Small Business Models in The Field of Freight and Passenger Transportation in Uzbekistan

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Abstract: The use and combination of different business models in regional transport sectors has become an important approach to achieving sustainable mobility. This study aims to examine the factors and conditions that influence the participation of small businesses in logistics services in the freight and passenger transport sectors. The analysis shows that, despite institutional and infrastructure-related constraints, entrepreneurial initiatives remain highly resilient and adaptable; this indicates a fragmented but effective system. This study contributes to the formulation of transport policies and lays the foundation for the development of targeted support mechanisms to promote inclusive mobility solutions. The results of the study can inform future territorial planning decisions and the process of integrating small businesses into transport network management.

Keywords: Entrepreneurship-based transport models, inclusive mobility solutions, regional logistics networks, small business participation, transport system resilience.

Introduction: Several studies have examined the development of small business models among regional transport operators and found that the development of flexible logistics solutions by small businesses has a positive impact on mobility efficiency [1]. The use of decentralized transport models has been shown to be effective in overcoming infrastructure gaps and improving service quality, especially in underserved areas [2]. A sustainable transport system develops on the basis of a balanced combination of entrepreneurial

capacity, political support and infrastructural flexibility [3].

However, existing studies have not distinguished between different dimensions of transport model operations, which highlights the need to identify the interrelationships between different business types and spatial constraints.[4] It remains unclear whether small-scale innovations can overcome the functional limitations or structural barriers of traditional logistics systems.[5]

Although data are collected from various national databases, field interviews and business surveys are the most commonly used methods due to their availability and relevance [6]. In addition, the informal sector has been found to contain micro-enterprises that have similar characteristics to formal operators but are more flexible [7]. Most of the existing studies are descriptive in nature and based on cross-sectional samples [8]. However, current studies have not analyzed how business models affect transport efficiency in terms of the territorial political environment [9].

To our knowledge, no research has yet focused on modeling resilience capacities and systemic constraints across subnational regions [10]. In contrast to single-region studies, in this study we attempted to construct and analyze a participatory framework using a mixed methodology [12]. In order to successfully implement entrepreneurial interventions in transport management, a deep understanding of the drivers and barriers to their implementation is necessary. Therefore, this study focused on examining the determinants of small business participation in improving mobility services in different regional economies of Uzbekistan [13]. In this regard, we summarized empirical research on the perspectives of small firms, regional planners, and transport users on the opportunities and barriers to the implementation of entrepreneurial models in freight and passenger transport management [14].

At the same time, we used descriptive statistics and inductive analysis methods to identify the factors, conditions and behavioral patterns of entrepreneurs that influence the development of small logistics services [15]. Systematic reviews of territorial mobility allow us to collect and analyze evidence from different settings and are increasingly used to inform the design and implementation of inclusive mobility solutions. We hypothesized that small business models can enhance integration or, conversely, reinforce fragmentation. The results of the analysis of the local context were combined with survey data.

METHODOLOGY

The survey areas include, but are not limited to, regional centers, small towns, suburban areas, border districts, and industrial clusters. The sample included registered transport operators in the eastern region of Uzbekistan. Data were collected by region between 2020–2023 and by other administrative levels between 2018–2023. The unit of analysis is the enterprise, with the main source of information being the opinions of owners of firms with fewer than 50 employees, as defined in accordance with the national SOE (Small and Private Enterprises) classification [16,17].

Structured questionnaires were sent through regional business support centers, and a total of 423 valid questionnaire responses were received. The data set reflected the use of business models in transport services, covering ownership form, scope of activity, and innovation implementation. Data were collected by independent reviewers using a standardized coding protocol and a manual data extraction form [18].

The inclusion criteria for this review were as follows: we excluded duplicate articles and editorials that relied on unsupported or unsupported assumptions that were not based on empirical data. The search was limited to the period 2010–2023, as most regional innovations occurred after 2010.

The field study procedure has been described in detail previously. For spatial selection, a grid-based corridor was created in the Fergana Valley, with a linear zone of 15 km in length and 2 km in depth [12]; this zone was selected based on an operational classification by vehicle type within the administrative boundaries close to the core of the transport zone. This approach helps to overcome the limitations caused by the multi-factorial effects observed in urban and rural areas.

The analysis model and evaluation were carried out in three stages: (i) formation of a matrix of variables through a questionnaire, (ii) implementation of data collection within the regions after the pilot phase, (iii) classification of responses for qualitative assessment and statistical analysis after 4, 8 and 12 weeks. Data collection was in two stages: the first stage was interviews with stakeholders, which were mainly used to identify views and problems; the second stage was quantitative questionnaire analysis, which was used to check the reliability of the responses. Our synthesis consisted of three stages: coding of initial findings, grouping codes into second-level themes, and the formation of final summarized themes.

The model structure was then tested. Significance was assessed by the position of the true value within the confidence interval [19]. Repeated measurements allow for an assessment of the stability of the model and the determination of statistical significance.

The quality assessment checklist consists of 12 questions that measure the reliability of the data source, representativeness of the sample, and methodological transparency. The dependent variable is defined as enterprise participation, which represents the level of acceptance of the model. To measure satisfaction, respondents were asked to rate whether the level of transport reliability in their area was satisfactory or not on a scale of 1 to 5, where 1 means very low and 5 means very high.

The final scale consists of two dimensions: accessibility and operational flexibility; each contains four items. Based on this method, the companies were divided into four transport model categories: fixed-route, demand-driven, general freight and mixed operations [20]. Descriptive themes were analyzed sequentially and used to generate inductive themes. The narrative synthesis approach recommended by the Transportation Research Framework was used to contextualize and integrate the results on model performance.

The thematic synthesis process was based on the qualitative research synthesis methodology of Thomas and Harden. Coding categories, interpretation rules, and visualization formats were adjusted to clarify the findings. This synthesis allows for more precise identification of conclusions that are free from contextual bias and have practical implications.

RESULTS

Respondents frequently noted that they found it convenient to use demand-based transportation models in periurban centers and shared freight terminals on local industrial corridors, as this allowed them to avoid delays, route inefficiencies, and excessive fuel consumption.

Table 3 presents the results of the linear regression analysis and the significance test of the coefficients. According to model 1, the indicators "entrepreneurship flexibility" and "service accessibility squared" are statistically significant and highly significant, indicating that there is a strong positive relationship between flexible business participation and enterprise participation. This means that enterprises with flexible structures contribute more to the provision of local transport services than firms with less flexibility.

Table 1. Normalized and actual scores of transport sector criteria

Name	Ideal	Normal	Real
Entrepreneurial potential	0.784	0.245	0.122
Infrastructure compatibility	1.000	0.312	0.156
Political and regulatory support	0.804	0.251	0.126
Access to services	0.616	0.192	0.096

However, infrastructure constraints, policy differences, service coverage, and the level of innovation were not uniform across regions, which reduced the predictive power of the statistically positive associations. Participants noted that political coherence improves planning stability and operational coherence, which leads to higher satisfaction. Some of these effects were observed in the Fergana Valley Corridor and border district clusters, while others were limited to the central urban areas.

Of the 50 participants, 38 expressed interest in testing a mixed freight and passenger model on their routes, based on logistical and economic reasons that support their growth goals. A positive spatial spillover effect was found, where clusters of businesses integrated into the corridor matrix outperformed micro-businesses associated with isolated and limited use models.

Table 2. Matrix of relationships between criteria and alternatives in transport sector modeling

Criteria / Alternatives	Entrepreneurial potential	Infrastructure compatibility	Political and regulatory support	Access to services	Demand-driven transportation model	Micromodel with a specific orientation	Freight-passenger mixed model	Purpose
Entrepreneurial potential	0.00000	0.00000	0.00000	0.00000	0.19526	0.13807	0.39052	0.12238
Infrastructure compatibility	0.00000	0.00000	0.00000	0.00000	0.39052	0.39052	0.13807	0.15603

Political and regulatory support	0.00000	0.00000	0.00000	0.00000	0.27614	0.27614	0.19526	0.12550
Access to services	0.00000	0.00000	0.00000	0.00000	0.13807	0.19526	0.27614	0.09609
Demand-driven transportation model	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.24669
Micromodel with a specific orientation	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.09790
Freight-passenger mixed model	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.15541
Purpose	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Table 3. Results of linear regression analysis

Variable	Coef.	Std. error	t-value	p-value	[95% Confidence Interval]	Ahem.
entrepreneurial_adaptability	0.589	0.191	3.09	0.004	0.204 – 0.973	***
infrastructure_constraints	-0.429	0.117	-3.66	0.001	-0.666 – -0.193	***
political_support	0.410	0.167	2.46	0.018	0.074 – 0.746	**
service_usage_level	0.911	0.178	5.13	0.000	0.553 – 1.270	***
innovation_implementation	0.238	0.212	1.12	0.268	-0.190 – 0.667	
transportation_satisfaction	0.064	0.090	0.71	0.483	-0.118 – 0.246	
Constanta	-0.427	1.396	-0.31	0.761	-3.241 – 2.388	

Satisfaction with transport reliability did not have a significant effect on participation. Political support had a moderate but significant effect on participation. Among the alternatives modeled, demand-driven hybrid models had a high level of acceptance, while fixed-route models had a low level of acceptance. However, the impact of these groupings on neighboring businesses in expanding transport systems remains relatively limited.

DISCUSSIONS

Our results suggest that the interaction between entrepreneurial flexibility and service accessibility can increase enterprise participation, which helps to understand approaches to aligning transportation service models with regional business ecosystems.

Empirical results show that the concentration of small firms on the same or similar transport corridors effectively enhances logistics integration. According to the survey results, the level of participation among enterprises separated from different administrative clusters has a high variability. The micro-firms considered in this study showed operational stability and behavioral consistency due to their territorial location within the regional network, acting as flexible nodes in the logistics matrix, but not being able to reshape the entire system or macrostructure. This is similar to the results observed previously in urban areas.

This can be explained by the fact that firms are located on the same or similar routes, which reduces uncertainty and eliminates coordination barriers, thereby reducing the risk of fragmentation. The tendency of the model to adapt to local conditions, as previously demonstrated in the case of near-urban transport units, is replicated, albeit on a limited scale, in mixed-hybrid models, which are considered the preferred organizational form in decentralized logistics systems based on shared vehicles.

We explain the lack of broader network effects in this cluster formation and the difficulty of scaling up of isolated micro-firms by the low impact of business innovations on regional planning systems, which are less

responsive to bottom-up initiatives and informal models. Independent organizations, on the other hand, are unable to scale up systematically due to institutional invisibility and resource constraints.

The results of this analysis enrich the concept of inclusive mobility and the evidence base for regional policies. The results of the study show that the influence of political support and infrastructure flexibility factors has a different impact on business participation. According to the results of interregional transport surveys, the use of on-demand logistics in industrial corridors is associated with cost-effectiveness. Regional satisfaction surveys, on the other hand, show that positive relationships between local government and business increase planning efficiency, service reliability, business confidence and network cohesion.

Policymakers can take full advantage of the flexible nature of these business models to strengthen the mobility infrastructure of economies in transition. This study suggests that the impact of grassroots transport models on service integration at the regional level may not always be uniform. That is, the combination of informal and formal transport elements does not always increase systemic coherence. However, these regional differences are similar to those studied in recent years in the diffusion of transport innovations through bottom-up policy pilot programs. These observations are consistent with the participation patterns noted in our analysis, namely that the fragmentation we observe is likely due to the entry of unregulated operators into zones where policy is not considered.

Like many previous studies, this study has some limitations that point to future research directions. First, due to the limited sample size, we did not examine how these business models change over time and only analyzed a cross-section of the sample. Although the problem of selection bias is not significant, researchers with a good understanding of the regional business environment can ensure the robustness of the findings by comparing different measures of model performance.

Although we conducted a multi-level analysis, our study has some limitations. Nevertheless, this model creates a practical framework for the transportation sector, but does not have the potential to change the scale of the industry architecture at a strategic level.

CONCLUSION

Our research findings may be useful in designing future transport policy mechanisms and applying them in practice to support territorial mobility. Policymakers can fully exploit the adaptive potential and integrative role of business models in the transport sector. Although the level of innovation adoption in this study was not found to be statistically significant, a deeper understanding of the operational conditions may lead to successful interventions for inclusive logistics development.

To strengthen the link between entrepreneurial resilience and access to services in the local context, policymakers can act in several ways, including: coordinated planning, capacity-building programs, and supporting infrastructure investments. The results of the study show that a firm's satisfaction with the local transport environment has a significant impact on its participation rate, so it will be important to better understand the factors that encourage participation in local settings.

This study also suggests that business models that lack institutional support and political alignment may be difficult to scale up, and that planners need to consider shaping practices that support mainstream innovation alongside regulatory integration. This study opens up new possibilities for more inclusive approaches in the transport sector. More specifically, it would be worthwhile to examine which types of regulatory instruments and governance models influence the evolution of the transport system, depending on the level of political support, and thereby how they may influence business decisions.

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