"UNDERSTANDING THE CHALLENGES AND OPPORTUNITIES FOR SUSTAINABLE PRACTICES IN ONLINE FOOD DELIVERY PLATFORMS"

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ABSTRACT

The rapid growth of online food delivery platforms has revolutionized the way consumers access food services. However, this convenience-driven industry presents significant challenges to achieving sustainability goals. Online food delivery platforms have witnessed immense growth in recent years, driven by factors such as urbanization, changing consumer preferences, and advancements in technology. While these platforms provide convenience and accessibility, they also contribute to environmental, social, and economic challenges. It explores the multifaceted nature of these challenges and the potential for sustainable practices to mitigate their adverse impacts. To achieve sustainable practices in online food delivery platforms, a comprehensive approach is needed. Collaboration among various stakeholders, including platform operators, restaurants, delivery personnel, consumers, and policymakers, is crucial. Effective policies and regulations should be developed to incentivize sustainable practices and hold platforms accountable for their environmental and social impacts. Consumer awareness and education campaigns can play a significant role in promoting sustainable choices and encouraging behavior change. The rapid growth of online food delivery platforms presents both challenges and opportunities for sustainability. Addressing the environmental, social, and economic impacts requires a holistic approach that incorporates sustainable practices at every level of the delivery ecosystem. By promoting collaboration among stakeholders, implementing effective policies, and raising consumer awareness, online food delivery platforms can transition towards a more sustainable and responsible industry, ensuring the well-being of the environment, society, and economy.

Key Words: Sustainable practices, online food delivery, Environmental impact, Eco-friendly delivery, Green logistics, Sustainable packaging, Carbon footprint, Eco-conscious consumers

1. INTRODUCTION

Economic growth and increasing broadband access are fueling the global expansion of e-commerce. Consumers are increasingly using online services. Their disposable income is increasing. Electronic payments have become more reliable,. The range of suppliers and the size of their distribution networks are expanding.

Online to offline (O2O) is a form of e-commerce in which consumers are attracted to a product or service online and prompted to complete a transaction in an offline setting. One area of O2O commerce that is expanding rapidly is the use of online food delivery (online FD) platforms. Around the world, the rise of online FDs has changed the way many

consumers and food suppliers interact. "The sustainability impact of this change (defined by the three pillars of economic, social and environmental)"[1] (Purvis, B.; Mao, Y.; Robinson, D. Three pillars of sustainability: In search of conceptual origins. *Sustain. Sci.* 2019, *14*, 681–695)has not yet been widely revealed andEvaluated. It is difficult to assess its impact. Thus, the aims of this review are threefold: (1) to conduct an interdisciplinary review that brings together academic research on a wide range of areas affected by the increasing use of online FDs; (2) discuss the opportunities and challenges arising from these impacts; and (3) highlight opportunities for action by all stakeholders, including the online FD industry, policy-makers, consumers and academics, to maximize its positive and minimize its adverse effects. Before presenting the review, it is important to have an overview of the online food delivery sector (Section 2) to help contextualize the results outlined in the review (Section 4, Section 5 and Section 6)[2].(Food Safety and Standards (Import) Regulations, 2017.)

2. Background

The background of sustainable practices in online food delivery platforms stems from the rapid growth and popularity of these platforms in recent years. Online food delivery platforms have transformed the way people access food services, offering convenience, choice, and quick delivery to consumers. However, this convenience-driven industry has also raised concerns about its environmental and social impact.The environmental challenges associated with online food delivery platforms are significant. These platforms contribute to packaging waste through the extensive use of single-use containers, cutlery, and plastic bags. Additionally, the emissions from the delivery vehicles used by these platforms contribute to air pollution and carbon emissions, exacerbating climate change. The food waste generated during the delivery process further compounds the environmental impact.

On the social front, the gig economy model prevalent in many online food delivery platforms raises concerns about worker rights, fair wages, and job security. Delivery personnel often face challenges such as low pay, lack of employment benefits, and limited job security. Ensuring fair labor practices and creating a supportive work environment for delivery personnel are crucial aspects that need to be addressed.

From an economic perspective, while online food delivery platforms offer new business opportunities for restaurants and small food vendors, the fees and commissions charged by these platforms can place a financial burden on these businesses. This raises concerns about the sustainability and viability of local businesses, particularly for small and independent food establishments. For example, "in 2018, a promotion campaign by the India-based online FD company Food panda offered consumers large discounts, which resulted in Foodpanda increasing the number of users by a factor of Ten.[3] Moreover, in 2018, Eleme in India, spent three billion yuan (US$443 million) over three months in a successful marketing strategy to increase its market share to more than 50 percent of the Indian market.[4] Despite online FD being very strong in some regions, as a whole across the world online FD is in the early stages of market development, and it will require considerable investment to fund promotions and campaigns and to provide subsidies to participating restaurants

The background also encompasses the growing recognition of the need for sustainable practices in the online food delivery industry. Stakeholders, including platform operators, consumers, and policymakers, have become increasingly aware of the environmental and social impacts associated with these platforms. There is a growing demand for more

sustainable options, including eco-friendly packaging, emission reduction measures, fair labor practices, and support for local businesses.

In response to these challenges, various stakeholders, including platform operators, governments, and non-governmental organizations (NGOs), have initiated efforts to promote sustainable practices in online food delivery platforms. These efforts range from implementing eco-friendly packaging initiatives to optimizing delivery routes for reduced emissions and supporting fair labor practices.

Understanding the background of sustainable practices in online food delivery platforms helps to contextualize the need for research and interventions in this area. It highlights the urgent need to address the environmental and social challenges while ensuring the economic viability of the industry. By adopting sustainable practices, online food delivery platforms can contribute to a greener and more socially responsible food delivery ecosystem.

3. Research Objectives

To review existing sustainable practices in online food delivery platforms: This objective involves studying and evaluating the effectiveness of current sustainable initiatives implemented by online food delivery platforms. The goal is to identify successful sustainable practices and assess their impact on environmental, social, and economic sustainability.

To understand the role of stakeholders in promoting sustainable practices: This objective aims to examine the roles and responsibilities of various stakeholders, including platform operators, restaurants, delivery personnel, consumers, and policymakers. The objective is to understand the level of engagement and collaboration among stakeholders and identify opportunities for collective action to address sustainability challenges.

To propose recommendations for sustainable practices in online food delivery platforms: Based on the findings from the research, this objective involves providing actionable recommendations for promoting sustainable practices in the online food delivery industry. The aim is to suggest strategies and actions that can be implemented by different stakeholders to overcome challenges and capitalize on opportunities for sustainability.

By accomplishing these research objectives, the study aims to provide a comprehensive understanding of the challenges and opportunities for sustainable practices in online food delivery platforms. The findings and recommendations will contribute to the development of a more sustainable and responsible online food delivery industry, benefiting the environment, society, and economy.

4. Methodology

The research aims to investigate the challenges and opportunities for sustainable practices in online food delivery platforms. To achieve this, a comprehensive research methodology is designed, incorporating population sampling, literature review, data collection, and analysis.

Literature Review: The research begins with an extensive literature review to establish a theoretical foundation. Academic databases, scholarly articles, reports, and case studies related to sustainable practices in online food delivery platforms will be analyzed. The literature review will identify key challenges, opportunities, and existing sustainable initiatives in the industry.More than 60 documents were identified on 'online food delivery impact(s)', using the following research engines: Scopus, Web of Science, Google Scholar, and China National Knowledge Infrastructure (CNKI). The broad range of databases searched was due to the interdisciplinary nature of the research question and the desire to search in two languages. Importantly, in addition to journal articles, the research scanning also

included books and book chapters, government policies, reports, working papers, and other grey literature sources. Given the newness of the online FD sector, our initial searches revealed that a systematic review of the academic literature was not possible as there was simply not enough published on the sustainability impacts to enable hard and fast conclusions about the state of the sector to be derived. Consequently, a rather more exploratory approach was adopted that identified topics worthy of further exploration and sought to showcase these to encourage future research.

Sampling: The population for this research includes key stakeholders in the online food delivery ecosystem, such as platform operators, delivery personnel, restaurant owners, consumers, and policymakers. A stratified sampling approach will be used to ensure representation from different regions and platforms of varying sizes. For this research the population of North Delhi are selected which are approx one million.

The sample will include a mix of online food delivery platforms accessible through mobile applications and websites. This will ensure a comprehensive representation of different platforms that cater to diverse user preferences and technological access.The sample will encompass online food delivery platforms operating under various business models, such as order-focused, logistics-based, and full-service models. This approach will allow for an in-depth analysis of how different business models influence sustainable practices in the delivery process.The sample will cover online food delivery platforms that offer payment options through online transactions and cash on delivery (COD). This distinction will help understand how different payment methods may impact the adoption of sustainable practices.

The research will focus on online food delivery platforms operating in different regions of India, including North India, West and Central India, South India, and East India. By considering regional insights, the study can identify region-specific challenges and opportunities related to sustainable practices in online food delivery.

Overall, the comprehensive sampling approach will provide valuable insights into the challenges and opportunities for sustainable practices in online food delivery platforms, considering various platform types, business models, payment methods, and regional variations.

Data Collection: Data will be collected through both primary and secondary sources. Primary data will be obtained through interviews, focus groups, and surveys with stakeholders. Interviews with platform operators and policymakers will provide insights into existing practices and policies. Surveys with consumers will gauge their preferences and behaviors towards sustainable practices. Secondary data will include industry reports, statistical data, and relevant documents from government agencies and NGOs.

Environmental Impact Assessment: To understand the environmental challenges, data on packaging materials, delivery distances, energy consumption, and waste generation will be collected. Life cycle analysis (LCA) will be conducted to assess the environmental impact of online food delivery platforms. Carbon footprint calculations will also be performed to quantify the carbon emissions associated with the industry.

Social and Economic Analysis: Data will be analyzed to assess the social challenges and opportunities in the industry. Labor practices, worker rights, job security, and worker well-being will be evaluated through interviews with delivery personnel and restaurant owners. Economic challenges, such as platform fees and support for small businesses, will be analyzed based on financial data and interviews with relevant stakeholders.

Comparative Case Studies: To understand successful sustainable practices, comparative case studies of online food delivery platforms that have implemented eco-friendly initiatives will be conducted. In-depth analysis of specific platforms will explore the outcomes, impacts, and best practices.

Data Analysis: Data collected from surveys and interviews will be analyzed using appropriate qualitative and quantitative methods. Qualitative data will undergo thematic analysis to identify recurring themes, while quantitative data will be subjected to statistical analysis to identify trends and relationships.

Recommendations: Based on the findings, practical recommendations will be developed for promoting sustainable practices in online food delivery platforms. These recommendations will address environmental, social, and economic aspects, as well as stakeholder engagement and policy considerations.

Conclusion: The research methodology will culminate in a comprehensive understanding of the challenges and opportunities for sustainable practices in online food delivery platforms. The findings will contribute to the development of a more environmentally responsible, socially equitable, and economically viable online food delivery ecosystem.

Research type

As a researcher, the research type chosen for this study is "Descriptive Research." The objective of the research is to provide a comprehensive and detailed analysis of the challenges and opportunities for sustainable practices in online food delivery platforms. Descriptive research allows for a systematic investigation of the current state of the industry, including its various aspects, characteristics, and trends.

Through this research type, I aim to gather data from diverse sources, such as academic literature, industry reports, news articles, and expert interviews. This data will be analyzed to present a clear picture of the sustainability practices adopted by online food delivery platforms, their environmental impact, and the existing challenges they face in implementing eco-friendly solutions.

The research will also explore the opportunities available to improve sustainable practices, including the integration of digital innovations, optimization of logistics and transportation, and the potential benefits of adopting green technologies. By employing a descriptive research approach, I seek to provide valuable insights that can guide policymakers, industry stakeholders, and platform owners in making informed decisions to promote sustainability and environmental responsibility in the online food delivery sector.

The findings of this research will contribute to the existing body of knowledge, offering a comprehensive understanding of the dynamics of sustainable practices in the industry. It will also lay the foundation for future studies and more targeted research to address specific issues and challenges identified during the descriptive analysis. Ultimately, the research aims to support the advancement of sustainable practices in the online food delivery domain, fostering a greener and more responsible approach to food delivery services.

Challengesoccur for Sustainable Practices in Online Food Delivery Platforms

In India, despite it being academically acknowledged that online FD is causing huge environmental challenges,[5] Meanwhile, for ordinary consumers, although they are aware of the environmental impact, they seldom think about how food and food-related wastes are produced, and many do not consider keeping leftover food for future meals or think to reuse the meal boxes, plastic bags or disposal chopsticks.[7] But challenges occurs in -

1. Packaging Waste: Online food delivery platforms contribute to significant packaging waste due to the extensive use of single-use containers, utensils, and packaging materials. This leads to increased landfill waste and environmental degradation. The challenge lies in reducing packaging waste while ensuring the safety and quality of delivered food. Opportunities for sustainable practices include promoting the use of eco-friendly packaging materials, encouraging reusable containers, and implementing packaging waste reduction strategies.there is little apparent concern being shown for this issue by either policy-makers or consumers. "This is in part due to the fact that only 1% of the plastic in municipal waste comes from food delivery[6] and the government is consequently putting more effort into dealing with other plastic waste, such as plastic bottles and bags"[7].

2.Carbon Emissions: Delivery vehicles used by online food delivery platforms contribute to carbon emissions, air pollution, and climate change. The challenge is to minimize the environmental impact of transportation and reduce the carbon footprint. "Transportation is one of the largest offenders of greenhouse gas emissions. The average passenger vehicle, which you need to be employed by virtually any food delivery app, emits 4.6 metric tons of greenhouse gases per year"[8]Opportunities for sustainable practices include optimizing delivery routes to reduce travel distances, encouraging the use of electric or low-emission vehicles, and promoting alternative delivery methods such as bicycle couriers or walking deliveries.

3. Food Waste Generation: Online food delivery platforms can contribute to food waste generation due to various factors, including order cancellations, incorrect orders, and excess food production. The challenge is to minimize food waste throughout the delivery process. Food waste because of online FD is often associated with companies setting a 'minimum price' requirement which means consumers pay for more food than they need or try to order food with roommates in order to meet the 'minimum price' for free delivery services. This incentive to order more results in uneaten food being discarded, especially when consumers are unwilling or unable to store the leftovers because they do not want to have same meals again, or have the hassle of taking it home with them from the office, or they cannot store it because they live in dormitories, and are therefore, not allowed to have fridges within their rooms[9]. Secondly, compared with ordering in a real restaurant where a range of sensory cues are available to the consumer, such as the aroma and sight of the food, it is very difficult for consumers using online FD to make the correct assumption about the portion size, as well as the taste. This means that "online FD food is more likely to be discarded owing to its unexpected poor taste or unexpected large portion size. Opportunities for sustainable practices include implementing efficient order management systems to reduce cancellations, improving communication between restaurants and delivery personnel to ensure accurate orders, and facilitating food donation programs to address excess food"[9].

4. Labour Practices and Worker Rights: The gig economy model prevalent in online food delivery platforms raises concerns about labor practices and worker rights. Delivery personnel often face challenges such as low wages, lack of employment benefits, and limited job security. "The social challenge lies in ensuring fair and ethical labor practices in the industry. Labor practices and worker rights in the food delivery system have become a subject of concern globally, including in India"[13]. The rise of app-based food delivery platforms has created a new paradigm of employment, with significant implications for workers' rights and job security"[14]. For Example : "Zomato and Swiggy are two prominent

app-based food delivery platforms operating in India. They connect consumers with local restaurants and provide delivery services through a network of delivery partners. Here are some key aspects related to labor practices and worker rights in this context:

Employment Status: One of the critical issues is determining the employment status of delivery partners. Zomato and Swiggy classify their delivery partners as independent contractors rather than employees. This classification has raised concerns as it limits the workers' access to certain benefits and protections that employees typically receive.

5. Precarious Work: The gig economy nature of food delivery work often leads to precarious working conditions. Delivery partners face long working hours, fluctuating incomes, and lack of job security. They typically work on a per-order or per-delivery basis, which can result in inconsistent earnings.

6. Wages and Incentives: Delivery partners are generally paid based on the number of orders or deliveries completed. The payment structure often includes a base fee per delivery along with additional incentives based on factors like distance, peak hours, and customer ratings. However, there have been instances of concerns regarding unfair wage practices, low base fees, and frequent changes in payment algorithms.

7 Health and Safety: The physical demands of food delivery work expose delivery partners to road accidents, injuries, and occupational health hazards. There have been reports of accidents involving delivery personnel, raising questions about the provision of adequate insurance coverage and safety measures by the platforms.

8. Unionization and Collective Bargaining: In recent years, there have been efforts by delivery partners to organize and form unions or associations to advocate for their rights and improved working conditions. However, these efforts have faced challenges due to the independent contractor classification and the decentralized nature of the work.

9. Platform Policies and Worker Support: Zomato and Swiggy have taken steps to address some concerns. They have introduced features like in-app SOS buttons, safety training, and insurance coverage for delivery partners. Additionally, there have been initiatives to provide financial assistance and support during the COVID-19 pandemic."[15]

10. Regulatory Environment: The Indian government has recognized the need to regulate the gig economy and protect worker rights. In 2020, the Ministry of Labour and Employment introduced a draft code that aimed to provide social security benefits to gig workers. However, the implementation of comprehensive regulations specific to food delivery workers is still evolving.

It is important to note that the labor practices and worker rights in the food delivery system are a complex and evolving issue. While there have been concerns regarding the treatment of delivery partners, efforts are being made by both the platforms and workers to address these challenges and find a balance between flexibility and worker protection.

Economic Challenges and Opportunities for Sustainable Practices in Online Food Delivery Platforms are -

11. Platform Fees and Commissions: One of the economic challenges in online food delivery platforms is the high fees and commissions charged to restaurants and food vendors. These fees can strain the profitability and sustainability of small businesses. The challenge is to strike a balance between the revenue needs of the platforms and the financial viability of the participating businesses.forexample "At the beginning of the decade, Foodpanda was founded across the Asia Pacific and South East Asia, covering Europe, Thailand, Malaysia, India, Philippines, Malaysia. But by the middle of this decade, Foodpanda has lost its image

in the global market. In 2014, it sold its Delivery Club business to Russia for $100 million, and in the same year, the German Delivery Hero acquired the Foodpanda group. In 2017, the Foodpanda was acquired by Ola in an all-share deal. Since then, the business of the company has grounded; Ola fired hundreds of employees from Foodpanda in 2017, hinting at an imminent financial crisis."[16]
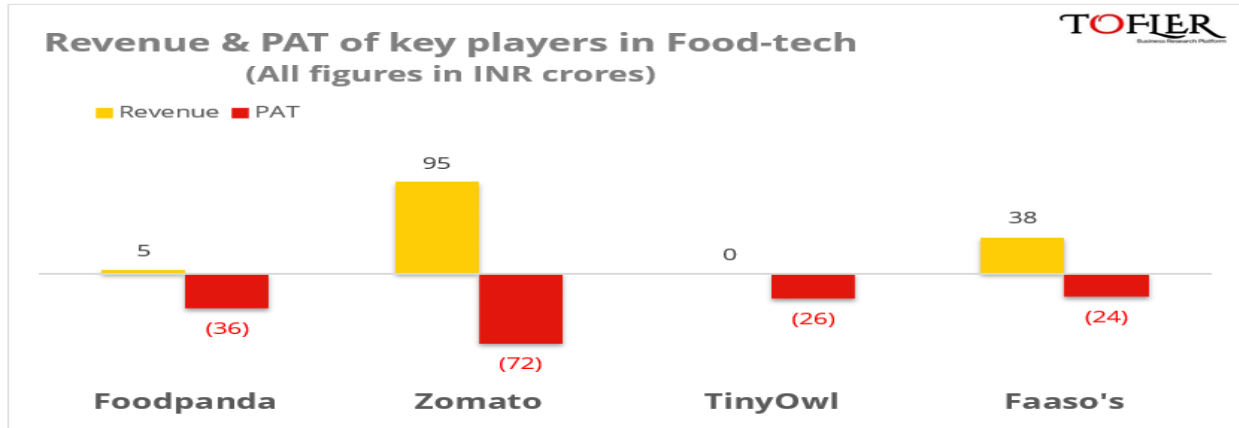
Revenue & PAT of key players in Food TechSource: Tofler

Opportunities in Sustainable Practices of Online Food Delivery Platforms

1.Sustainable Packaging Solutions: One of the key opportunities for sustainable practices lies in exploring and promoting eco-friendly packaging solutions. This includes using biodegradable or compostable materials, minimizing excessive packaging, and encouraging customers to opt for minimal packaging or reusable containers. By adopting sustainable packaging practices, online food delivery platforms can significantly reduce their environmental impact.

"Our government and honourable Prime Minister have taken a thought lead in this area and we as designers could contribute to realising this dream and taking a global lead. While designers shall work hard with this objective, there is a need for a complete eco-system. Materials, suppliers, manufacturers, applicators, economics, etc have all to go hand-in-hand to create an eco-system that makes it viable for product companies to quickly switch to sustainable packaging"[10]

"There is a demand among a small but growing segment of environmentally-conscious consumers. As a result, the market has more options of paper, jute, cloth and even plant-based packaging. In June, Pepsico India announced that the packaging for its snack products, Dominos and Pizza Hut, will be made from 100% compostable, plant-based material before the end of this year. Sustainable packaging doesn't have to be an expensive or inefficient option for any   business. As this increasingly becomes an expectation on behalf of consumers,"[11]

Sustainable packaging is an ongoing process and requires frequent evaluation and development in order to utilize new methods and tools for better output. While the tools

we have so far are still developing, they can help designers to ensure better understanding to the package design process and if it meets with an adopted sustainable strategy.

2.Delivery Route Optimization: Optimizing delivery routes is an important opportunity to reduce carbon emissions and improve overall efficiency. By utilizing advanced logistics algorithms and real-time data, platforms can optimize delivery routes, minimizing travel distances and time, leading to reduced fuel consumption and emissions. Implementing route optimization technology and incentivizing eco-friendly delivery practices can contribute to more sustainable and efficient operations. Delivery route optimization should be based on Heuristics algorithm. "Heuristics algorithm is based on the model of undirected weighted graph.[13] "The constructive heuristics algorithm is applied in the developed system and uses nearest-neighbor (NN) approach. The algorithm that is used to solve TSP has several iterations[12], which are–

1) Salesman is in initial point as the current vertex.

2) Search the edge that has the least weight between the
current vertex and the unvisited vertex V.

3) V is set as the current vertex.

4) Mark V as visited vertex.

5) Repeat step 2.

6) If all vertices have been visited, stop the iteration and go
back to initial point.

The output of this algorithm is the sequence of steps as the TSP solution.

Fig.1.ExampleofapplicationthatappliesheuristicalgorithmandusesGoogleMaps.

5 Waste Reduction Measures: Implementing waste reduction measures throughout the delivery process can significantly contribute to sustainability. This includes promoting recycling programs for packaging materials, encouraging restaurants to minimize food waste through portion control and better inventory management, and educating consumers about responsible waste disposal practices. By incorporating waste reduction measures, online food delivery platforms can mitigate their environmental impact.

In summary, the environmental challenges in online food delivery platforms revolve around packaging waste, carbon emissions, and food waste generation. However, these challenges also present opportunities for implementing sustainable practices. By exploring eco-friendly packaging solutions, optimizing delivery routes, and implementing waste reduction measures, online food delivery platforms can significantly reduce their environmental footprint and contribute to a more sustainable food delivery ecosystem.

Opportunities for sustainable practices include implementing fair wage policies, providing better employment benefits, and establishing mechanisms to address worker grievances. On the basis of opportunities we can discuss these context -

3. Fair Wages and Job Security: Many delivery personnel in online food delivery platforms work under precarious conditions, receiving low wages and lacking job security. Ensuring fair wages and job security is crucial for the well-being and livelihood of these workers. Opportunities for sustainable practices include establishing minimum wage standards, providing transparent payment systems, and offering employment contracts that guarantee job security and stability.

4. Supportive Work Environment: Creating a supportive work environment is essential for the physical and mental well-being of delivery personnel. The social challenge is to address issues such as long working hours, excessive workloads, and lack of support systems. Opportunities for sustainable practices include implementing measures to ensure reasonable working hours, providing access to healthcare and support services, and promoting a healthy work-life balance.

5. Worker Welfare Initiatives: Online food delivery platforms can contribute to worker welfare by offering additional benefits and support. Opportunities for sustainable practices include providing training and skill development programs for career advancement, offering insurance coverage for work-related risks, and establishing programs for financial planning and support.

6. Inclusive and Equitable Employment Opportunities: Ensuring inclusive and equitable employment opportunities is crucial for promoting social sustainability. The challenge lies in addressing issues of discrimination, inequality, and limited opportunities for marginalized groups. Opportunities for sustainable practices include implementing diversity and inclusion policies, fostering equal employment opportunities, and supporting initiatives that empower underrepresented groups in the industry.

By addressing these social challenges and embracing the opportunities for sustainable practices, online food delivery platforms can create a more socially responsible industry. Providing fair wages, job security, a supportive work environment, and inclusive employment opportunities will improve the well-being and livelihoods of delivery personnel. Ultimately, this will contribute to the social sustainability of the online food delivery ecosystem

Opportunities for sustainable practices include implementing transparent and fair fee structures, providing incentives for sustainable practices, and exploring alternative revenue models that promote long-term partnerships. For this opportunities Online food delivery platforms should -

7. Support for Small Businesses: Online food delivery platforms have the potential to support and promote local restaurants and small food vendors. However, the economic challenge lies in ensuring that these businesses can thrive in the competitive marketplace. Opportunities for sustainable practices include offering marketing support and visibility to local businesses, facilitating collaborations between platforms and vendors, and establishing initiatives to nurture and grow small businesses within the online food delivery ecosystem.

8. Collaborative Business Models: Collaboration between online food delivery platforms and local businesses can create win-win scenarios. However, the challenge is to establish mutually beneficial partnerships that promote sustainability and economic growth. Opportunities for sustainable practices include exploring revenue-sharing models that

provide a fair distribution of profits, fostering long-term relationships based on shared values and goals, and implementing mechanisms for continuous dialogue and feedback between platforms and vendors.

9. Economic Growth and Local Business Resilience: Online food delivery platforms have the potential to contribute to economic growth and resilience, particularly for small and independent food establishments. However, the economic challenge lies in ensuring that the benefits of the industry reach all stakeholders and contribute to local economic development. Opportunities for sustainable practices include actively promoting and supporting local businesses, encouraging entrepreneurship, and investing in initiatives that enhance the local food ecosystem.

10. Innovation in Revenue Sharing Models: Developing innovative revenue-sharing models can address the economic challenges faced by online food delivery platforms and vendors. Opportunities for sustainable practices include exploring revenue-sharing structures that account for the size and resources of businesses, incentivizing sustainable practices through revenue-sharing arrangements, and creating mechanisms for vendors to participate in the decision-making process of the platform.

By addressing these economic challenges and embracing the opportunities for sustainable practices, online food delivery platforms can contribute to a more economically viable and sustainable industry. Supporting small businesses, implementing fair fee structures, fostering collaborations, and promoting local economic growth will enhance the long-term sustainability of the online food delivery ecosystem.

Recommendations for Sustainable Practices

To foster a more sustainable online food delivery industry, various stakeholders, including online platforms, restaurants, governments, and consumers, must work together to implement sustainable practices. Here are some recommendations for promoting sustainability in the online food delivery sector:

Integrated Sustainable Approach: Adopt an integrated approach that encompasses environmental, social, and economic sustainability. This includes:

a) Environmental: Encourage the use of eco-friendly packaging, optimize delivery routes to reduce emissions, and promote renewable energy adoption in operations.

b) Social: Ensure fair labor practices, provide adequate support to delivery partners, and prioritize their well-being and safety.

c) Economic: Work towards a sustainable business model that is economically viable in the long term and supports the growth of local businesses.

Incentives for Sustainable Packaging and Delivery Practices: Online food delivery platforms can implement incentive programs to motivate restaurants and consumers to choose sustainable practices:

a) Offer financial incentives or reduced commission rates for restaurants that use biodegradable or reusable packaging.

b) Provide discounts or loyalty points to customers who opt for sustainable packaging or delivery during off-peak hours to minimize energy consumption.

Support for Fair Labor Practices: Ensure fair treatment and support for delivery partners:

a) Set clear guidelines for fair wages, working hours, and benefits for delivery personnel.

b) Provide training on road safety, customer service, and sustainable delivery practices.

c) Implement mechanisms for feedback and dispute resolution to address any issues effectively.

Promotion of Local Businesses:Support local restaurants and food producers to foster a sustainable food ecosystem:

a) Highlight local businesses on the platform, giving them increased visibility to attract more customers.

b) Collaborate with local farmers and suppliers to source fresh and locally produced ingredients.

c) Reduce reliance on long-distance deliveries by prioritizing nearby restaurants.

7.5 Public-Private Partnerships and Collaborations:

Collaborate with governments, NGOs, and other stakeholders to drive sustainable initiatives:

a) Partner with local authorities to improve infrastructure for sustainable transportation, such as dedicated bike lanes or EV charging stations.

b) Collaborate with environmental organizations to assess and improve the sustainability of operations continually.

Policy and Regulatory Frameworks:Support and advocate for policies that encourage sustainability in the online food delivery industry:

a) Advocate for regulations that promote the use of eco-friendly packaging materials and discourage single-use plastics.

b) Engage with policymakers to incentivize the adoption of electric vehicles and other sustainable delivery methods.

c) Work with governments to establish fair labor standards and safety regulations for delivery personnel.

By implementing these recommendations, the online food delivery industry can significantly reduce its environmental impact, promote fair labor practices, support local businesses, and contribute to a more sustainable and responsible food delivery ecosystem.

5. **Summary of Findings**:

The research on "Understanding the Challenges and Opportunities for Sustainable Practices in Online Food Delivery Platforms" has shed light on various critical aspects of the industry. Environmental challenges, such as packaging waste, carbon emissions, and food waste generation, pose significant threats to sustainability. Social challenges, including fair labor practices, worker rights, and job security, demand attention to ensure the well-being of delivery personnel. Economic challenges, such as high platform fees and support for small businesses, require innovative approaches to foster economic growth and resilience.

Throughout the study, several opportunities for sustainable practices have emerged. These opportunities include promoting eco-friendly packaging solutions, optimizing delivery routes to reduce emissions, and supporting inclusive and equitable employment opportunities. Collaborative business models, innovative revenue-sharing structures, and initiatives to nurture local businesses also offer pathways to enhance sustainability in the online food delivery industry.

Implications for Sustainable Practices: The implications of the research findings are significant for various stakeholders. Online food delivery platforms can adopt sustainable packaging solutions and route optimization strategies to reduce their environmental impact. Ensuring fair wages, job security, and a supportive work environment will contribute to the social responsibility of these platforms. Collaborative partnerships and support for small businesses can foster economic growth and enhance the overall resilience of the industry.

For policymakers, the research underscores the importance of creating an enabling environment through regulations and incentives that promote sustainable practices. By aligning the interests of all stakeholders and encouraging collective action, policymakers can contribute to the creation of a more sustainable online food delivery ecosystem.

Consumers play a crucial role in driving sustainable practices. Greater consumer awareness about the environmental and social impacts of online food delivery can lead to more responsible choices. By opting for sustainable packaging options, supporting local businesses, and patronizing platforms that prioritize fair labor practices, consumers can actively contribute to sustainability.

Future Research Directions: The research has laid the groundwork for understanding the challenges and opportunities for sustainable practices in online food delivery platforms. However, there are several areas that warrant further investigation:

a. Long-term Impact Assessment: Future research should focus on evaluating the long-term impact of sustainable practices in the online food delivery industry. This includes assessing the effectiveness of initiatives and policies in reducing environmental and social impacts over time.

b. Stakeholder Collaboration: More in-depth studies are needed to explore effective mechanisms for stakeholder collaboration. Understanding how different stakeholders can work together to address challenges and implement sustainable practices will be crucial for the industry's future sustainability.

c. Behavioral Change and Consumer Preferences: Research should delve into consumer behavior and preferences to understand the factors influencing sustainable choices in online food delivery. Identifying key drivers for consumer behavior can inform targeted interventions to promote sustainability.

d. Technological Innovations: Investigating the role of technological innovations, such as artificial intelligence and data analytics, in enhancing sustainable practices can offer insights into the industry's future potential for sustainability.

e. Policy and Regulatory Impact: Future research should assess the impact of policy and regulatory measures on sustainable practices in the online food delivery sector. Understanding how different policy frameworks influence industry behavior will inform better policymaking.

6. Conclusion

In conclusion, the research on "Understanding the Challenges and Opportunities for Sustainable Practices in Online Food Delivery Platforms" has provided valuable insights into the complexities of sustainability within the fast-growing industry. As online food delivery platforms continue to reshape the way we access and consume food, it is evident that addressing sustainability challenges is paramount to ensuring a greener and more responsible future.

The literature review has highlighted several critical challenges faced by the industry. The environmental impact of the delivery process, particularly the surge in delivery vehicles leading to increased pollution levels, demands urgent attention. The reliance on single-use packaging and the generation of significant food waste further exacerbate the sustainability concerns. Additionally, the gig economy's entry barriers have raised questions about the working conditions and job security of delivery gig workers, necessitating a comprehensive review of labor practices within the industry.

Customer service relationships and the growing expectations for faster deliveries pose challenges to sustainable practices. Meeting customer demands while minimizing environmental impact requires innovative approaches and green technology integration. The emergence of ghost kitchens, catering solely to delivery orders, calls for resource optimization and waste management strategies to ensure responsible food production and distribution.

However, amidst the challenges, the research has unveiled promising opportunities for sustainability in online food delivery platforms. Digital innovations, such as artificial intelligence and data analytics, offer tools to optimize delivery routes, reduce fuel consumption, and improve overall efficiency. By adopting a circular economy approach, where packaging materials are reused or recycled, platforms can significantly reduce waste generation and promote a more eco-friendly ecosystem.

Integrating sustainable practices into the business model presents a substantial opportunity to drive positive environmental impact. By embracing green brand legitimacy and promoting eco-friendly behaviors, platforms can influence customer choices towards more sustainable options. Collaboration with green technology providers enables the transition to electric or hybrid delivery vehicles, significantly reducing the industry's carbon footprint.

The role of policymakers in shaping sustainability within the industry cannot be overlooked. Government regulations and policies can serve as catalysts for driving sustainable practices. By incentivizing eco-friendly behaviors and imposing penalties for unsustainable actions, policymakers can steer platforms towards greener practices and a more responsible food delivery ecosystem.

In conclusion, the research underscores the urgency of addressing sustainability challenges in online food delivery platforms. The industry's growth presents a unique opportunity to foster positive change and make significant contributions to environmental protection. Collaborative efforts from all stakeholders, including platform owners, gig workers, customers, technology providers, and policymakers, are essential in building a sustainable and responsible food delivery ecosystem.

To achieve sustainable practices, platforms must adopt a holistic approach, incorporating green technology, optimizing resource utilization, and prioritizing worker welfare. Additionally, customer awareness and support for eco-friendly choices play a crucial role in driving change. By actively engaging in sustainable behaviors and demanding responsible practices, consumers can influence platforms to prioritize environmental responsibility.

Moving forward, research in this area should continue to explore innovative approaches and solutions to overcome sustainability challenges. Longitudinal studies tracking the industry's progress in implementing sustainable practices will be valuable in measuring the impact of ongoing initiatives.

Ultimately, the journey towards sustainability in online food delivery platforms is a collective endeavor that requires commitment, collaboration, and continuous improvement. By embracing the challenges and opportunities presented, the industry can take significant strides towards a more sustainable future, ensuring that the convenience of online food delivery aligns with environmental responsibility and social welfare.

Notes

1. Purvis, B.; Mao, Y.; Robinson, D. Three pillars of sustainability: In search of conceptual origins. *Sustain. Sci.* 2019, *14*, 681–695. [Google Scholar] [CrossRef][Green Version]

2. Food Safety and Standards (Import) Regulations, 2017.

3. Watch: Foodpanda's Crave Party is Set to Be Its Biggest Food Experience Campaign. Available online: https://archive.is/F2uxR (accessed on 14 April 2020).

4. Alibaba's Ele.me Goes on 3 Billion Yuan Summer Spending Spree to Fight Competition. Available online: https://archive.is/woZLB (accessed on 14 April 2020).

5. https://www.inc.com/ben-sherry/ai-delivery-robots-autonomous-vehicles.html (accessed 8 August 2022).

6. Ahuja, K., Chandra, V., Lord, V., & Peens, C. (2021). *Ordering in: The rapid evolution of food delivery*. McKinsey & Company. Retrieved August 30, 2022, https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/ordering-in-the-rapid-evolution-of-food-delivery

7. Do

8. Joselow, M. (2020). *Delivery vehicles increasingly choke cities with pollution*. Scientific American. Retrieved November 30, 2022,

9. https://packaging360.in/casestudies/a-case-study-on-sustainable-packaging-design/

10. https://packaging360.in/casestudies/a-case-study-on-sustainable-packaging-design/

11. . C. Nilsson. "Heuristics for the Traveling Salesman Problem". Available: https://web.tuke.sk/fei-cit/butka/hop/htsp.pdf. Accessed on April, 1st, 2015.

12. S. Lin, B. W. Kernighan, "An Effective Heuristic Algorithm for the Travelling-Salesman Problem". Available: http://www.seas.gwu.edu/~simhaweb/champalg/tsp/papers/LinKernigha Original.pdf. Accessed on April, 1st, 2015.

13. https://www.statista.com/outlook/dmo/eservices/online-food-delivery/platform-to-consumer-delivery/worldwide#:~:text=Revenue%20in%20the%20Platform%2Dto,US%24302.40bn%20by%202026 (accessed 8 August 2022).

14. https://www.epa.gov/sites/production/files/2015-08/documents/reducing_wasted_food_pkg_tool.pdf (accessed 2 December 2022)

15. Cini, L., & Goldmann, B. (2021). The worker capabilities approach: Insights from worker mobilizations in Italian logistics and food delivery. *Work, Employment and Society, 35*(5), 948–967.

16. https://vedak.com/blogs/failure-of-foodpanda-major-lessons-for-startups/

Fig.1.ExampleofapplicationthatappliesheuristicalgorithmandusesGoogleMaps.
Fig. 2 Revenue & PAT of key players in Food Tech, Source: Tofler

References

1. AFP (2021). *"Ghost kitchens' boom in Asia as pandemic sparks huge demand*. Hong Kong Free Press. Retrieved November 30, 2022, https://hongkongfp.com/2021/09/19/ghost-kitchens-boom-in-asia-as-pandemic-sparks-huge-demand/

2. Ahn, J., & Kwon, J. (2021). Examining the relative influence of multidimensional customer service relationships in the food delivery application context. *International Journal of Contemporary Hospitality Management, 33*(3), 912–928.

3. Ahuja, K., Chandra, V., Lord, V., & Peens, C. (2021). *Ordering in: The rapid evolution of food delivery*. McKinsey & Company. Retrieved August 30, 2022, https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/ordering-in-the-rapid-evolution-of-food-delivery.

4. Akter, S., Michael, K., Uddin, M. R., McCarthy, G., &Rahman, M. (2022). Transforming business using digital innovations: The application of AI, blockchain, cloud and data analytics. *Annals of Operations Research, 308*, 7–39.

5. Bai, J., & Tang, C. S. (2022). Can two competing on-demand service platforms be profitable? *International Journal of Production Economics, 250*, 108672.

6. V. (2007). Is sustainable development in multinational enterprises a marketing issue? *Multinational Business Review, 15*(1), 67–88.

7. Behl, A., Rajagopal, K., Sheorey, P., &Mahendra, A. (2022). Barriers to entry of gig workers in the gig platforms: Exploring the dark side of the gig economy. *Aslib Journal of Information Management*. https://doi.org/10.1108/AJIM-08-2021-0235

8. Bozkaya, E., Eriskin, L., &Karatas, M. (2022). Data analytics during pandemics: A transportation and location planning perspective. *Annals of Operations R*https://doi.org/10.1007/s10479-022-04884-0Butler, S. (2022). *Delivery driver drops food off at wrong house then tells customer to fetch it himself*. Indy100. Retrieved August 30, 2022, https://www.indy100.com/viral/delivery-driver-food-wrong-house.

9. Chau, C. (2021). *Hong Kong police warn striking Foodpanda workers to disperse or face possible force*. Hong Kong Free Press. Retrieved August 30, 2022, https://hongkongfp.com/2021/11/16/hong-kong-police-warn-striking-foodpanda-workers-to-disperse-or-face-possible-force/.

10. Chen, M., Hu, M., & Wang, J. (2022). Food delivery service and restaurant: Friend or foe? *Management Science, Published Online,.* https://doi.org/10.1287/mnsc.2021.4245

11. Chen, X., & Lee, T. J. (2022). Potential effects of green brand legitimacy and the biospheric value of eco-friendly behavior on online food delivery: A mediation approach. *International Journal of Contemporary Hospitality Management*. https://doi.org/10.1108/IJCHM-07-2021-0892

12. Chiu, C. H., Choi, T. M., & Tang, C. S. (2011). Price, rebate, and returns supply contracts for coordinating supply chains with price-dependent demands. *Production and Operations Management, 20*(1), 81–91.

13. Choi, T. M. (2022a). Achieving economic sustainability: Operations research for risk analysis and optimization problems in the blockchain era. *Annals of Operations Research*. https://doi.org/10.1007/s10479-021-04394-5

14. Choi, T. M. (2022b). Financing product development projects in the blockchain era: Initial coin offerings versus traditional bank loans. *IEEE Transactions on Engineering Management, 69*(6), 3184–3196.Choi, T. M., Kumar, S., Yue, X., & Chan, H. L. (2022). Disruptive technologies and operations management in the Industry 4.0 era and beyond. *Production and Operations Management, 31*(1), 9–31.

15. Heiland, H. (2021). Neither timeless, nor placeless: Control of food delivery gig work via place-based working time regimes. *Human Relations, 75*(9), 1824–1848.

16. Helling, B. (2022). *DoorDash missing item? Here's what to do*. Ridester.com. Retrieved August 16, 2022, https://www.ridester.com/doordash-missing-item/.

17. Hess, D., Rogovsky, N., &Dunfee, T. W. (2002). The next wave of corporate community involvement: Corporate social initiatives. *California Management Review, 44*(2), 110–125.

18. Høgevold, N. M., Svensson, G., Wagner, B., J. Petzer, D., Klopper, H., Carlos Sosa Varela, J., Padin, C., & Ferro, C. (2014). Sustainable business models. *Baltic Journal of Management*, *9*(3), 357–380.

19. Homayouni, Z., Pishvaee, M. S., Jahani, H., &Ivanov, D. (2021). A robust-heuristic optimization approach to a green supply chain design with consideration of assorted vehicle types and carbon policies under uncertainty. *Annals of Operations Research*. https://doi.org/10.1007/s10479-021-03985-6

20. Houck, B. (2017). *Why some restaurants are cutting ties with mobile ordering apps.* Eater. Retrieved August 16, 2022l, https://www.eater.com/2017/8/29/16214442/restaurant-order-pay-apps-seamless-postmates-uber-eats.

21. Ivanov, D. (2022). Viable supply chain model: integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic. *Annals of Operations Research*, *319*(1), 1411–1431.

22. Jawahar, N., SatishPandian, G., Gunasekaran, A., & Subramanian, N. (2017). An optimization model for sustainability program. *Annals of Operations Research, 250*(2), 389–425.

23. Jha, R. (2022). A novel hybrid intelligent technique to enhance customer relationship management in online food delivery system. *Multimedia Tools and Applications, 81*, 28583–28606.

24. Jia, H., Shen, S., RamírezGarcía, J. A., & Shi, C. (2022). Partner with a third-party delivery service or not? A prediction-and-decision tool for restaurants facing takeout demand surges during a pandemic. *Service Science, 14*(2), 139–155.

25. Joselow, M. (2020). *Delivery vehicles increasingly choke cities with pollution*. Scientific American. Retrieved November 30, 2022, https://www.scientificamerican.com/article/delivery-vehicles-increasingly-choke-cities-with-pollution/

26. Kapoor, A. P., &Vij, M. (2018). Technology at the dinner table: Ordering food online through mobile apps. *Journal of Retailing and Consumer Services, 43*, 342–351.