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A Novel Survey-QFD-WASPAS Methodological Approach for Designing Crowd Storage Platforms: A Case Study of Serbia

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Abstract: The concept of crowd logistics has been present in practice for several decades, while it has gained importance in the literature in recent years. Crowd delivery is a widely accepted concept, while crowd storage is still nowhere near its potential. To the best of the authors' knowledge, there are no scientific papers dealing with crowd storage in the literature. Crowd storage is one of the categories of crowd logistics services, which involves renting free space on the basis of an agreement, usually between individuals, using specialized online platforms, which are also markets for crowd storage services. Since the concept has not been researched in the literature so far, this paper focuses on several aspects. A unique methodological approach that includes three phases is proposed in this paper. In the first phase, research regarding crowd storage services in the world is carried out. The second phase involves research regarding the crowd storage services in Serbia. The third phase, at the same time the most complex, in the first step defines user requirements and the required resources for the development of crowd storage platforms based on the survey results. In the second step, the weights of the criteria are determined by applying the QFD method. In the third step, the WASPAS method is used for the software solution selection. Furthermore, the results of the research show that crowd storage services in Serbia are still not experiencing expansion. Finally, based on the results of the survey, and by applying the QFD method, user requirements are determined, as well as the resources needed. The crowd storage platform is the alternative with the highest value after the evaluation. Bearing in mind the aforementioned, the justification for the introduction of the specialized online crowd storage platform is confirmed. The concept itself creates numerous positive effects of sustainability: human, social, economic, and environmental.

Keywords: crowd storage; logistics; QFD; WASPAS; sustainability; Serbia



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1. Introduction

Crowd storage services present renting personal space by individuals, through specialized online platforms, to persons who need additional space. This is a win-win situation, since hosts make a profit by renting out unused space, while users get favorable storage, usually within a short radius of their living residence. This way of finding additional storage space has been used for many years in the USA and Western Europe, which has achieved great economic, environmental, and social benefits [1]. However, this category of crowd logistics services has not been popularized or developed in the same way as crowd transportation services. In fact, most publications in the crowd logistics area have referred to the studying of the challenges faced by crowd transport service providers, as well as the studying of ways and factors that influence the implementation of this concept in the professional companies' domain [2–4]. There are numerous questions associated with this concept, especially when it comes to the Business to Customer (B2C) or Customer to Customer (C2C) relationships. Very few publications have studied crowd storage, mostly by mentioning the primary service characteristics of the present platforms and their general usage [5]. The main research question in this paper was: what is the procedure for

developing a crowd storage platform based on empirical customer requirements? With this in mind, this paper greatly fills the literature gap, neutralizing the practical and theoretical gap between crowd storage and other categories of crowd logistics services. In the paper, based on marketing research and benchmarking, the basic characteristics of crowd storage, such as typical users, types and sizes of crowd storage on the market, as well as current providers of services in Serbia and the world, were determined. The reasons why Serbia was taken for the case study are the following: there are no crowd storage platforms in Serbia; the Serbian market (when observing crowd storage) is fairly undeveloped, hence, it is a good example to which the proposed methodology can be applied in order to prove that this methodology can be applied not only in developed but in undeveloped countries as well in order to develop a crowd storage platform; Belgrade, as well as Serbia, represents one of the main hubs in this part of Europe (since it is a regional center of economic activity with a large concentration of people). Precisely for these reasons, this paper's goal was to develop a new methodological procedure for the creation and popularization of a self-storage platform, primarily in regions where this type of service does not exist yet. Primarily, the research goal was to analyze and identify users' requirements for additional storage space, using survey, QFD (Quality Function Deployment), and WASPAS (Weighted Aggregated Sum Product Assessment) methods in order to propose a methodology for crowd storage services platform development. The WASPAS method represents a unique combination of the Weighted Sum Model (WSM) and the Weighted Product Model (WPM). The WSM method determines the overall score of an alternative as a weighted sum of the criteria values, while WPM determines the score of an alternative as a product of the scale rating of each criterion to a power equal to the weight of the given criterion. The reason why the WASPAS method was applied in this paper is reflected by the fact that WASPAS tries to reach the highest accuracy of estimation by optimizing the weighted aggregated function. Furthermore, this paper provides solid and unique scientific and practical contributions that are reflected in the fact that this is the first such paper in the literature. Apart from creating an excellent basis for future research in the literature, the proposed methodology is a tool that can be applied to create platforms in any market in the world.

This paper is structured into six main sections that analyze the described topic. After the introduction, the first section presents a literature review, highlighting the conclusions from the studies found in the literature. Furthermore, this section introduces the concept of crowd logistics, explaining in more detail how the crowd storage service functions, from the host's and user's perspectives. In the second section, a methodology is presented in more detail. The third section presents marketing research on crowd storage services in the world, defining the different types of crowd storage according to the purpose, size, and type of goods. This section presents the analysis of different self-storage platforms depending on the specialized category of services they provide as well. The fourth section refers to the analysis of the crowd storage market in Serbia, closely describing the service providers, the availability of type and location of the storage space, along with the users' satisfaction. This section provides a benchmarking analysis of crowd storage in Serbia and the world, conducted according to basic criteria, such as advertising methods, storage space type, and price, in order to determine Serbia's market position and the main aspects for future advancement. The fifth section presents the survey's results, which are examined in order to determine user requirements, resources, and crowd storage characteristics in Belgrade. Additionally, in the same section, using the QFD method, connections between user requirements and identified resources are determined, together with their weights. Finally, in a separate part of the fifth section, the results of the WASPAS method are presented. In the sixth section, the sensitivity analysis is presented, including the theoretical and managerial implications.

2. Problem Description and Literature Review

For the purposes of this research, at the very beginning, a detailed review of the literature was carried out, which, from the aspect of crowd logistics, is very scarce, and almost non-existent when it comes to crowd storage. Therefore, in this paper, scientific studies that mainly deal with the analysis of crowd logistics, that is, the research of benefits and shortcomings, as well as problems and challenges in the concept of service realization, were used. Furthermore, the majority of scientific studies in the field of crowd logistics have focused on the research on crowd transportation, emphasizing the importance of this type of home delivery [4]. However, a very small group of authors have reviewed crowd storage in their papers, mainly mentioning the basic idea of this service concept, as well as some of the most famous representatives in the market. In their papers, the authors defined crowd logistics as an innovation that will provide economic, environmental, and social benefits [1,3]. In addition, the authors in the study [1] identified four main challenges that companies face when implementing the crowd logistics model, which are primarily related to the unclear legal framework, problems related to the recruitment of human resources, different characteristics of the population's lifestyle, as well as mistrust. For this reason, the paper [6] analyzed the factors that influence the motivation of the population when implementing crowd logistics services. In this regard, the authors determined ways, or significant factors, that can affect overcoming the mentioned challenge. The results show that a positive impact on the population motivation is created by adequate monetary compensation, as well as mutual trust between interest groups, while a negative impact is recorded by insufficient protection at work, as well as legal obstacles in the employment process. In addition to the aforementioned challenges, most of the papers have dealt with the analysis of factors that also affect the implementation of the crowd logistics services model in the company's business framework, among which the market environment, external motivation, as well as the company's capacity to implement new solutions are identified [7,8]. For a more detailed analysis of these factors, the study [2] proposed a methodology for their assessment, with the aim of implementing the crowd logistics model as an alternative solution for the realization of logistics services. It is a fact that crowd logistics is gaining more and more attention in the logistics industry, which is supported by the fact that many new companies are starting to introduce this concept into their business models. Therefore, in the research [9], the authors established one of the methods for the successful implementation of crowd logistics, which involves the usage of blockchain technology, with the aim of generating smart contracts and increasing business flexibility.

In the paper [5], the authors specifically defined the concept and method of implementing crowd storage services, emphasizing their spatial representation, along with the identification of the most famous self-storage platforms, as well as the year of their establishment. In addition, the authors of this paper presented the case study related to the crowd storage model, providing specific information about the functioning of the self-storage platform Costockage. This aspect of the research in the paper [10] is complemented by the analysis of the value that crowd logistics platforms create for interest groups, among which the values related to resource alignment, operations management, and increased risk control were identified. Furthermore, in research [11,12], the authors define crowd logistics platforms as intermediaries primarily responsible for coordinating services, but also providing IT solutions intended for communication, the realization of transactions, the regulation of supply and demand, as well as resource management. In the paper [13], the authors proposed three different implementations based on the Iterated Local Search algorithm for crowd logistics optimization. On the other hand, the authors in [14] evaluated the suitability of crowd-shipping platforms for small and medium-sized enterprises. A similar problem was addressed by [1], where the authors proposed crowd models for last-mile delivery in an emerging economy.

Crowd storage is treated to a lesser extent in the papers [15,16]. Therefore, in the paper [7], the authors defined four basic categories of crowd logistics services, comparing them according to different criteria, such as the risk for users, required resources for their

implementation, as well as the existence of operational support from the platform. Some of the basic shortcomings of crowd storage services were related to the insufficient security of the stored goods, the avoidance of responsibility for damage caused to the goods, as well as the absence of goods insurance were also established. On the other hand, the importance of crowd storage services, which is reflected in the optimal use of resources, encouraging the sharing economy, as well as the creation of innovative and creative logistics solutions, was highlighted. The authors in [16] determined some of the benefits of the crowd logistics services, i.e., crowd storage, which refers to economic, ecological, and social gains, such as lower costs of services, a reduction in the construction of commercial storage facilities, as well as an increased socialization of the population. This paper describes another function of crowd storage as well, which refers to the temporary storage during the delivery of goods when the household that provides the service also has the role of being a collection and delivery point (CDP). Therefore, a CDP can be defined as a crowd storage where suppliers consolidate or deliver goods and customers pay, pick up, or return goods.

In addition to using scientific publications, this paper is also based on research on self-storage platforms, self-advertising sites, as well as the sites of professional crowd storage service providers. Therefore, this paper has more of a research character, but is based on the scientific literature as well, which is oriented towards the study of the general concept of crowd logistics services realization. For this reason, this paper closes the gap established in the literature, giving a concrete insight into the state of the crowd storage market, as well as concrete results with the methodology for creating a self-storage platform.

The proposed methodology is comprised of three phases that are described in more detail in the methodology section. The third phase included three steps. In the first step, a survey was carried out, after which the results of the survey were used in the QFD method in order to determine criteria weights (the second step). In the last step, the WASPAS method was used to determine the final ranking of the alternatives. The QFD method is a powerful technique that is applied for the purpose of designing and improving products and services with the aim of satisfying user requirements. In the paper [17], the authors performed an evaluation and selection of KPI in procurement and distribution logistics using the SWARA-QFD approach. On the other hand, in the paper [18], the authors applied the QFD method in order to design a completely new product packaging, in order to make logistics operations, such as transportation, loading, and unloading, more efficient. Some experts believe that the traditional QFD method has certain disadvantages, such as subjective evaluation, as well as giving priority to the engineering characteristics of products and services, which can later affect the creation of numerous limitations in the real environment [19]. However, the input data for the QFD method applied in this research were obtained from the conducted survey; therefore, the author's subjectivity is neutralized to the greatest extent. In the next phase of the research, the output data of the QFD method were used as the input data of the WASPAS method. The WASPAS method is often applied in combination with other methods, such as the case in the paper [20], where the authors applied the WASPAS and SWARA (Step-Wise Weight Assessment Ratio Analysis) methods to evaluate the weights of criteria related to 3PL providers that mainly deal with the transport of dangerous goods. Furthermore, the WASPAS method was combined with other methods, such as fuzzy FUCOM (Fuzzy Full Consistency Method), ET (Evidence Theory), and RBT (Rule-Based Transformation) in the paper [21]. In addition, the WASPAS method was used for a real-life decision-making problem [22]. The proposed model was used for the evaluation of the resilient 4PL providers for e-commerce.

Based on the literature review, as well as the conducted research, crowd logistics can be defined as a new concept for the realization of logistics services, where its functioning is mainly based on technological infrastructure and the external engagement of the population. Namely, the basic idea of crowd logistics is to strike a balance between the supply and demand of logistics services by using specialized online platforms that enable the engagement of the users who have unused or excessive space and are willing to rent it in exchange for financial compensation.

Some of the basic differences between traditional and crowd logistics relate to the logistics service providers themselves, as well as infrastructure and information management methods. Based on the conducted research, it was concluded that the providers of services in crowd logistics are using their own underutilized resources through modern digital technologies. According to the paper [5], there are three types of crowd logistics:

- Local delivery service;
- Crowd shipping;
- Crowd storage.

Crowd storage services include renting free space in the form of empty rooms, garages, basements, storage containers, or even empty closets to individuals or commercial users who need additional capacity.

Online platforms are marketplaces for renting storage spaces, where you can post and search ads for additional space for free, which is often more convenient from both an economic and a location perspective. In terms of the lease period, self-storage units are very flexible because they can be rented for a few days or throughout the year, without the obligation to sign long-term contracts [23].

The online platform can be used by the hosts for offering storage or by the users who request space. A person who wants to access the platform in the role of host must first register and confirm their agreement with the terms and conditions that the specific platform prescribes for all its members. This is an initial and very significant step, given that there are no official contracts on renting space, but cooperation is based on a mostly voluntary basis. After this step, the host is given the option to post an ad for renting a storage space. When placing an ad, the host fills in a pre-defined form in which it is necessary to specify the area of the space, the amount of the monthly fee, the type of storage space, i.e., whether the host can rent a room, office, warehouse, closet, etc., and then the minimum period of renting the space, as well as special features of the storage, such as a cooling system, video surveillance, security locks, and the Internet. Furthermore, the host is obliged to post a picture of the space they rent. It is important to note that when placing an ad, it is not necessary to provide personal data or the exact address where the space is located, but roughly a part of the city or a city district. In this way, the user's personal data is certainly protected, while increasing the functioning security of the platform itself.

When the user is interested in a certain ad, the platform offers the possibility of sending a query to the host, through which the user receives additional information about the business conditions, such as the available reservation period, special storage conditions, potential discounts, and more. Furthermore, it should be noted that the administrator has access to the entire communication in order to help with possible doubts. Once the host and user reach an agreement, there are two payment options. The first option refers to the fact that the user and the host can regulate the rental costs independently of the platform, while the second option is based on transactions the realization of which are offered by the platform itself. Most users choose the second option for security reasons and more reliable billing, although around 15% of the monthly fee, depending on the operating conditions of the platform itself, is usually paid for marketing activities and its maintenance. Furthermore, it should be noted that the service is billed a few days before the beginning of the contracted storage period, whereby the storage fee is charged in advance.

From the user's perspective, i.e., the person seeking storage services, it is first necessary to register the account on the specific platform. The registration process involves entering a username, e-mail address, and user password. Some platforms also require the entry of an ID card or passport number, as well as face identity verification. After this initial step, the user has the right to communicate with hosts, that is, to send inquiries regarding the storage space they are interested in. Without registering an account, the user is only allowed to search ads, but not to communicate and reserve space. The advertisement search is based on the principle of data filtering, where the user, depending on the platform itself, can enter the city where they are looking for the desired storage space, its size, or price. When the contracted storage period ends, the user is required to evaluate the host, with the

aim of increasing the quality and reliability of the services the platform mediates, because future users can be informed about potential cooperation in this way [24].

3. Methodology

The proposed methodological approach includes three phases, as shown in Figure 1. In the first phase, market research on crowd storage services in the world is conducted in order to define different types of crowd storage according to purpose, size, and type of goods. Different types of self-storage platforms are analyzed in this section as well, according to the specialized services they offer. This research phase also provides the basis for the other methods' implementation, defining the main crowd storage characteristics, which are analyzed in more detail in the fourth section.

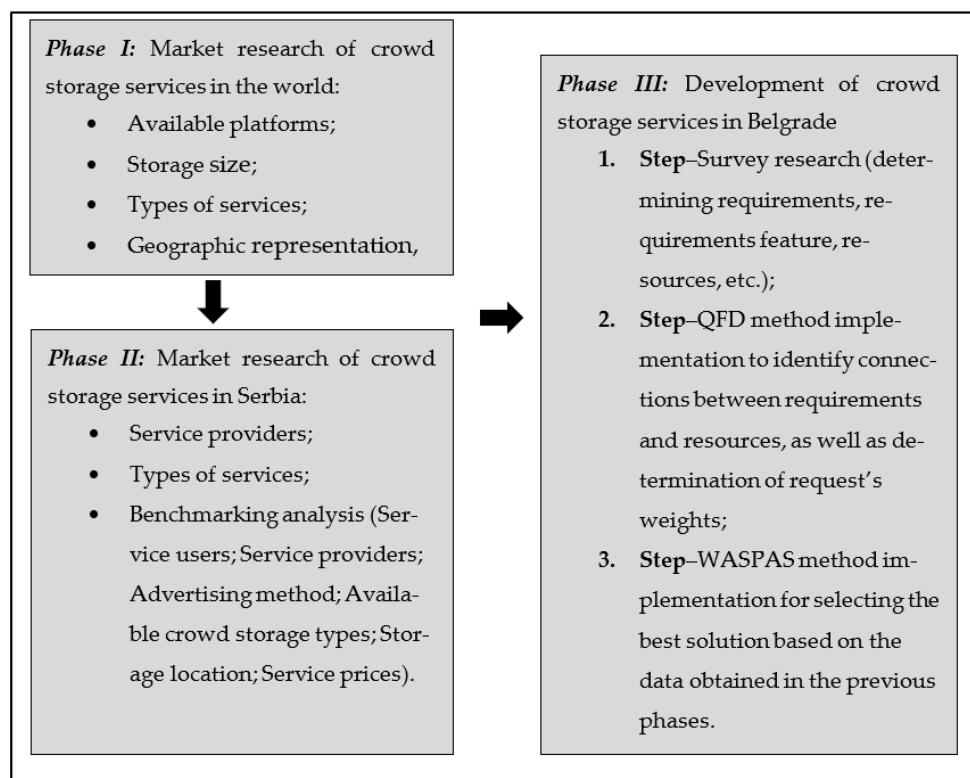


Figure 1. Methodology for designing crowd storage platforms.

The second phase, presented in more detail in the fifth section, presents research on crowd storage services in Serbia, by identifying Serbia's market position according to the results obtained by conducting a benchmarking analysis. The benchmarking analysis results are then used to identify solutions that would significantly improve Serbia's market position from this aspect. In accordance with that, the third phase of the research, including the development of crowd storage services in Belgrade is conducted.

As part of the last, and at the same time, the most complex phase of the paper, the conditions for the development of crowd storage services in Belgrade are analyzed by conducting survey research, and by implementing QFD and WASPAS methods. A more detailed explanation of the steps carried out in this phase is given in the following part of this section.

3.1. Survey

The choice of the appropriate methodology for data collection and processing is a prerequisite for the research's reliability and relevance in predicting future trends. Therefore, during the third phase of the methodology proposed in this paper, an online survey was carried out, for the quick and efficient collection of objective and concrete answers from a

large group of people, and with the certainly accurate processing of the results. The online survey makes it easier to get in touch with the respondents, which is very important because by surveying a larger number of people, data with less stochasticity is obtained. Questions were gradually formed from general ones to those that are crucial for research [25,26]. The survey was composed of 15 questions, while the survey sample consists of 56 respondents. The target group was residents of the city of Belgrade who were over 18 years old and had lived in the city for at least one year. The results of the research are presented and explained in detail in a separate subsection of the sixth section, and they primarily relate to the identification of user requirements, as well as their features, resources, and capacities.

3.2. QFD Method

The QFD method was developed with the aim of fulfilling and satisfying user requirements through product and service design and improvement. Based on the determined requirements, the product/service characteristics are defined, and afterward, the critical points of the products/services and the manufacturing/delivery process are determined. After that, it is necessary to define a procedure for solving critical points. One of the main drivers of this method is the “voice of the customer”, where the aim is to determine the user requirements for the product/service and define the steps to fulfill them. This method was primarily intended for design and development, but it quickly expanded to other business areas such as marketing, sales, production, and control, and over time it began to be used in logistics. The application of the QFD method in logistics is mainly reflected in the development of the logistics providers’ services. This method can be applied both for the development of a new product/service and for the improvement of an already existing product/service. The QFD method is most often implemented through four phases that are carried out within four quality houses:

- The first phase: The identification of user requirements and definition of product/service characteristics;
- The second phase: The determination of critical products and services components;
- The third phase: The determination of critical parameters of the production process, i.e., monitoring of material and service products;
- The fourth phase: The determination of procedures and instructions for the products and services realization and control.

In addition to the “voice of the customer”, another fundamental element of the QFD method is the House of Quality (HoQ). The HoQ consists of user requirements (WHATs), resources (HOWs), a matrix in which the connections between user requirements and resources are determined, the roof (resource correlation), competition assessment, determining user requirements priorities, determining resources priorities, and the final assessment. The QFD method implementation and the process of forming a House of Quality include the following steps [23,27]:

- Step 1—*Development of a user requirements list*. It involves the definition of user requirements related to the quality of a particular logistics service;
- Step 2—*Development of resource list*. It involves the identification of the necessary resources for the realization of previously defined user requirements;
- Step 3—*Determining connection between user requirements and resources*. It refers to assigning an appropriate connection (a symbol that is then transformed into a value) between requirements and resources;
- Step 4—*Resources correlation*. It presents the internal correlations establishment between available resources by assigning a determined symbol that represents the weight of a concrete connection;
- Step 5—*Evaluation of the competition*. It is realized through a concrete service comparison with the services of identified competitors. The comparison is performed based on a gradual scale, both from the aspect of user requirements and available resources;
- Step 6—*Determining requirements priority*. In this step, three values are determined: importance, target value, and sales point. The user requests importance is rated on

a scale of 1 to 10, with 10 being the most important. The target value is rated on a scale of 1 to 5, where grade 1 indicates changes, grade 3 indicates that improvement is needed, and grade 5 indicates that the service is better than the competition. The sales point can be rated with one of two values offered: grade 1 is assigned if the service has a negative impact on the sales, and grade 2 in case the effect on sales is positive. Finally, the absolute weight of the user request is formed by applying Equation (1):

$$\text{Requirement abs. weight}_{(j)} = \text{Importance}_{(j)} * \text{Target value}_{(j)} * \text{Sales point}_{(j)} \quad (1)$$

- Step 7—*Determining resource priority*. In this step, two values are determined: absolute and relative resource weight. The absolute resource weight is calculated by using Equation (2), where index i indicates the sequence number of the resource, while index j refers to the sequence number of the request. The relative weight of the resource is calculated according to Equation (3).

$$\text{Resource absolute weight}_{(i)} = \sum_i \sum_j \text{Symbol}_{(i)} * \text{Importance}_{(j)} \quad (2)$$

$$\text{Relative weight}_{(i)} = \sum_i \sum_j \text{Symbol}_{(i)} * \text{Resource absolute weight}_{(j)} \quad (3)$$

- Step 8—*Final assessment*. It involves the calculation of absolute and relative factors. The absolute factor is calculated as the quotient of the value of the corresponding resource's absolute weight and the sum of all resources' absolute weights, as presented in Equation (4). The relative factor is calculated as the quotient of the concrete resource's relative weight and the sum of all resources' relative weights, as presented in Equation (5).

$$\text{Absolute factor}_{(i)} = \frac{\text{Resource absolute weight}_{(i)}}{\sum_{(i)} \text{Resource absolute weight}_{(i)}} \quad (4)$$

$$\text{Relative factor}_{(i)} = \frac{\text{Relative weight}_{(i)}}{\sum_{(i)} \text{Relative weight}_{(i)}} \quad (5)$$

The application of the QFD method in this research is conducted to develop a totally new service in Serbia, by identifying the connections between user requirements and resources, along with their weights. The output data of this method were then used as input data in the WASPAS method.

3.3. WASPAS Method

The WASPAS method includes the following steps [21,28].

Step 1—Defining initial decision matrix X. In this paper, an initial decision matrix was defined based on the survey results, as well as the results of the QFD method.

Step 2—Normalization of the decision matrix. In this step, a normalization of the decision matrix is performed using Equation (6) for beneficial criteria and Equation (7) for non-beneficial criteria.

$$x_{ij}^* = \frac{x_{ij}}{\max_i(x_{ij})}, \quad i = 1, 2, \dots, m \text{ and } j = 1, 2, \dots, n \quad (6)$$

$$x_{ij}^* = \frac{\min_i x_{ij}}{x_{ij}}, \quad i = 1, 2, \dots, m \text{ and } j = 1, 2, \dots, n \quad (7)$$

where x_{ij}^* represents the normalized value of the i th alternative with respect to the j th criterion.

Step 3—Determining total relative importance based on WSM. The total relative importance is determined for every alternative by applying Equation (8).

$$Q_i^{(1)} = \sum_{j=1}^n x_{ij}^* w_j \quad (8)$$

Step 4—Determining total relative importance based on WPM. The total relative importance is determined for every alternative by applying Equation (9).

$$Q_i^{(2)} = \prod_{j=1}^n (x_{ij}^*)^{w_j} \quad (9)$$

Step 5—Determining the total relative importance (Q_i) of an alternative. In order to determine the Q_i , the decision-maker must define the value of λ (which can take any value from 0–1 interval). In the final step, alternatives are ranked according to the value of Q , where the best alternative has the highest value, Equation (10).

$$Q_i = \lambda Q_i^{(1)} + (1 - \lambda) Q_i^{(2)} \quad (10)$$

4. Marketing Research of Crowd Storage Services in the World

This phase of research on crowd storage services was carried out through several basic steps. It is important to note that secondary data were predominantly used in the research, due to the specificity of the business concept, which does not include various economic entities, state and scientific institutions, but mostly natural persons. Furthermore, considering that it is a new concept that has not been studied in detail through scientific and professional publications, the research is mainly based on the users', partners', and competitors' data of online platforms. Considering the existence of a large number of specialized online platforms for the realization of crowd storage services, and therefore their users, the representative sample was deliberately defined and included typical representatives of the market. In this research secondary data were used and collected using the unstructured observation. During processing and analysis, the first step was the control of the data, after which the classification was performed alongside with further processing. The results of the research are presented in the following part of the section in the form of a report, along with conclusions and recommendations for further improvements.

The users of crowd storage services were first analyzed as part of the marketing research. In terms of age, over 80% of crowd storage services are realized by the population between 21 and 55 years old. This result is expected, given that the majority of people within the mentioned age group use the Internet most actively, and also expand their families, which increases the need for additional storage space. Furthermore, over 75% of users have medium-low or medium-high incomes, which indicates that additional storage space is most often rented by the middle class, which mostly lives in smaller residential buildings in the wider city center, without the possibility of expanding their capacities. For this reason, over 70% of users are looking for the location of a storage facility within a radius of 2 km from their apartment, while the average rental period is from 6 to 8 months. Furthermore, it should be noted that crowd storage services, in addition to natural persons, i.e., the population, are also used by commercial tenants, who on average make up 15 to 20% of the users of these services. These are mostly smaller business entities, such as public notaries, doctor's offices, and carpentry workshops, which store documentation, machines, and tools for work in this way at much more affordable prices [29].

Furthermore, as part of the research, the types of crowd storage were analyzed, which differ from each other according to the items that are convenient to store in them, then the size, as well as whether the storage units are exposed to external influences. Therefore, the first group consists of independent warehouses in closed spaces such as empty rooms, garages, basements, attics, etc. With such units, it is always preferable to lock them, and store the items in a closed space protected from external influences. Such crowd warehouses are suitable for storing furniture, clothes, camping equipment, luggage, books, business

equipment, etc. The size can greatly vary, therefore, on online platforms, you can find ads offering space from 5 to 100 m². Storage containers are included in the second group of crowd storage. They are usually positioned outdoors, therefore the contents stored in them can be affected by extreme temperatures and condensation, therefore they are not recommended for storing sensitive items. They are most often used to store large, bulky items such as cars, garden furniture, and various types of plants and equipment. The third group consists of so-called business warehouses. The name indicates that they represent highly equipped warehouses, which are similar to the logistics provider ones, but these warehouses are much smaller in size, with availability characterized by a lower price. Therefore, business warehouses are often equipped with security locks, video surveillance, a system for regulating temperature and light, a ventilation system, sound, and heat insulation, etc. In the next group, although they do not represent typical warehouses, due to the large supply and demand on online platforms, parking spaces, and car garages are included. Furthermore, we should mention another group of crowd warehouses that allow luggage storage during a short period of time in larger cities. These crowd warehouses actually represent smaller sized warehouses that are most often positioned near airports, bus and train stations, shopping centers, and other traffic nodes, and are characterized by the possibility of renting them for a period of 24 h [30].

From the aspect of dimensions, crowd storage can be classified into three groups (Table 1). The first group consists of small crowd warehouses, with areas ranging from 2.5 to 5 m², which corresponds to the area of one closet or smaller storage room. Crowd warehouses of these dimensions are usually rented for storing seasonal items. The second group includes medium crowd warehouses, with an area of 5 to 15 m², which corresponds to one larger room or garage. This size is also the most used since it allows for storing excess things or freeing up space due to the renovation of the apartment. The third group consists of large crowd warehouses, with an area of 15 to 30 m², but larger storage units can certainly be found on the platforms. These warehouses are most often as big as a one-room apartment or a basement, and are usually used to store items for a longer period of time.

Table 1. Classification of crowd storage sizes.

Crowd Storage Size	Crowd Storage Area (m ²)
Small	2.5–5
Medium	5–15
Large	15–30

Based on this analysis, according to the classification of items that could be stored, it was concluded that people usually store furniture, clothes, and household equipment (Figure 2). Additionally, those storages are used for storing office furniture, and e-commerce products as well as tools, technical equipment, vehicles, and sports equipment. In case the storage has air conditioning, the groceries that do not need the refrigerator could be stored for a couple of days [31].

After analyzing the general features of crowd storage, as well as their users, the identification of online platforms that have the role of mediator was carried out. Table 2 presents online platforms, which are typical market representatives in the category of services they provide, along with the year of their establishment, the geographic market in which they operate, as well as the average rating assigned by the users. Typical representatives of the market were selected based on the number of registered users, the number of ads offered, as well as the number of successfully completed transactions.

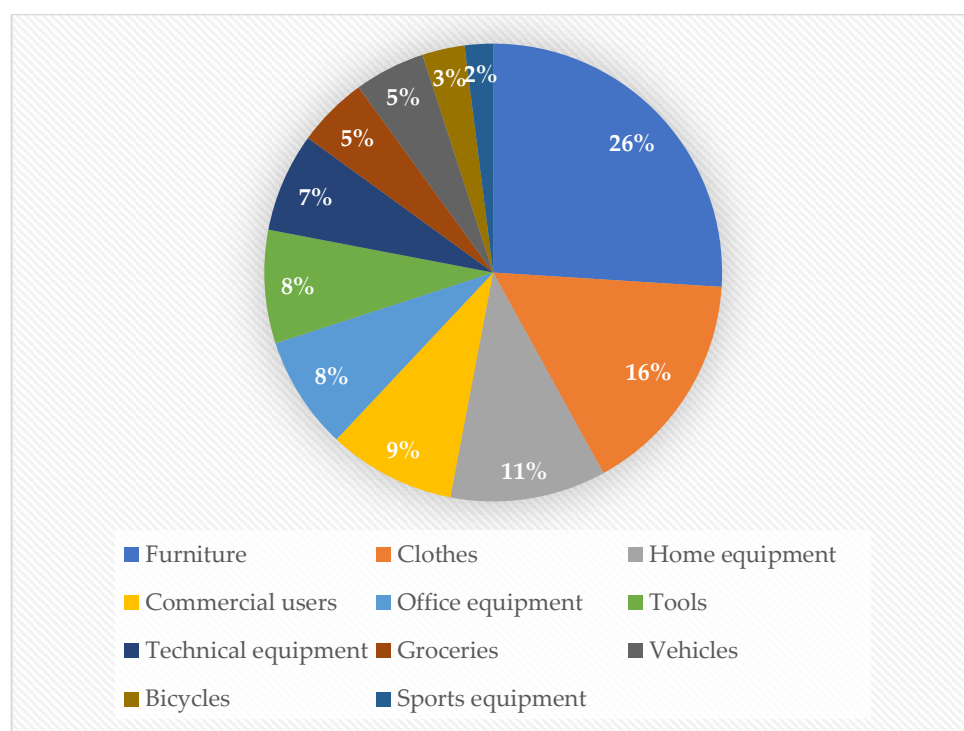


Figure 2. Goods type distribution according to the disposal frequency in crowd storage.

Table 2. Online platforms for crowd storage services in the world [32–35].

Online Platform	Category Service	Geographic Market	Average User Rating (1–5)
Monsieur Parking	Parking space renting	France	3
Stashbee	Parking space and crowd storage renting	Great Britain	4.1
Neighbor	Parking space, crowd and business storage renting	USA	3.3
Stasher	Luggage storage renting	Various locations	4.3

Monsieur Parking is an online platform that regulates the supply and demand of parking spaces in major cities across France. This platform offers an economical, simple, and sustainable solution for drivers who regularly encounter parking difficulties in major cities such as Paris, Lyon, Marseille, Nice, and others [32]. The average rating of this online platform by the users is 3. There are a lot of divided impressions, therefore, on the one hand, users praise the speed of response and the quality of the service, while on the other hand, users complain about the high amount of commission, which the site calculates as a fee for mediation. The commission is 20% of the price of the service, which, according to user reviews, is also taken by real estate agents, therefore, from a financial point of view, it cannot be said that this platform allows users to save money. Another of the users' complaints is the lack of up-to-date ads, therefore ads that are out of date and no longer active can appear, which makes it significantly more difficult for users to make a selection.

Stashbee is an online platform covering the British market in terms of crowd storage services. This platform mediates the rental of both storage and parking spaces, which makes it more attractive and visited [33]. The average rating is high, with a value of 4.1, and users especially emphasize its transparency and user-friendliness, as well as the up-to-date information on the platform. The only negative impressions are related to members who offered space and did not honor the agreement.

Neighbor is an American platform that offers very diverse forms of crowd storage, such as self-contained indoor storage, car parking, as well as business storage. This platform provides insurance in case the user does not pay for the service usage [34]. However, most users of this platform deny the accuracy of this information, complaining that they have not been paid, which is why they rated their services at an average of 3.5.

Stasher is the first worldwide platform for luggage storage. It allows travelers to be connected with hotels and independent shops that securely store luggage while visitors enjoy exploring the city [35]. Users gave this platform a high score (4.3), emphasizing that the service is fast and efficient, that the choice of locations is very diverse, and that this type of service makes their travels significantly easier. The only problem is that the reservations are realized very quickly in short time intervals, therefore it is necessary to update the offered ads very efficiently. For this reason, administrators advise confirmation by phone call so that users can be absolutely sure that their location has been successfully booked.

Each of the identified online platforms, regardless of the category of crowd storage services, has a special section where users can find instructions on how to register and use the platforms as well as the responsibilities of users and hosts. The main reason why it is clearly defined is to facilitate renting storage or parking spaces. In this way, all doubts regarding the reservation process, the protection of personal data, as well as the consequences in case of breach of the agreement are eliminated.

Accordingly, the mutual feature for all of these online platforms is that they cannot be used by minors or persons who are temporarily or permanently suspended users. The obligation of all users of the platform is to register an account with the correct information. Furthermore, each user of the platform is responsible for their actions. If the user discovers or suspects that his account or personal data are being used without authorization, they must immediately notify the platform administrator in order to take protective measures. Each of the online platforms within this section prescribes which items are prohibited, i.e., items that cannot be stored. In most cases, it refers to toxic, radioactive, contaminated, flammable, or dangerous goods, followed by firearms, ammunition, live or dead plants and animals, cash, and generally illegal goods.

After accepting and understanding the terms and conditions, most platforms list additional obligations of the hosts and the users. The host is obliged to provide all the details of the storage or parking space, together with any storage or parking conditions that they wish to be met. Such content should include text, graphics, images, and other relevant information such as the size, location, and security of the space offered. All information must be accurate, complete, and up-to-date, and in case the space becomes unavailable for any reason, the host is obliged to remove the ad from the platform. Furthermore, during the storage, and in case of unplanned accidents, the host is obliged to make reasonable efforts to protect the stored goods by taking the same precautions as they would apply to their own property located in the same location. In the event that the host prematurely terminates the reservation agreement, the platform reserves the right to suspend the user account.

The user is obliged to pay the fee to their host in a timely manner. In the event of damage caused by stored goods or any personal negligence, the user agrees to offer compensation for repairs. In addition, the user is also only obliged to use the storage, i.e., parking space, for the purpose of temporary storage or parking, and in accordance with the pre-agreed conditions. The user is obliged to remove the stored goods, i.e., the parked vehicle at the host's request, if the host specifies that they have issued a notice of cancellation and refund to the platform. In the event that the user does not vacate the rented space, the host has the right to destroy or sell the stored goods after the expiration of the notice period, while the platform has the option of charging the user for the notice period.

Within this section of the platform, the payment terms are also determined. On all analyzed online platforms, placing ads and sending inquiries from interested users is completely free. The user fee, after confirming the reservation, consists of the payment

to the host and the commission that belongs to the online platform. All transactions are electronically performed, through a software application defined by the platform. In case of unpaid fees, the platform or the host can deny the user access to the parking or storage space, and they also have the option to move the stored goods at their own discretion [36].

Regarding the information, the registered member, by accepting the terms and conditions prescribed by the online platform, gives consent to the free reproduction, modification, translation, and display of the same by the platform. Furthermore, the user of the platform accepts that the administrator is not obliged to publish any content sent to the platform. It is especially emphasized that registered members may not upload information that is false, inaccurate, violates laws, regulations, copyrights, or refers to offensive, threatening, and dangerous content. Ads may be removed if they are clearly plagiarized, offer the storage of illegal items, have unrealistic prices, or contain false information. The online platform allows users limited access to the contact information of other platform members until the consent of the platform itself or the specific user is obtained. Therefore, the user must agree to only use the personal information of other users for communication related to the reservation of or a complaint about the rented space. The platform does not tolerate spam or unsolicited commercial communications, reserving the right to monitor messages sent through the Website, in order to identify violations of the prescribed terms and conditions.

The platform has the right to limit the user's activities on it, issue a warning, or cancel the registration if the terms and conditions have been violated. Furthermore, the user's activities are restricted in the case of the impossibility of confirming the authenticity of the user's information submitted to the platform, as well as in the case that the user's activities may cause legal liability to the platform or financial loss [36].

5. Marketing Research of Crowd Storage Services in Serbia

Based on the marketing research of crowd storage services in Serbia, which was carried out using the same methodology applied in the previous part of the paper, it can be established that crowd storage services in these areas have not been developed or popularized as in the American and European markets. More intensive development of crowd storage services has started in the last five years for two reasons. The first reason is associated with the new way of building residential buildings, which is characterized by the absence of storerooms and basements, due to which users are forced to rent smaller and relatively cheap storage spaces. Another reason is the pandemic that has caused working from home, therefore a large number of companies have canceled their business premises and now need to store office furniture and inventory in the aforementioned warehouses. Furthermore, it should be noted that the number of companies providing crowd storage services in Serbia is still small and that, currently, the present companies in the crowd storage market in the initial phase of business were engaged in providing moving services. Later, seeing that the initial investments were repaid in a very short period of time and that the demand for additional space was growing, the aforementioned companies began to buy additional land, equipping it with high-quality storage containers [37].

5.1. Market Analysis

In the period between 2008 and 2015, platforms for self-advertisement were mainly developed, which can be considered the forerunner of online platforms for providing crowd storage services. Since the establishment of the first self-storage company in 2015, storage services intended for natural persons are also available on the market. In the last 5 years, three more companies have been founded, and it is estimated that due to the increase in demand, the number of providers of these services will continue to grow. However, it can be observed that the online platform for the implementation of crowd storage services has not yet been implemented in Serbia. The prerequisites for this certainly exist, because the development of such a platform would involve combining self-advertising and storage services offerings to individuals.

By analyzing crowd storage services in Serbia, self-storage companies and online platforms for finding different types of space were identified, along with the years of their establishment. In addition, Table 3 highlights the types of storage space that are the most frequent in the offer, as well as the average ratings of the users.

Table 3. Crowd storage service providers in Serbia [31,38–41].

Crowd Storage Service Provider	Year of Establishment	Available Crowd Storage Types	Average User Rating (1–5)
Kupujem-Prodajem	2008	Garage, Warehouse	4.4
Halo Oglasi	2009	Garage	2.4
Nekretnine	2009	Garage	3.6
Toro Box Self Storage	2015	Storage container	4.6
4Zida	2016	Garage	3.8
Skladištenje stvari	2018	Warehouse	5.0
You Space	2018	Storage box	5.0
Sasomange	2019	Garage	3.1
Storage Box	2021	Storage container	5.0

One of the identified providers is *Toro Box Self Storage*, the first self-storage company in Serbia, whose offer is based on storage containers intended for both individuals and commercial users. In terms of size, the offer includes conceptually designed storage units with a maximum square footage of up to 50 m², while units with an area of up to 20 m² are mostly rented. It should be noted that from a security perspective, all storage units are provided with an alarm system, video surveillance, and reflectors, and are optionally also air-conditioned [31]. The storage containers owned by this company are centralized on the outskirts of Belgrade, therefore they only enable accessibility and good traffic connection with the municipalities of the wider city area. User satisfaction is high, therefore the quality of their services is rated at 4.6. Users point out the innovation of the idea, the good equipment of the space, the friendly staff, as well as the affordable prices. The only complaint concerns the greater distance from the city center, so users spend a lot of time in traffic.

The next crowd storage company identified is *You Space*. Unlike the company *Toro Box*, where the user delivers their belongings, which are stored separately from the belongings of other users, the practice of the company *You Space* is different. Namely, it is necessary for the user to register and fill out an online order on the site, in order to arrange a delivery date for the empty boxes in which this company practices storing things. The boxes are made of solid material and have two levels of protection. The first level is a unique code, which is used to know where the box is at all times, which courier picked it up, and when it was placed in the warehouse. The protective seal represents the second level of protection, which allows the box to be sealed while eliminating the possibility of unauthorized opening. When the empty boxes are delivered, the user has the option of packing things in them within 20 min, or if they need more time, they can schedule a courier service in another time window. When the user has finished packing their things in boxes, they can enter information about the items packed in them on their *You Space* account. Uploading photos of the stored things and the possibility of tracking the location of the box at any time is also available. After that, the boxes are picked up and transported to the company's warehouse, which is secured by an alarm system, video surveillance, reflectors, and security 24 h a day. The services of this company are exclusively available throughout the territory of the city of Belgrade. The goods are stored for the agreed period of time, and the boxes are delivered to the user when they request them through the website. The delivery of the desired boxes is realized within 24 h from the moment of the claim. Unlike the delivery of empty boxes, the

delivery of boxes from the warehouse is charged at a fixed rate regardless of the number of boxes. Furthermore, the storage service is charged once a month, by sending an invoice with the calculation to the user's e-mail address. Cash payment is not possible [38]. From the users' point of view, this company is rated very highly, without any complaints. Users point out the accuracy of the shipping and delivery times of the boxes, the innovation of the idea, as well as the favorable price of the service.

Storage Box is a company that has a similar offer and company policy to *Toro Box Self Storage*. Therefore, the services of this company imply the use of storage containers of different dimensions, which are centralized in Zemun [39]. The users of the services are very satisfied, and they especially emphasize professionalism, as well as the clean and tidy space with affordable rental prices.

Skladištenje Stvari offers a well-organized warehouse area of over 1000 m² for the realization of basic services, which the company has categorized as the storage of goods, the storage of belongings, and the storage of furniture. In addition to the above, the offer also includes the services of loading, transportation, and unloading of goods, then packaging and labeling, along with goods insurance during the storage period, with an adequate refund in case of damage [40]. The location of the storage space is, as in the case with the previously analyzed companies, on the outskirts of the city, and service users rated this company very highly.

As alternative solutions, which are similar to the analyzed online platforms for crowd storage services in the world, additional storage space in Serbia can also be found on classified ads websites, such as *Kupujem-Prodajem*, *Sasomange*, *Halo Oglasi*, and *4Zida*. On these sites, most often under the category *Other uncategorized services*, it is possible to find halls, warehouses, garages, and, rarely, storage containers throughout Serbia. Along with the ad, it is possible to obtain information regarding the space, such as location, area, and additional characteristics, based on which the user can decide to contact a host by phone or using a concrete platform. Moreover, the good thing about these sites is the possibility of rating the cooperation and accuracy of information by previous users, which is very important for future users. Posting ads on these sites is free for a period of 30 days, while it is charged for a longer period [41].

The temporary storage service can also be provided by agencies whose primary activity is relocation. Therefore, many agencies that provide this type of service, in addition to the transportation, loading, and unloading of items, complete their services with assembly, disassembly, packing, and temporary storage. The number of these agencies, as well as the number of their users, has significantly grown in recent years due to the greater variety of services. Therefore, temporary storage services in warehouses, mostly positioned in the wider city area, are the most common solution for users who move out or move into a new home. The service is complete and professional, but the prices are also unaffordable for most residents. Exclusively from a storage perspective, the service can be useful as a short-term solution, both in terms of time and capacity, as the available warehouse space is limited.

5.2. Benchmarking Analysis of Crowd Storage Services in Serbia and the World

In this subsection, external competitive benchmarking was applied, in order to see the performance of providing crowd storage services in the world, with the aim of adopting good business practices. Therefore, the comparison criteria refer to users and service providers, the advertising method, the types of storage space offered, as well as the spatial distribution and service prices (Table 4).

In the countries of Western Europe and the USA, in more than 80% of cases, the users are natural persons who rent additional space in order to free up living space. Less than 20% are commercial users, that is, small business entities, who use the space for storing business materials and furniture. Statistics show that one in ten households in America rents additional storage space. In Serbia, the situation is different, because most crowd storage companies provide storage services to commercial users. This data shows that

the idea of crowd storage is not sufficiently current and promoted among the population of Serbia. The need for additional space is certainly caused by the new way of building without storerooms and basements; therefore, it can be concluded that the need exists and that the demand will increase in the coming years, and so it is necessary to further develop the concept of crowd storage with adequate promotion and offers. In addition to the lack of awareness among users about crowd storage services, the problems faced by service providers are the general lack of reliable economic statistics; i.e., insufficient research, management, and optimization of crowd storage space, as well as profitability.

Table 4. Benchmarking analysis of crowd storage services.

Criteria	Crowd Storage Services in Serbia	Crowd Storage Services in the World
Service users	Mostly commercial users	Mostly individuals
Service providers	Professional crowd storage service providers	Citizens
Advertising method	Websites of a crowd storage service providers and classified ads websites	Specialized crowd storage platforms
Available crowd storage types	Mostly storage containers	Mostly self-storage in a closed space
Spatial distribution of services	The capital	All large, densely populated cities
Service prices	Lower	Higher

The next analyzed topic refers to the way crowd storage services are offered. There are online platforms in the world where members independently and for free post ads in which they offer to rent basements, rooms, and even closets. Business is based more on trust and is a matter of agreement, and considering that the prices of real estate in the world are much higher compared to Serbia, in this way, users are provided with cheaper storage compared to the services provided by specialized providers. Of course, this way of doing business has its advantages on the one hand, but also has disadvantages on the other. The advantage is that the user can find suitable storage space at a good price near their place of residence, unlike the services of specialized providers who concentrate their storage capacities either in one place or in a couple of locations in the city, at much higher prices. On the other hand, hosts are given the opportunity to make additional profit from unused space, without additional efforts to make a profit. One of the issues could be providing outdated information by hosts that cause problems with agreements between users and hosts. Furthermore, the registered members of the platform themselves often do not respect the agreement, so it can happen that one party is harmed without the possibility of compensation or legal prosecution. Therefore, based on the comparison from this aspect, it can be concluded that there is no platform in Serbia that represents the market for the realization of crowd storage services. According to the conducted analysis, the additional storage space rented by individuals could only be found using services of specialized providers or via classified ads websites. Certainly, offering this kind of service is important, but the existence of an online platform will ensure the usage of services more often, and at lower prices.

According to the type of crowd warehouses represented, it can be established that in the world this type of crowd logistics service is mostly realized in independent warehouses in closed space, as well as in business-equipped warehouses, while the offer itself is more diverse, therefore luggage storage rooms are also increasingly used. In Serbia, even with companies that are professional service providers, crowd storage can be realized in storage containers or in special boxes, as is the case with the company *You Space*. The reasons for that are advertising methods and user structure. The absence of a sufficient number of warehouses for storing luggage can also be established. This type of service is professionally only provided in Belgrade by the *Storage Box* company, as well as the BAS bus station, which is an insufficient number of locations for a city that attracts an increasing number of tourists every year.

From the spatial distribution of the services perspective, and according to the analyzed platforms, additional space is mostly requested by residents of large, densely populated cities, while the offer varies (from central city areas to peripheral parts of the city). The situation is similar in Serbia because the reasons for renting storage space are the same. However, all storage services are provided in the Belgrade area, as evidenced by the fact that the analyzed companies are located in Belgrade, while some companies such as *You Space* emphasize that their services are exclusively available in the territory of the capital. Therefore, according to the demand of the residents, it is necessary to increase the spatial distribution of these services in other major cities of Serbia as well.

Finally, a comparison according to the service prices was made. As expected, the prices of storage space in the world are higher, but the difference is not drastic. It can be seen that the prices of warehouses rented by individuals in the countries of Western Europe and the USA are close to the prices at which professional crowd storage companies rent out their capacities in Serbia. However, the prices of professionally equipped storage, which can be found on the analyzed platforms for providing crowd storage services in the world, are higher by around 10 €/m² on average. The reason for this is certainly higher real estate prices and a higher standard of living, but it can be concluded that the prices in Serbia would be more favorable if there were specialized platforms that would mediate the realization of crowd storage services. As for parking spaces, it can be concluded that there is a greater price fluctuation in the demand for parking and garage spaces, compared to storage space.

6. Development of Crowd Storage Services in Belgrade

Based on the analysis of crowd storage services in Belgrade, presented in the previous section, it was concluded that there is a need to provide additional storage space in Serbia. Although self-storage companies have appeared on the market in the past few years, as well as a larger offering of storage space on self-advertisement sites, by analyzing future trends, such as new construction methods, changes in the behavior of consumer society, and the growth of e-commerce, it was concluded that user requirements for storage space will inevitably increase. In this regard, an efficient and proven solution that has been applied in the world for years was observed, and it refers to the introduction of an online platform for the regulation of crowd storage services. In order to additionally examine the justification and possibility of introducing such a platform, a survey was conducted that examines the demands of the residents of Belgrade in more detail. Namely, Belgrade is the largest, and most densely populated city in Serbia, and it is also a tourist, economic, and administrative center. The majority of migration is directed towards Belgrade, which indicates the possibility of creating a demand for storage even among visitors, not only among the population. In addition, all analyzed self-storage companies operate in Belgrade, but on the outskirts of the city, which, along with the high frequency of road traffic and the absence of alternative modes of transportation, creates a big problem for users.

Since the main motive of this part of the research was to examine the possibility and justification of the implementation of an online platform for the regulation of crowd storage services in Belgrade, the goal was to quickly and efficiently collect answers from a large group of people. For this reason, as already mentioned, an online survey was used as a research methodology. The questions in the survey were divided into two sections. The first section contained general questions, while the second contained questions regarding the subject of the research. In total, the survey consisted of 14 questions. The sample of the survey included 56 respondents who were over 18 years old and had lived in Belgrade for at least a year. The survey was conducted anonymously.

6.1. The Results of the Survey

The general questions from the survey along with the results are presented in Table 5. General questions are primarily important for the purpose of cross-referencing with ques-

tions that are more specifically related to the research problem, and for the purpose of establishing significant connections and correlations.

Table 5. Descriptive statistics.

Question	Results
Gender structure of respondents	<ul style="list-style-type: none"> • 44.6% of male respondents; • 55.4% of female respondents.
Age structure of respondents	<ul style="list-style-type: none"> • 67.85% of respondents aged 18–30; • 25% of respondents aged 31–45; • 7.15% of respondents aged 46–60.
Structure of respondents according to occupation	<ul style="list-style-type: none"> • IT experts (41.07%); • Students (17.86%); • Logisticians (8.93%); • Retailers (8.93%); • Economists (7.14%); • Directors (7.14%); • Educators (3.3%); • Healthcare workers (2.83%); • Lawyers (2.8%).
Structure of respondents according to the number of household members	<ul style="list-style-type: none"> • households with 2 members (32.14%); • households with 4 members (26.79%); • households with 1 member (17.86%); • households with 3 members (14.29%); • households with 5 members (8.92%).
Structure of respondents according to the place of residence	<ul style="list-style-type: none"> • 55.8% of respondents live in the city center; • 36.7% of respondents live in the wider city area; • 7.5% of respondents live in a suburban area.
Structure of respondents according to size and type of housing unit	<ul style="list-style-type: none"> • 57.14% of respondents live in a one-room or two-room apartment (36–60 m²); • 26.79% of respondents live in a three-room or four-room apartment (61–100 m²); • 10.71% of respondents live in a two-story house (more than 100 m²); • 5.36% of respondents live in a studio apartment (up to 35 m²).

The next group of questions refers to the examination of storage space offers. Therefore, the respondents were first asked a question related to the existence of excess space within their housing units. According to the results, 20% of respondents had excess space that could represent a potential offer for the realization of crowd storage services. On the other hand, 80% of negative responses were received to this question, which should be interpreted from two aspects. The first is that the respondents did not have additional space because their available space was used for their requirements, as well as the second aspect that refers to the fact that the respondents did not have an excess of their own space and that they needed additional space for storage. Therefore, a more detailed analysis is necessary to determine how many respondents are looking for additional space.

Respondents whose answer was positive were asked the additional question which refers to the type of available storage space. In addition to the listed answers to this question, respondents were given the opportunity to write the type of space they own, which was not in the listed options. One respondent stated that he has a skylight which can be offered for crowd storage. Additionally, the analysis determined that the most of available spaces were basements, empty and storage rooms (Figure 3).

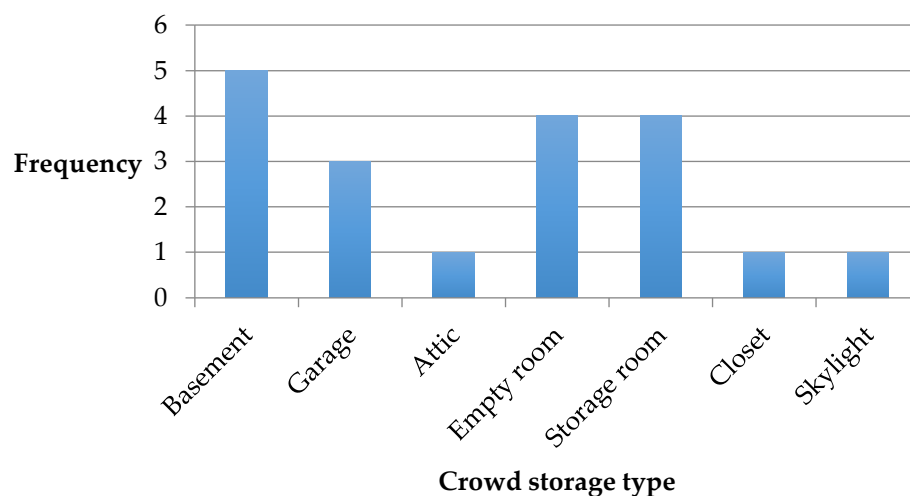


Figure 3. Distribution of the crowd storage types.

After examining the supply, the next set of questions related to examining the demand for additional storage space. According to the results obtained on the question related to the possession of excess things that would be desirable to put away, 42.5% of the respondents declared that they needed additional space, while 57.1% of the respondents answered negatively. When the answers obtained from this question are compared with the answers obtained from the question about the existence of free space excess, to which 20% of the respondents answered positively, it could be concluded that actually 37.5% of the respondents had a space that fully met their requirements. Therefore, 42.5% of the respondents had a need to dispose of excess items and, therefore, for additional storage space; 37.5% of the respondents had no requirements because their needs were already met, while 20% of the respondents had an excess of free space, which was why they did not need to rent additional space.

Respondents who positively answered the question about having excess items in their housing unit were asked an additional question related to the type of goods they would like to dispose of (Figure 4). The most common answers were clothes, followed by books and documentation, bicycles, scooters, and furniture. It is also interesting to note that female respondents owned excess clothing, while excess books and documents were mostly stored by the students.

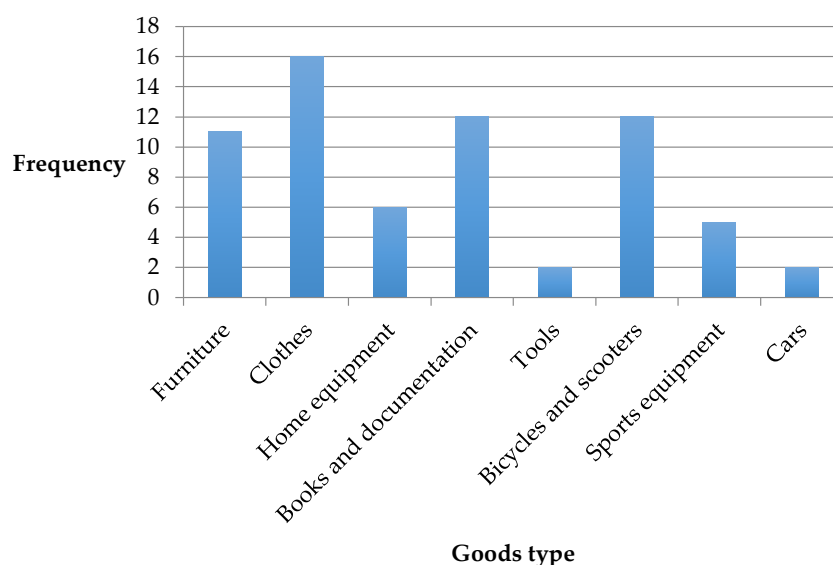


Figure 4. Frequency of the most commonly stored type of goods.

When researching the demand, the data expressing the quantity of the stored goods are also important. It was concluded that the optimal measurement when considering renting a space is the area, although the items actually occupy a certain volumetric capacity; however, the area measurement is much closer and clearer to the respondents themselves. Therefore, 50% of respondents declared that their belongings would occupy between 2.5 and 5 m², a slightly smaller percentage of respondents needed between 5 and 15 m², while only two respondents declared that they needed a space of 15 to 30 m². None of the respondents needed a storage area of more than 30 m². When considering the price of storage space, a hypothetical example of a 5 m² space offering in the wider city area with a proposed price of 30 € was given. The results showed that 60.7% of respondents agreed with this offer, while 39.3% of respondents did not consider this offer acceptable.

After analyzing the supply and demand of crowd storage services, a set of questions related to the features and capabilities of the platform itself were asked. Therefore, respondents were offered some of the most important features, which are characteristic of this type of service, with the possibility of rating according to importance from 1 (not important at all) to 5 (very important). The offered features are defined based on the analysis of platforms that have been regulating this type of service for many years in the countries of Western Europe and the USA, and based on the study of comments and suggestions from a wide population of their users. Therefore, the potential users of the platform rated all features to the highest extent with 5, that is, as very important, with the largest number of respondents assigning a rating of 5 to the feature related to providing accurate and timely information (Table 6). Of course, this characteristic also results in efficiency, which is significant for all interest groups; therefore, it is very important for the administrators of the platform, as well as its users, to be up-to-date and only provide verified information. For the purpose of ranking the importance of features, average scores were also calculated.

Table 6. Ratings of the main characteristics of crowd storage platform.

Rating of Crowd Storage Platform's Characteristic	Transparency and Practical Usage	Customer Support Availability	Providing Accurate and On-Time Information	Defined Conditions and User Data Protection
1	0	0	1	0
2	2	4	1	3
3	11	12	7	15
4	16	18	15	14
5	27	22	32	24
Σ	56	56	56	56
Average rating	4.21	4.03	4.35	4.05

In order to form an optimal concept, the main expectations from the implementation of crowd storage services were examined. Within this question, users could choose several answers. Therefore, 45 respondents declared that the main benefit of the introduction of the platform would be to quickly and easily find storage space (Figure 5). Furthermore, more than 50% of respondents agreed that the future online platform should make it possible to find storage space at lower prices and in better locations, as well as to free up the living space of excess things. It is also interesting that the possibility of additional profit from unused space was only considered by 24 respondents, which again indicates that it is necessary to raise awareness of the concept of crowd storage services among the residents of Belgrade through adequate promotion.

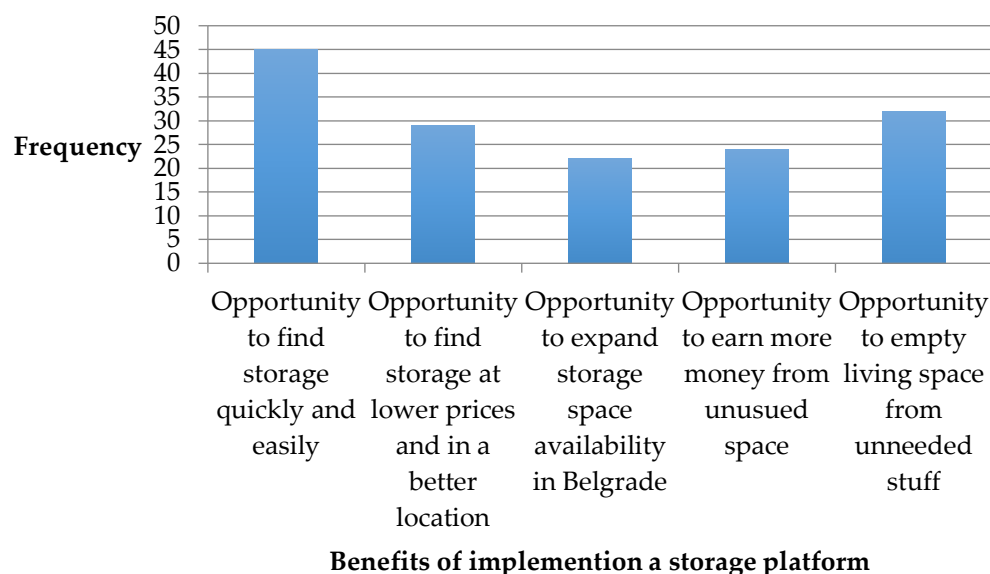


Figure 5. Benefits of the crowd storage platform.

For a more precise examination of supply and demand, as well as the relationship between them, the survey results were analyzed in more detail. Namely, respondents who lived in three- or four-room apartments, as well as respondents who lived in the wider city area, had the most excess free space. When considering the type of storage space, basements (26.31%), empty rooms and storage rooms (21.05% each) were dominant in the offer, which again mostly belonged to owners of three- and four-room apartments. On the other hand, the demand for additional storage space was examined as well. Respondents who lived in one- and two-room apartments located in the inner-city center had the most excess belongings.

6.2. The Results of the QFD Method Application

The QFD method enables the design and improvement of material products and services, with the aim of satisfying user requirements. In this paper, the QFD method is implemented in order to develop a completely new service (the introduction of a specialized online platform, which still does not exist in Serbia).

Figure 6 represents the House of Quality, which refers to the user requirements identification, along with methods for their satisfaction. As for the requirements, their identification was carried out using a survey, and users primarily emphasized the importance of accurate and on-time information, transparency and user-friendliness of the platform, data protection, customer support availability, then, affordable price, favorable storage space location, as well as storage conditions under which hygiene and safety conditions are primarily implied. It should be noted that the fulfillment of the first four requirements is directly influenced by the platform, while the price, location, and storage conditions depend on the users who are registered as hosts to the greatest extent. On the other hand, among the identified resources, i.e., ways of satisfying the mentioned requirements, there are workforce, information technologies, data verification process, terms and conditions, marketing activities, along with user ratings.

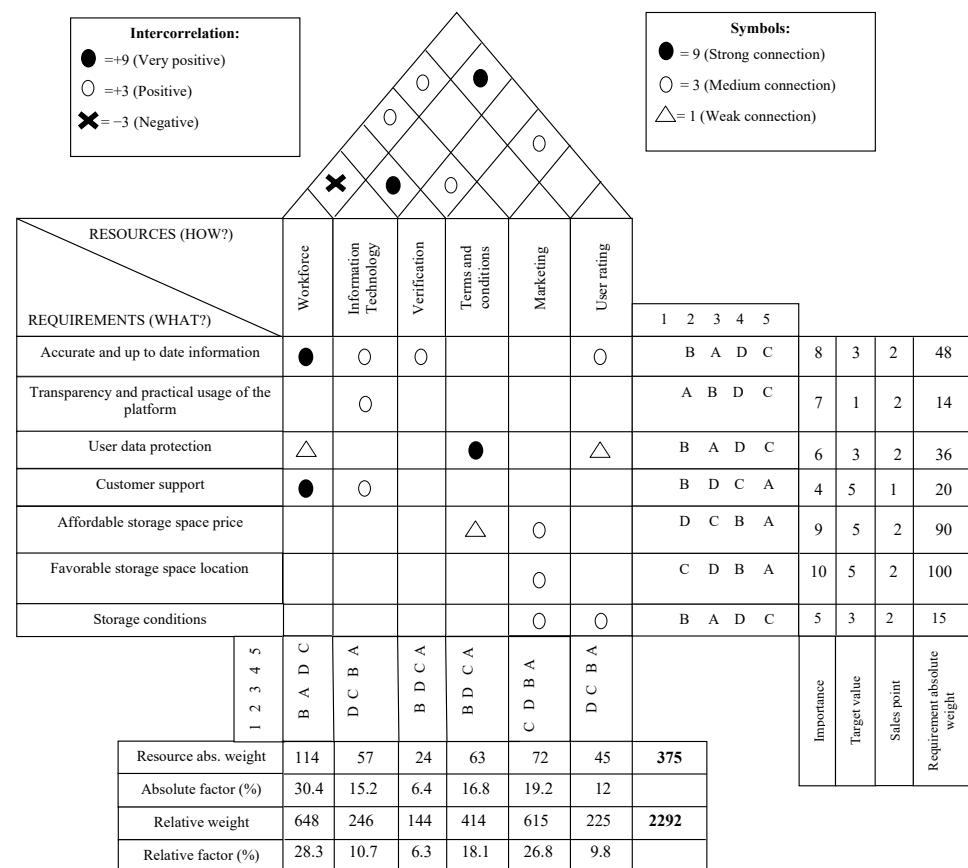


Figure 6. House of Quality.

After developing a list of user requirements and required resources, a connection between them was determined by assigning a certain symbol. Namely, each of the symbols numerically indicates the strength of the connection that was evaluated between the specific request and the resource. Therefore, a strong connection was identified between the requirement for accurate and up-to-date information and the workforce, because the promptness of employees when publishing an ad, as well as their ability to assess the validity of information, directly affect its successful implementation. However, the accurate and on-time information is certainly influenced by information technologies, in terms of their accuracy, function speed, and the limitation of simultaneous user visits, but to a much lesser extent; therefore, this connection is rated as medium. The medium connection is also assigned to the relationship between a requirement for accurate and up-to-date information and the verification process, which for greater security needs to be realized by verifying the e-mail address, photographing the identity card, as well as the person who registered the account. Finally, a medium connection is also assessed between this requirement and the user rating, as previous users can confirm the accuracy of information related to a specific ad based on their experience.

The next user requirement, which implies a transparent platform that is easy to use, is moderately influenced by information technology. However, the concept of information technology is quite broad, therefore when observing this resource, the emphasis is placed on the design and development of the front-end part of the platform. The medium connection between these entities is assigned because the satisfaction of the specific requirement can be more intensively influenced by other factors, such as the concrete conceptual solution and the skills of the programmer to implement it.

The user data protection directly depends on the terms and conditions defined by attorneys or other authorized persons. Within the terms and conditions section, special attention should be paid to the data privacy policy, which implies limited access to other

users, as well as established protection measures against data theft or falsification. Additionally, data protection depends on the workforce in some way, since the employees could recognize privacy policy violations and react. Finally, a weak connection was identified between this requirement and the user rating, which indicates the need to protect personal data when assessing the previous host or user.

The existence of customer support is a requirement that can be directly fulfilled by hiring trained and professional staff. Employees in this position should have all relevant information on solving both general and specific problems while providing advisory services. On the other hand, communication itself is impossible without information technologies, therefore the connection between these entities is rated as a medium.

The price of storage space largely depends on the host. However, with the increase in the number of users, the volume of demand in relation to supply also increases, therefore creating a prerequisite for generating lower prices on the market. In order to attract as many users as possible, it is necessary to carry out certain marketing activities, such as promotion, target group research, and market research. Due to the indirect influence of the platform on the specific requirement, the connection between the price of storage space, on the one hand, and marketing activities, on the other hand, was rated as medium. However, the platform can only have an impact on the price of storage space in the event that the host's proposed price is unrealistic, whereby they violate terms and conditions. In this regard, the platform has the right to contact the host in order to correct the price, which is why the correlation between the requirement for an affordable price and terms and conditions is assessed as weak.

As well as the price, the location of the space mostly depends on the hosts who rent spaces and the users who request them. Additionally, with the increase in the number of users, the variety of locations offered also increases, therefore, by implementing marketing activities, with the aim of gaining a larger number of users, this request can be influenced. For this reason, the relationship between the location of the warehouse space and marketing activities is rated as medium.

In the end, the storage conditions, under which hygiene and safety conditions are primarily considered, also depend to the greatest extent on the users themselves. The influence that the platform can achieve in this case regarding this requirement is the possibility of evaluating previous hosts. In this way, future users can be informed in time about the storage conditions, while the specific host can be suggested to improve the performance of the storage space that is rented. The connection between this requirement and the marketing activities is analogously assigned, as in the case of the previous two requirements.

The roof of the HoQ is formed based on an assessment of the strength of correlations between resources. Intercorrelations are represented by symbols, which also numerically indicate the strength of the connections. Therefore, the connection between the workforce and marketing is assessed as positive, because employees, among other things, deal with the realization of these activities. Furthermore, the connection between the verification process and terms and conditions is assessed with the same strength, because the data verification process, as well as its further use, should be a mandatory step defined in the terms and conditions. In addition, terms and conditions are positively correlated with the workforce, because these conditions, as well as their implementation, to a certain extent, also relate to the business procedures of employees. Finally, terms and conditions define the user rating option, but only in case those users have made an agreement about renting storage space. In this regard, the strength of the connection between these two resources was assessed as positive. A very positive connection was established between information technology and the verification process, as well as between information technology and user rating because these resources are based on the application of the software. Finally, a negative relationship was identified between information technologies and the workforce, because the automation and computerization of the process in the realization of crowd storage services reduce the number of employees required for their implementation.

Within the HoQ, a comparison in relation to the competition is also presented. Therefore, the letters refer to the following:

- A—Specialized online platform for providing crowd storage services;
- B—Classified ads websites;
- C—Self-storage companies;
- D—Moving agencies.

The level of requirements satisfaction, as well as the level of the resource representation, are rated on a scale from 1 (very weak) to 5 (very strong). In terms of accuracy and up-to-date information, at the highest level, there are self-storage companies that publish verified information on their websites, followed by the moving agencies, the self-storage platform, and self-advertising platforms, respectively. The reason for ranking like this is that self-storage companies and moving agencies are considered professional service providers, therefore the information they publish must be accurate and up-to-date, while the services on the mentioned platforms are mostly provided by amateurs. In addition, the reason why the self-storage platform, in the case of this requirement being higher in rank compared to the self-advertising platforms, is that on the specialized online platform, each ad is checked and approved by the administrator before publication, which increases the accuracy of the data. While on the other hand, ads on self-advertising platforms are not checked by anyone; thus, even ads that are not active anymore can appear.

The transparency and practical usage of the platform are rated as the highest for self-storage companies and moving agencies. On the other hand, these companies often have websites and not C2C platforms, but this is certainly the simplest way to search for important information about the company. Self-advertisement platforms are ranked worse because, unlike specialized platforms, the procedure for registering members is much simpler. However, the lower complexity of this requirement affects the increase in the complexity of others, therefore the paperwork is more complex for self-storage companies, while it is almost non-existent for C2C platforms.

Self-storage companies and moving agencies are also rated the highest in terms of data protection, because they store information about their users in internal databases, without publishing them online, followed by a specialized online platform, which invests a lot of effort in additional checks and data protection measures, such as the verification process and additional checks of administrators. Self-advertising platforms, where the only measure of protection is compliance with the privacy policy, are ranked the worse.

The biggest advantages of a specialized platform are the existence of customer support, as well as more affordable space prices in more favorable locations. On the other hand, the ratio of price and location is ranked as the worst for self-storage companies, as well as moving agencies, while self-advertising platforms are in between.

Finally, as far as requirements for storage conditions are concerned, by far the best and most diverse conditions are provided by self-storage companies. Their storage units are specialized for different types of goods; therefore, in addition to the basic conditions, they optionally provide air conditioning and ventilation conditions, while equipping it with different alarm systems. Furthermore, the conditions provided by moving agencies are largely controlled and suitable for storing a wide range of goods. The self-storage platform is ranked worst compared to the previous once, because the space rented by individuals is certainly not specialized for certain types of goods, but it can certainly meet the basic requirements of users. Self-advertising platforms are ranked last because administrators do not deal with the possibility of improving the performance of their users, that is, the space offered.

As for engagement in meeting the aforementioned requirements, from the perspective of the workforce, self-storage companies and moving agencies are at the highest level. The reason for this is that these companies fully provide a professional service, while on the platform for regulating crowd storage services, the service providers are amateurs. Self-advertising platforms are ranked as the worst according to this criterion because they do not hire the workforce for marketing, customer support, or booking specialists.

The information technology and the verification process are at the highest level within the specialized platform, because the entire mediation, identity verification, and communication take place on the same platform. The next ones are self-storage companies and moving agencies, while the worst in terms of verification are self-advertising platforms.

When observing marketing activities, the specialized online platforms are ranked as the best, but it should be noted that they are not as high as in other crowd logistics services. Self-advertising platforms are ranked as the second best and are very popular among users. The worst ranked are moving agencies and self-storage companies, with whose service concept, from the aspect of storage, a significantly smaller number of people are familiar with and whose promotional activities are not so noticeable.

Finally, as far as user ratings are concerned, this resource would be the most represented, but also the most useful on the self-storage platform, followed by platforms for self-advertising, where there is also the possibility of rating the ad, as well as leaving comments about it. Last ranked are self-storage platforms and moving agencies, because users can be informed about them based on reviews and ratings that can be assigned by people who have not used their services.

Determining the user requirements priority was performed from the importance, target value, and point of sale perspectives. The importance of the requirement is numerically ranked, and the evaluation is conducted based on the results of the survey. Therefore, the most important things for users are the location and price of storage space, then the provision of accurate and up-to-date information by a transparent, an easy-to-use platform that protects their data and provides favorable storage conditions, as well as assistance from customer support. The target value is rated on a scale of 1 to 5, with the following numbers indicating:

- 1—changes;
- 3—improvement;
- 5—the service is better than the competition.

Furthermore, the assignment of the target value was performed on the basis of a previous assessment of the competition. Therefore, it is necessary to improve the accuracy and timeliness of information, the transparency of the platform, data protection, as well as the option of user ratings, while the service is more competitive in terms of customer support, price, and space location.

A point of sale can have one of the following two values:

- 1—the service has a negative effect on sales;
- 2—the service has a great sales effect.

Therefore, the sale of the service is affected by accurate and up-to-date information, because if the information in the ad does not correspond to the real condition of the space, the user will not buy the service or will file a complaint. Furthermore, the sale of the service is also influenced by the price and location of the space, as they are some of the basic criteria when choosing a space for renting. In addition, data protection, user ratings, and ease of use of the platform can cause a large sales effect, as they assure users that their data is protected and that the service delivery is fast and efficient. Customer support can have a negative effect on sales, i.e., operators who cannot always answer all customer questions, thereby losing their trust.

The absolute weight of the requirement is calculated using Equation (1). Therefore, the highest absolute weight is achieved by user requirements related to an affordable price and convenient location, followed by accurate and up-to-date information, as well as data protection. The lowest absolute weight is achieved by user requirements related to customer support, transparency, and an easy-to-use platform that offers the option of user ratings.

In the end, the priority of the resources was determined, as well as their final assessment. From the perspective of the absolute weight of resources, which was calculated by applying Equation (2), the highest value was obtained by the workforce, followed by marketing activities, terms and conditions, information technologies, user ratings, and finally,

data verification. The relative weight, which was calculated using Equation (3), generated analogous results. The absolute and relative factors were calculated using Equations (4) and (5), respectively.

The criteria weights were determined based on the absolute weight of each of the criteria. Namely, for each criterion, the share in the total absolute weight was calculated; so for the first criterion, a weight of 0.149 was determined as follows: $48/323 = 0.149$. The weights of the other criteria were determined in the same way.

6.3. The Results of the WASPAS Method Application

After determining the criteria weights using the QFD method in the previous step, the WASPAS method was used to perform the final ranking of the alternatives. The first step of applying the WASPAS method is determining the initial decision matrix (Table 7). In this matrix, all alternatives that were observed in this paper were evaluated according to the observed criteria on a scale from 1 to 5.

Table 7. Initial decision-making matrix.

	C1	C2	C3	C4	C5	C6	C7
Type	max	max	max	max	min	max	max
Weight	0.149	0.043	0.111	0.062	0.279	0.310	0.046
A1	5	5	3	5	3	4	3
A2	3	5	3	5	4	4	3
A3	2	4	5	4	1	2	4
A4	2	5	5	4	2	2	5

After determining the initial decision matrix, the next step of the WASPAS method involves normalization (Table 8) in accordance with the type of criteria using Equations (6) and (7).

Table 8. Normalized decision-making matrix.

	C1	C2	C3	C4	C5	C6	C7
Weight	0.149	0.043	0.111	0.062	0.279	0.310	0.046
A1	1.00	1.00	0.6	1.00	0.333333	1.00	0.6
A2	0.6	1.00	0.6	1.00	0.25	1.00	0.6
A3	0.4	0.8	1.00	0.8	1.00	0.5	0.8
A4	0.4	1.00	1.00	0.8	0.5	0.5	1.00

In the next step, Equations (6) and (7) were applied, to determine total relative importance based on WSM ($Q^{(1)}$) and total relative importance based on WPM ($Q^{(2)}$) (Table 9). After that, Equation (8) was applied to obtain a final ranking of alternatives (Table 10). In this paper, λ value was taken as $\lambda = 0.5$, but generally, it can take a value between 0 and 1. For this reason, in the next section of the paper, a sensitivity analysis was performed to see whether the final rank of alternatives will change.

Table 9. Determining total relative importance based on WSM and WPM.

	C1	C2	C3	C4	C5	C6	C7	Q ⁽¹⁾
A1	0.15	0.04	0.07	0.06	0.09	0.31	0.03	0.75
A2	0.09	0.04	0.07	0.06	0.07	0.31	0.03	0.67
A3	0.06	0.03	0.11	0.05	0.28	0.15	0.04	0.73
A4	0.06	0.04	0.11	0.05	0.14	0.15	0.05	0.60
	C1	C2	C3	C4	C5	C6	C7	Q ⁽²⁾
A1	1.00	1.00	0.94	1.00	0.74	1.00	0.98	0.68
A2	0.93	1.00	0.94	1.00	0.68	1.00	0.98	0.58
A3	0.87	0.99	1.00	0.99	1.00	0.81	0.99	0.68
A4	0.87	1.00	1.00	0.99	0.82	0.81	1.00	0.57

Table 10. Final ranking of the alternatives for $\lambda = 0.5$.

Alternative	Q ⁽¹⁾	Q ⁽²⁾	Q	Final Rank
A1	0.75	0.68	0.715	1
A2	0.67	0.58	0.625	3
A3	0.73	0.68	0.703	2
A4	0.60	0.57	0.588	4

Based on the results presented in Table 10, it can be concluded that alternative A1 has the highest value followed by alternatives A3, A2, and A4. The final ranking of the alternatives can be presented as follows: A1 > A3 > A2 > A4.

7. Sensitivity Analysis and Discussion

7.1. Sensitivity Analysis

In this section of the paper, a sensitivity analysis was performed, to see whether the change in the value of λ will affect the final ranking of the alternatives. On that occasion, all possible values of this coefficient were taken into account; i.e., from 0 to 1. The obtained results after conducting the sensitivity analysis are shown in Table 11. As can be seen, the rank of alternatives is as follows for all λ values except for $\lambda = 0$: A1 > A3 > A2 > A4. The only change in the solution occurs when λ takes the value 0, where in that case the WASPAS method is actually transformed to the WPM method. Only then, alternative 3 has the highest value and the rank of alternatives is as follows: A3 > A1 > A2 > A4 (Figure 7). Furthermore, based on the values from the table, it can be concluded that as the value of the λ coefficient increases, so does the difference in value between alternatives 1 and 3. Based on the obtained results, it can be said that the obtained solution is fairly stable since there are no major changes in the final ranking of the alternatives.

Table 11. Sensitivity analysis.

	$\lambda = 0$	$\lambda = 0.1$	$\lambda = 0.2$	$\lambda = 0.3$	$\lambda = 0.4$	$\lambda = 0.5$	$\lambda = 0.6$	$\lambda = 0.7$	$\lambda = 0.8$	$\lambda = 0.9$	$\lambda = 1$
A1	0.679	0.686	0.694	0.701	0.708	0.715	0.722	0.730	0.737	0.744	0.751
A2	0.581	0.590	0.599	0.607	0.616	0.625	0.633	0.642	0.651	0.660	0.668
A3	0.681	0.685	0.690	0.694	0.699	0.703	0.708	0.712	0.717	0.721	0.726
A4	0.573	0.576	0.579	0.582	0.585	0.588	0.592	0.595	0.598	0.601	0.604

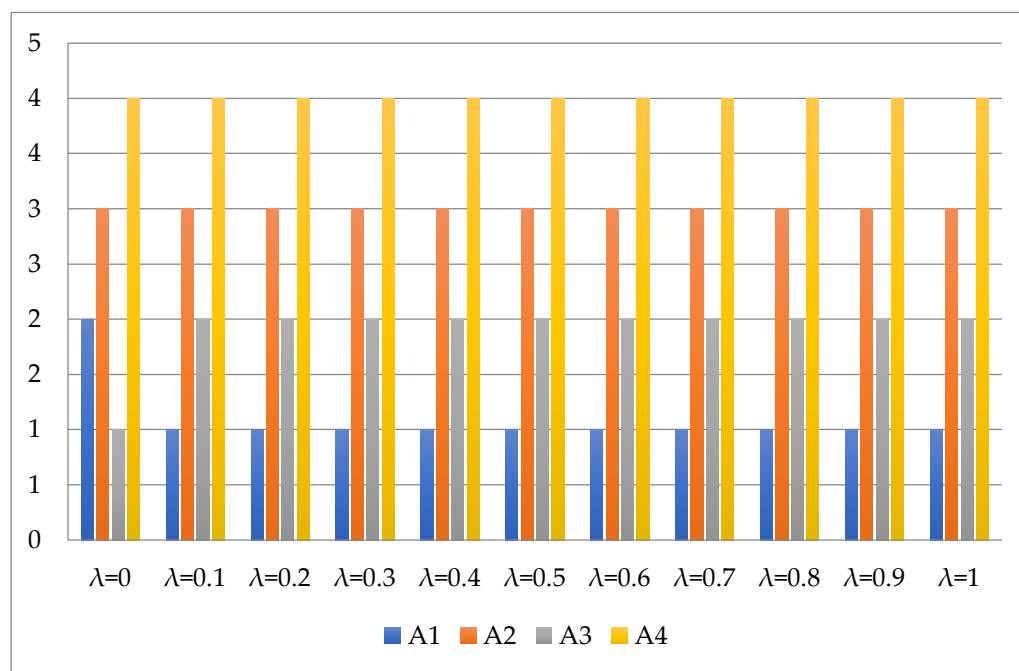


Figure 7. Sensitivity analysis results.

7.2. Theoretical and Managerial Implications

The methodology applied in this research can be used when creating a conceptual solution for a self-storage platform for any multi-million, densely populated city. By surveying users, it is possible to determine requirements and preferences in the selection of storage space, as well as supply and demand within the specific market. Based on the obtained results, and by applying the appropriate standardized method for quality improvement, it is possible to more closely define the requirements and the methods for their satisfaction. In this regard, it would significantly affect the reduction of risks from the financial and functional aspects of the platform. Furthermore, by more detailed research of the specific market, it is possible to define the competition, but also the problem points in the implementation of crowd storage services, which would influence the stimulation of new solutions that would contribute to the progress of crowd and city logistics. Based on the literature review, it was concluded that there is a serious lack of papers regarding crowd storage, especially regarding the development of a crowd storage platform. Hence, the results of this paper could not have been compared with the results of the similar researches. Furthermore, in developed countries, existing platforms could provide valuable statistics (storage size, location, demand and supply, etc.) that could be used for the further development and improvement of the crowd storage platforms. This could be combined with Big Data, Artificial Intelligence (AI), and other tools in order to enhance the capability of the platform.

This research also provides a starting point for identifying new ideas that could significantly ease the lives of residents of large cities. Given that emphasis in the future will certainly be on creating a connected sustainable community, the self-storage platform would be a good example for implementing solutions that will be based on the creation of ecological, economic, and social benefits. From the aspect of environmental benefits, the introduction of the self-storage platform will reduce the need for the construction of dedicated storage facilities, which will prevent the use of green areas for industrial or construction purposes. Furthermore, specifically in Belgrade, the implementation of a self-storage platform would reduce the number of passenger cars used for transporting things, with the aim of storing them in professional self-storage units located on the outskirts of the city. Finally, a self-storage platform would encourage people to engage in micro-

entrepreneurship, which again presents a good starting point for improving sustainability. Based on the results of the paper, several effects on sustainability were identified:

- Environmental,
- Social/Human,
- Economic.

The first effect on the sustainability of the crowd storage platform is the reduction in the construction of new storage facilities. Furthermore, by renting storage space near customer locations, all negative effects of the transportation are reduced. In addition to the aforementioned effects, which are mainly environment-related, the platform could have an impact on social/human and economic aspects. Since this platform represents a C2C business model, there is a higher chance of long-term renting, thus affecting the social/human aspect (a win-win situation for both sides). Namely, by creating a platform, the hosts can gain additional revenue.

The development of the self-storage platform, and therefore the expansion of crowd storage services, will enable the connection of different types of crowd logistics services, such as crowd transportation or crowd distribution. In this regard, this research creates the basis for the implementation of a future platform that would combine the services of crowd storage and crowd transportation, so that people, after finding the desired space, would have the possibility of renting transport capacity in the form of vans or pickup vehicles. In this way, the users of the platform would be the organizers of the logistics service themselves, and the costs of transportation and storage would be significantly lower and more accessible to the wider population. In addition to this, the proposed methodology can be applied in other crowd logistics areas such as crowd delivery and crowd shipping in order to construct the platform. By doing so, managers can better understand customer requirements, and thus improve business efficiency. Furthermore, this methodology could enable continuous improvement by surveying customers in order to determine the most important and desirable features of the platform. In addition, the proposed methodology could be applied for designing the products, since managers (in production, retail, etc.) could obtain valuable information based on surveys and QFD regarding the desired features of the product, which would increase their competitiveness in the market.

In addition to the aforementioned indisputable practical contributions, this research also provides outstanding scientific contributions. Namely, by filling the gap in the literature on the identification of requirements and resources necessary for the development of self-storage platforms, the basis for future research has been established. The paper also shows the importance of applying the survey approach in identifying user requirements. User requirements are connected with previously identified resources using the QFD method, in an extremely practical way, with the aim of obtaining the weights of user requirements, as well as criteria that are important for choosing the optimal solution. Furthermore, this approach, with certain modifications, can be used to investigate similar problems in other areas.

8. Conclusions

Crowd storage services are becoming increasingly popular and people are thrilled about them no matter if they are users or hosts. One of the reasons for their approval and more intensive use are certainly trends such as the new concept of building apartments without basements, as well as intensive migration of the population directed towards larger cities, which influences the increase in space intended for housing with the reduction in storage space. Therefore, the majority of the population of urban areas found a solution to this problem on online platforms that have become typical representatives of the crowd storage services market. The space offer is diverse, and the prices are much more favorable compared to professional storage. However, the analysis found that this concept is not yet popular and sufficiently developed in Serbia. Therefore, mainly spaces rented by professional providers of crowd storage services can be found in the offer, primarily in

Belgrade, or additional capacities can be found on self-advertising sites. Accordingly, based on the results of the conducted survey, it can be concluded that the supply of storage space in Belgrade exists and that it is mostly located in the wider city area in the form of basements and empty rooms. Demand is higher than the supply, and is based on the requests of the owners of one- and two-room apartments in the inner-city zone. This data shows that basements, attics, and storerooms, which can be found in old buildings in the inner-city zone, cannot satisfy the demands of the users, which proportionally grow with the increase in population density, as well as with the change in the behavior of the consumer society. Based on the conducted survey and the QFD method, it can be concluded that users are primarily looking for a favorable location of space at affordable prices while receiving accurate and verified information from a provider that guarantees the protection of personal data and help in the form of customer support. In order to fulfill all of the abovementioned requirements, it is primarily necessary to engage professional human resources and advanced information technology. Based on the results of the WASPAS method, it can be concluded that the stated user requirements would be satisfied to the greatest extent by the introduction of a self-storage platform, initially intended for the residents of Belgrade.

The main contribution of the self-storage platform is reflected in the possibility of the better use of space, primarily in large, densely populated cities. In addition, other benefits are present as well, such as a higher degree of socialization, encouraging residents to engage in micro-entrepreneurship in order to create new solutions, while the biggest benefit of this solution would be the creation of a sustainable and environmentally conscious community. In addition, this paper makes an invaluable contribution and closes the gap identified in the literature in the field of crowd logistics, dealing with solving a concrete global problem.

Generally, the proposed methodology does not have limitations. The only limitation of this research is reflected in the fact that the survey sample could be bigger in order to obtain even more reliable results. In addition, another limitation is reflected in the fact that only citizens of Belgrade were included in the survey sample. A combination of the proposed methodology with Big Data, simulation, metaheuristics, etc., presents a good basis for the wider applicability of the proposed approach.

In this sense, future research on this topic could certainly include a larger group of respondents, which would result in more precise results, and therefore more precise parameters important for the creation of a future self-storage platform. In addition, the idea is certainly to include other larger cities in Serbia in future research, such as Novi Sad, Niš, and Kragujevac, in order to examine the justification for expanding the geographic domain of services. Future research should be directed towards testing the developed methodology for other markets in the world regardless of size. One of the future research directions is combining other methods and approaches in order to improve and perfect the proposed approach. In this way, critical service components and critical process parameters would be analyzed in more detail, and procedures and instructions for their implementation and control would be determined. Furthermore, another direction of future research is the inclusion of user behavior factors in order to collect practical information. As one of the last directions of future research, defining promotional strategies and the development of a marketing plan for the designed crowd storage platform, as well as the measurement of the quality of the services provided, stand out.

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