Journal of Urban Development and Management
https://www.acadlore.com/journals/JUDM

Human Resource Dynamics in Urban Crowd Logistics: A Comprehensive Analysis

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Received: 08-09-2023 **Revised:** 09-10-2023 **Accepted:** 09-17-2023

Citation: M. Andrejić, V. Pajić, and A. Stanković, "Human resource dynamics in urban crowd logistics: A comprehensive analysis," *J. Urban Dev. Manag.*, vol. 2, no. 3, pp. 135–144, 2023. https://doi.org/10.56578/judm020303.

Abstract: The advent of Information and Communication Technologies (ICT) has significantly revolutionized urban logistics, particularly through the emergence of crowd-sourced platforms. This evolution has engendered substantial benefits, including cost-effectiveness, enhanced delivery speeds, and environmentally sustainable practices. Yet, the unregulated nature of such platforms poses considerable challenges, especially in Human Resource Management (HRM) within crowd distribution networks. This study, in a groundbreaking exploration, examines the complexities inherent in HRM in the context of urban crowd logistics. It primarily focuses on employment dilemmas, training intricacies, and the intricacies of salary computation, thereby illuminating areas hitherto unexplored in existing literature. It is identified that both crowd workers and pldatform operators encounter significant challenges in effective human resource administration, marking a critical area of concern. The study further discerns the regulatory lacunae prevalent in this sector, proffering prospective remedial measures and advanced HRM strategies. Such insights are pivotal in augmenting the understanding of the interplay between human resources and crowd logistics, laying a foundation for both academic research and practical application. The paper, therefore, not only contributes to scholarly discourse but also offers pragmatic guidance for optimizing HRM in crowd logistics. This comprehensive analysis serves as a crucial resource for policymakers, industry stakeholders, and academics, charting a course for future inquiry and refinement in crowd logistics HRM.

Keywords: Crowd logistics; Distribution; Courier; Information and Communication Technologies (ICT); Human Resource Management (HRM); Urban area; Salary

1 Introduction

The proliferation of ICT has precipitated profound alterations in the dynamics of work and employment, leading to the emergence of novel professions and occupations [1]. This technological advancement has fostered the rise of more flexible work forms, which, in a majority of national legislations, remain outside the ambit of formal employment relationships. A distinct category of work, predicated on the utilization of online platforms, is the provision of crowd transport services.

In these crowd logistics services, the pivotal role of ICT is observed not only in communication with users but also in the coordination of workers executing these services. The absence of physical interaction with employers and peers, coupled with the lack of legal frameworks and performance-based remuneration, positions delivery workers in a challenging scenario regarding the realization of fundamental labor rights. Consequently, crowd transport service providers often resort to alternative employment relationship definitions, such as false self-employment or independent entrepreneurship. This phenomenon aligns with the surge in entrepreneur numbers, paralleling the increased integration of ICT in work processes. Furthermore, notable fluctuations have been observed in the logistics sector [2].

The primary focus of this study is an analysis of the legal position of employees in crowd transport. A comprehensive literature review has underscored a significant gap, given the scarcity of research addressing this specific topic. The objective of this research is to delineate the relationship between delivery workers and employers and to scrutinize the working conditions mandated by online platforms. Additionally, the study aims to explore the

concept of task performance and the requisite training for employees. This literature review identifies a conspicuous gap in addressing these issues. Thus, the principal contribution of this paper is to bridge this gap.

Structured into several sections, the methodology encompasses desk data collection and interviews with delivery workers. The ensuing section delineates the problem description. The third section delves into the employment and training of platform workers, a pivotal element in crowd logistics. The fourth section expounds on performance appraisal and bonus calculation. A case study is meticulously analyzed in the fifth section. Concluding remarks and directions for future research are presented in the final section.

2 Problem Description

Crowd transportation services, a subset of the broader category of crowd logistics, involve the utilization of individuals possessing transport capacity for home delivery tasks [3]. These services are facilitated through an online platform, functioning as an intermediary between the user and the service provider, specifically the delivery personnel. The development of such platforms encompasses a complex, multi-phase procedure [1]. The initiation of the crowd transportation service is marked by the ordering process, commencing with the creation of a user account on the platform. This phase necessitates the submission of personal information, including name, surname, and phone number, which, upon completion, authorizes the user's ordering capability. From the user's perspective, the service execution appears seamless, involving the selection of specific actions and desired products via the online platform. The synergy between courier services and a variety of restaurants and retail stores ensures that users typically receive their orders at their home address within an average time frame of 30 minutes post-ordering. The payment modalities for these services include both cash and electronic means, with the online platform overseeing the settlement of both the product's purchase price and the delivery fee. The successful conclusion of the crowd transportation service is marked by the delivery of the order to the specified address and the resolution of all associated costs [4]. However, the core of this research lies in examining the crowd transportation services from the standpoint of the engaged human resources. The forthcoming sections of the paper delve into a detailed exploration of their significance, roles, employment, and training, providing a comprehensive understanding of the human element in these services.

A digital worker is broadly categorized as an individual employing ICT for work-related tasks, with engagement through digital platforms being either primary or supplementary [5]. Three distinct categories of employees fall within the ambit of digital workers (referenced in Figure 1). The first category encompasses remote workers, or telecommuters, who are recognized in national legislation as employees and utilize ICT in their professional capacity. Remote workers are defined as individuals executing their tasks from home or another locale, autonomously and without direct supervision from their employer.

Figure 1. Digital workers categorization

The second category comprises freelancers. According to national legislation, freelancers are considered non-traditional employees who leverage online platforms as intermediaries for connecting with potential clients or employers. These individuals predominantly provide services in creative and multimedia industries, marketing, translation, IT, and consulting, utilizing ICT as a primary tool. Freelancers are characterized by their engagement with multiple employers, often without sustained continuity, representing the most flexible work arrangement in the contemporary landscape. They enjoy considerable autonomy in terms of working hours and the degree of supervision. A study by the Center for Public Policy Research reveals that Serbia hosts approximately 74,000 digital workers, ranking it highly on both a global and European scale in terms of the proportion of freelancers relative to the overall population and workforce [6].

The third category of digital workers encompasses platform workers, who are engaged via online platforms to deliver specific services, such as transportation or delivery. The relationship between these platforms and platform workers is notably more complex than a mere facilitation of supply and demand. It encompasses a sophisticated

system involving platform workers and owners, which, while not formally recognized as an employment relationship, contains many elements that typically characterize one.

Platform workers, akin to freelancers, enjoy significant flexibility in terms of work engagement, working hours, and supervision by platform owners. Despite this, they face considerable disenfranchisement. Unlike traditional employees, platform workers generally lack essential worker rights and are not covered by social and health insurance systems. This flexibility in work often translates into vulnerability in their relationship with employers. The contracts with platform owners, often subject to abrupt termination, are characterized more by obligation than by the protective nature of labor law. Furthermore, there is an evident need for the protection of platform workers during service provision and for the realization of their labor and social rights [5].

The concept of crowd logistics, particularly propelled by the recent surge in e-commerce, has garnered increasing attention in academic circles. A substantial portion of this focus pertains to food delivery within the sphere of crowd transportation. An extensive review of existing literature reveals that while there are studies on crowd transportation, none specifically address the issues outlined in this paper.

Zhen et al. [7] proposed six models to evaluate various operational modes of crowd transportation for parcel delivery. A detailed examination of last-mile delivery in on-demand food services was conducted by Seghezzi and Mangiaracina [8]. Their study, based in Italy, assessed the economic viability of these deliveries, concluding that free delivery, commonly associated with food services, is not economically sustainable. The findings also indicated that an increase in orders does not necessarily correlate with higher profits due to the escalated costs involved, and that variable earnings could potentially enhance platform profitability. Further research into the delivery performance in crowd shipping, including the factors influencing it, was undertaken by the study [9]. This study aimed to identify critical factors impacting each stage of the delivery process, from bidding to completion. A multi-objective model, considering company costs, customer satisfaction, and courier earnings in crowd transportation, was introduced by the study [10]. The implementation of this model indicated a potential reduction in costs by 3.4% and an improvement in delivery speed by 42%, which is particularly significant in urban dispatching scenarios. The intersection of regulations and the economic integration of ride-sourcing with on-demand food delivery platforms was analyzed by the study [11]. Additionally, the Analytic Hierarchy Process (AHP) method was employed by the study [12] to evaluate crowd logistics solutions from various stakeholder perspectives, resulting in a benchmarking list of optimal solutions. In a study paralleling the focus of this paper, van Doorn [13] scrutinized the labor politics and wage calculations of on-demand food delivery couriers in Germany. Beyond transportation, the emerging field of crowd storage was explored by Stanković et al. [1], who developed a Survey-Quality Function Deployment (QFD)-Weighted aggregated sum product assessment (WASPAS) methodology for designing a crowd storage platform. Lastly, Ćorović et al. [14] assessed the quality of crowd logistics services in Serbia, finding high user satisfaction but acknowledging room for further enhancement.

3 Employment and Training of Platform Workers

In the domain of self-advertising platforms, there is a notable prevalence of employment offers for platform workers, particularly couriers. These platforms commonly feature application forms requiring candidates to provide personal details, specify the country for their delivery services, their choice of vehicle, and their availability in terms of weekly free hours. This trend underlines the significant and growing demand for human resources in this sector, especially paralleling the expansion of e-commerce.

The relationship between a platform worker and the platform is often multifaceted and intricate. Platforms may supply basic work resources such as a transportation vehicle, a phone or tablet, and occasionally a uniform. More frequently, however, workers are required to furnish these essentials at their own expense. The majority of platforms stipulate prerequisites for courier employment, including being of legal age, possessing a personal mode of transportation along with a valid driver's license, and owning a smartphone with mobile internet. A work permit is also essential. While work experience and specific certificates are not mandatory, knowledge of at least one foreign language is considered advantageous. In some cases, platforms may charge a membership fee for access, although this practice is less common [5]. Attracted by the prospects of flexibility and competitive earnings, many individuals are drawn to these job opportunities. Nevertheless, the actual working conditions for platform workers often diverge from expectations. Upon registering on a platform, workers typically receive an email containing instructions for the subsequent stages of the hiring process.

The instructions provided to platform workers typically include guidance on liaising with partner companies, often courier services, with which they enter into fixed-term or occasional/temporary job contracts. Consequently, couriers are regarded as employees of these intermediary or partner companies, not of the platform itself. This arrangement presents a significant challenge, as it involves working for a foreign employer who may neither have a physical presence nor be registered in the courier's home country. The complexity is further exacerbated when partner companies terminate contracts shortly after their inception. This leaves workers with platform access, but without any formal oversight of their rights or activities.

Upon entering a contract with the intermediary company, the next phase involves training, for which the partner company is responsible. This training primarily focuses on familiarizing the platform worker with the mobile application, exclusive to couriers. The application's user interface is designed to display new delivery assignments, and incorporates features such as reports, calendars, and the courier's personal profile. Additionally, the interface includes access to a list of orders and an active city map where couriers operate. This map visually represents the courier's gravitational zone in green, delineating the area within which the courier is tasked to pick up and deliver parcels. Figure 2 illustrates the application's user interface and the corresponding active city map.

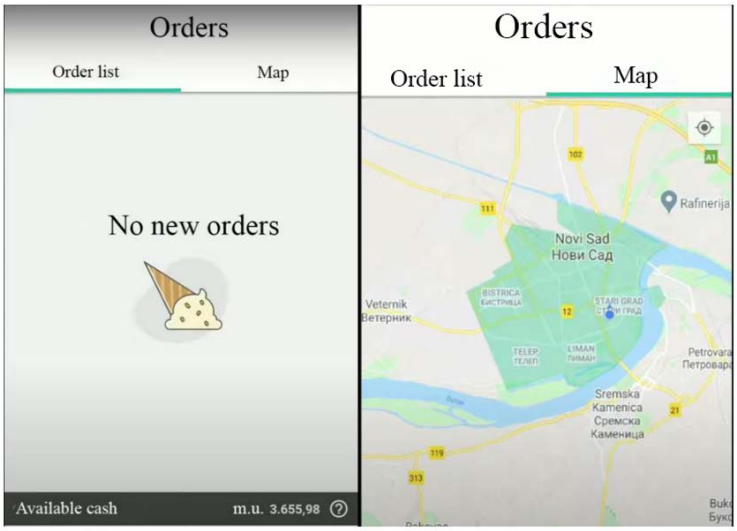

Figure 2. User interface and active city map

Within the application's main menu, the Calendar option enables couriers to bid for future working hours, typically three to five days in advance. This feature is designed to facilitate efficient scheduling and optimal utilization of courier services. The working hours already bid on and successfully reserved by a courier are highlighted in green. In contrast, hours rendered unavailable due to the fulfillment of the required number of couriers are marked in gray. Meanwhile, hours still open for bidding are indicated in white. An additional feature within the Calendar is the Summary field. This component provides couriers with a comprehensive overview of their scheduled hours, including both those bid on and those designated for delivery tasks. Displayed in Figure 3, the Calendar's interface, including the Summary field, also features a distinctive diamond icon adjacent to the bid hours. This icon signifies periods of peak demand for delivery services, as determined by the partner companies of the platform owner, which may include entities such as restaurants and retail stores. The icon serves as a guide for couriers to identify potentially high-demand time slots, facilitating strategic planning of their work schedules.

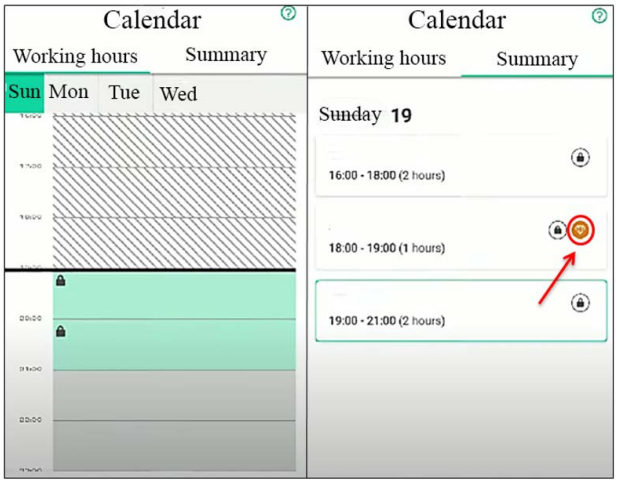

Figure 3. Calendar and Summary options in application

The "Reports" option in the application's main menu is a pivotal tool for couriers, enabling them to monitor financial details of their completed deliveries. This feature is divided into short-term and long-term reports. Short-

term reports offer a snapshot of financial transactions, including the starting cash balance, corrections, tips, the current cash balance, and earnings, categorized by days for the last three working days. In contrast, long-term reports cover the same financial aspects but extend over the last 15 working days. This differentiation allows couriers to track their finances over varying time frames, providing both immediate and extended financial insights (Figure 4).

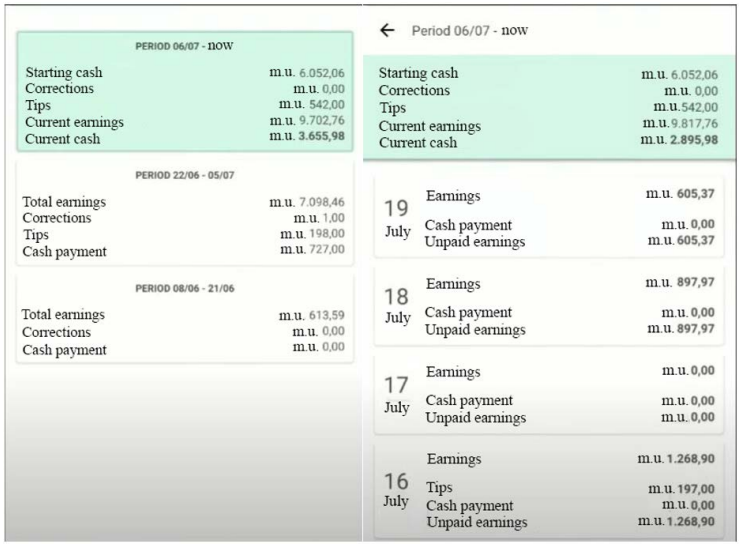

Figure 4. Short-term and long-term reports

In the process of accepting and executing deliveries, the platform's algorithm assigns a specific delivery to a courier, who then has the discretion to accept or reject it. Upon assignment, the courier's device displays key information: the pickup location, marked by a green circle (as shown in Figure 5), and the delivery destination, typically indicated by a yellow circle. Additionally, details regarding the total distance of the delivery and the earnings associated with it are provided. This setup allows the courier to make an informed decision based on the locations involved and potential earnings. Upon accepting the delivery, further details regarding the type and quantity of goods to be delivered are disclosed. The courier can then choose to proceed with or decline the delivery. Once the delivery is accepted, the algorithm suggests an optimized route to enhance the efficiency and speed of the delivery. The courier, after collecting the delivery from the retail store, is required to confirm the pickup in the application and report their location. A similar confirmation process is repeated upon delivering the order and receiving payment from the customer.

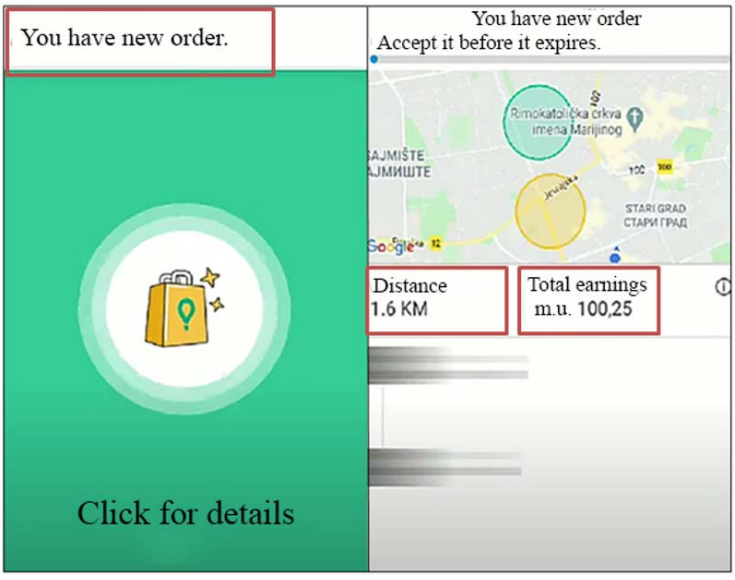

Figure 5. Delivery information

The application now includes an updated feature enabling couriers to communicate with service users via chat

during the delivery process. Couriers also have the option to customize their profile within the application. Visible to users, the courier's profile displays their photo, phone number, average user ratings, and the total distance they have covered. Another significant option within the courier application is the provision to contact support in case of traffic incidents or other emergencies during delivery.

In addition to application usage training, couriers are instructed on how to effectively utilize thermal-regulated backpacks for deliveries. This training encompasses guidelines on attaching and securing the backpack to their transportation mode, organizing food within it, and other related tips. Furthermore, couriers receive advice on handling various operational challenges, including managing multiple or express deliveries, dealing with absent users at delivery locations, or addressing discrepancies between the bill and the application's listed price. The entire training process is designed to be concise, lasting approximately 30 minutes.

4 Performance Appraisal and Bonus Calculation

The performance monitoring system for platform workers operates through a computer algorithm, intensifying the challenges they face. This algorithm conducts a comprehensive assessment of courier efficiency, tracking metrics such as willingness to work, task refusal, delivery punctuality, and customer feedback. However, it evaluates performance based purely on data, often disregarding the contextual circumstances of the tasks. For instance, if a courier fails to engage during their scheduled hours due to illness or work-related injury, the algorithm assigns negative points, neglecting the validity of their absence. This practice contradicts the legal entitlement to sick leave, highlighting the stringent working conditions platform workers endure, where accruing negative points is considerably easier than earning positive ones.

Accumulation of excessive negative points, resulting in a rating below the required average, leads to couriers losing priority in job offers and work hour bidding. In severe cases, this could even result in sanctions, including restricted access to the platform. A potential solution to mitigate this issue is the mandatory provision of comprehensive information to platform workers regarding the algorithm's functioning. This includes details on task assignment and performance evaluation methods. Such transparency would enhance workers' understanding of their responsibilities, promoting a more cautious and responsible approach to their tasks.

The punitive system for platform workers is rooted in a paradox, especially when considering their primary motivation for job selection. A 2020 study on delivery drivers' motivational factors highlighted work flexibility and a sense of freedom as key incentives. However, the algorithm designed to enhance efficiency and optimize operations also significantly increases employer oversight, leading to potential issues. The algorithm, while streamlining the work process, potentially intensifies the workload and engages in what could be considered unlawful surveillance. This is manifested not only through more invasive monitoring than that typically exercised by traditional employers but also by limiting the freedom to select tasks. Refusing tasks, even for legitimate reasons, can result in allocation of less favorable jobs and reduced work opportunities, thereby rendering the perceived autonomy of platform workers illusory. They find themselves obligated to be constantly available to meet the algorithmic standards. Such working conditions subordinate them compared to traditional employees, often leading to overburdening. During shifts, platform workers are constantly engaged in tasks that must be completed within very short time frames. Interviews with couriers revealed that they are permitted to reject only a small fraction (10%) of job tasks based on the total number of deliveries completed that day. Consequently, a courier can decline merely one delivery out of every ten without incurring negative points. Additionally, interviews with bicycle couriers have uncovered that they are often assigned deliveries beyond their capacity, involving heavy or bulky items. This not only demands increased physical effort but also poses significant risks to their health and safety, contributing to a higher incidence of traffic accidents among couriers.

Reward systems for platform workers predominantly favor the most efficient couriers, contingent on the specific business policies of the platform. Well-established platforms like Glovo and Wolt incentivize couriers with bonuses for completing a set number of deliveries within a defined time frame. For instance, couriers are offered bonuses for accomplishing at least five deliveries within a two-hour window [15]. Interviews with couriers reveal that while reaching this efficiency level is feasible, the algorithm often assigns deliveries covering greater distances, thus consuming more time. Another bonus model requires completing 130 deliveries per week. As per couriers' accounts, this target necessitates daily activity, with each day involving up to 12 hours of work. The bonus for meeting this weekly quota varies between 13,000 and 15,000 monetary units (m.u.), depending on the platform. Beyond platform-provided bonuses, couriers can also receive tips from customers, though the amount and frequency of these tips fluctuate and are not entirely within the courier's control. Furthermore, high user ratings for couriers translate into potential assignment of less demanding tasks by the algorithm. Platforms also engage couriers with additional earning opportunities through challenges based on the number of deliveries within certain time frames, encouraging promptness and efficiency. A 2020 study highlighted couriers' growing dependency on their phones and platforms, noting that achieving platform-set goals often brings a sense of personal accomplishment, and the pursuit of higher earnings further amplifies this dependence. To systematically outline the various aspects of reward

and penalty systems for platform workers, Table 1 is provided. This table delineates the different incentives and challenges faced by couriers, offering a comprehensive overview of the reward mechanisms in place.

Table 1. Reward and penaly measures

Penalty System Measures	Reward System Measures
The achievement of negative points assigned by the algorithm and the user; Assignment of more difficult work tasks; Banning access to the platform.	Achievement of positive points assigned by the algorithm and the user; Assigning easier work tasks and priorities in bidding working hours; Achieving bonuses and challenges (130 deliveries per week, individual challenges); The possibility of receiving a tip.

5 Earning Calculation – Case Study

The mobile application equips couriers with the capability to track and confirm their earnings from completed deliveries. Displayed in Figure 6 (on the left side) is an example of selected hours for a specific courier. On some online platforms, couriers receive a fixed wage, typically averaging 180 m.u. per hour, independent of the number of deliveries completed during that time. Additionally, each working hour is subject to a corrective factor, which varies between 1.5 and 2. This factor is applied to the variable earnings for each delivery carried out within that hour, effectively augmenting the courier's income based on delivery performance. Moreover, during certain hours characterized by more dynamic delivery activity, couriers have the opportunity to earn extra bonuses. These periods are distinctly marked with a diamond symbol in the application, signifying the potential for additional earnings associated with those specific hours.

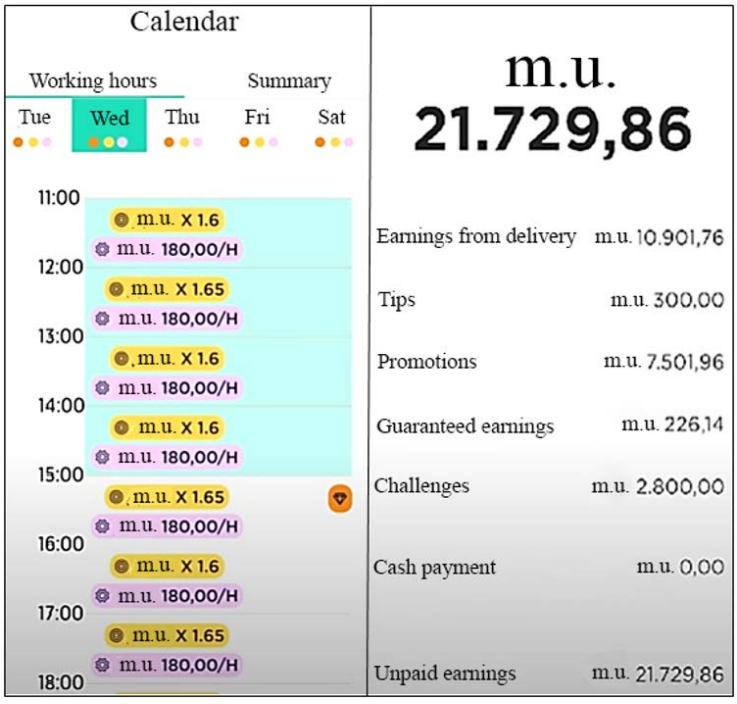

Figure 6. Achieved earnings per hour

In Figure 6 (right side), the application provides a detailed display of a courier's total earnings over a specific time frame, breaking down the various components. The displayed delivery earnings reflect the total amount accrued from individual deliveries. Additionally, this total includes tips, which in the illustrated case amount to 300 m.u., and earnings from promotional activities, denoted by the diamond symbol. The challenges, tailored by the online platform for each courier based on their performance, further contribute to earnings. Figure 7 showcases a notification sent to a courier's account, designed to incentivize them to complete 67 deliveries within 7 days to earn an additional 2,800 m.u. Based on calculations, this target requires the courier to work approximately 4.5 hours daily throughout

the week. It is observed that with each successive challenge, while the potential earnings increase, so do the delivery requirements. This scenario raises critical questions regarding the limits of courier efficiency and their capacity to continually meet these escalating challenges. Such considerations are crucial in understanding the balance between incentives and the practical workload for couriers in the platform economy.

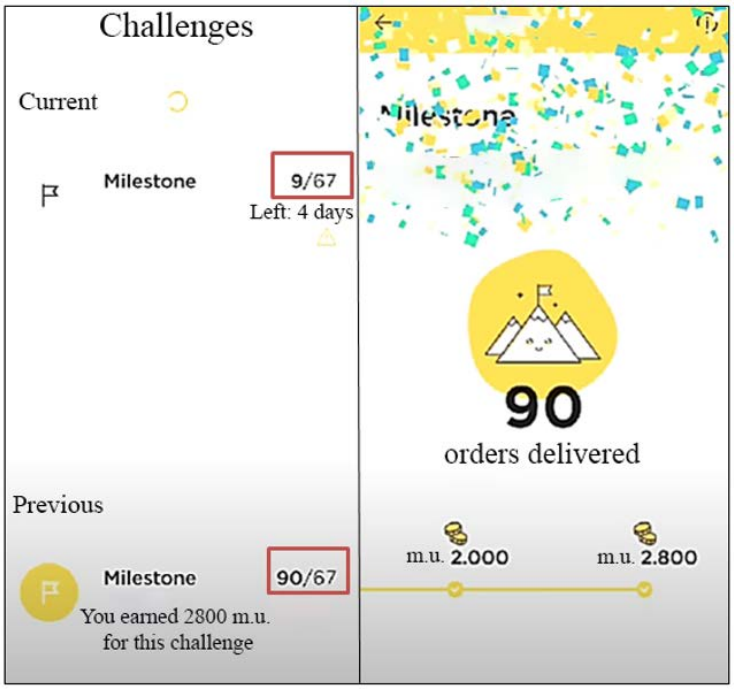

Figure 7. Challenges in the application

The application offers couriers a comprehensive view of all individual orders for a chosen working day, as depicted in Figure 8. This feature enables platform workers to not only verify earnings from each specific delivery but also to review additional vital details. These include the distance traveled for each delivery, the pickup and delivery locations, and the contents of the deliveries. Such information is integral to understanding the financial implications of each order, as these factors directly influence the earnings derived from every delivery task.

In Figure 8, a specific delivery highlighted in red illustrates an earnings calculation that resulted in 228.44 m.u. This calculation is composed of several elements: the base tariff of 55 m.u., the distance covered during the delivery multiplied by a rate of 30 m.u. per kilometer, and the waiting time at the pickup location multiplied by a rate of 3 m.u. per minute. It is noteworthy that the first five minutes of waiting are considered standard, with each additional minute accruing extra charges. The aggregated value from these components is subsequently enhanced by the application of a corrective factor, which is specific to the hour in which the delivery was made. Any tips or bonuses earned during that particular delivery are then added to this base value. The methodology behind this earnings calculation is further elucidated through Eq. (1), which systematically outlines the practical aspects of this computation process.

$$\begin{aligned}(Base\ tariff + number\ of\ kilometres\ km) * m.u./km + waiting\ time * m.u./min)* \\ corrective\ factor + tips + bonus = (55m.u. + 1,6km * 30m.u./km + 12min * 3m.u./min * 1,65 \\ + 0 + 0 = (55m.u. + 47,55m.u. + 35,9m.u.) * 1,65 = 138,45m.u. * 1,65 = 228,44m.u.\end{aligned} \quad (1)$$

Based on legal stipulations prescribing a 40-hour work week, couriers working with online platforms that guarantee a fixed income can expect a base monthly salary of 7,200 m.u. When variable income is considered, assuming an average of two deliveries per hour at 200 m.u. each, weekly earnings can reach 23,200 m.u. Multiplying this by the number of working weeks in a month yields a total monthly income of approximately 92,800 m.u. However, this calculation should also factor in tips and bonuses, which are common in this line of work. Thus, the estimated monthly earnings for a schedule of 8 hours per day over a five-day week are projected to be around 100,000 m.u.

Nevertheless, as previously highlighted, platform workers often lack entitlements to pension and health insurance, making the coverage of these benefits an individual responsibility. If a platform worker opts to pay the minimum for these insurances, they must register as an entrepreneur under the Labor Law [16]. This registration results in a net

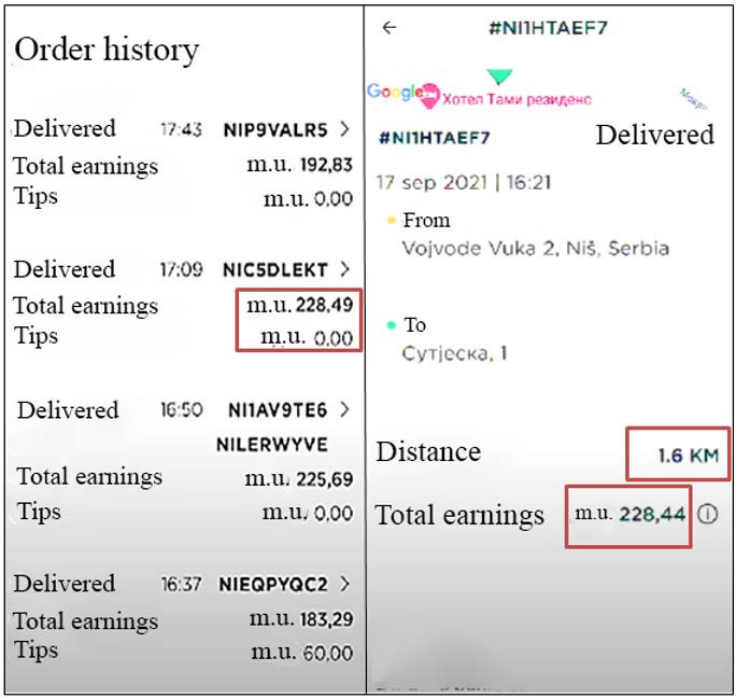

Figure 8. Order history per days

monthly income of about 80,000 m.u. After accounting for expenses like fuel, vehicle maintenance, and parking, the average net income is estimated to be around 60,000 m.u. This amount is notably higher than the minimum wage in Serbia, approximately 35,000 m.u. Yet, it's important to note that monthly income can vary significantly based on factors such as the number of working hours, the transportation mode used, the time of day worked, whether the platform offers a fixed income, and the level of customer satisfaction and generosity.

6 Conclusions

The research conducted highlights a consistent growth in the delivery market within Serbia, as evidenced by the proliferation of job advertisements for courier positions. The allure of these jobs often lies in their promise of favorable earnings and flexible work hours, leading many to accept these offers. However, couriers frequently encounter a challenging landscape marked by inadequate information and a lack of pertinent legal regulations governing their employment. In the current framework, platform workers typically sign temporary and occasional work contracts with local courier services, not with the online platforms they serve. This arrangement shifts all responsibility to the platforms' business partners, whose role is limited to employment mediation. Consequently, platform workers are left disenfranchised, devoid of health and social protection, and other standard employment rights.

The key to enhancing the status and protection of platform workers lies in revising the Labor Law. Analysts in Serbia suggest that the focus should not be on introducing new legislation specific to flexible work forms, which could be prone to misuse. Instead, the emphasis should be on amending the existing law to eliminate the necessity for platform workers to register as entrepreneurs to access health and social protection. Such amendments would acknowledge their relationship with the platform as an employment relationship rather than a mere contractual obligation, ensuring the full spectrum of employment rights and obligations. This raises a pertinent question: will the allure of earnings and work flexibility remain intact with such substantial legal changes? From the earnings perspective, the introduction of mandatory fixed hourly wages is unlikely to bring significant alterations. Moreover, maintaining work flexibility is certainly feasible within this new legal framework.

The primary objective is to balance the provision of fundamental rights and protections for platform workers with the retention of appealing and motivational work conditions. Online platforms can continue to excel in the domain of crowd transportation services by offering flexible working hours within the legally prescribed 40-hour weekly limit and an incentive system that enhances delivery efficiency and accuracy. The research indicates that the potential for earnings from deliveries is largely a function of individual couriers' efforts and decisions. Therefore, it is crucial to preserve key aspects of this work model, such as the selection of working hours and the availability of performance-based bonuses, while ensuring that responsibilities and obligations are clearly defined and regulated by online platforms. Future research should not only focus on legislative amendments but also on improving infrastructural

conditions. The lack of safe bike lanes, poor road quality, and insufficient parking facilities pose significant risks and adversely affect couriers' working environment. Additionally, there is a need for increased awareness among platform workers about the realities of their work conditions, which are not always as ideal as portrayed. Informing workers about the operation of performance tracking algorithms and work coordination systems is also vital. Further studies could explore the application of Multi-Criteria Decision Making (MCDM) methods in earnings calculations and incorporate models for assessing customer satisfaction and logistics service quality. One limitation of this paper is its focus on a relatively narrow case study, confined to a single city or country, suggesting the need for broader, more diverse research in future studies.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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