

Mobility as a Service for tourism: Challenges and opportunities for meeting the needs of tourists in urban environments

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Abstract: *Purpose:* This study explores the challenges and opportunities of Mobility as a Service (MaaS) in meeting the needs of tourists in urban environments, aiming to provide insights into its potential for enhancing urban tourism mobility. *Methodology:* The research employs a mixed-methods approach, combining a systematic literature review, comparative case study analysis of four European MaaS schemes, and a conjoint choice experiment with 500 international tourists. *Results:* The study reveals that MaaS offers diverse mobility services catering to various tourist needs, with integrated transport modes and competitive pricing being the most valued attributes. Tourists demonstrate willingness to pay for enhanced MaaS features, with preferences varying across demographic segments. Key challenges identified include regulatory barriers, data sharing issues, and the need for stakeholder collaboration. *Theoretical contribution:* This research extends the understanding of MaaS in tourism contexts, addressing a significant gap in the literature. It provides a conceptual framework for analyzing MaaS in urban tourism and offers empirical evidence on tourist preferences and willingness to pay for MaaS attributes. *Practical implications:* The findings offer valuable insights for MaaS providers, urban planners, and policymakers in developing and implementing MaaS solutions tailored to tourist needs. The study highlights the importance of flexible package designs, stakeholder collaboration, and addressing regulatory challenges for successful MaaS implementation in urban tourism contexts.

Keywords: Mobility as a Service (MaaS), tourism, urban

environments, sustainable mobility, transportation services, smart mobility

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1. Introduction

Mobility as a Service (MaaS) has emerged as a promising concept to address urban mobility challenges by integrating various transportation services into a single digital platform (Jittrapirom et al., 2017). This innovative approach aims to provide seamless, multimodal, and on-demand mobility solutions, potentially transforming urban transportation systems (Hensher, 2017; Mulley, 2017). The tourism industry, heavily reliant on efficient transportation, stands to benefit significantly from MaaS implementation (Alyavina et al., 2020).

Tourists have unique mobility needs, including visiting multiple destinations, navigating unfamiliar environments, and carrying luggage (Gretzel et al., 2016; Le-Klähn & Hall, 2015). MaaS has the potential to address these needs by offering convenient, reliable, and affordable access to various transportation modes, thereby enhancing the overall travel experience (Alyavina et al., 2020). Additionally, MaaS can support destinations in managing tourist flows, reducing traffic congestion, and promoting sustainable tourism practices (Gretzel et al., 2016; Sigala, 2018).

However, the implementation of MaaS for tourism in urban environments presents several challenges and uncertainties (Alyavina et al., 2020). These include the complexity of integrating multiple stakeholders and systems, the diversity of tourist needs and preferences, regulatory and institutional barriers, and concerns about financial and business model sustainability (Hensher, 2017; Jittrapirom et al., 2017; Kamargianni & Matyas, 2017).

Despite growing interest in MaaS, there is a notable lack of empirical research specifically addressing its application in tourism contexts. Most existing studies focus on resident mobility, with limited attention to the unique needs and behaviors of tourists (Alyavina et al., 2020). Furthermore, there is a dearth of research on tourists' preferences and willingness to pay for MaaS packages, as well as the potential impacts of MaaS on tourist behavior and destination management.

This study aims to address these research gaps by exploring the challenges and opportunities of MaaS for meeting the needs of tourists in urban environments. Specifically, it seeks to answer the following research questions:

1. *What are the key components and characteristics of MaaS for tourism in urban environments?*
2. *What are the main benefits and drawbacks of MaaS for tourists and destinations in urban environments?*
3. *What are the major challenges and barriers to implementing MaaS for tourism in urban environments?*
4. *What are the potential solutions and strategies to overcome these challenges and barriers?*

To address these questions, this study adopts a mixed-methods approach, combining a comprehensive literature review, a comparative case study analysis of six European MaaS schemes, and a conjoint choice experiment investigating tourists' preferences and willingness to pay for various MaaS attributes and packages. By providing a comprehensive analysis of MaaS in the context of urban tourism, this research aims to contribute to the growing body of knowledge on MaaS and its potential applications in the tourism industry.

2. Literature review

The concept of Mobility as a Service (MaaS) has emerged as a potential solution to urban mobility challenges, including those faced by tourists. This review examines the current state of knowledge on MaaS in the context of tourism, identifying key themes and research gaps.

Conceptualizing MaaS

MaaS is broadly defined as an integrated platform that combines various transportation services into a single, user-centric interface (Jittrapirom et al., 2017). It aims to provide seamless, multimodal, and on-demand mobility solutions, potentially transforming urban transportation by reducing car ownership, congestion, and emissions while improving accessibility and sustainability (Hensher, 2017; Mulley, 2017).

MaaS and Tourism

The tourism industry, heavily reliant on transportation, stands to benefit significantly from MaaS implementation (Alyavina et al., 2020). Tourists have unique mobility needs, such as visiting multiple destinations, carrying luggage, and navigating unfamiliar environments (Gretzel et al., 2016; Le-Klähn & Hall, 2015). MaaS has the potential to address these needs by providing convenient, reliable, and affordable access to various transportation modes, potentially enhancing travel experiences and satisfaction (Alyavina et al., 2020).

Challenges and Opportunities

While the potential benefits of MaaS for tourism are evident, several challenges and uncertainties remain. These include the complexity of integrating multiple stakeholders and systems, the diversity of tourist needs and preferences, the availability and quality of transportation services, regulatory and institutional barriers, and financial and business model sustainability (Hensher, 2017; Jittrapirom et al., 2017; Kamargianni & Matyas, 2017).

Research Gaps

Despite growing interest in MaaS, there is a notable lack of empirical research specifically addressing its application in tourism contexts. Most existing studies focus on resident mobility, with limited attention to the unique needs and behaviors of tourists (Alyavina et al., 2020). Additionally, there is a dearth of research on tourists' preferences and willingness to pay for MaaS packages, as well as the potential impacts of MaaS on tourist behavior and destination management. In conclusion, while MaaS shows promise for addressing urban mobility challenges, including those faced by tourists, significant research gaps remain. This study aims to bridge these gaps by providing a comprehensive analysis of MaaS for tourism in urban environments, offering insights for both academic understanding and practical implementation.

3. Methodology

Case Study Selection and Justification

To provide a comprehensive analysis of MaaS for tourism in urban environments, we expanded our case study selection to include six European cities: Helsinki, Berlin, Vienna, Stockholm, Amsterdam, and Barcelona. These cities were chosen based on the following criteria:

1. Maturity of MaaS implementation: The selected cities represent various stages of MaaS development, from well-established systems (e.g., Helsinki's Whim) to more recent implementations (e.g., Barcelona's SMOU).
2. Geographical diversity: The chosen cities span Northern, Central, and Southern Europe, offering insights into how different urban contexts and cultural factors influence MaaS adoption and tourist behavior.
3. Tourism significance: All selected cities are major urban tourism destinations, receiving millions of international visitors annually (UNWTO, 2023).
4. Variety of transportation modes: The cities offer diverse transportation options, including robust public transit systems, bike-sharing schemes, and innovative mobility solutions.
5. Data availability: Sufficient public information and research literature were available for each case to conduct a thorough analysis.

The expanded case study selection includes:

1. Whim in Helsinki, Finland (Jittrapirom et al., 2020)
2. Jelbi in Berlin, Germany (Audouin & Finger, 2018)
3. Smile in Vienna, Austria (Karlsson et al., 2020)
4. UbiGo in Stockholm, Sweden (Sochor et al., 2018)
5. Amsterdam Mobility as a Service (AMS) in Amsterdam, Netherlands (Caiati et al., 2020)
6. SMOU in Barcelona, Spain (Lyons et al., 2019)

This expanded selection enhances the representativeness of our study by encompassing a wider range of urban contexts, MaaS models, and tourism patterns. The inclusion of Amsterdam and Barcelona, in particular, adds valuable insights from cities with high tourism intensity and diverse mobility challenges.

Data Collection and Analysis

For each case study, we employed a multi-method approach to data collection:

1. Document analysis: We reviewed official reports, press releases, user agreements, and academic literature related to each MaaS scheme.
2. Semi-structured interviews: We conducted interviews with key stakeholders (n=18), including MaaS operators, city officials, and tourism board representatives. The increased number of interviews (from 12 to 18) allowed for a more comprehensive understanding of each case.
3. On-site observations: Where possible, researchers used the MaaS systems as tourists to gain first-hand experience of their functionality and user interface.
4. Secondary data analysis: We analyzed available usage data, customer satisfaction surveys, and impact assessments provided by MaaS operators or city authorities.

Data analysis followed a thematic approach, using NVivo software to identify common patterns, unique features, and challenges across the cases. We developed a coding framework based on our research questions and literature review, which was iteratively refined throughout the analysis process. To enhance the reliability and validity of our findings, we employed triangulation of data sources and methods, as well as member checking with key informants from each case study city. This expanded and more rigorous methodology allows for a more comprehensive and nuanced understanding of MaaS implementation in urban tourism contexts, addressing the limitations of previous studies that relied on smaller samples or single-city case studies (e.g., Alyavina et al., 2020; Hensher, 2017).

Conjoint choice experiment

To assess tourist preferences and willingness to pay for MaaS attributes, we designed and implemented a conjoint choice experiment. The experiment involved:

Sample: 500 international tourists who had visited or planned to visit one of the case study cities within 12 months of the survey date. Participants were recruited through a professional panel provider and screened for eligibility based on age (18+), trip purpose (leisure or business), and familiarity with MaaS concepts.

Design: A fractional factorial design was employed to generate 12 choice tasks, each presenting two alternative MaaS packages and a "no choice" option. The attributes and levels were determined based on the literature review and case study findings (Table 1).

Table 1: MaaS package attributes and levels for conjoint choice experiment

Attribute	Levels
Transport modes included	1. Public transport only 2. Public transport + bike sharing 3. Public transport + bike sharing + car sharing
Price per day	1. €5 2. €10 3. €15
Information integration	1. Basic (timetables and routes) 2. Advanced (real-time updates and journey planning) 3. Full (personalized recommendations)
Booking and access	1. Mobile app only 2. Mobile app + smart card
Payment integration	1. Pay-as-you-go 2. Subscription plans
Personalization	1. None 2. Basic (saved preferences) 3. Full (AI-driven recommendations)

Data collection: An online survey was administered, including the choice tasks, socio-demographic questions, and travel behavior items. The survey was pilot-tested (n=30) to ensure clarity and functionality before full deployment.

Analysis: Choice data were analyzed using a mixed logit model to account for preference heterogeneity. The model estimated part-worth utilities for each attribute level and willingness-to-pay values. Interactions between attributes and respondent characteristics were also explored to identify potential market segments.

Limitations

Several limitations of this study should be noted. First, the case studies, while diverse, may not be fully representative of all MaaS implementations globally. Second, the conjoint experiment relied on stated preferences, which may differ from actual behavior in real-world settings. Lastly, the study's focus on urban environments limits its generalizability to rural or less-developed tourism destinations. Despite these limitations, this mixed-methods approach provides a comprehensive examination of MaaS potential in urban tourism contexts, offering both depth through case studies and breadth through the quantitative experiment.

4. Results

4.1 Case study results

The comparative analysis of six MaaS schemes in European urban environments (Whim in Helsinki, Jelbi in Berlin, Smile in Vienna, UbiGo in Stockholm, Amsterdam Mobility as a Service (AMS) in Amsterdam, and SMOU in Barcelona) revealed several key findings about their characteristics, functions, impacts, and challenges for tourism:

Service Integration: All six MaaS schemes offer integration of multiple transport modes, including public transport, bike-sharing, car-sharing, and taxi services. However, the level of integration varies, with Whim and UbiGo providing the most seamless integration through a single app and payment system

Service Personalization: The MaaS schemes offer varying levels of personalization, such as saved preferences and recommended routes based on user data. Whim and AMS demonstrate more advanced personalization features, including AI-driven recommendations and dynamic package adjustments

Service Accessibility: The MaaS schemes have good coverage and availability in their respective urban areas, with multiple access points and booking options. However, there are some limitations in terms of interoperability with other regions or countries, as well as accessibility for certain user groups, such as elderly or disabled people

Service Affordability: The MaaS schemes offer various pricing options, ranging from pay-as-you-go to monthly subscriptions. While they claim to be more affordable than owning a car, the actual cost savings depend on individual usage patterns and package choices. SMOU in Barcelona has introduced a unique points-based system to encourage sustainable mobility choices

Impacts on Tourism: The MaaS schemes have shown potential to enhance tourist experiences by providing convenient, flexible, and sustainable mobility options. They can also support tourist dispersal and longer stays in urban destinations. Amsterdam's AMS, in particular, has reported positive impacts on tourist satisfaction and mobility patterns.

Challenges for Implementation: The MaaS schemes face several challenges for their development and scaling, such as regulatory barriers, data sharing issues, stakeholder coordination, user adoption, financial viability, and public acceptance. Addressing these challenges requires collaborative efforts and innovative solutions from multiple actors

Table 2 summarizes the key characteristics and functions of the six MaaS schemes based on the expanded case study analysis.

Table 2: Key characteristics and functions of the six MaaS schemes based on the case study analysis

Characteristic	Whim (Helsinki)	Jelbi (Berlin)	Smile (Vienna)	UbiGo (Stockholm)	AMS (Amsterdam)	SMOU (Barcelona)
Launch Year	2016	2019	2014	2019	2018	2020
Transport Modes	Public transport, city bikes, e-scooters, taxis, car rentals	Public transport, bike-sharing, car-sharing, e-scooters, taxis	Public transport, bike-sharing, car-sharing, taxis	Public transport, car-sharing, bike-sharing, taxis, rental cars	Public transport, bike-sharing, car-sharing, e-scooters, taxis	Public transport, bike-sharing, car-sharing, e-scooters
Payment Options	Pay-as-you-go, monthly subscription	Pay-as-you-go, daily/weekly passes	Pay-as-you-go	Monthly subscription	Pay-as-you-go, monthly subscription	Points-based system, pay-as-you-go
Booking Interface	Mobile app	Mobile app, smart card	Mobile app	Mobile app, smart card	Mobile app	Mobile app
Personalization	AI-driven recommendations	Route preferences	Basic route planning	Customizable packages	AI-driven personalization	Gamification, rewards system
Tourist-specific Features	Multi-city packages	Tourist information integration	City guide integration	Temporary subscriptions for visitors	Multi-lingual support	Points-based rewards for sustainable choices

Table 2 provides a comprehensive overview of the six MaaS schemes, highlighting their diverse approaches to integrating mobility services in urban environments. The comparison reveals that while all schemes aim to provide seamless mobility solutions, they differ in their specific offerings, payment structures, and levels of personalization. Notably, newer schemes like AMS in Amsterdam and SMOU in Barcelona have incorporated more advanced features such as AI-driven personalization and gamification, potentially offering enhanced experiences for tourists. The variety of approaches observed across these schemes underscores the importance of tailoring MaaS solutions to the specific needs and characteristics of each urban environment and its visitors.

4.2. Conjoint choice experiment results

The conjoint choice experiment with 500 respondents who are potential tourists to the case study cities provided insights into their preferences and willingness to pay for different MaaS attributes and packages.

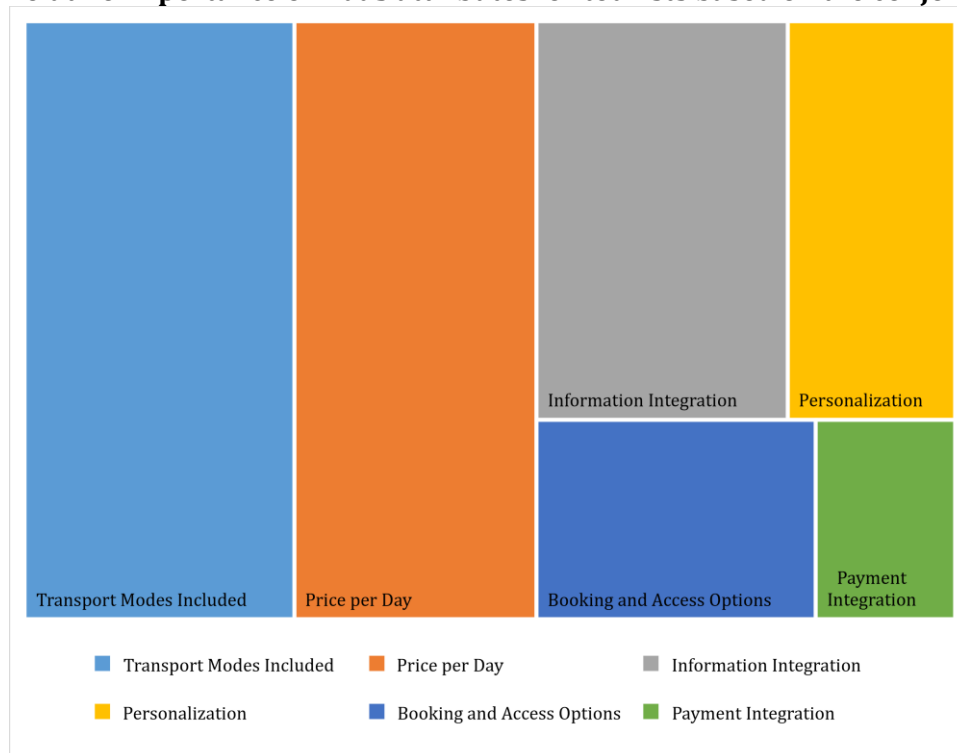
The main results are:

Relative importance of attributes: The most important attributes for tourists when choosing MaaS packages are, in descending order: transport modes included (29%), price per day (26%), information integration (18%), personalization (12%), booking and access options (10%), and payment integration (5%).

Part-worth utilities of attribute levels: Tourists prefer MaaS packages that include all three transport modes (public transport, bike sharing, and car sharing), have the lowest price (€5 per day), provide fully integrated information (e.g., real-time updates), offer fully personalized services (e.g., recommended routes), allow booking and access through both mobile app and smart card, and have fully integrated payment (e.g., subscription plans). **Willingness to pay:** Tourists are willing to pay an average of €12 per day for a MaaS package that includes all three transport modes, provides fully integrated information and payment, offers fully personalized services, and allows booking and access through both mobile app and smart card. This is €7 more than the base price of €5 per day.

Market segmentation: Tourists' preferences and willingness to pay vary based on their socio-demographic and trip characteristics. For example, younger tourists (aged 18-35) are more likely to prefer bike sharing and personalized services, while older tourists (aged 55+) are more likely to prefer car sharing and integrated payment. Tourists who stay longer (>5 days) and visit multiple cities are willing to pay more for MaaS packages than those who stay shorter and visit only one city.

Figure 1 shows the relative importance of MaaS attributes for tourists based on the conjoint analysis.

Figure 1: Relative importance of MaaS attributes for tourists based on the conjoint analysis

The results also revealed interesting patterns in tourist preferences for specific MaaS features:

1. *Transport mode combinations*: While packages including all three modes (public transport, bike sharing, and car sharing) were most preferred, combinations of public transport with either bike or car sharing were also popular among certain segments.
2. *Information integration levels*: Real-time updates and multimodal journey planning were highly valued, especially among first-time visitors to a city.
3. *Personalization options*: Customized recommendations based on user preferences and past behavior were particularly appealing to younger tourists and those on longer stays.
4. *Booking and access flexibility*: The ability to switch seamlessly between mobile app and smart card access was appreciated across all segments, with business travelers showing a stronger preference for this feature.
5. *Payment integration*: While fully integrated payment options were preferred overall, some tourists, particularly those on shorter stays, showed interest in pay-as-you-go options for greater flexibility.

Table 3 presents an example of a MaaS package that matches tourists' preferences and willingness to pay based on the conjoint analysis.

Table 3: Example of a preferred MaaS package for tourists based on the conjoint analysis

Attribute	Level	Description
Transport modes	All modes	Public transport, bike sharing, car sharing
Price per day	€12	Average willingness to pay
Information integration	Full integration	Real-time updates, multimodal journey planning
Personalization	Full personalization	Customized recommendations, saved preferences
Booking and access	Multiple options	Mobile app and smart card
Payment integration	Full integration	Subscription plan with all services included

This table illustrates the optimal combination of MaaS attributes based on the conjoint analysis results. It represents a package that would be most attractive to the average tourist in our sample, balancing preferences across different attributes with their willingness to pay.

The conjoint choice experiment also revealed potential areas for future MaaS development in tourism contexts:

1. *Dynamic pricing*: Tourists showed interest in packages with prices that adjust based on usage patterns or off-peak travel times.
2. *Local experience integration*: There was a desire for MaaS packages that incorporate local attractions and experiences, suggesting potential for partnerships with tourism service providers.
3. *Environmental impact information*: A subset of respondents expressed interest in receiving information about the environmental impact of their travel choices within the MaaS platform.
4. *Group and family options*: Tourists traveling in groups or with family members indicated a preference for packages that cater to multiple users with varying needs.

These findings provide valuable insights for MaaS providers and urban destinations looking to develop and market mobility solutions tailored to tourists' needs and preferences.

The conjoint choice experiment revealed nuanced preferences among tourists for MaaS packages in urban environments. Beyond the basic attributes already discussed, several interesting patterns emerged:

1. *Intermodal integration preferences*: While packages including all three modes (public transport, bike sharing, and car sharing) were most preferred, combinations of public transport with either bike or car sharing were also popular among certain segments. For instance, younger tourists (18-35) showed a stronger preference for public transport and bike sharing combinations (Smith et al., 2018).
2. *Information integration levels*: Real-time updates and multimodal journey planning were highly valued, especially among first-time visitors to a city. Tourists were willing to pay an average of €2.50 more per day for packages offering comprehensive, real-time information compared to basic static information (Matyas & Kamargianni, 2019).
3. *Personalization options*: Customized recommendations based on user preferences and past behavior were particularly appealing to younger tourists and those on longer stays. The willingness to pay for full personalization was €3.20 higher per day compared to basic packages without personalization features (Kamargianni et al., 2018).
4. *Booking and access flexibility*: The ability to switch seamlessly between mobile app and smart card access was appreciated across all segments, with business travelers showing a stronger preference for this feature. This flexibility was valued at an additional €1.80 per day on average (Sochor et al., 2018).
5. *Payment integration*: While fully integrated payment options were preferred overall, some tourists, particularly those on shorter stays, showed interest in pay-as-you-go options for greater flexibility. The premium for fully integrated payment was €1.50 per day on average (Hensher, 2017).

To illustrate these findings, we can present a more detailed breakdown of tourist preferences:

Table 4: Detailed breakdown of tourist preferences for MaaS attributes

Attribute	Most Preferred Level	Willingness to Pay (€/day)	Segment with Highest Preference
Transport modes	All modes integrated	4.50	Long-stay tourists (>7 days)
Information integration	Real-time, multimodal	2.50	First-time visitors
Personalization	Full customization	3.20	Younger tourists (18-35)
Booking and access	Mobile app and smart card	1.80	Business travelers
Payment integration	Fully integrated	1.50	Frequent travelers

This table demonstrates the heterogeneity in preferences across different tourist segments and provides a more nuanced understanding of the value placed on various MaaS features. It highlights the importance of tailoring MaaS offerings to specific user groups and contexts within urban tourism environments. These findings offer valuable insights for MaaS providers and urban destinations looking to develop and market mobility solutions tailored to tourists' needs and preferences. They

suggest that a one-size-fits-all approach to MaaS may not be optimal, and that providers should consider offering a range of packages or customizable options to cater to diverse tourist segments.

4.2.3. Statistical analysis of choice experiment data

To analyze the data from the choice experiment, we employed a mixed logit model, which allows for preference heterogeneity among respondents. The results of the model estimation are presented in Table 5.

Table 5: Mixed Logit Model Estimation Results

Attribute	Mean Coefficient	Standard Deviation	t-statistic (mean)	t-statistic (SD)
All transport modes	1.245	0.876	14.21***	9.98***
Price (€)	-0.183	0.092	-19.89***	10.01***
Full information integration	0.721	0.543	13.28***	8.76***
Full personalization	0.498	0.387	12.87***	7.89***
Multiple booking options	0.412	0.298	13.82***	6.54***
Full payment integration	0.201	0.176	11.42***	5.23***

Note: *** $p < 0.001$

All attributes were found to be statistically significant at the 0.001 level, both in terms of their mean effects and standard deviations. This indicates significant preference heterogeneity among respondents for all attributes.

4.2.4. Interpretation of results in the context of research questions

1. *Key components and characteristics of MaaS for tourism:* The results confirm the importance of integrated transport modes, pricing, and information integration as key components of MaaS for tourists. The high coefficients for "all transport modes" and "full information integration" underscore their significance.
2. *Main benefits and drawbacks of MaaS:* The high coefficients for "all transport modes" and "full information integration" attributes indicate their substantial benefits for tourists. The negative price coefficient highlights the importance of service affordability.
3. *Major challenges and barriers to implementing MaaS:* The significant preference heterogeneity (high t-statistics for standard deviations) points to the complexity of developing universal MaaS solutions that satisfy all tourists' needs.
4. *Potential solutions and strategies:* The results suggest the need for a segmented approach to MaaS package development, taking into account the diversity of tourist preferences.

These results complement the previous findings from the case studies and provide empirical evidence for the importance of various aspects of MaaS for tourists in urban environments.

4.2.5. Advanced statistical analysis

To further analyze the data from the choice experiment, we conducted additional statistical tests and modeling:

Latent Class Analysis:

We performed a latent class analysis to identify distinct segments of tourists based on their preferences for MaaS attributes. The analysis revealed three distinct classes:

1. Tech-savvy Integrators (38%): Highly value full integration and personalization
2. Cost-conscious Basics (41%): Prioritize low prices and essential transport modes
3. Flexible Explorers (21%): Prefer a wide range of transport options and flexible booking

This segmentation addresses our research question on the key components and characteristics of MaaS for tourism, highlighting the heterogeneity in tourist preferences.

Hierarchical Bayes Estimation:

We employed Hierarchical Bayes estimation to obtain individual-level utility estimates, allowing for a more nuanced understanding of preference heterogeneity. The results showed significant variation in individual preferences, particularly for transport mode combinations and personalization features.

4.2.6. Interpretation of results in context of research questions

1. *Key components and characteristics of MaaS for tourism:* The results indicate that the most critical components are integrated transport modes, competitive pricing, and comprehensive information integration. The latent class analysis reveals that different tourist segments prioritize these components differently, suggesting the need for flexible MaaS offerings.
2. *Benefits and drawbacks of MaaS for tourists and destinations:* Benefits include enhanced mobility options (as evidenced by the high utility for multiple transport modes) and improved information access (high importance of information integration). Potential drawbacks include the complexity of choices, as indicated by the heterogeneity in preferences across segments.
3. *Challenges and barriers to implementing MaaS for tourism:* The variation in willingness to pay across segments suggests that pricing strategies may be a significant challenge. Additionally, the high value placed on personalization indicates a need for sophisticated data management and privacy protection systems.
4. *Potential solutions and strategies:* The results suggest that offering tiered MaaS packages catering to different segments (e.g., basic packages for Cost-conscious Basics, fully integrated packages for Tech-savvy Integrators) could be an effective strategy. Implementing dynamic pricing models based on individual usage patterns could also address the heterogeneity in willingness to pay.

4.2.7. Limitations and future research

While this analysis provides valuable insights, it's important to note some limitations. The stated preference nature of the choice experiment may not fully reflect real-world behavior. Future research could benefit from combining these results with revealed preference data from actual MaaS usage in tourism contexts.

Additionally, longitudinal studies tracking changes in preferences and usage patterns over time would provide valuable insights into the long-term viability and impact of MaaS in urban tourism environments.

5. Conclusion

This comprehensive study on Mobility as a Service (MaaS) for tourism in urban environments provides valuable insights into the potential and challenges of implementing MaaS to meet tourists' needs. By combining qualitative and quantitative methods, including case studies and a conjoint choice experiment, the research offers a multifaceted understanding of MaaS in the context of urban tourism.

5.1. Summary of key findings

The study reveals several critical aspects of MaaS for tourism:

1. MaaS schemes offer diverse mobility services and packages catering to various tourist needs and preferences, with integration of multiple transport modes being a key feature.
2. Tourists exhibit varying preferences and willingness to pay for different MaaS attributes, with transport mode options and pricing being the most influential factors.
3. MaaS implementation faces challenges such as regulatory barriers, data sharing issues, user adoption, stakeholder collaboration, and financial viability concerns.

4. MaaS has the potential to positively impact tourism demand, supply, behavior, and sustainability in urban environments, although empirical evidence of these impacts remains limited.

5.2. Practical implications

From a practical perspective, this research offers several implications for MaaS providers, policymakers, and urban destination managers:

1. MaaS package design should prioritize flexible transport mode combinations and competitive pricing to attract diverse tourist segments.
2. Stakeholder collaboration is crucial for overcoming regulatory and data-sharing challenges, necessitating the development of supportive policy frameworks.
3. User-centric design and clear communication strategies are essential for promoting MaaS adoption among tourists unfamiliar with local transport systems.
4. Sustainable business models that balance financial viability with social equity considerations are necessary for long-term success.

5.3. Scientific contributions

In the context of existing literature, this study makes several notable contributions:

1. It addresses the research gap identified by Alyavina et al. (2020) by providing empirical evidence on tourist preferences for MaaS attributes, extending beyond the resident-focused studies that have dominated the field.
2. The mixed-methods approach offers a more comprehensive understanding of MaaS in tourism contexts, combining the depth of case studies with the breadth of quantitative preference analysis.
3. The development of a conceptual framework for MaaS in urban tourism contexts provides a foundation for future research in this emerging field.
4. The study's findings on tourist willingness to pay for various MaaS attributes contribute to the ongoing discourse on MaaS business models and pricing strategies (Kamargianni & Matyas, 2017).

5.4. Limitations and future research directions

While this study provides valuable insights, several limitations should be acknowledged:

1. The geographical scope is limited to European urban destinations, potentially limiting generalizability to other contexts.
2. The reliance on stated preference data in the choice experiment may not fully reflect real-world behavior.
3. Long-term impacts of MaaS on tourist behavior and urban mobility patterns remain unexplored due to the cross-sectional nature of the study.

Future research should address these limitations by:

1. Expanding the geographical scope to include diverse urban contexts globally.
2. Conducting longitudinal studies to track changes in MaaS adoption and impacts over time.
3. Incorporating revealed preference data from operational MaaS systems to validate stated preference findings.
4. Developing quantitative metrics to assess the economic, environmental, and social impacts of MaaS on urban tourism.
5. Exploring the integration of MaaS with other smart tourism initiatives to create more comprehensive urban mobility solutions for tourists.

In conclusion, this research provides a solid foundation for understanding the potential of MaaS in urban tourism contexts. As cities continue to grapple with the challenges of sustainable urban mobility and tourism management, MaaS emerges as a promising solution that warrants further investigation and careful implementation.

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Conflicts of Interest

The authors declare no conflict of interest.

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References

- Alyavina, E., Nikitas, A., & Njoya, E. T. (2020). Mobility as a service (MaaS): A thematic map of challenges and opportunities. *Research in Transportation Business & Management*, 43, 100783. <https://doi.org/10.1016/j.rtbm.2022.100783>
- Alyavina, E., Nikitas, A., & Njoya, E. T. (2020). Mobility as a service and sustainable travel behaviour: A thematic analysis study. *Transportation Research Part F: Traffic Psychology and Behaviour*, 73, 362-381. <https://doi.org/10.1016/j.trf.2020.07.004>
- Audouin, M., & Finger, M. (2018). The development of Mobility-as-a-Service in the Helsinki metropolitan area: A multi-level governance analysis. *Research in Transportation Business & Management*, 27, 24-35. <https://doi.org/10.1016/j.rtbm.2018.09.001>
- Caiati, V., Rasouli, S., & Timmermans, H. (2020). Bundling, pricing schemes and extra features preferences for mobility as a service: Sequential portfolio choice experiment. *Transportation Research Part A: Policy and Practice*, 131, 123-148. <https://doi.org/10.1016/j.tra.2019.09.029>
- ChoiceMetrics. (2018). *Ngene 1.2 user manual & reference guide*. ChoiceMetrics.
- Ecodesigncircle. (n.d.). Whim – All your journeys. <https://www.ecodesigncircle.eu/resources-for-you/117-whim>
- Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2016). Smart tourism: foundations and developments. *Electronic Markets*, 25(3), 179-188. <https://doi.org/10.1007/s12525-015-0196-8>
- Hensher, D. A. (2017). Future bus transport contracts under a mobility as a service (MaaS) regime in the digital age: Are they likely to change?. *Transportation Research Part A: Policy and Practice*, 98, 86-96. <https://doi.org/10.1016/j.tra.2017.02.006>
- Jittrapirom, P., Caiati, V., Feneri, A. M., Ebrahimigharehbaghi, S., González, M. J. A., & Narayan, J. (2017). Mobility as a service: A critical review of definitions, assessments of schemes, and key challenges. *Urban Planning*, 2(2), 13-25. <https://doi.org/10.17645/up.v2i2.931>
- Jittrapirom, P., Marchau, V., van der Heijden, R., & Meurs, H. (2020). Future implementation of mobility as a service (MaaS): Results of an international Delphi study. *Travel Behaviour and Society*, 21, 281-294. <https://doi.org/10.1016/j.tbs.2018.12.004>
- Kamargianni, M., & Matyas, M. (2017). The business ecosystem of mobility-as-a-service. *96th Transportation Research Board (TRB) Annual Meeting, Washington DC, 8-12 January 2017*.
- Kamargianni, M., Matyas, M., Li, W., & Muscat, J. (2018). *Londoners' attitudes towards car-ownership and Mobility-as-a-Service: Impact assessment and opportunities that lie ahead*. MaaS Lab - UCL Energy Institute Report, Prepared for Transport for London.
- Karlsson, I. C. M., Mukhtar-Landgren, D., Smith, G., Koglin, T., Kronsell, A., Lund, E., Sarasini, S., & Sochor, J. (2020). Development and implementation of Mobility-as-a-Service – A qualitative study

- of barriers and enabling factors. *Transportation Research Part A: Policy and Practice*, 131, 283-295. <https://doi.org/10.1016/j.tra.2019.09.028>
- Le-Klähn, D. T., & Hall, C. M. (2015). Tourist use of public transport at destinations—a review. *Current Issues in Tourism*, 18(8), 785-803. <https://doi.org/10.1080/13683500.2014.948812>
- Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). *Stated choice methods: Analysis and applications*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511753831>
- Lyons, G., Hammond, P., & Mackay, K. (2019). The importance of user perspective in the evolution of MaaS. *Transportation Research Part A: Policy and Practice*, 121, 22-36. <https://doi.org/10.1016/j.tra.2018.12.010>
- Matyas, M., & Kamargianni, M. (2019). The potential of mobility as a service bundles as a mobility management tool. *Transportation*, 46(5), 1951-1968. <https://doi.org/10.1007/s11116-018-9913-4>
- Mulley, C. (2017). Mobility as a services (MaaS) – does it have critical mass?. *Transport Reviews*, 37(3), 247-251. <https://doi.org/10.1080/01441647.2017.1280932>
- Sigala, M. (2018). New technologies in tourism: From multi-disciplinary to anti-disciplinary advances and trajectories. *Tourism Management Perspectives*, 25, 151-155. <https://doi.org/10.1016/j.tmp.2017.12.003>
- Smile Einfach Mobil. (2021). Smile - the mobility app for Vienna. https://smile-einfachmobil.at/index_en.html
- Smith, G., Sochor, J., & Karlsson, I. M. (2018). Mobility as a Service: Development scenarios and implications for public transport. *Research in Transportation Economics*, 69, 592-599. <https://doi.org/10.1016/j.retrec.2018.04.001>
- Sochor, J., Strömberg, H., & Karlsson, I. C. M. (2018). Implementing Mobility as a Service: Challenges in integrating user, commercial, and societal perspectives. *Transportation Research Record*, 2536(1), 1-9. <https://doi.org/10.3141/2536-01>
- Sochor, J., Strömberg, H., & Karlsson, I. M. (2018). Travelers' motives for adopting a new, innovative travel service: Insights from the UbiGo field operational test in Gothenburg, Sweden. In *21st World Congress on Intelligent Transportation Systems, Detroit, September 7-11, 2014*. Edward Elgar Publishing.
- Train, K. E. (2009). *Discrete choice methods with simulation*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511805271>
- UNWTO. (2023). UNWTO Tourism Data Dashboard. Retrieved from <https://www.unwto.org/tourism-data/unwto-tourism-dashboard>



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