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Digital platforms, multimodal transport, and super apps

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Abstract

While bundling different mobility services has been an objective of transport authorities in recent years (i.e., Mobility as a Service – MaaS), we can now observe a shift where mobility is integrated with non-transport services and activities such as shopping, healthcare, and leisure. Indeed, driven by societal changes and business and market forces, some mobility service providers are offering a plethora of different services within the same platform. As a result, this trend has given rise to transport super apps like Uber, Grab, or Bolt. These companies are competing with super apps from a broad range of industries including communication (WeChat, KakaoTalk), e-commerce (Rappi, Shopee), and financial services (Alipay, Paytm), which, in turn, also target the mobility market. Along with this major paradigm change on how people access services and can chose among a multitude of service providers, this paper applies a multiple case study approach, based on purposive sampling, to examine the evolution of mobility platforms. We also outline changes in business models and revenue streams, and discuss implications and possible future transition pathways for the transport sector.

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Keywords: Mobility platforms, urban mobility, integrated transport, platformization, diversification, multiple case study.

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1. Introduction

An ongoing process of platformization can be observed in the transport sector (Mitropoulos et al., 2021; Sá et al., 2022; Weiss and Hasselwander, 2024), which presents mobility providers with the opportunity to diversify their offerings, both horizontally and geographically (Guyader and Piscicelli, 2019; Hasselwander et al., 2022; Hasselwander, 2024b). While this transformation unlocks new growth and cross-subsidization potentials (Hasselwander, 2024a; Sá et al., 2022), it also prompts a critical decision for these providers: whether to develop dedicated apps for every service, each with distinct boundaries encompassing branding, customer base, and value proposition, or to follow a more integrated approach (Ennen et al., 2024).

For instance, Deutsche Bahn operates separate apps for accessing rail services (DB Navigator), carsharing (Flinkster), and bike-sharing (Call a Bike). Alternatively, providers can take a different path, opting to consolidate all their services, which may even go beyond mobility services, within a single app under a strong and recognizable brand. Notable examples of this approach can be seen in multinational firms like Uber, Grab, Bolt, and other major mobility platforms (Hasselwander, 2024b; Rizki et al., 2024a, 2024b). This "super app" approach, which seems to increase in relevance, serves a unified customer base and emphasizes the value proposition of convenience and multifunctionality (Hasselwander, 2024a; Hasselwander and Weiss, 2024).

This trend towards consolidation reflects the increasing demand for integrated and personalized mobility and services, a concept known in the scientific literature as Mobility as a Service (MaaS) (Scheier et al., 2022) or its extended version Mobility as a Feature (MaaF) (Hensher and Hietanen, 2023). However, it is important to note that, while these apps offer users a seamless travel experience and the access to other everyday services, they can also give rise to market dominance, driven by network effects. This may lead to winner-takes-all scenarios and monopolistic concentration (Thelen, 2018), both in the platform-consumer and platform-supplier relations.

Hence, the purpose of this paper is to illustrate the ongoing transformation of the mobility sector and the evolution of mobility platforms from their inception in the early 2010s to their recent ascent towards mobility super apps. Specifically, we analyze how this transformation has influenced business models, service offerings, and revenue streams, as well as competition and market structure.

2. Methods and data

We conducted a multiple case study focusing on major mobility platforms, selecting 11 cases using a purposive sampling approach as outlined by Stake (2013). This approach defines three criteria for the selection of cases: The cases must be relevant to the research focus, exhibit enough diversity across contexts, and offer rich opportunities for understanding complexity and contexts. Although Stake (2013) recommends 4-10 cases for a multiple case study, our slightly larger sample was chosen to ensure comprehensive insights while remaining within a manageable range. Note that excessive case numbers can lead to too much uniqueness and complexity, making it more challenging for researchers to identify meaningful patterns and interactions.

Relevant to our research focus are all multi-sided mobility platforms acting as digital intermediaries between transport service consumers and providers. Therefore, e-scooter or bike-sharing companies like Bird, Lime, Ofo, or Spin are not part of the analysis since their business models are usually not (yet) based on multi-sided markets, as they typically own and rent out the vehicles themselves and do not integrate third-party providers into their apps. To ensure diversity across contexts in our sample, we selected platforms from different world regions including Europe (BlaBlaCar, Bolt, Cabify, FreeNow, and MaaS Global), North America (Uber and Lyft) and Asia (Careem, DiDi Chuxing, Grab, and Ola), with these platforms offering different core mobility services including carpooling, MaaS, as well as ride- and taxi-hailing. Our selection of platforms was also driven by their extensive coverage in the transportation literature and readily available data, so that they are likely to provide valuable insights.

We compiled data from online sources such as newspapers and the firms' press releases, social media channels, and financial reporting to obtain information regarding mobility platforms' international expansion and diversification over time. The data collection regarding international expansion was performed in 2020 as part of the study by Hasselwander et al. (2022), while the remaining data was collected in early 2024.

Performing a content analysis, the available materials were systematically coded to aggregate content. Finally, the results are then discussed against a backdrop of the available literature.

3. Results and discussion

Based on the analysis of the multiple case studies, we identify several trends in the mobility sector.

First, we observe the emergence of regional champions that dominate different geographic markets such as DiDi Chuxing in China, Ola in India, Grab in Southeast Asia, or Careem in the Middle East. This indicates a winner-takes-all tendency in the Global South, where less intense regulation and anti-trust laws are common (Hasselwander et al., 2022; Heeks et al., 2021). In contrast, the markets in the Global North are characterized by stronger competition with several mobility platforms contending for market shares, including Uber and Lyft in North America as well as Bold, Cabify, FreeNow, and others in Europe. These mobility platforms usually also target emerging markets in the Global South, as evidenced by Bolt's strong presence in Africa, Cabify's dominance in Latin America, and Uber's global expansion (cf. Hasselwander et al., 2022) (Figure 1). Lyft, in this context, emerges as an exception, as they have not yet expanded services beyond the North American market.

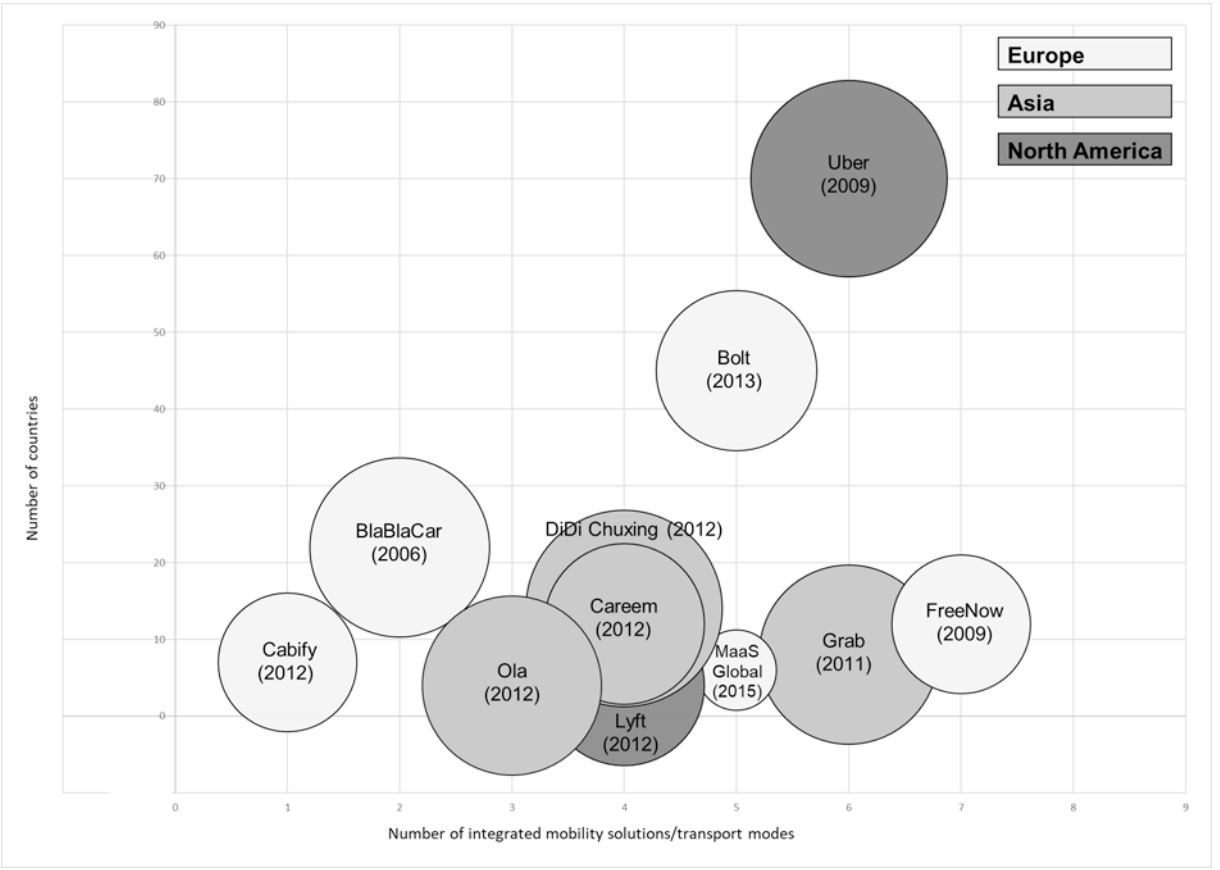

Fig. 1. Mobility platforms' horizontal integration and international expansion

Note: Launch year in parentheses. Not all services might be available in all geographic markets. The size of the circles represents the no. of app downloads in the Google Play store (scale: 1=100K+; 2=1M+; 3=10M+; 4=50M+; 5=100M+; 6=500M+).

Second, as Figure 1 illustrates, there is a growing trend towards multimodality and MaaS. While most major mobility platforms have initially focused on ride-hailing and/or taxi-hailing, they now offer a wide array of urban mobility services including e-scooter, bike- or car sharing, often enabled through organic growth (e.g., Bolt's expansion into micro-mobility services), strategic partnerships (e.g., Free Now's integration of carsharing services by Miles) or mergers and acquisitions (e.g., Uber's acquisition of Jump Bikes in 2018). Some mobility platforms even extend to public transit services such as Free Now, which has integrated Germany's nationwide public transit

flat fare “Deutschlandticket”. The evolution of shifts in service offerings is also vividly reflected in the name changes and rebranding of some mobility platforms, considering that Free Now was initially founded as “mytaxi “, Uber as “UberCab”, Grab as “GrabTaxi”, or Bolt as “Taxify”. Moreover, it appears that this path of first establishing a strong core business and then successively integrating new services is more promising than pursuing a multimodal strategy from inception as seen with MaaS Global, UbiGo, and other commercial MaaS platforms. The limited success of these platforms suggests that the MaaS model is more difficult to scale and fails to attract new users, which leads to a weaker position for negotiation when forming the necessary partnerships with service providers. Also, it seems that end users are less devoted to subscribe to monthly mobility subscriptions (so-called MaaS bundles).

Third, the unique business model of mobility platforms also facilitates the expansion into unrelated domains (i.e., diversification): in the sharing economy a commonly observed phenomenon known as platform envelopment (Eisenmann et al., 2011). This trend can even be observed for companies that are specializing in niches (both geographically and product wise). For example, even though Cabify has not expanded horizontally by integrating other mobility options (Figure 1), it has expanded into other product domains, offering delivery services (Cabify Express) and cashless payment services (Cabify Cash). Other mobility platforms have adopted a more explicit diversification strategy. For instance, Uber has expanded into delivery and freight services early on and has recently announced plans for a "super app" that integrates additional unrelated services such as restaurant and flight bookings (Hasselwander, 2022a). Similarly, Grab positions itself as an "all-in-one platform", offering not only mobility services but also food and grocery deliveries, cashless payments, insurances, hotel bookings, and more. These shifts in core business focus are also reflected in the financial reports of these companies. While mobility services still contribute a significant portion of Uber's revenue at 56%, this share has even decreased to 36% in the case of Grab (Figure 2).

However, this trend has also facilitated the entry of platforms from unrelated industries into the mobility sector. For instance, Kakao T, a popular mobility platform in South Korea, operates as a subsidiary of KakaoTalk (Kakao Corporation), a super app that has started as an instant messaging platform. Similarly, Yandex Taxi in Russia originated from Yandex LLC, a tech company which initially specialized in internet search engines. Finally, in China, ride-hailing services are not solely accessible via the DiDi Chuxing app; they can also be booked and paid for through so-called mini-apps within the WeChat and Alipay super apps. This integration underscores how mobility platforms can gradually lose direct access to customers, transforming into commodities that are replaceable within the broader ecosystem of super apps.

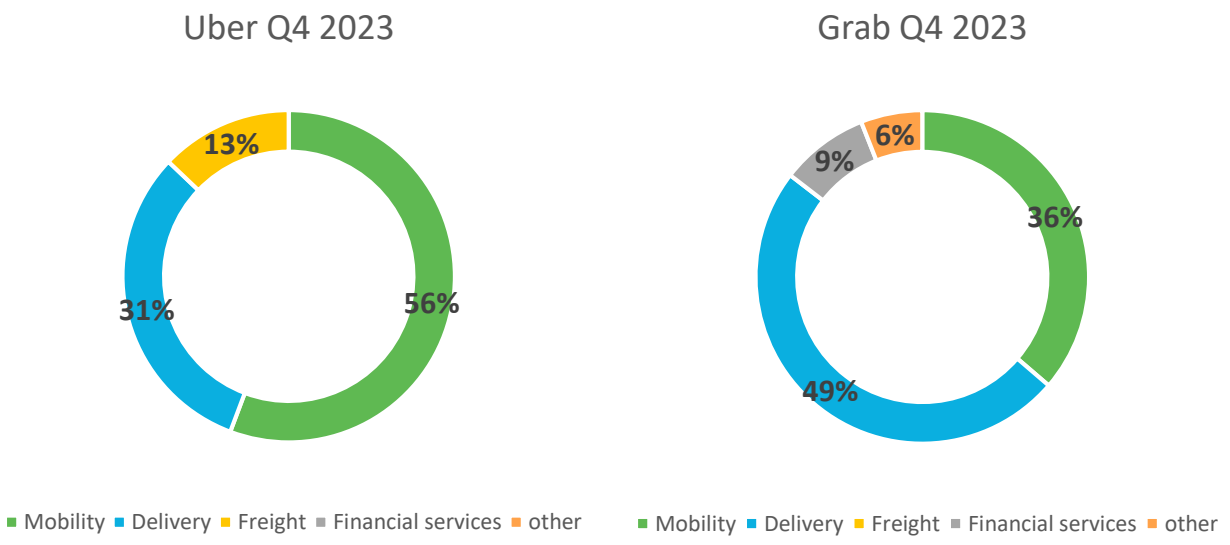

Fig. 2. Mobility platforms’ revenue by segment

4. Concluding remarks

The results of this study provide a better understanding of mobility platforms' evolutionary trajectory, market alignment, and strategic decision making over time. It provides insights on how they integrate both additional mobility services and even non-transport services in response to dynamic market developments and evolving user preferences. The analysis of a diverse set of mobility platforms reveals that a multitude of pathways is guiding the diversification of their portfolios, encompassing both organic expansion and strategic mergers and acquisitions. Finally, the results provide evidence on how platformization enables platforms from unrelated industries including communications, e-commerce, and financial services to enter the mobility markets, intensifying competition, pressuring incumbent players, and accelerating the transformation of this sector.

Based on our analysis of the mobility sector – and drawing an analogy to the developments in the MaaS field (cf. Smith et al., 2018) – we propose the following three future transition pathways for the transport sector:

i. **Mobility platform driven**: In the mobility platform driven transition pathway, major mobility platforms take the lead in driving the development of comprehensive super apps. These platforms evolve beyond their initial focus on mobility services to offer a wide range of additional functionalities and services. By expanding their portfolios, they aim to become one-stop destinations for users' daily needs, encompassing transportation, deliveries, shopping, and more.
ii. **Super app driven**: In the super app driven transition pathway, non-transport platforms take the lead. A representative survey among smartphone users in Germany revealed that mobility ranks among the less valued features within the super app framework (Hasselwander and Weiss, 2024). Hence, for a super app provider with a primary focus on mobility, scaling may pose greater challenges. Instead, platforms with strong core businesses such as banking, e-commerce, and social media could leverage their existing user base and infrastructure to seamlessly integrate mobility and other complementary offerings into their ecosystem.
iii. **Public-private driven**: In the public-private driven transition pathway, the public sector takes a proactive role in regulating super app developments and fostering the creation of locally tailored solutions. Recognizing the potential of super apps to enhance urban mobility and access to essential services, governments and municipal authorities collaborate with private sector partners to establish regulatory frameworks and incentivize the development of "local" super apps (Hasselwander et al., 2024). These locally built platforms are designed to address specific community needs and priorities, leveraging insights from public stakeholders and integrating seamlessly with existing infrastructure and services.

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References

Eisenmann, T., Parker, G., & Van Alstyne, M. (2011). Platform envelopment. Strategic Management Journal, 32(12), 1270–1285. https://doi.org/10.1002/smj.935

Ennen, D., Frieske, B., Hasselwander, M., Kumar, S., Lütjens, K., Maertens, S., Scheelhaase, J., & Scheier, B. (2024). Digital platforms for mobility services: Analyzing recent trends and regulatory efforts from a business and policy perspective [Manuscript submitted for publication].

Guyader, H., & Piscicelli, L. (2019). Business model diversification in the sharing economy: The case of GoMore. Journal of Cleaner Production, 215, 1059–1069. https://doi.org/10.1016/j.jclepro.2019.01.114

Hasselwander, M. (2024). Digital platforms' growth strategies and the rise of super apps. Heliyon, 10(5), e25856. https://doi.org/10.1016/j.heliyon.2024.e25856

Hasselwander, M. (2024). Mobility as a Feature (MaaF): Why and how ride sharing platforms have evolved into super apps. Transportation Research Procedia, 78, 297-303. https://doi.org/10.1016/j.trpro.2024.02.038

Hasselwander, M., & Weiss, D. (2024). Key Factors Influencing Consumer Adoption Intentions of Super Apps in Germany. IEEE Access, 12, 101985-101998. http://dx.doi.org/10.1109/ACCESS.2024.3431950

Hasselwander, M., Bigotte, J. F., & Fonseca, M. (2022). Understanding platform internationalization to predict the diffusion of new mobility services. Research in Transportation Business and Management, 43. https://doi.org/10.1016/j.rtbm.2021.100765

Hasselwander, M., Weiss, D., & Werland, S. (2024). Local super apps in the 15-minute city: a new model for sustainable smart cities? Frontiers in Sustainable Cities, 6, 1404105. https://doi.org/10.3389/frsc.2024.1404105

Heeks, R., Gomez-Morantes, J. E., Graham, M., Howson, K., Mungai, P., Nicholson, B., & Van Belle, J. P. (2021). Digital platforms and institutional voids in developing countries: The case of ride-hailing markets. World Development, 145. https://doi.org/10.1016/j.worlddev.2021.105528

Hensher, D. A., & Hietanen, S. (2023). Mobility as a feature (MaaF): rethinking the focus of the second generation of mobility as a service (MaaS). Transport Reviews, 43(3), 325-329. https://doi.org/10.1080/01441647.2022.2159122

Mitropoulos, L., Kortsari, A., Ayfantopoulou, G. (2021). A systematic literature review of ride-sharing platforms, user factors and barriers. European Transport Research Review, 13, 1-22. https://doi.org/10.1186/s12544-021-00522-1

Rizki, M., Joewono, T. B., & Susilo, Y. O. (2024a). Exploring levels of adoption of multi-function transport apps: Transtheoretical model of change on the customer journey of Transport-SuperApp (TSA) users. Communications in Transportation Research, 4, 100125. https://doi.org/10.1016/j.commtr.2024.100125

Rizki, M., Joewono, T. B., & Susilo, Y. O. (2024b). The influence of app function evolution on transport SuperApp use behaviour over time. Transportation. https://doi.org/10.1007/s11116-024-10485-6

Sá, E., Carvalho, A., Silva, J., & Rezazadeh, A. (2022). A Delphi study of business models for cycling urban mobility platforms. Research in Transportation Business and Management, 45. https://doi.org/10.1016/j.rtbm.2022.100907

Scheier, B., Frieske, B., & Viergutz, K. (2021). Chancen und Potenziale von Mobility-as-a-Service nach der Corona-Pandemie. Wirtschaftsdienst, 101(5), 394-399. https://doi.org/10.1007/s10273-021-2924-3

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

Stake, R. E. (2013). Multiple case study analysis. New York: Guilford Press.

Thelen, K. (2018). Regulating Uber: The politics of the platform economy in Europe and the United States. Perspectives on Politics, 16(4), 938-953. https://doi.org/10.1017/S1537592718001081

Watanabe, C., Naveed, K., & Neittaanmäki, P. (2016). Co-evolution of three mega-trends nurtures un-captured GDP - Uber's ride-sharing revolution. Technology in Society, 46, 164–185. https://doi.org/10.1016/j.techsoc.2016.06.004

Weiss, D., & Hasselwander, M. (2024). Towards the Super Apps Era: The Final Step in the Digital Platform Transition [Manuscript submitted for publication].