25% of respondents believe that this job does not require any particular skills to be performed successfully (Figure 10). The remaining respondents primarily cite spatial awareness, particularly navigating the city (66.67% of respondents who believe the job requires skills), as well as knowledge of a foreign language (English) – 40.74%. Other common responses include possessing soft skills such as communication and politeness, experience, advanced driving skills, and patience.

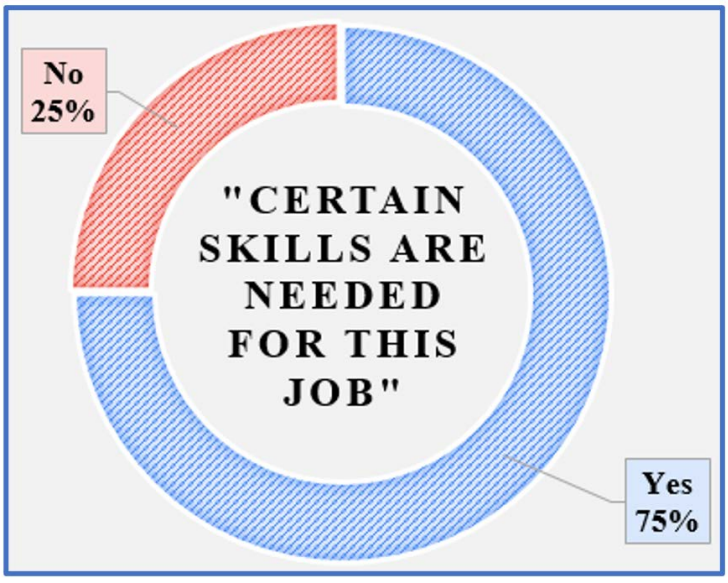

Figure 10. The need for skills

As many as 56% of couriers did not undergo any training when hired for their current positions (Figure 11). These respondents are employed by Company 1 or Company 2. This is an interesting finding, considering that the websites of these companies state that mandatory training is provided upon hiring.

Of the 44% who underwent training, the majority of respondents (43.75%) reported that the training lasted up to one hour. The shortest training mentioned lasted 15 minutes, while the longest lasted from one to two days. The respondent who provided the latter response has been working in this job for over three years. The distribution

of courier training durations is shown in Table 4. Regarding the training itself, nearly all responses focused on familiarization with the courier app. Some training sessions were in the form of presentations and videos, while others involved accompanying a delivery or several deliveries.

Table 4. Training duration

Training Duration	Number of Respondents	%
Up to one hour	7	43.75%
From one hour to one day	4	25%
From one to three days	3	18.75%
One week to two weeks	2	12.5%

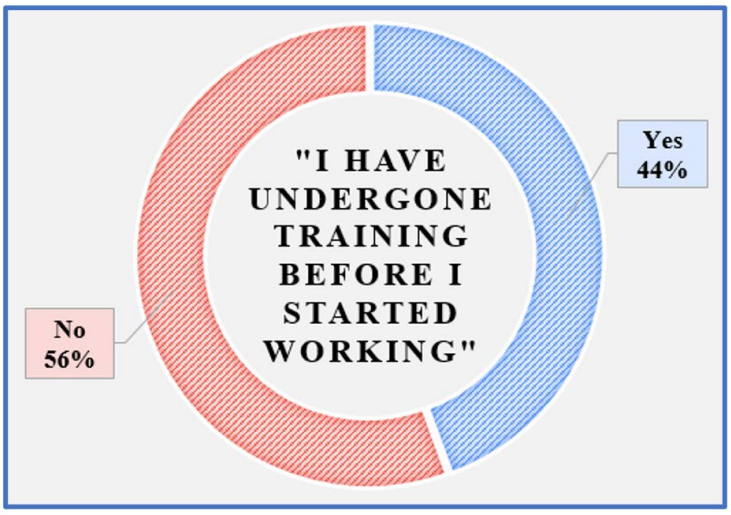

Figure 11. Courier training

By observing the duration of employment of couriers who underwent training when they were hired, a trend in training can be seen. Those who have been working for over 3 years, which corresponds to the early stages of platform operation in Serbia, mostly went through training. After that, the number of trained couriers decreased. In the last 6 months, however, the number of training sessions held for couriers has been on the rise (Figure 12). The reason for this may be either the increasing complexity of platforms and the applications used, necessitating training, or a growing awareness among companies about the importance of training couriers, possibly driven by the experience that trained couriers encounter fewer issues when starting the job.

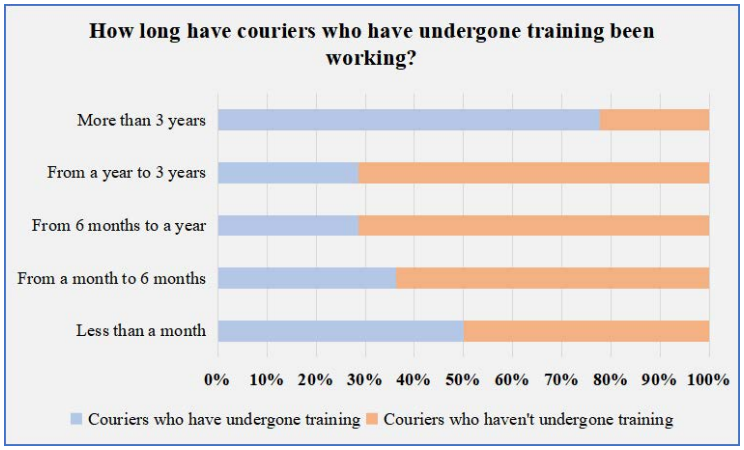

Figure 12. Comparison of working experience and training

Couriers use an application that differs from the one used by customers. Given that this application is an essential tool for performing courier tasks, it is important to assess their satisfaction with its functionality. The largest

percentage of respondents (41.67%) would rate the app's performance with a score of 4. The highest rating was given by 25% of couriers, while two couriers, making up 5.56% of the respondents, gave the app the lowest rating (Figure 13).

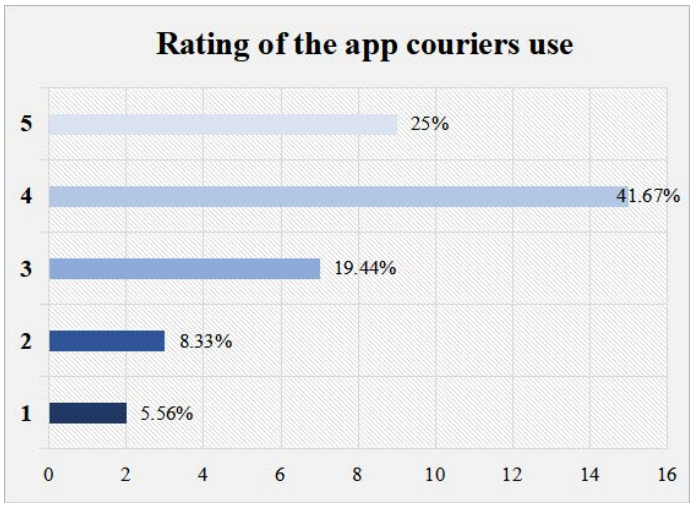

Figure 13. App ratings provided by couriers

If the chart from Figure 13, showing the ratings of the courier application, is broken down by the platform the couriers work for, a new chart is obtained in Figure 14. This allows for a comparison of the average ratings of the applications for Company 1, Company 2, and Company 3. Company 3 received the highest rating - 4, although this is based on a sample of only two respondents, so it is not as reliable. On the other hand, Company 1 and Company 2 are comparable, with Company 1 being rated significantly higher at 3.88, compared to Company 2, which scored 3.3.

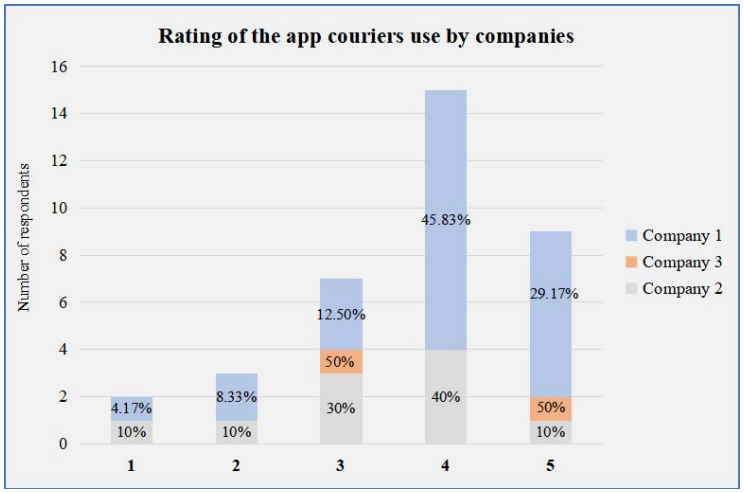

Figure 14. App ratings for Company 1, Company 2 and Company 3

5.3 Modes of Transportation

The next questions were related to the means of transportation used for deliveries. The first question aimed to investigate which vehicles are actually used by couriers, while the purpose of the second question was to ask couriers, based on their experience in the position, to assess which mode of transportation would be most suitable for the job. A convincing majority of the respondents use a car (58%), 17% use a motorbike as their mode of transportation, 19% use an electric bicycle, which is becoming an increasingly popular option for people in everyday life, while 6% of respondents own both a motorbike and a car and perform the job using both vehicles (Figure 15).

Exactly 55% of the respondents agreed that the most suitable mode of transportation for this job is a motorbike. In second place, the electric bicycle was chosen by 28% of the respondents. A car was selected as the most suitable mode of transportation for deliveries by 17% of the couriers (Figure 16).

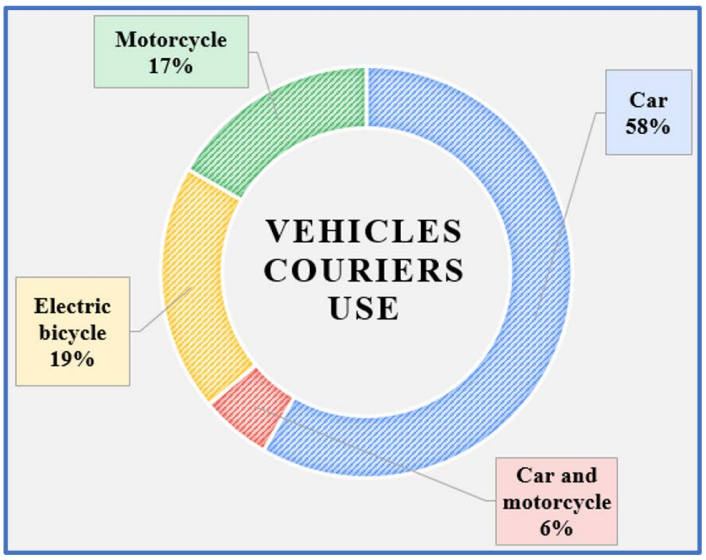

Figure 15. Vehicles used by couriers

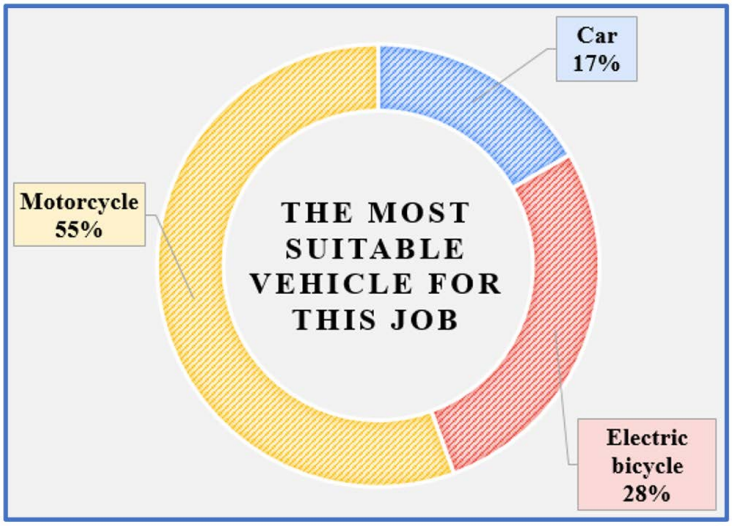

Figure 16. Courier opinion about the most suitable vehicle

In Table 5, the columns represent the modes of transportation that couriers actually use for deliveries, while the rows are filled with their opinions on which mode of transportation is ideal for the task. An interesting fact is that exactly 41.7% of the respondents use the same mode of transportation they consider the most suitable for performing their job. No motorbike or electric bicycle riders stated that they consider a car the most appropriate vehicle, while the majority of car drivers considered a motorbike as the most suitable resource for couriers.

Table 5. Used and most suitable modes of transportation

Used Modes of Transportation	Car	Car and Motorbike	Motorbike	Electric Bicycle
Car	6	/	/	/
Motorbike	11	1	5	3
Electric bicycle	4	1	1	4

5.4 Average Number of Hours and Deliveries per Day for Couriers

For further analysis, information regarding the average number of working hours and the average number of deliveries per day is essential. The average number of working hours per day for respondents is 9.2 hours (Figure 17).

The shortest working hours (4 hours and 5 hours) are recorded by those who have this job as a secondary occupation, meaning delivery is not their primary job. The longest working hours per day reach up to 16 hours. Over 12 hours per day are worked by 22.2% of respondents. The average number of deliveries per day is 24 deliveries. The fewest deliveries per day are reported by a respondent who made only 7 deliveries, while the highest average number is 50. The most common range of deliveries per day is between 20 and 30, accounting for around 57% of respondents.

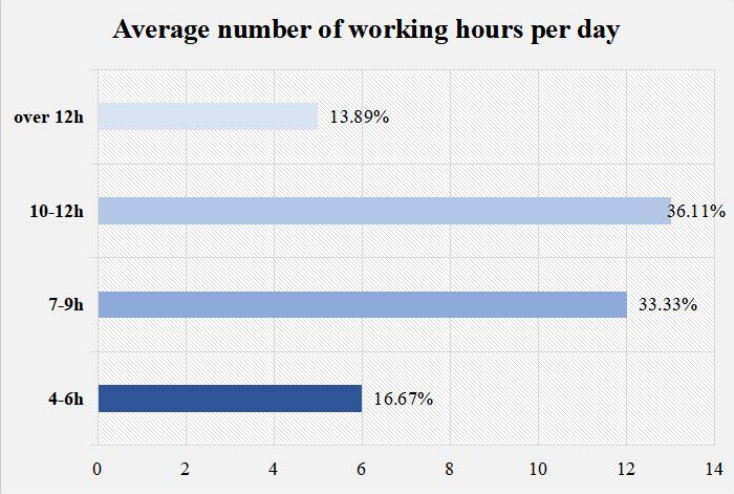

Figure 17. Average number of working hours

5.5 Satisfaction with Earnings and Reward System

The following question asked respondents to evaluate their agreement with the statement: "My salary covers my living expenses, and I consider it to be an adequate monetary compensation for the work I perform." As shown in Figure 18, the percentage distribution for each rating from 1 to 5 is presented. The majority of respondents rated the statement with a 3, the "neutral" or "middle" score, at 38.89%. Only one respondent (2.78%) gave a rating of 1. The average agreement score among respondents for this statement is 3.36.

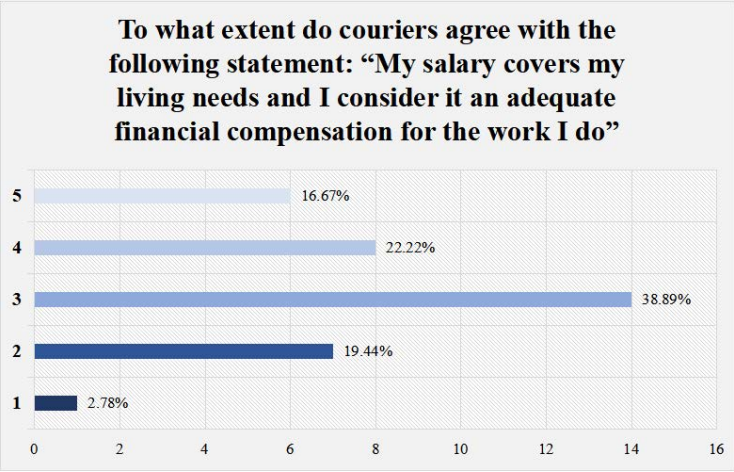

Figure 18. Salary satisfaction

In addition to salary, it is important to assess the significance of tips for delivery drivers. This is a job where tips are often given, but it is at the discretion of the customers. The importance of tips for couriers working for Company 1, Company 2, and Company 3 can be seen in Figure 19, where 1 represents the least significance and 5 represents the greatest. The highest percentage of responses is for a rating of 5. The overall average rating for the significance of tips across all 36 respondents is 3.58.

Figure 20 presents the average ratings from the previous two graphs (18 and 19) by age group. For couriers between the ages of 19 and 25, the adequacy of their salary and the significance of tips were rated approximately the same. In contrast, the next age group rated the significance of tips higher than their satisfaction with earnings.

Couriers aged 36 to 45 were the only group to rate satisfaction with their earnings higher than the significance of tips. There is only one respondent over 55 years old, so the ratings for this group are negligible.

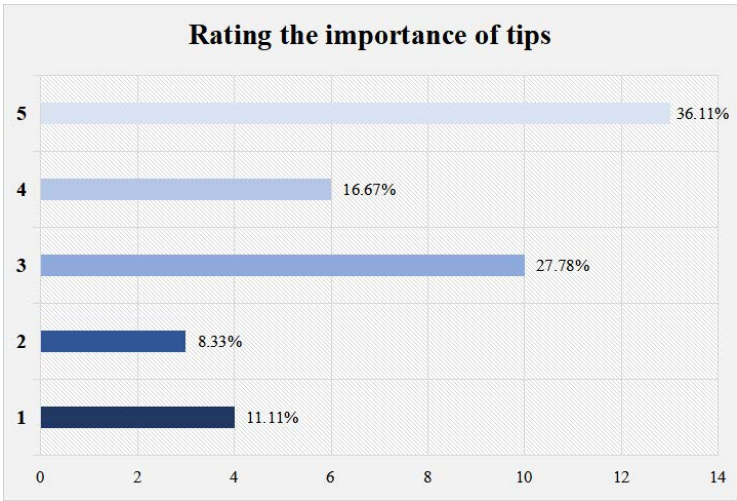

Figure 19. Tips significance

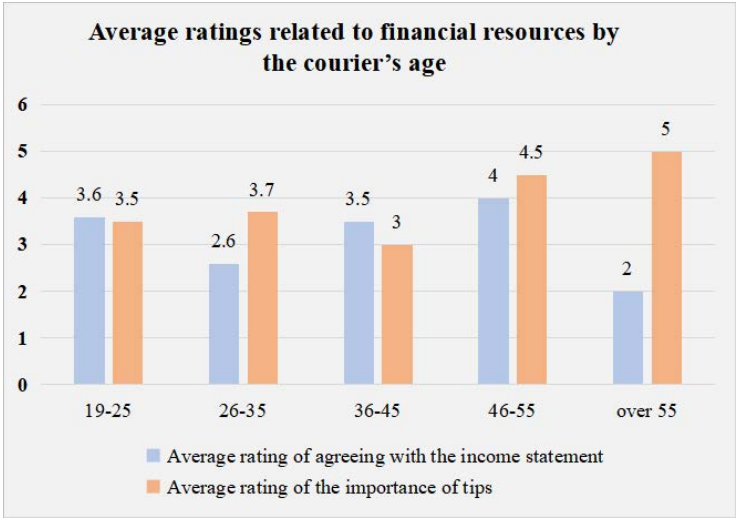

Figure 20. Salary ratings in different age groups

Reward systems play a significant role in motivating employees at all levels across various industries. A total of 89% of respondents indicated that a reward system is in place. The four respondents who answered negatively all work for Company 1. Many respondents were not precise when answering the question regarding the specific conditions that must be met to earn a reward under the system. However, it was determined that there are no daily bonuses, only weekly and weekend bonuses for those using motorized vehicles.

One respondent, employed at Company 1, provided the following information: the weekly bonus for 100 deliveries is 2,200 dinars, for 150 deliveries it's 2,800 dinars, and for 180 deliveries it's 13,000 dinars, meaning that for 180 deliveries, the total bonus can reach 18,000 dinars. The weekend bonus consists of 500 dinars for 25 deliveries, and 500 dinars for 45 deliveries, meaning a total of 1,000 dinars for 45 deliveries.

Another respondent, working for Company 2, shared the following details: for 140 deliveries, a bonus of 5,000 dinars is earned; for 185 deliveries, the bonus is 10,000 dinars; and for 205 deliveries, an additional 20,000 dinars can be earned. These figures apply to those using a car, as bonuses differ based on the type of vehicle.

Responses on how often respondents meet the requirements to earn these bonuses vary greatly. About 30% of respondents frequently earn bonuses, while 24.1% report rarely or never qualifying. The remaining respondents indicate that they usually meet the bonus criteria every other week or that it depends on the workload or their working hours.

5.6 Delivery Costs

It has already been mentioned that delivery drivers cover the costs of their deliveries with their total income. This includes vehicle maintenance and depreciation, fuel, parking, and similar expenses. The average percentage of these costs in relation to the total earnings of the respondents is 26.2%. As shown in Figure 21, the most common response from respondents is that the share of costs in their total earnings is between 30% and 35%. Only one respondent, who uses an electric bicycle, reported delivery costs of less than 5%.

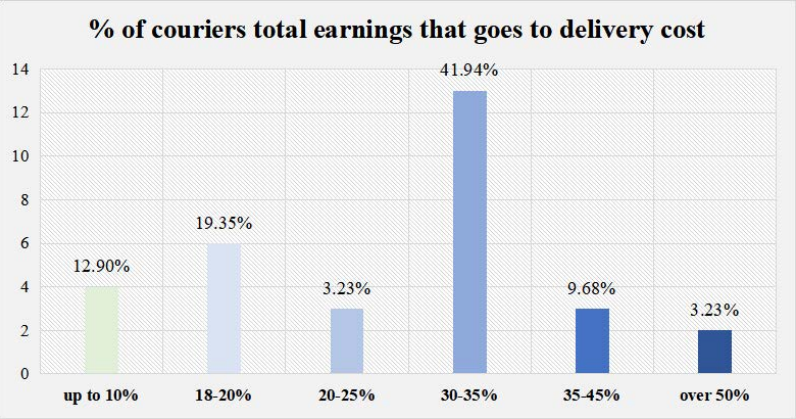

Figure 21. Share of delivery costs

For this question, 31 responses were considered, as 5 respondents did not provide the percentage of their earnings but rather specific monetary figures. Based on the provided data, the following can be noted:

- One respondent, who uses a motorcycle and works an average of 10 hours per day, spends 20,000 dinars per month on delivery-related costs.

- Another respondent, who drives a car and works an average of 8 hours per day, spends between 1,500 and 2,000 dinars on delivery costs per working day, which amounts to approximately 40,000 dinars per month.

It is assumed that delivery costs directly depend on the type of vehicle used for the deliveries. Figure 22 presents the structure of responses to these two questions. The average delivery costs when food is delivered by car are the highest, amounting to 30.65%. This percentage slightly decreases if the driver uses a car occasionally and a motorcycle at other times, with the average cost being 30%. The most cost-effective delivery option is for electric bicycle riders, with delivery costs amounting to just 11.5%, as they do not require fuel.

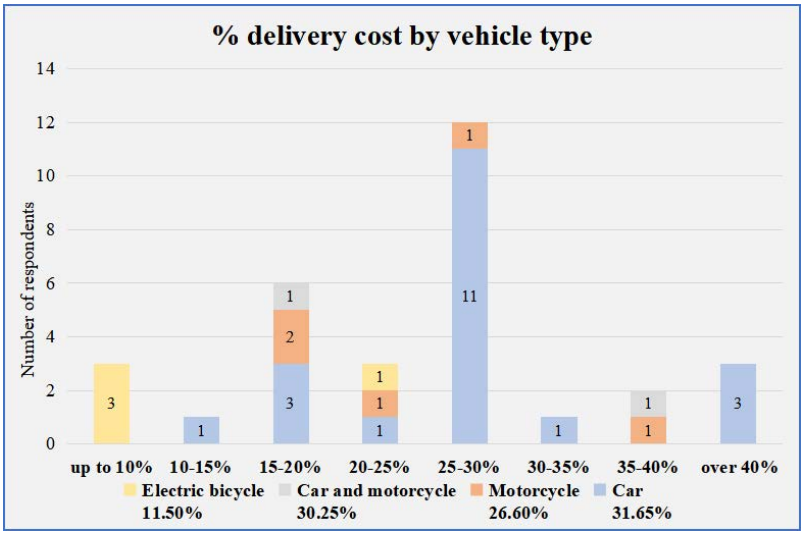

Figure 22. Share of delivery costs by vehicle type

If the average number of working hours per day is also taken into account, along with the delivery cost percentages and types of vehicles used, the structure shown in Table 6 is obtained.

Table 6. The average number of working hours, the type of transportation used, and the percentage of delivery costs

Delivery Cost	C	C+M	EB	M	Σ
Up to 10%			**3**		**3**
4-5h			1		
6h			1		
10h			1		
10-15%	**1**				**1**
7h	1				
15-20%	**3**	**1**		**2**	**6**
4h				1	
8h				1	
10h	1				
12h		1			
12+ hours	1				
14h	1				
20-25%	**1**		**1**	**1**	**3**
7.5h			1		
10h				1	
12h	1				
25-30%	**11**			**1**	**12**
5h	1				
6h	2				
7h	1				
8h	2			1	
10h	2				
12h	1				
13h	1				
13-16h	1				
30-35%	**1**				**1**
8h	1				
35-40%		**1**		**1**	**2**
10h		1			
11h				1	
Over 40%	**3**				**3**
7h	1				
8h	1				
12.5h	1				
Σ	**20**	**2**	**4**	**5**	**31**

Note: C - car, C+M - car and motorbike, EB - electric bicycle, M - motorbike

5.7 Potential Problems

To examine potential problems faced by couriers during delivery, the next question asked them to rate the following aspects of their job: stress, parking, traffic congestion, customer support for the courier app, work control, and communication with customers. Table 7 below shows the average ratings of these aspects on a scale from 1 to 5, where 1 indicates that the aspect is not a problem at all, and 5 indicates that it is an extremely important issue.

Table 7. Ratings of potential problems

Potential Problems	Average Rating
Stress	2.8
Parking	2.5
Traffic congestion	2.9
Customer support for courier app	2.75
Work control	1.5
Communication with customers	1.7

It can be concluded that traffic congestion is the biggest problem for couriers, though even this issue was not rated

as highly (2.9). Stress ranks second, although it was expected to receive a much higher rating given the working conditions, spending the whole day in traffic, etc. The groups that experience the least stress are the two oldest age groups, namely those over 45 years old. This fact may be linked to life experience. Interestingly, the youngest group of couriers, those between 19 and 25 years old, also do not perceive the job as stressful. The most stressed couriers are those between 26 and 45 years old. Parking was not rated as a significant problem, likely due to the large share of motorbike and electric bicycle users, while car drivers considered this issue more important. Communication with customers was not seen as a major issue, while work control, which essentially does not exist in a formal form, was considered to not pose any problem for the respondents at all.

5.8 The Care Companies Provide for Their Couriers

The extent to which companies care about employee satisfaction is reflected in the graph shown in Figure 23. Alarmingly, 27.78% of respondents rated their company's care with a 1, indicating a complete lack of concern, while only 5.56% rated their company's care for courier satisfaction with a 5, indicating exceptional care. Furthermore, 36.11% of respondents rated it a 3, reflecting a "middle ground" assessment. The overall average rating for how companies care for their couriers is 2.4, which aligns with expectations but highlights an area where companies should definitely focus on improvement.

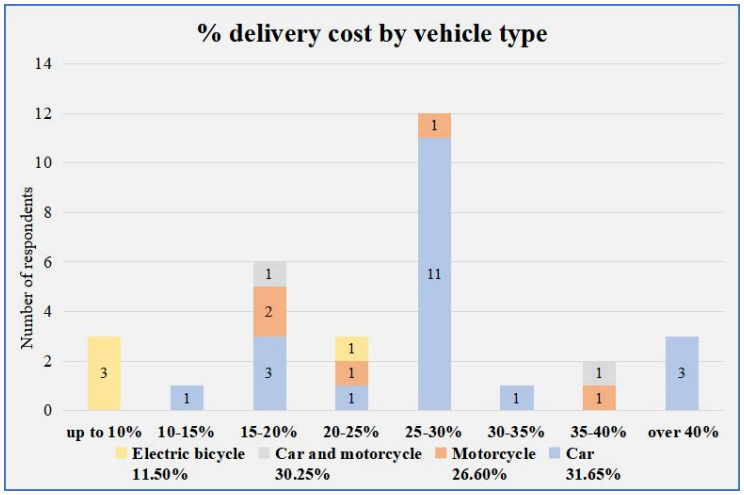

Figure 23. Ratings for company's concerns

Figure 24 shows the structure of ratings regarding how companies care for their couriers across specific companies, namely Company 1, Company 2, and Company 3. Similar to the evaluation of the app performance, the average rating for Company 3 is the highest (3.5), although this comes from only two respondents. The difference between Company 1 and Company 2 is negligible, with ratings of 2.33 and 2.4, respectively.

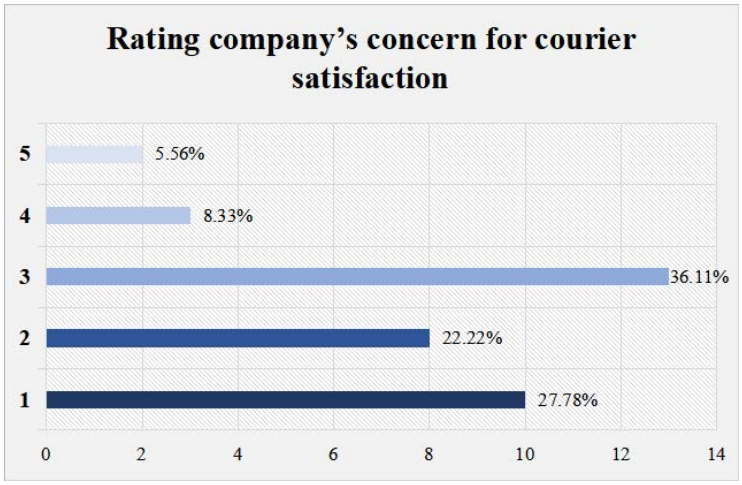

Figure 24. Concerns ratings for Company 1, Company 2 and Company 3

5.9 Advantages and Disadvantages of Being Courier

The last two survey questions gave respondents the opportunity to highlight the biggest advantages and disadvantages of their jobs. In Table 8 below, the most frequently mentioned advantages are shown along with the percentage of respondents who mentioned them. All 36 respondents listed one or two of the following three advantages: flexibility, good earnings, and the absence of a supervisor. It can be concluded that these three characteristics serve as motivators for courier work through platforms, with flexibility, specifically flexible working hours and the ability to organize one's own schedule, being the dominant advantage.

Table 8. Advantages of being courier

Advantages	%
Flexibility	66.67 %
Good earnings	30.56 %
Absence of a supervisor	11.11 %

As for the drawbacks of this job, the responses were more varied compared to the previous question. The largest percentage of couriers (22.22%) cited high financial costs, vehicle maintenance, or the constant decrease in income as the biggest drawbacks. If those respondents who mentioned difficulty in meeting the conditions for rewards were included, it would be found that nearly 28% of couriers associate the greatest disadvantage of the job with financial issues, either low earnings or high expenses. Interestingly, money is mentioned both as the main disadvantage and the main advantage. Other drawbacks mentioned include traffic congestion and parking (19.44%). This raises the question of why these aspects are not rated higher in the section on assessing potential problems. Additionally, other issues mentioned include waiting at restaurants, poor courier app support, safety, and physical and mental strain, among others. Furthermore, one respondent noted that the delivery zone is not regulated for bicycles, motorcycles, and cars, suggesting that deliveries in city centers should be assigned to couriers on bicycles and scooters due to parking issues. Several couriers also highlighted delivery allocation as a significant problem:

- "More deliveries within working hours."
- "Lack of a fair distribution of deliveries. For example, one person starts at 8 AM and another at 12 PM, yet they end up with the same number of deliveries at the end of the day. This should not happen."
- "Poor delivery allocation, long waiting times for deliveries."
- "The workday doesn't depend much on the couriers themselves."

Among the published papers, a number of them address delivery allocation algorithms, and this issue is already recognized as a problem in all countries where platforms operate, including Serbia. The question arises whether the issue lies solely with the algorithm, or if there is simply an excess of couriers relative to the demand for deliveries, making it impossible to achieve a high number of deliveries every day due to limited requests.

6 Conclusions

The analysis of companies involved in crowd distribution in Serbia has shown that this logistics model holds significant potential for further development and improvement. Market leaders in crowd distribution in Serbia, such as Company 1, Company 2, and Company 3, have set high standards in terms of service quality, delivery speed, and customer experience. Their success lies in their ability to engage a large number of independent workers, who use their own resources and time to complete deliveries. These companies have successfully built advanced platforms that enable real-time tracking of deliveries, communication between couriers and customers, and contactless payment verification. Additionally, these platforms are constantly evolving, regularly introducing new features to "attract" their users. However, it is essential for companies involved in crowd distribution in Serbia to continuously work on improving working conditions and providing support to their workers to ensure the long-term sustainability of this model. In the future, it is expected that crowd distribution will continue to evolve, keeping pace with technological innovations and changes in consumer habits. Although there are challenges to overcome, the potential for further development of this model is vast, making it an important segment of modern logistics.

The survey conducted provides insight into the functioning of crowd logistics from the perspective of the couriers themselves. A sample of 36 respondents answered 26 questions, ranging from general inquiries such as gender, age, and education level, to more specific questions about job satisfaction, training programs, potential problems, logistical costs, adequacy of transportation, and more. Overall, crowd models allow for a certain level of flexibility, but this comes with its own set of challenges for the couriers. Based on the data collected, it can be concluded that flexibility stands out as the biggest advantage of the courier job, as it allows couriers to organize their work and personal lives independently. Additionally, the lack of superiors is highlighted as an extremely positive aspect of the job. At the same time, there are several problems related to income insecurity, lack of benefits and insurance, and inadequate working conditions in certain situations. One of the key issues is income insecurity, which arises

due to fluctuating demand and the lack of guaranteed hours, as well as the allocation of deliveries by operators. Furthermore, many couriers expressed dissatisfaction with how problems are handled through courier customer support, traffic congestion, parking issues, and the physical exertion required by the job. The survey did not address problematic issues such as health insurance and paid leave, as these are known to be present.

The research has shown that there is a need for more effective communication between couriers and the companies they work for, as well as greater transparency regarding payment policies and working conditions. Improving these aspects could significantly contribute to increasing courier satisfaction and their loyalty to the platforms. This study opens up numerous areas for future research. Future studies should aim to increase the number of respondents. Additionally, testing the questionnaire in other markets could provide valuable comparative insights with Serbia. Moreover, it is necessary to identify factors (through statistical testing) that influence courier satisfaction. The application of other models and tools and the creation of hybrid models could also represent another direction for future research.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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