

Electrifying Last-Mile Deliveries: A Case Study-Based Evaluation of Electric Vehicles

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Abstract: The practice of last-mile delivery has emerged as an avenue for maintaining the competitive edge. The incorporation of electric vehicles (EVs), for the last mile delivery, offers huge benefits for the organisations. In this context, the article aims to examine the possibilities of EVs in last-mile delivery in the Indian context by using data and information from various secondary sources. The article showcases that E-mobility options like the use of EVs in delivery processes will play a critical and necessary function in satisfying growing needs and resolving the challenges associated with the burgeoning delivery scenario.

Keywords: E-mobility; Electric vehicles (EVs), Last-mile delivery

JEL Codes: M10, M38, L91

1. INTRODUCTION

Interruptions have a twofold personality, exerting negative effects on existing procedures as well as providing unexpected and new possibilities. Covid-19 resulted in a major change in the transportation field, especially in the automobile sector, resulting in transformational developments. A key development amongst them is the increased attention to electric mobility (E-mobility). The requirement for rapid fulfilment of orders is now a well-established standard. The increasing significance of online shopping and the increasing demands of customers have heightened the strain on businesses to speed up delivery whilst retaining cost-effectiveness. In tandem with the tumultuous transformations, the deployment of electric vehicles (EVs) garnered velocity in the last-mile delivery domain (Times of India, 2022). As a consequence of the growing stress on boosted performance and cost diminution, the practice of last-mile delivery has emerged as an avenue for maintaining a competitive edge. The incorporation of EVs, hybridised or self-driving automobiles, and unmanned aerial vehicles (drones) offers the promise to drastically decrease carbon emission levels, optimise personnel spending, and increase affordability (Malhotra, 2023).

As the global landscape shifts towards more sustainable practices, the logistics industry faces increasing pressure to decrease its environmental imprint. In this context, last-mile deliveries, or the final leg of the supply chain, are an important battleground for innovation. Electric vehicles (EVs) have emerged as a possible alternative to traditional combustion engines, providing cleaner and quieter performance. However, their incorporation into last-mile delivery networks necessitates a full examination to determine their practicality, efficacy, and potential obstacles. This article provides a comprehensive look into electrifying last-mile delivery, using a case study approach to assess the practical ramifications of using electric cars. By analyzing real-world instances and the results, people hope to provide insights into the prospects and challenges of EV integration in the logistics sector.

The urgency of transitioning to sustainable transportation solutions arises from growing worries about climate change, air pollution, and urban congestion. Last-mile delivery operations, which involve frequent stop-and-go movements in highly populated regions, add greatly to these issues. Traditional diesel or gasoline-powered automobiles create dangerous pollutants while also incurring expensive operating and maintenance costs. Against this backdrop, electric vehicles provide an appealing option, with zero tailpipe emissions, less noise pollution, and lower operating expenses over their lifetime. Furthermore, advances in battery technology have increased the range and durability of electric vehicles, making them more suitable for tough urban delivery conditions. However, the switch to electric last-mile delivery is not without hurdles. Infrastructure constraints, like as the availability and accessibility of charging stations, remain a major concern. Furthermore, the initial investment expenses associated with purchasing EVs and installing charging infrastructure can be significant financial impediments for logistics organizations, particularly small and medium-sized businesses.

This article dives into the experiences of businesses that have used electric vehicles for last-mile deliveries using a series of case studies. By analyzing their tactics, outcomes, and lessons gained, we want to give useful insights for industry stakeholders managing the transition to sustainable logistics practices. In essence, electrifying last-mile deliveries is a critical step towards improving environmental sustainability and operational efficiency in the logistics industry. This article seeks to improve informed decision-making and promote the wider adoption of electric cars in last-mile delivery fleets by analyzing real-world implementations.

2. LITERATURE REVIEW

Delivery service providers have established lofty targets for electrification, fulfilling that involves concerted work (Janakiraman *et al.*, 2023). Organizations of e-commerce are reaping numerous favours and are swiftly implementing EVs. Businesses are additionally forging alliances with various e-mobility businesses to close the demand-supply mismatch. To properly use EVs, businesses have to have a plan for the future (Kishore, Waghmare & Johnvieira,

2022). Last-mile delivery signifies the conclusive phase of the process of distribution in which the product is conveyed from the final distributing centre, which might be a warehouse or distributing centre, to the ultimate receiver, who may be at their home or a specified collecting location (Archetti & Bertazzi, 2021; Olsson, Hellström, & Pålsson, 2019). The proliferation of last-mile delivery is expected to persist in the years to come, pointing to a possible spike in CO₂ emissions and environmental damage provided adequate controls are applied (Ross, 2021). EVs are establishing themselves as a trailblazing solution that successfully minimises emission levels, consequently reducing pollution throughout the delivery operation (Ehrler, Schöder, & Seidel, 2021). (De Mello Bandeira et al., 2019) found that Urbanisation and e-commerce have complicated last-mile parcel delivery, posing environmental and quality-of-life challenges. Emerging countries face challenges in developing and implementing alternatives to traditional fossil-based operations, notwithstanding their importance. (Priye et al., 2021) studied that in India, electric rickshaws (ERs) have shown to be a sustainable and cost-effective means of public transportation. The ER service provides job and earning prospects for the unskilled labour market. Indian state governments are proposing ER services for both first and final mile travel. The finding of the study shows that paratransit drivers typically have low financial and educational backgrounds. Male drivers make up a significant proportion of paratransit drivers in the city. Lack of allocated parking, fixed charging stations, and fare control are seen as significant impediments to emergency services. Accidents involving emergency vehicles are primarily caused by a lack of separate lanes and dangerous overtaking by fast-moving vehicles. The biggest safety concerns in mixed traffic conditions are the light body of ERs, as well as drivers' carelessness and violation of traffic rules. (Strulak-Wójcikiewicz & Wagner, 2021) suggested that sharing economy solutions can promote sustainable urban freight transport by lowering the need for delivery trucks and promoting the use of green cars, making them increasingly important in modern cities. The multi-case study technique was used to evaluate the LCV-sharing market and find effective crowd shipping practices. A survey was conducted to gauge public interest in the sharing economy. Despite a small market presence, LCV-sharing is gaining popularity in key Polish cities. Car-sharing operators offering delivery vans, as well as those targeting the freight market, offer a cost-effective and environmentally friendly alternative to leasing, particularly for companies that do not require frequent deliveries. (Andruetto, 2022) identified that the urban logistics transit system poses a considerable burden on cities because to externalities such as CO₂ emissions, noise, and congestion, which impact both environmental quality and population health. To address externalities, urban logistics methods, vehicle types, and technologies are being developed and applied. However, the literature lacks a comparative examination of several concepts. This evaluation benefits both public and private decision-makers within the system.

3. OBJECTIVES OF STUDY

1. To examine the upcoming possibilities of EVs in last-mile delivery, with a focus on India.
2. To acquire an understanding of the positive aspects associated with employing EVs in last-mile deliveries in the Indian context.

4. RESEARCH METHODOLOGY

4.1. Nature of the Study

This paper utilised a case study-based approach. The study has emphasised a particular phenomenon from different dimensions. Thus, the possibilities and feasibilities of EVs are dissected.

4.2. Nature and Source of Data

Due to the breadth of the study, the authors leaned on secondary information from blog posts, peer-reviewed papers, and articles. Furthermore, the analysis integrates data from numerous company websites, reports, and whitepapers.

4.3. Basis of Analysis

The research paper is theoretical but explorative. The study replicated the future of EVs. It also tried to explore the feasibility of such vehicles.

5. THE UPCOMING POSSIBILITIES OF EVS IN LAST-MILE DELIVERY

EVs are increasingly becoming the go-to form of transportation for many different kinds of purposes. Specifically, the structured final-mile delivery sector occupies an indispensable and significant position in driving EV uptake across the Indian setting. Prominent organisations in the food delivery, groceries, and electronic commerce delivery industries have made bold promises about electrifying their fleets. Big Basket has pledged to electrify 70% of its fleet by 2024, whereas Zomato has pledged to electrify its fleet completely by 2030 (Janakiraman *et al.*, 2023). The worldwide drive regarding sustainable growth is a powerful motivator for adopting green logistical options. The growing need for low-emission logistics options is driving wider use of EVs for last-mile deliveries (Ehrler, Schöder, & Seidel, 2021). The projected increase in the next five years indicates a Compound Annual Growth Rate (CAGR) of 15-20% throughout multiple categories such as delivery of food, grocery, online shopping, and more. Particularly, the food delivery business, which now handles around 5 million daily requests, is expected to grow at a 30% CAGR in the next five years (Janakiraman *et al.*, 2023). This significant increase will culminate in an increased need and increased demand for more delivery vehicles, demanding a corresponding increase in the area of E-mobility. Electric mobility options like

EVs in delivery processes will play a critical and necessary function in satisfying such growing needs and resolving the challenges associated with the burgeoning delivery scenario.

6. POTENTIAL BENEFITS OF USING E-MOBILITY SOLUTIONS:

One of the primary benefits when utilising EVs is that they reduce atmospheric pollutants like PM or NOx, resulting in a smaller mobility footprint (Kishore, Waghmare & Johnvieira, 2022). EVs have fewer detrimental environmental effects (Iwan, Nürnberg, Jedliński, & Kijewska, 2021). The usage of EVs as a substitute for car engines powered by fuel aids businesses in tackling emissions and the consumption of resources that are not renewable (Sharma, 2021). The environmentally friendly advantages of EV adoption are widely documented but aren't the sole reason for adopting e-mobility solutions for last-mile delivery. There are additional factors to consider. Deployment of EVs in last-mile deliveries adds not merely to the social and environmental elements of sustainability for businesses, but additionally to fiscal viability and other advantages for businesses. In this scenario, one key virtue of EVs is their very low fuel usage. EVs have much lower fuel usage with respect to various types of vehicles. Fuel usage and the total logistics cost are inextricably linked. So, by consuming less fuel EVs offer huge advantages for businesses. EVs can potentially provide significant financial benefits due to lower Total Cost of Ownership (Janakiraman *et al.*, 2023).



Figure 1: Significant Financial Benefits due to lower Total Cost of Ownership

Source: BCG

EVs are easy to use and inexpensive to maintain choices for last-mile deliveries, necessitating fewer car components than traditional automobiles. Range-related stress is alleviated by the confined traveling perimeter and predetermined paths, since EVs may charge at the origin area in 2-3 hours, reducing reliance on infrastructural networks.

7. CONCLUSION

Electric vehicles (EVs) have attained substantial headway in the context of last-mile deliveries and have the potential to emerge as the most common option for organized last-mile delivery networks. This is due to its favorable financial and environmental attributes, along with the help they enjoy through governmental programs and assistance. To capitalize on the benefits of EV adoption, organizations ought to prioritise optimizing routes for delivery and leveraging artificial intelligence (AI) to optimise everyday dispatches. The aforementioned approach will assist organisations minimise total kilometres traversed whilst additionally enhancing the final mile accessibility. Delivery platforms must take an all-encompassing approach to fulfill their electrification ambitions.

References

- Archetti, C., & Bertazzi, L. (2021). Recent challenges in Routing and Inventory Routing: E-commerce and last-mile delivery. *Networks*, 77(2), 255–268. <https://doi.org/10.1002/net.21995>
- Ehrler, V. C., Schöder, D., & Seidel, S. (2021). Challenges and perspectives for the use of electric vehicles for last mile logistics of grocery e-commerce – Findings from case studies in Germany. *Research in Transportation Economics*, 87, 100757. <https://doi.org/10.1016/j.retrec.2019.100757>
- Iwan, S., Nürnberg, M., Jedliński, M., & Kijewska, K. (2021). Efficiency of light electric vehicles in last mile deliveries – Szczecin case study. *Sustainable Cities and Society*, 74, 103167. <https://doi.org/10.1016/j.scs.2021.103167>
- Janakiraman, V., Sankar, N., Khandelia, A., & Tiwari, A. (2023). Electric vehicles: *Future of Last-Mile deliveries in India*. In *BCG Global*. Retrieved July 15, 2023, from <https://www.bcg.com/publications/2023/electric-vehicles-future-of-last-mile-deliveries-in-india>
- Kishore, Waghmare, R., & Johnvieira, A. (2022). Use Of Electric Vehicles In Last-Mile Delivery For B2c: A Step Towards Green Supply Chain, *Journal of Positive School Psychology*, 6(6), 2239–2247.
- Malhotra, G. (2023, March 4). Innovating an efficient last-mile delivery. Financial Express. Retrieved July 14, 2023, from <https://www.financialexpress.com/business/express-mobility-innovating-an-efficient-last-mile-delivery-2996080/>
- Olsson, J., Hellström, D., & Pålsson, H. (2019). Framework of Last Mile Logistics Research: A Systematic Review of the Literature. *Sustainability*, 11(24), 7131. <https://doi.org/10.3390/su11247131>

- Ross, S. (2021, March 26). Last-Mile Delivery Challenges, and How to Solve Them. Supply Chain Brain. Retrieved from <https://www.supplychainbrain.com/blogs/1-think-tank/post/32800-last-mile-delivery-challenges-and-how-to-solve-them>
- Sharma, S. (2021, February 9). Electric Vehicles—The Future of Last-Mile Deliveries in 2021 and beyond. Locus Blog. Retrieved from <https://blog.locus.sh/electric-vehicles-for-last-mile-deliveries/>
- Times of India. (2022, July 30). EV revolution and its effect on last-mile delivery transportation. The Times of India. Retrieved July 14, 2023, from <https://timesofindia.indiatimes.com/auto/policy-and-industry/ev-revolution-and-its-effect-on-last-mile-delivery-transportation/articleshow/93234102.cms>
- De Mello Bandeira, R. A., Goes, G. V., Schmitz Gonçalves, D. N., D'Agosto, M. de A., & Oliveira, C. M. de. (2019). Electric vehicles in the last mile of urban freight transportation: A sustainability assessment of postal deliveries in Rio de Janeiro-Brazil. *Transportation Research Part D: Transport and Environment*, 67, 491–502. <https://doi.org/10.1016/j.trd.2018.12.017>.
- Priye, S., Manoj, M., & Ranjan, R. (2021). Understanding the socioeconomic characteristics of paratransit drivers and their perceptions toward electric three-wheeled rickshaws in Delhi, India. *IATSS Research*, 45(3), 357–370. <https://doi.org/10.1016/j.iatssr.2021.03.002>.
- Strulak-Wójcikiewicz, R., & Wagner, N. (2021). Exploring opportunities of using the sharing economy in sustainable urban freight transport. *Sustainable Cities and Society*, 68(February). <https://doi.org/10.1016/j.scs.2021.102778>.
- Andruetto, C. (2022). Exploring electrification, consolidation, cargo bikes and automation using a sustainability performance assessment framework. *Integrated Transport Research Lab*, April, 1–28.