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ETHICAL AND GOVERNANCE CHALLENGES IN CLOUD KITCHENS: A REVIEW OF FOOD SAFETY, DATA PRIVACY AND DIGITAL BUSINESS PRACTICES

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ABSTRACT
The rapid evolution of digital technologies has transformed the food-service industry and facilitated the rise of cloud kitchens – a new mode of digital food commerce that depends on digital orders, digital payments, delivery logistics and data-enhanced marketing without significant dependence on traditional restaurants. While offering cost efficiencies, entrepreneurial possibilities, operational flexibility and expanded market access, cloud kitchens raise several key ethical issues of concern. This conceptual paper seeks to map the key ethical considerations of cloud kitchens, focusing particularly on the areas of food safety, data privacy and digital business practices. Using a review of secondary literature, academic studies and pertinent regulatory provisions, the paper identifies concerns with respect to food hygiene, food handling, traceability, packaging, consumer information, personal data collection, cybersecurity, platform dependency, algorithmic visibility, online reviews, pricing transparency and digital marketing. Earlier research highlights that information asymmetry, opportunism, platform control, and the distrust deficit have all led to governance challenges in online food delivery platforms. Research into cloud kitchens likewise identifies concerns over food safety, perceptions of quality, consumer trust, and dependence on platforms. We argue that digitalisation has broadened the remit of governance well beyond food-safety regulation in the case of cloud kitchens. Operating within a broad food ecosystem consisting of consumers, food businesses, digital platforms, delivery providers, employees, suppliers and regulators, it is increasingly complex to attribute accountability. We conclude by advocating for an integrated governance approach, embracing food safety, data privacy, consumer protection, platform accountability and ethical digital business practices to promote the responsible development of cloud kitchens.

Keywords: Cloud Kitchens, Food Safety, Data Privacy, Digital Governance, Consumer Protection, Digital Business Practices, Food Delivery, Ethical Governance.

I. INTRODUCTION

The rapid adoption of digital technologies has dramatically reshaped the food-service sector. Online food delivery, mobile ordering, digital payment systems, social media and data analytic tools have drastically altered the way in which consumers discover, acquire and obtain food. These changes have spurred the creation of novel business models that diverge from conventional restaurants. Cloud kitchens, a concept alternatively referred to as ghost kitchens, virtual kitchens, or dark kitchens, represent one of the most important developments in this context.

Cloud kitchens are food-preparation premises designed primarily for takeout and delivery rather than the provision of traditional in-house dining services. The success of a cloud kitchen hinges significantly on reliance on a digitally operated ordering system, integrated online payment processing, an extensive delivery network, social media presence and digital marketing. Unlike established restaurants that invest in extensive physical dining space, the cloud-kitchen setup either largely dispenses with this element or greatly minimises it. This model presents business owners with substantial savings on dining facility costs and allows them to operate multiple brands or cuisines simultaneously from a single location.

From the perspective of aspiring entrepreneurs and seasoned food companies, the cloud-kitchen model offers numerous advantages. It lowers barriers to entry, gives menu development greater flexibility and enables businesses to reach consumers through digital channels. According to Rout, Dawande and Janakiraman (2024), cloud kitchens foster economic advantages by facilitating consolidations in facilities, enabling multiple eateries to function from shared spaces, and optimise the efficient allocation of delivery resources. The surge in consumer demand for food delivery has also played a critical role in the proliferation of cloud kitchens. Mathur and Mathur (2023) explored in their study how consumer intentions regarding cloud kitchen purchases in India are influenced by their perceptions, attitudes, and purchase choice.

Their research underscores the significance of digital food delivery in the evolution of the cloud-kitchen business model. Similarly, Chhabra and Rana (2021) examined the ascent of cloud kitchens in India, highlighting food-delivery applications as key facilitators of the connection between consumers and this business model.

However, the inherent digitisation of cloud kitchens brings significant ethical and governance challenges in its wake. In a traditional restaurant setting, consumers can physically inspect the premises and interact directly with staff. Cloud kitchens, by contrast, generally prevent consumers from observing the food preparation or the kitchen environment itself. Consequently, consumers rely heavily on digital representations such as food photos, descriptive text, ratings, and reviews, creating a disconnect or ‘information gap’ between the business and the consumer.

Consequently, ensuring food safety is a primary concern. Cloud kitchens are required to adhere to strict standards for hygiene, food handling, storage, preparation, packaging, and delivery. In India, food-safety regulations supervised by the Food Safety and Standards Authority of India (FSSAI) establish regulations for food businesses, including licensing, registration requirements, and standards for hygiene.

Another emerging concern relates to data privacy. Consumers willingly share personal information through ordering, payment, account creation, and delivery services. The Digital Personal Data Protection Act, 2023 provides a legal framework in India for the processing of digital personal data and acknowledges the importance of protecting individual personal data while also allowing for the lawful processing of this data.

Cloud kitchens are heavily reliant on digital food delivery platforms, which, in turn, raise issues of platform governance, algorithmic visibility, commission rates, user reviews, pricing, and business accountability.

Research conducted by Yadav, Meenakshi and Banerjee (2022) revealed that information asymmetry, opportunism, control, and trust gaps are significant factors leading to governance problems in the interactions between online food delivery platforms and restaurant partners in India.

Hence, for cloud kitchens, an ethical governance framework cannot be limited to food safety protocols. It must also encompass data protection measures, consumer welfare initiatives, platform accountability, and principled digital business practices.
The primary objective of this paper is to analyze these issues and to offer a holistic framework for ethical governance in the context of cloud kitchens as part of digital food commerce.

II. OBJECTIVES OF THE STUDY

The study is designed with the following objectives:
1. To investigate the primary food-safety challenges pertinent to cloud-kitchen operations, including aspects of hygiene, food handling, storage, traceability, packaging, and delivery.
2. To identify and examine the key challenges surrounding data privacy and security as generated by the digital operations of cloud kitchens, particularly in the processes of collection, processing, storage and dissemination of customer data.
3. To conduct a comprehensive review of the ethical considerations in the digital business practices of cloud kitchens, focusing on issues like platform dependency, algorithmic visibility, online review system integrity, pricing transparency, and digital marketing strategies.
4. To formulate a conceptual framework for responsible governance of cloud kitchens through an integrated approach that considers food safety, data privacy, consumer protection, platform accountability, and stakeholder responsibility.

III. REVIEW OF LITERATURE

Studies on Cloud Kitchens and Digital Food Commerce

Chhabra and Rana's (2021) study provided a detailed analysis of the growth trajectory and future prospects of cloud kitchens in India, with particular attention to evolving consumer behaviours and the role of food-delivery services. The researchers highlighted how food-delivery applications are instrumental in helping cloud kitchens connect with and reach their target consumers. Their findings indicated that factors such as consumer convenience, shifting lifestyles, and the expansion of the online food delivery market significantly contributed to the growth of the cloud kitchen phenomenon in India.
Mathur and Mathur's (2023) study focused on purchase intent and consumer behavior towards cloud kitchens in India, examining the influence of consumer attitudes and perceptions in relation to online food delivery. Their results underscore the critical importance of consumer perspectives in driving the acceptance and expansion of the cloud-kitchen business model.
Rout, Dawande, and Janakiraman (2024) explored the value creation associated with cloud kitchens. Their research revealed that cloud kitchens can leverage their location-based advantages through unified facilities and realize cost efficiencies through consolidated delivery networks. Their findings emphasize the operational and economic benefits derived from the cloud-kitchen model while simultaneously underscoring the symbiotic relationship between restaurants and delivery platforms.
These research findings confirm the close links between cloud kitchens, digital platforms, consumer behavior, and efficient operations. However, the ethical dimensions of these connections still require greater scrutiny.

Food Safety in Cloud Kitchens

The aspect that has received a significant amount of attention with delivery only food business is concerning food safety. Unlike restaurants, Cloud Kitchens are not exposed to the same

extent to their customers hence, the aspects of regulatory adherence and transparency are vital. Research relating to online food delivery had outlined potential food safety risks in relation to packaging and distribution stages.

Information published on the Frontiers in Psychology research highlights that along with the increase in number of stages between food preparation and consumption in online delivery it is observed that 'packaging and distribution can create many opportunities for secondary contamination".

Additional recent attention relating to the examination of dark kitchens has also identified governance mechanisms which can address food safety issues through low food safety documentation, informality, employee hygiene practices and also facilities. The paper by Chandu et al (2025) finds that in dark kitchens: 'Difficulties of regulatory inspections are reported owing to their complex management, technological integration, dispersed location and heterogeneity; monitoring is also found difficult owing to their digital fragmentation and operational diversities'. These observations hence convey that although the concept of cloud kitchen is discussed with a focus towards kitchen hygiene it is actually a much more encompassing aspect including aspects of packaging, delivery and traceability to documentation and monitoring processes. In India, The Food Safety Standards Authority of India has laid regulatory guidelines to the entire food business operations and has set requirements for registration/licenses, premises, etc. These are crucial for food safety governance practices within cloud kitchen models.

Digital Platform Governance

The issues relating to governance between online food delivery platforms and restaurant partners were discussed in a research by Yadav, Meenakshi & Banerjee (2022) where using a transaction-cost perspective and in-depth interviews, they outlined some crucial strategic governance issues in the India online food delivery platforms viz. Information asymmetry, opportunism, control, and a trust deficit between food-ordering platforms and restaurants partners in India. They argue that suitable mechanisms of governance will help both platform and partners, and partners can engage more and generate more value.

This is especially relevant as cloud kitchens are almost dependent on the online platforms for getting customers, getting the right visibility and order volume thus the reliance will lead to bargaining asymmetry and create the platform partners (food businesses) at a disadvantage.

Moreover, recent research has also examined the working relationship between cloud kitchens and online food-ordering platforms in India Chandu et al. (2025) show that although both the cloud kitchens and food ordering platforms can be seen as complementary and consumer' reliance on both the aspects (customer's desire for affordability and convenience) has boosted up the system, but there were issues with regard to brand visibility, reliance on online platforms as well as quality perception. This suggests that good governance of the digital platforms will also imply good governance in the cloud kitchens.

Data Privacy and Digital Consumer Information

During digital food commerce, consumer data such as, name, phone number, address, ordering behavior, order history etc will be collected. The Digital Personal Data Protection Act 2023 is providing legal guidelines for the processing of digital personal data across India. It has set norms relating to consent, notice and also the duties of data fiduciaries and rights of data principles.

From an ethical standpoint, Data governance not only means meeting the legal compliances but it means sharing transparent details on data usage with the customers along with assuring

robust protection, non-sharing with other parties unless consented or legally necessitated and retention is also carried out by the cloud kitchens and technology partners to minimal required extent.

Increased use of personalization will also boost the data ethics aspect; by understanding the food preference, past orders, etc the restaurants could provide targeted offers. However, too much profiling will again lead to negative consumer experiences regarding lack of privacy.

Online Reviews, Ratings and Consumer Trust

The internet has been playing a great role in influencing the ordering pattern by giving access to online reviews and rating system, as a physical restaurant cannot be investigated prior to the order, the customers heavily rely on online ratings. While genuine reviews decrease the information asymmetry the existence of fake or misleading reviews could create a wrong impression and will only fail the consumer; a good aspect on reviewing could significantly change a customer's purchase decisions and visibility. Hence online platforms should monitor reviews meticulously and actively eliminate fraud in this regard.

Digital Marketing and Consumer Protection

The core marketing of a cloud kitchens rely on digital technologies; these includes the use of media such as social media accounts, online advertisements, personalised recommendations of food along with promotions and offer-based pricing. Some consumer protection issues regarding misleading images on various platforms, unclear terms and conditions related to the promotional offer, lack of clarity and hidden charges will result in improper consumer choice. Thus ethical marketing combined with consumer protection is important. The relevant research has thus proved that digital food ordering requires both a suitable environment for consumer protection as well as marketing practices with ethical considerations.

IV. MAJOR ETHICAL AND GOVERNANCE CHALLENGES IN CLOUD KITCHENS

1. Food Safety and Hygiene: Cloud kitchens, by their very nature, must uphold the highest standards of food safety. This means ensuring that food is prepared, cooked, stored, and packaged in a safe and hygienic environment. Maintaining the hygiene of both employees and equipment is equally critical. When several distinct brands share the same kitchen space, it presents additional hygiene-related challenges, such as preventing cross-contamination and coordinating hygiene protocols. The delivery and packaging processes also need to be addressed from a food-safety perspective. Responsibilities extend from ingredient acquisition to the consumer's final enjoyment.

2. Food Traceability and Accountability: The complex structure of cloud kitchens, often involving multiple suppliers and preparing food for various brands under one roof, highlights the importance of effective traceability. A reliable food-traceability system enables businesses to pinpoint the origin of ingredients and respond swiftly to food-safety concerns. Accountability becomes even more intricate when an order involves the cloud kitchen, the digital platform, and the delivery personnel. A clear division of responsibilities for food quality, handling customer complaints, and implementing corrective actions is essential.

3. Consumer Data Privacy: Cloud kitchens operate in a data-intensive digital environment. The collection and processing of consumer data (such as names, contact numbers, delivery addresses, order history, and purchasing behaviours) are inherent in their business model. While these data are valuable for order fulfilment, customer service, personalization, and

marketing, businesses have an ethical obligation to limit unnecessary data collection. Transparent communication about how data is being used, robust data security measures, transparent third-party sharing policies, and responsible data retention practices are crucial for building and maintaining consumer trust.

4. Data Security and Third-Party Sharing: Data often changes hands among various entities: cloud kitchens, digital platforms, payment processors, and delivery services. This multi-stage data flow increases the risk of unauthorized access and misuse. Implementing comprehensive security protocols and establishing clear delineation of responsibilities among all parties involved is paramount to protect consumer information.

5. Platform Dependency: Cloud kitchens largely rely on digital platforms for market visibility, customer access, and order generation.

This reliance can lead to an imbalance of bargaining power, with platforms dictating commission rates, promotional terms, and visibility guidelines. Ethical platform governance, ensuring fairness and mutual benefit for both platforms and food businesses, is therefore necessary to foster a sustainable ecosystem

6. Algorithmic Transparency: Search results, rankings, and recommendations on digital platforms are often determined by complex algorithms. These algorithms can significantly influence which cloud kitchens gain visibility and, consequently, receive more orders.

If sponsored placements or special relationships influence ranking, consumers should be informed to ensure fair competition and to prevent manipulation.

7. Online Reviews and Ratings: Online reviews and ratings play a significant role in influencing consumer purchasing decisions. Genuine reviews offer transparency and build trust, while fraudulent reviews can mislead consumers and damage a brand's reputation. Platforms have an ethical responsibility to implement mechanisms to detect and prevent review manipulation, thereby preserving the credibility of their systems.

8. Pricing Transparency: Consumers should have a clear understanding of the total cost of their order, including food prices, delivery charges, taxes, and any other applicable fees, before making a payment. Opaque pricing can lead to consumer dissatisfaction and distrust.

9. Ethical Digital Marketing: Cloud kitchens use digital marketing extensively to reach their target audience. It is essential that marketing efforts are truthful and accurately represent food products, menu items, and promotional terms. The use of misleading images, exaggerated claims, and unclear disclaimers should be avoided.

10. Stakeholder Responsibility: Ethical governance in the cloud-kitchen sector extends beyond the business operator. Employees need fair wages and safe working conditions. Delivery workers should not face pressures that compromise their safety. Suppliers must provide quality ingredients. Consumers have a right to receive safe food and accurate information. An ethical cloud-kitchen ecosystem requires responsibility from all stakeholders involved.

V. RESEARCH GAP

The literature shows a lot of research about cloud kitchens, online food delivery, consumer behaviour, food safety and digital platforms, but these topics were seldom examined together. Food safety has been discussed concerning hygiene, handling, food production and regulatory compliance and platform studies about governance, power, information asymmetry and trust. Discussions on digital commerce have touched upon consumer data and privacy.

There is a gap to understanding how cloud kitchens should be organised as both food-service businesses and digital businesses. We consider that, at least for the consumer, food safety

(physical) and consumer data safety (digital) both contribute to the feeling of trust in cloud kitchens. Factors like the governance system of the digital platform, its recommendations, its pricing strategy, and reviews will impact the consumers' feelings of the credibility of a cloud kitchen. This paper offers an innovative perspective to understand the ethical governance of cloud kitchens by putting together the discussion on food safety, data privacy, platform governance, consumer protection and ethical digital business practices.

VI. CONCEPTUAL UNDERSTANDING OF ETHICAL GOVERNANCE IN CLOUD KITCHENS

The present review indicates that ethical governance of cloud kitchen should be understood as multi-dimensional responsibility.

First dimension is governance of food-safety (correct hygiene, food storage, good production practices, packaging, and delivery). Second dimension is governance of data (responsible collection, handling, security and sharing). Third is platform governance (transparency in rankings, reviews, recommendations, commercial interests of the platform and relationships between consumers and providers). Fourth is consumer protection (reliable product descriptions, transparent price, complaint resolving mechanism). Fifth dimension is stakeholders (including employees, delivery riders, suppliers, consumers and regulatory bodies). These five dimensions are closely related.

A cloud kitchen might provide really good quality of food but could cause mistrust from its consumers because of non-compliance of privacy rules, or the lack of digital transparency could not compensate for the lack of proper physical food safety standards.

Accordingly, the food safety of cloud kitchens should be merged with Digital safety principles. The core idea of this paper is the fact that for cloud kitchens to be managed in a responsible way they have to achieve food-safety, digital responsibility, Transparency, accountability and Stakeholder Trust at the same time.

VII. SIGNIFICANCE AND IMPLICATIONS OF THE STUDY

A relevant contribution of the study is the integration of classic concerns in the field of food safety with the new ones that arise from the growing digital sphere of the food sector in cloud kitchens. For cloud kitchens providers the information presented herein should foster responsible management of both food safety, data privacy, and transparency as business imperatives not only as a formal compliance requirement.

Digital Food-Delivery Platforms will, through these findings, be forced to take note of the importance of fair ratings system, credible online reviews, transparent terms & conditions and responsible consumer data handling.

For the consumers, the study raises awareness regarding the importance of being conscious about safety-food, privacy and ethical digital marketing. Furthermore, this study provides important information for policy makers and regulators who need to devise effective policies for cloud kitchens to properly develop themselves and grow without compromising with the consumers' well-being, safety and trust. This paper can serve as a foundation for subsequent empirical studies that explore aspects such as consumer trust, cloud kitchens' food-safety compliance, food-safety awareness and privacy-data in the cloud-kitchen business model.

VIII. CONCLUSION

As a result, cloud kitchens are an important part of digital transformations within the food-service sector. Their technology-intensive, delivery-driven business model has created new business opportunities, made the market more inclusive and flexible, and contributed to greater convenience and wider selection for consumers. However, these benefits can only materialize within the ethical and proper governance framework, thus allowing to manage the inherent governance and ethical challenges in this business.

In this conceptual paper we have identified the three principal dimensions of the Governance and Ethical challenges for cloud kitchens: food safety, data privacy, and digital business.

Food-safety challenges are about the food quality itself and concerns everything from ingredients and their handling to storage, production, preservation, packaging, and transport. Data privacy challenges address how to collect, process, protect, and responsibly share consumer information. Digital business challenges include consumer's dependence on the digital platform, opaque algorithmic visibility, the credibility of online reviews, pricing transparency, and ethical marketing. Previous literature has been shown that Information asymmetries, platform power, opportunism, trust issues, quality risks, and consumer perceptions play crucial roles in any digitally mediated Food Commerce, and that traditional Food Safety governance framework solely is not sufficient to meet the governance challenges for cloud kitchens.

To overcome this complexity, we should pursue a integrated approach to the Ethical Governance of Cloud kitchens combining: food safety, data privacy and security, consumer protection, platform transparency and stakeholder responsibility.

To succeed in the long term, and capture the benefits cloud kitchens promise for entrepreneurs, consumers and the whole industry alike, Cloud Kitchens and the digital platforms which support them will have to take steps to foster and earn customer Trust through transparency and Accountability - Ethical Governance should therefore be understood not as a brake on digital innovation but, on the contrary, as enabling the development of responsible and reliable Food Commerce in the digital age.

REFERENCES

1. Chandu, V., Reddy, K. P., Patel, K. C., Pavan, P. R., Vardhan, K. V., & Nikesh, P. H. S. (2025). The symbiotic growth of cloud kitchens and online food delivery platforms in India. *International Journal of Engineering Research and Science & Technology, 21*(4), 324–330.
2. Chhabra, N., & Rana, A. (2021). Rise and the future of cloud kitchens in India: A consumer study. *International Journal of Research in Engineering, Science and Management, 4*(7), 158–165.
3. Food Safety and Standards Authority of India. (2011). *Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011*. Government of India.
4. Food Safety and Standards Authority of India. (2026). *Food laws and regulations*. Government of India.
5. Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.Government of India. (2023). *The Digital Personal Data Protection Act, 2023*. Ministry of Law and Justice.
6. Kitchin, R. (2014). *The data revolution: Big data, open data, data infrastructures and their consequences*. SAGE Publications.

7. Mathur, P., & Mathur, V. K. (2023). Consumer purchase intention and behavior toward cloud kitchen (pandemic opportunity) with reference to India: An empirical examination. *Vision: The Journal of Business Perspective, 12*(2).
8. Rout, A., Dawande, M., & Janakiraman, G. (2024). Cloud-kitchens: Value creation through co-location. *Journal of Service Research*. World Health Organization. (2006). *Five keys to safer food manual*. World Health Organization.
9. Yadav, N., Meenakshi, N., & Banerjee, P. (2022). Exploring governance issues between online food delivery platforms and restaurant partners in India. *Digital Policy, Regulation and Governance, 24*(3), 292–308.
10. Zuboff, S. (2019). *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. PublicAffairs.