

Place of Informal Transportation in Public Transport

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Abstract- Informal transportation has become an important topic in recent years. It plays a critical role in transportation due to filling gaps for unmet transport demands. At this point, there is a need for collaboration with public authorities. In this study, the dynamics of informal transportation are defined as policy, demand, culture, and technology to form a holistic perspective. The Delphi method is applied to study to construct a SWOT analysis. SWOT analysis is constituted regarding international transportation experts, literature studies, and the author's expertise. According to the SWOT analysis, flexibility, agility, and complement are seen as strengths, and lack of institutionalization and lack of integration with public transportation is seen as the main weaknesses. From the external perspective, when collaboration can be seen as the main opportunity, lack of regulation and monitoring can be seen as obstacles to improving service quality for informal transport. Transportation experts from Istanbul assessed the proposed model using Analytic Hierarchy Process (AHP). Results showed that external analysis is the most criterion in the first level of the model. In the second level, threats come first with 0.38 weight. This study will be a guide to find out improvement plans for a stronger relationship between formal and informal institutions regarding dynamics and results of SWOT analysis. Also, it presents a global framework of SWOT analysis for informal transportation.

Keywords Informal transportation, dynamics of transportation, Delphi method, AHP method, SWOT analysis.

1. Introduction

Informal transportation has been an important issue in recent years. There are many reasons for getting high importance such as lack of capacity for public transportation, Covid-19 effects, ease of accessibility, and changing customer behaviors. Thus, it plays an important role in the transportation system. Regarding the study of Cervero, it is called gap fillers due to filling service gaps left unfilled by public transport transportation [1].

While there is no consensus about what is definition of informal transportation, there are different definitions for it. According to Cervero [1], the definition of informal transportation varied as paratransit, low-cost transportation, intermediate technologies, and third-world transport. Favourate Y Sebele-Mpofu [2] defined informal transportation with three district groups that are Subsistence Enterprises, Microenterprises, and Small Medium Enterprises (SMEs) regarding tax proportion. Outside of these categories, is accepted informal transportation by the authors. Regarding Transportation Research Board (TRB), it is described as demand-responsive services by self-organized individual operators without any regulations [3]. To make a consensus about informal transportation, Hirschhorn, van de Velde, Veeneman and ten Heuvelhof [4] analyzed the relationship

between informal organizations and formal institutions. Findings showed that public transportation will be more attractive with informal types. In this way, it is easy to provide sustainable transportation.

Literature studies show that there are challenges between informal and formal transportation in cities. There is a need for coordination and optimization of informal transportation [5,6]. Greg Marsden [5] handled integration and coordination problems between informal and public transport.

Also, the authors discussed the importance of financial resources and powers to implement public transport policies. To improve coordination, academicians indicated that policymakers should take responsibility for more integrated approaches [6]. Berman, Smith, and Bauer [7] expressed that regional objectives for public transport should be put forth with respect to potential importance. Although there are many studies about informal transportation, there is a lack of SWOT analysis for the only informal transportation system with a holistic perspective. This study fills the gap by providing a global framework including strengths, weaknesses, opportunities, and threats of informal transport. The next section is the background of informal transportation including case studies, global perspectives, and policies about it. The dynamics of informal transportation are in the third section

with four perspectives which are policy, culture, demand, and technology dynamics. In the fourth part, the methodology is presented as the Delphi method with result that is a SWOT analysis regarding literature studies, international transport experts, and the author's experience. The last part is the discussion and the conclusion is the fifth part.

2. Background

Cervero and Golub [8] presented a global perspective on informal transportation. They analyzed case studies for developing and developed cities. While for developing cities examples were Mexico City, Jakarta, and Nairobi, for developed cities were New York City, Hong Kong, and Belfast. Guillen, Ishida, and Okamoto [9] researched the use of informal public transport modes in developing countries habitual. They conducted an empirical study in Davao City, Philippines. Results showed that there is a need to understand the concept of sustainability, infrastructure needs, seamless multi-modal connections, and overall quality of service regarding Filipino commuter psychology. Aworemi, Salami, Adewoye, and Ilori [10] represented the impact of socio-economic characteristics of formal and informal public transport demand for Kwara State, Nigeria. The survey was conducted with 256 respondent commuters. According to the findings, income and cost of the trips play an essential role in public transport demand in the selected areas. Also, the authors indicated that the government should support informal transportation to improve the performance of services. World Research Institute published a study about informal transportation case studies from Latin American cities. The study focused on reforms in informal transportation taking into account benefit-cost analysis. Also, Institute presented a guide for bus reform in Latin America [11]. Hirschhorn et al. [4] studied the relationship between formal and informal institutions for the governance of public transport. The authors analyzed case studies about informal transport in two cities that are Oslo and Amsterdam. Results show that informal transportation is a complimentary issue for formal transportation due to filling gaps.

From the policy perspective, Golub, Balassiano, Araújo, and Ferreira [12] analyzed the impact of proposed policies for informal transportation. Eleven potential policies were evaluated with benefits and cost analysis. Results showed that policies cause a competitive environment for both informal and formal transportation. Hirschhorn et al. [4] presented a study how the interplay between formal and informal frameworks. The main aim of the study is to find out about the governance of attractive public transport. Findings show that interaction between formal and informal institutions provides to make the right decision about what policies to design and understanding how policy-making and implementation. Daniel Oviedo [13] proposed a snapshot of the informal organization of public transport operators in the Caribbean. The authors analyzed the topic from three main perspectives that are functional, space-time, and social sides. They indicated that informal transportation services should be improved regarding policy and regulation in urban transportation planning content.

3. Dynamics of Informal Transportation

Policy, demand, culture, and technology have been seen as dynamics of informal transportation that are summarized in this section.

3.1. Policy Dynamics

Policies are handled from two perspectives which are indirect and direct policies. Direct policies on informal transportation can be wrapped up as follows. Although there are many studies about informal transportation policies, most of them focus on legalization and regulation [8,14,15]. Policy-makers desire to integrate all transport modes under a legal context to monitor and improve service quality regarding changing demands. Firstly, they attempt to legalize the system and regulate it [8]. Finally, they invest to improve the service quality.

Indirect policies were summarized by Al Oтары, AbouZeid, and Kaysi [16], with four main headings as follows. The first one is the accessibility of current bus services that affects passenger choices for mode selection. If the distance between the household and the bus line is closer, passengers are prone to choose public transportation otherwise they start to seek new transport options such as informal ones. The second one is service quality which includes comfort, safety, reliability, information system, customer care, environmental impact, and travel time [17-19]. Changes in land development are seen as a third policy due to changing demand numbers and also behavior. The last policy is changing fuel costs. When fuel cost increase, people turn to use public transportation due to decreasing travel costs. Similarly, welfare changes affect transport choices [12].

3.2. Demand Dynamics

Customer segmentation can be different among types of informal transportation. Amrapala and Choocharukul [20] analyzed customer segmentation for informal transportation in Bangkok. The authors conducted a survey with 242 valid responses from users. Findings showed that young riders tend to be more satisfied with the services. Also, the authors presented passenger profiles in Sri Lanka. The authors indicated that young riders who are between 21-30 ages preferred intensively. When they look at occupation segments, there are different users that are students, housewives, office workers, self-employed, and unemployed. In addition, half of the users have their own private vehicles. The study of de Almeida Nascimento and de Andrade [21] indicated that young people are eager to prefer informal transportation in Brazil. When they look at travel motivation, the vast majority is related to non-business journeys like shopping, health, and banking.

3.3. Culture Dynamics

Informal organizations can be seen as cultural or social institutions [22]. Social embeddedness locate in these organizations' hearts. Economic relations are executed by

social relations [23]. Informal transport companies are shaped historically and culturally without institutionalization.

From passengers’ perspectives, informal organizations reshape mobility culture because of serving different services such as demand response, low cost, and more flexibility [24]. According to the cultural context, vehicles varied from vans to two or three-wheelers [8]. In addition, they are called different names regarding social context. For instance, in Bangkok, their name is TukTuks, in Jakarta, the names are Bajajs, in Indonesia, they are called Ojeks like this [1]. Informal transport pictures are shared from different cities in Fig.1 and 2.



Fig. 1. Tuk Tuks in Bangkok [25].



Fig. 2. Bajajs in Jakarta [26].

Regarding literature studies, types of informal transport vehicles are presented as follows in Table 1.

Table 1. Types of informal transportation.

Class	Routes	Capacity	Service Coverage
Minibus/ jitney	Fixed	12-24	Subregion [1]
Microbus	Fixed	4-11	Subregion [1]
Three-wheelers	Variable	1-4	Neighborhood [27]
Pedicab	Variable	1-6	Neighborhood
Combi-vans	Fixed	12-24	Subregion [1]
Motorcycle	Variable	1-3	Neighborhood [27]

3.4. Technology Dynamics

Digitalization affects every sector as well as transportation. With digitalization, sharing services, platform services, and demand response services have become important issues in the transport sector [28,29,30,31].

Common points of these solutions are managed by software to decide how much demand, from which point, and in what features which include comfort, accessibility, and use of cost.

Technology presents a valuable tool to diversify transportation solutions. The rapid development of new transport solutions forces authorities to collaborate [15]. In some situations, public transportation can be inadequate in the face of changing demand. At this point, before-mentioned transport services such as sharing, platform, and demand response are preferred as first and last-mile solutions [32,33].

4. Methodology

The Delphi method is widely used in the literature in different areas such as healthcare, education, finance, technology, transportation, etc. [34-38]. Although it is based on consensus, steps are defined to apply effectively [39].

The method is used in the study to structure a SWOT analysis for informal transportation. It was developed by RAND during the 1940s to collect opinions from experts in a structured way [40]. According to Linstone and Turoff, the methodology is summarized in four main steps which are as below [34].

Step 1: Experts discuss the topic to understand it clearly with their comments.

Step 2: After discussion, a consensus begins to form.

Step 3: Ask the experts if there is any disagreement for consensus. If there is, go a step backward and discuss it again. Otherwise, go forward.

Step 4: Finalize the discussion with a consensus.

In addition, the method includes some rules that are followed [41].

- Experts should be selected regarding their experience.
- The topic should be defined clearly.
- Each expert should contribute respectively.
- There is no pressure for ideas to dominate.
- External factors should not affect ideas.
- There should be an interaction between experts to make a consensus.

The methodological framework is presented in Fig. 3. below. Firstly, the topic is selected for discussion. After, related experts are invited regarding their expertise. Then, the topic is explained to understand clearly which is called round 1. In round 2, the discussion starts and rates in round 3. If there is no disagreement, the process is finalized. Otherwise, come back round 2 and discuss again to make a consensus.

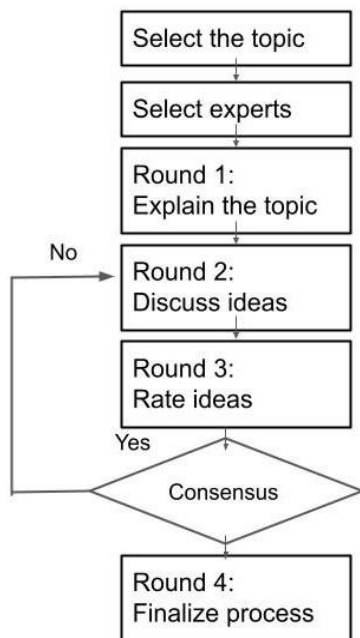


Fig. 3. Methodological framework.

4.1. Model Design

The SWOT analysis is composed of strengths, weaknesses, opportunities, and threats of examined issues. It has been the mostly used tool for strategic planning [42]. It provides to present not only internal perspectives that are strengths, and weaknesses and also external ones which are opportunities, and threats.

SWOT analysis was proposed by CCAKGW Learned [43], and it has been applied to wide issues are transportation, healthcare, information technology, the banking industry, marketing, agriculture, etc. [44-47]. In this part, SWOT analysis is applied to informal transportation to find out its

location in the transport sector. SWOT analysis is prepared regarding experts' opinions and literature studies with the author's experience which is shown in Fig.4. Experts are selected from worldwide which is named the informal transportation working group of The International Association of Public Transportation (UITP). Their expertise is transportation systems that are from Africa, Asia, and Europe to integrate a wider perspective for the study. And also, the proposed SWOT analysis represents a global framework for informal transportation as a result of the Delphi method.

According to Fig. 4., SWOT analysis composes of internal and external ones. When strengths and weaknesses are located under the internal one, opportunities and threats are under the external one. For the strengths, flexibility, agility, and complement are seen main advantages by experts for transportation. Informal transportation fills the gap when supply could not meet passenger demand. It can provide different types of vehicles such as minibusses, microbuses, three-wheelers, and pedicabs like this which are summarized in Table 1. Also, it contributes to an increase in the working power due to providing new job opportunities. On the weaknesses side, lack of integration with public transport and lack of institutionalism are seen as basic disadvantages. Informal transportation serves as a local service. Also, there is a safety question due to the lack of marketing and unstandardized labor.

When we look at it from an external perspective, collaboration with public authorities is a big chance for the integration and institutionalism of informal transportation. If we provide more options for transportation, there is a chance to decrease using private vehicles. Also, informal transportation can play a critical role to satisfy demand regarding changing behavior and the growing population. For the threats, lack of regulation is the main obstacle to improving the service quality. Because of a lack of monitoring, unfair ticketing, security issues, and negative environmental issues will have emerged in the future.

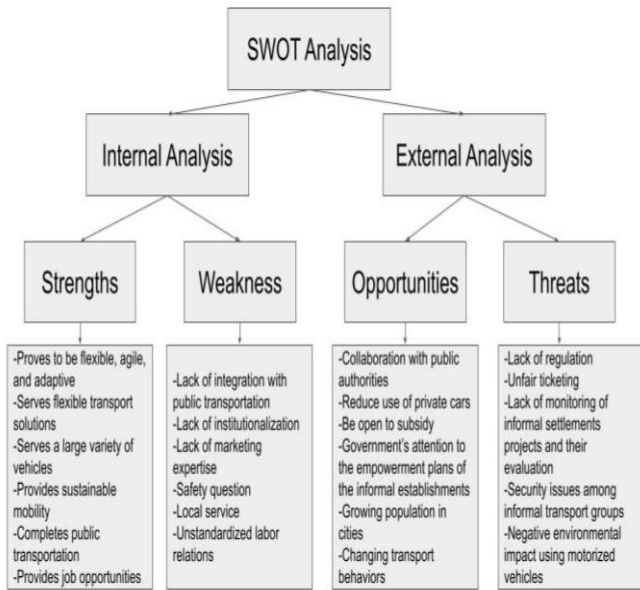


Fig. 4. SWOT analysis for informal transportation [42,48,49,50].

4.2. Data Collection and Results

Using the Delphi method, components of SWOT analysis are proposed in the previous part. To understand which criterion is more important than others, Analytic Hierarchy Process (AHP) method is applied to SWOT analysis for informal transportation as a case study of Istanbul. AHP is chosen due to its wide application such as in a effective way [51,52].

Transportation experts assessed the proposed model which is shown in Fig. 4. Pairwise matrices were filled with experts with an explanation of the proposed model. According to the results, external analysis is more important than internal one which is presented in Table 2. When we look at the second level of the proposed model, threats come first with 0.38 weight, then opportunities come in second with 0.25 weight regarding experts' evaluation. And weakness comes last with 0.12 weight.

Table 2. SWOT analysis results.

Level	Criteria	Weight	Order
First	Internal analysis	0,36	2
	External analysis	0,64	1
Second	Strengths	0,24	3
	Weakness	0,12	4
	Opportunities	0,25	2
	Threats	0,38	1

5. Discussion and Conclusion

Informal transportation has been more important day by day. Especially during Covid-19, transportation behavior is changed due to decreasing the risk of getting sick. People preferred uncrowded transportation solutions to public transportation such as demand services, and private cars [53]. At this point, Covid-19 provides a challenge to rethink improving public transportation services.

Literature studies argued that informal transportation needs to improve service quality with public authority collaboration [19,42,49,50,54]. The main improvement areas can be put in order such as unplanning services, competition in the market, inefficient planning, safety problems, labor abuses, and lack of discipline [8]. Unplanning services are activated by passenger demands at any time. For competition, instead of regulation and rules for competition, operator powers are valid in the market. Although in peak hours, there are lots of services available, out of peak times there is absent transportation due to higher revenues in peak times. Because of lack of training, poor maintenance of vehicles, and inappropriate vehicles for high loading yield safety issues. Drivers can be worked under difficult circumstances such as long working hours, minimum salaries, and unsuitable working age. Due to a lack of coordination with public authorities, operators can easily avoid paying taxes and obey the service rules.

However there are lots of negative impacts of the informal sector in the transportation areas, there are many potential contributions such as filling gaps using their capacity, dealing with changing passenger behaviors, providing flexible services, increasing mobility in the cities, and willing a part of integrated transportation services [48,55]. This study proposed a SWOT analysis for an informal transportation system to find out its place in the transportation sector, and also discover improvement areas. The Delphi method is used to integrate transportation experts from all over the world under UITP informal working group. According to the results, flexibility, agility, and complement are seen as strengths, and lack of institutionalization and lack of integration with public transportation are seen as the main weaknesses by literature studies and transportation experts. From the external perspective, in terms of opportunities and threats, while collaboration can be seen as the main opportunity, lack of regulation and monitoring can be seen as obstacles to improving service quality for informal transport.

According to data findings that are SWOT analysis results of the Istanbul case, external analysis comes first in the first level of the model regarding experts. In the second level, threats come first with 0.38 weight. To improve informal services threats have to transform into opportunities using strengths.

The study will be a guide as a global framework for both operators and academicians to increase the service quality of informal transportation. For future studies, the proposed framework will be applied as a case study for different cities. Also, developed frameworks will be

compared to each other to discover similarities and differences.

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