

Tech Meets Tradition: Globalizing Indian Cuisine Through Innovation

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Abstract: Indian traditional food is more than just sustenance—it's a cultural legacy with immense economic potential. With its rich flavors, unique ingredients, and health benefits, it holds the power to captivate both domestic and global markets. However, globalization has reshaped consumer preferences, with younger generations gravitating toward Western fast food, posing challenges for traditional cuisine. Despite ranking among the world's top ten cuisines, Indian food struggles to establish a global foothold due to the absence of strong international brands, time-intensive preparations, and limited market penetration. To unlock its full potential, the industry must embrace technological advancements in food processing, supply chains, packaging, automation, and digital platforms. Packaged brands like Haldiram's and MTR have already tapped into global demand, showcasing the possibilities ahead. A balanced approach, combining innovation with cultural authenticity, is key to positioning Indian traditional food as a competitive and sustainable force in the global market.

Key Words: Indian Traditional Food, Food Technology, Globalization, Indian cuisine, Global Market.

1. INTRODUCTION

Food is the most essential part of human life. It satisfies gastronomic pleasure and has an element that can affect a region's income. Increasing traditional food production, distribution, and purchase can help strengthen a country's regional economies.

Indian Traditional food reflects the country's rich cultural, historical, and regional diversity of vibrant tapestry woven together by various spices, ingredients, and cooking methods with potential health benefits. (Guttapalam, 2024) Traditional Indian food is diverse geographically. Each region has its unique ingredients, recipes, and methods, such as rice-based dishes, coconut curries and tangy flavours of the southern region, Dairy-based dishes, wheat-based dishes, chaats, Dal Bati from the northern region, the western region known for its snacks and sweets like Vada pav, Dhokla, Pav Bhaji, Shri Khand & the eastern region known for its fish and sweet dishes. It shows the blend of ancient practices, ingredients and culinary innovations passed down through generations.

Indian Traditional foods are often deeply rooted in Ayurvedic principles. Foods can be classified into three categories: Satvik, Rajasic, and Tamasic, based on their quality. Satvik food includes fresh fruits and vegetables, fresh cow milk and salads, and Rajasic food includes garlic, coffee, and wine. Tamasic food contains beef, alcohol, fried foods, etc. It is recommended that one should have a Satvik diet to take a rajasic diet in moderation and avoid the tamasic diet as it is detrimental to health through the principles. In Ayurvedic nutrition, herbs and spices are essential; ginger, honey, rock salt, and turmeric are included in the diet for medicinal reasons. (Mangalassary, 2016b)

Black pepper, ginger, turmeric, chilli, cardamom, fenugreek, fennel, cumin, coriander, cinnamon, clove, and ajwain are among the spices that India produces in large quantities and are well-known throughout the world for their flavour and aroma since ancient times. Because of their taste and health benefits, these spices hold a special place in traditional Indian cuisine.

However, In recent years, the world's food system has gradually changed due to numerous factors, such as greater availability and diversity of food products, urbanisation, FDI, Women's Employment in the workforce, changing lifestyles, the fast-food industry, supermarkets replacing wet markets, and consciousness about health benefits, which has brought a shift in consumers' consumption patterns. One of the key drivers of these shifts is Globalization.

With most nations' borders open, Globalisation has created a chance to expand the distribution of traditional foods to a worldwide market by attracting foreign investment in the food and beverage sector, restaurants, supermarkets, and agriculture. (Munarso & Mulyawanti, 2019a)

Indian cuisines are richly rooted in centuries of tradition, offering tapestry flavours, ingredients, and techniques that not only please the consumers' palates but also provide numerous health and medical benefits. They may stand as a remarkable product that can compete with global food products.

Despite these benefits, there is an essential issue for traditional Indian foods as their consumption patterns shift from cereals to more costly protective foods, processed foods, and popular fast foods, primarily among young consumers.

2. RESEARCH GAP

The researcher identified an apparent *knowledge gap* in the prior research concerning the declining significance of traditional Indian food due to Globalisation and changing lifestyles & lack of recognition in the global market. In addition, the prior research did not address the subject of technology's contribution to the elite recognition of traditional Indian food in the global market (Miles, 2017).

3. NEED FOR THE STUDY

Indian traditional cuisine, which is deeply rooted in Ayurveda, represents a rich cultural legacy while providing delightful flavours and great nutritional benefits. Many traditional recipes contain therapeutic characteristics that promote health and well-being.

Despite its exceptional qualities, Indian traditional cuisine has yet to gain widespread global recognition. Furthermore, Globalisation has influenced the younger generation to embrace more Western and fast-food diets, resulting in a progressive reduction in preference for local culinary traditions.

It is imperative to analyse the challenges hindering its global reach and explore how technological advancements can enhance its adaptability and competitiveness in the international market to safeguard and promote the legacy of Indian traditional cuisine. By addressing these aspects, Indian traditional food can be strategically positioned to gain global prominence while preserving its authenticity.

4. OBJECTIVE OF THE STUDY

- To understand how technology can play a crucial role in adapting traditional Indian food to the Global market.
- To conceptualise the factors that limit Indian cuisine from gaining fame and acceptance in the global market.

5. LITERATURE REVIEW

The impact of technological innovation on competitiveness is drawing attention. The employment of new technologies in the food industry has increased recently to create innovative food items that offer several advantages, including functional foods, safety, nutrition, and health. There is room for research in other or emerging nations because most of the work in this field has been focused on China, the United States, and Europe. (Castillo-Vergara et al., 2021).

Guttapalam, (2024) Indian traditional food possesses a wide range of ingredients, preparation techniques, and regional variants that provide valuable nutrients, antioxidants, and bioactive compounds that aid digestion, immunity, and the prevention of chronic diseases and other health issues.

Gina Kennedy¹ et al., (2004) reviewed that food systems are gradually changing as food becomes more widely available and diverse. Economic, social, food supply, and diet, among other factors, are major drivers of food system change. Economic variables include urbanisation, market liberalisation, and income growth. Social variables include rural-urban migration, women's employment, and lifestyles. In contrast, food supply factors include lengthy shelf life and intense agriculture-based food production, and dietary factors include increased salt, sugar, and fat consumption.

Globalisation has impacted the country's food system; the uniqueness and delicacy of local foods create economic possibilities when commercialised in national or international markets. (Munarso & Mulyawanti, 2019b) Specific technology is required to boost competitiveness, such as product design, packaging technology, and quality management, to support local foods.

All industries, including food, often benefit from information and communication technologies. IoTs can help the food industry provide valuable services like creating new food products, packaging, real-time temperature and moisture monitoring, transportation traceability, reducing food waste and disease, and developing IoT systems at a lower cost with greater efficiency. These technologies raise concerns, nevertheless, regarding security and data privacy. (Kariapper et al., 2021a)

Digital and innovative supply chains can potentially reform the food chain and can help to avoid waste, & improve food security. The technical & cost of monitoring suppliers in the supply chain makes it inconvenient for retailers and manufacturers for long-term investment. Utilising digital and automation technologies can help avoid food waste and easy traceability of food. (Abideen et al., 2021b)

With a large production base, greater availability of raw materials, and appropriate fiscal policies allowing 100 per cent FDI in the food processing industry, India can export processed food products that meet market requirements and standards. (Devi, 2014) The food processing industry can assist farmers in adding value to their products.

Indian fruits like mango and pineapple have been preserved as fruit juice powders through the use of freezing and drying technology, and ongoing efforts have been made to preserve traditional Indian foods in a ready-to-eat form, including chapattis, halwa, upma, and instant pulao. (Arya, 1984)

Pal (2019) found the food market has changed due to recent lifestyle patterns, which has created the need for innovation in the food packaging sector to provide fresh food with a more extended shelf life and protection against food rotting, oxygenation, ripeness, and ultraviolet interactions. Intelligent packaging, nano-packaging, active packaging, aesthetic packaging, and bioactive packaging are recent innovations in food & packaging technologies that could help meet customer demands.

For over 5000 years, Indian cuisine has changed over time. Indian cuisine was influenced by plenty of variables, such as Globalisation, Ayurveda, geography, climate, and ancient civilisations. (Mangalassary, 2016c) For instance, British cuisine adopted chicken tikka masala as its national dish, and several Indian spices and recipes have found a place on the menus of nations worldwide. Many Indian cuisines have begun to appear in the Western market in frozen, ready-to-eat packaging to keep up with the trend.

6. RESEARCH METHODOLOGY

The research paper is based on secondary data from various sources, such as scholarly articles, academic journals, research papers, and relevant news reports.

This study employs a conceptual research design and follows a qualitative, conceptual, and exploratory approach to theoretical development.

7. FINDINGS

The study involves challenges faced by Indian traditional food in the Global market and how technology can play a crucial role in overcoming these challenges.

7.1 Challenges in Taking Indian Food to the Global Market.

Although it has a rich cultural legacy and delightful and nutritious food, traditional Indian food, except for a few dishes, is not well known in the international market. Traditional Indian food suffers some fundamental challenges, such as:



Figure 1. Challenges in taking traditional Indian food to the Global market.

(Source: Compiled by researcher)

1. Lacking a Strong Brand Name.

A brand is an identity that consumers remember for a long time and is a source of authenticity, quality, and safety measures. For Indian traditional food, neither a firm brand name nor fast food chains have emerged to help it reach the global level. As a result of these factors, Indian traditional food receives little acknowledgement despite its rich cultural legacy and health benefits.

Indian traditional foods require strong brand names, similar to foreign food products established in Indian markets, such as Domino's, Pizza Hut, and McDonald's, to expand in the global market, which has adapted to the needs of local consumers and is flourishing in Indian markets.

2. Adaptability/Understanding consumer needs and wants.

It is necessary to understand international customer demands. It wants to modify cooking methods, flavour, and marketing strategies to attract foreign consumers and increase sales of our traditional Indian food worldwide. Burger King, McDonald's, Pizza Hut, and Domino's have done this by understanding the Indian culture to flourish in the Indian market. For instance, to enter the Indian market, McDonald's has offered the Aloo Tikki Burger Veg Maharaja Mac, eliminated the use of beef and pork from the menu, respected Indian culture and religious sentiments added spicy flavours to the foreign cuisine, used Indian celebrities for advertisements to connect emotionally with the audiences, special festive offers showing cultural integration. McDonald's offered no onion and no garlic dishes during the Navratri celebration. As a result, for traditional Indian food to thrive in the global market, it must adapt to the needs and desires of foreign consumers.

3. Lack of organised processed traditional Indian food units.

The demand for packaged traditional Indian meals has increased due to shifting lifestyles. Because consumers want convenient traditional Indian food and are resistant to Western cuisine, processed traditional Indian food has a strong potential for expansion. With brands like Halidram and Bikanervala available on the international

market, recent advancements in the food manufacturing sector can be observed in beverages, snacks, and sweets.

Processed and packaged food in India has a lot of untapped potential. While there are many unorganised traditional processing facilities, the absence of organised traditional processing facilities in India limits their access to the international market because of food safety regulations. The main problems facing PITF-processed traditional Indian food currently include cost, packaging, shelf life, fresh flavour, nutrition, processing technology, and product standardisation, among other things.

4. Time-consuming preparations.

The modern global era is characterised by speed, which has resulted in the fast-food culture. Given the disadvantage of time-consuming preparation, traditional Indian food must find a means to compete with the fast-food culture, in which traditional food may be delivered swiftly while still providing all of the benefits and delighting the palates of international consumers. Mechanical improvements, safe preservation methods, and food processing units can help to overcome this obstacle, perhaps allowing traditional Indian cuisine to reap more economic rewards in the global market. We may learn from foreign food companies like McDonald's, KFC, and Burger King, which not only serve promptly but also cater to the tastes of their clients.

5. Standardisation of Indian Recipes.

Indian recipes vary greatly depending on geography, culture, and customs. A single dish's taste and preparation methods may vary across India due to the usage of different recipes and ingredients. This lack of standardisation complicates ensuring consistent flavour and quality, crucial for restaurant chain success. Such unpredictability can impede Indian traditional food's capacity to appeal to and earn acceptance from international consumers in the global market.

6. Logistics and supply chain.

Many traditional Indian foods have a short shelf life, and many Indian foods taste best when consumed fresh. Frozen or ready-to-eat food often struggles to replicate the taste and nutrition, preventing it from being exported, so there is a need for effective cold chain logistics or the preparation of long shelf-life products that satisfy the consumer's palates without sacrificing taste and nutrition.

7. Food safety and quality measures.

Ensuring compliance with food safety and quality standards is essential for gaining access to the global market. It offers a significant challenge to traditional Indian cuisine, frequently prepared using artisanal methods that lack standardised processes or documented safety protocols. Traditional cooking procedures, such as using a *chulha* (traditional wood-fired stove) to obtain an authentic taste, may cause hygiene and safety concerns in international markets.

Furthermore, some approaches, such as traditional fermentation processes or the use of lactic acid to enhance shelf life, may not meet worldwide safety standards. These issues highlight the necessity to modernise ancient processes while maintaining authenticity to meet strict global food safety standards.

8. Perceptions of Indian Food

There is a misconception that Indian dishes are spicy and oily, which is bad for health. This misconception can lead to poor marketing of Indian food in the global market; one should create awareness of the distinctiveness of traditional Indian food and the benefits of Indian spices, which provide various health benefits. Traditional Indian cuisines must adapt and make appropriate changes in their recipes and cooking processes, similar to what McDonald's and Kellogg's have done in India to succeed in the global market.

9. Lack of nationwide awareness.

Many traditional Indian foods are limited to their respective regions, limiting their exposure and appreciation on a larger scale. For example, Bihar's famous dish, *litti chokha*, *Thekua* sweet, Maharashtra's *Pooran poli*, and Gujarat's *Undhiyu*, are rarely found in other Indian states, posing a challenge to the promotion of traditional Indian food on both national and international levels.

7.2 Role of technology in adapting traditional Indian foods for the global market.

Technology can be crucial in adapting traditional Indian cuisine to the global market while preserving authenticity and cultural heritage. Key areas where technology has a significant impact:

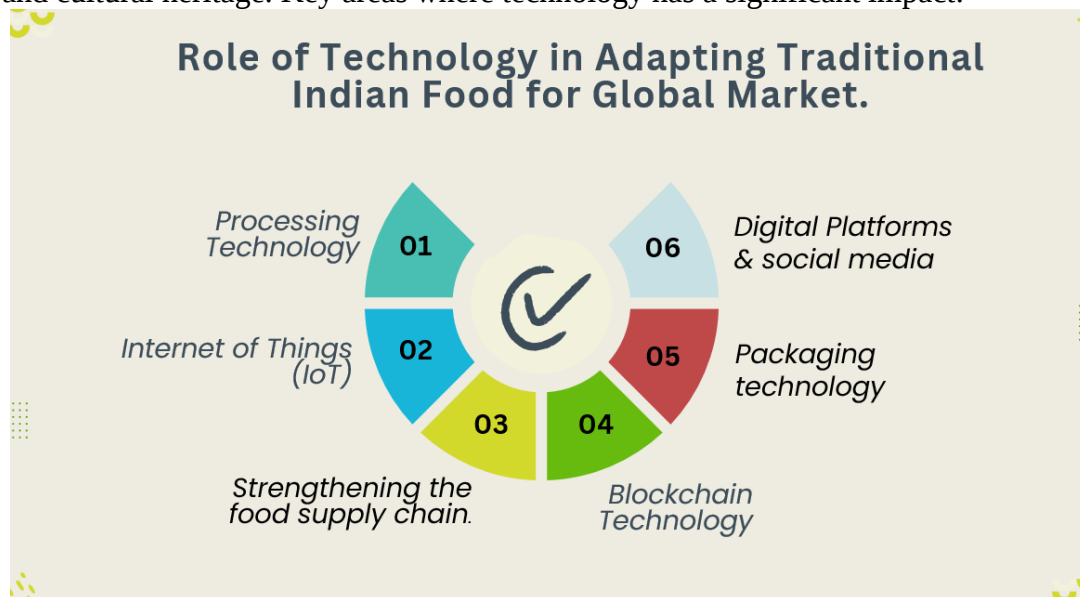


Figure 2: Role of technology in adapting traditional Indian foods for the global market.
 (Source: Compiled by researcher)

1. Processing technology.

Food processing technology uses scientific procedures and techniques to transform raw materials into final food items while maintaining their safety, quality, nutritional content, and shelf life.

High-pressure processing, pulse electric field, ultrasonics, cool plasma, chromatographic separations, ohmic heating, and microwave irradiation are some of the processing technologies that help us with pasteurisation, fast heating, purification, safety, quality, shelf-life extension, freshness preservation, and nutritional value. (Fryer & Versteeg, 2008)

For instance, global food products like instant or ready-to-eat noodles are enabled by food processing technologies. Similarly, these technologies can help to promote traditional Indian food in the global market by overcoming barriers such as time-consuming preparations, extended shelf life, nutritional value preservation, and authenticity.

2. Internet of Things (IoT)

IOT-enabled systems can be highly significant in the food industry by automating the food supply chain process, tracing products, monitoring freshness, and using sensors to analyse food ingredients for nutrition analysis in agriculture to improve yields and quality. Implementing this innovative technology in the supply chain network and production can help us improve traditional Indian cuisine and compete in the global market. (Kariapper et al., 2021b)

3. Strengthening the food supply chain.

Depending on the product needs, food supply chains can be continuous for cash crops, fast for perishables, agile for retail, flexible for agricultural products, and tailored for hybrid foods. The global food supply system is also complicated and has difficulty meeting safety and sustainability regulations.

With these traditional food supply chains, customers are worried about food sources and processing. Food supply chains in underdeveloped nations are more complex due to the lack of market governance. A smooth food supply chain requires sustainability, availability, safety, security, and traceability.

As a result, these food supply chains can be enhanced using IOT, Blockchain technology, processing technologies, agriculture-related technology, and data-driven approaches. So we have enough supply to expand in the global market.

4. Blockchain technology.

Blockchain is a distributed, decentralised, and digital system that creates permanent, unchangeable records by storing and appending transactions chronologically.

Blockchain applications can handle the complexities of food supply chains while mitigating food stakeholders' safety and health concerns, improving traceability, transparency, and accountability. Examples include the QR code on the product packaging, efforts such as Food Watch, and so on.

5. Packaging technology

Packaging is one of the most significant procedures in the food industry, and it acts threefold. First, it helps to maintain the quality and safety of commodities during storage, transit, and consumption. Second, it acts as a source of information for customers. Third, we can use it as a point of attraction through aesthetically pleasing packaging.

Many technologies have recently been developed by combining knowledge from various disciplines, such as biotechnology, sensor science, nanotechnology, information technology, etc. Intelligent packaging, Active packaging, nanotechnology, and modified atmosphere packaging are among the technologies currently in demand in the packaging industry. These technologies can provide benefits such as preservation, increased shelf life, safety, and quality assurance, among other things. (Pal, 2019)

Thus, employing these modern technologies can help traditional Indian foods extend their shelf life while maintaining authenticity, nutritional content, and freshness, allowing them to acquire appeal in the global market.

6. Digital platforms & Social media platforms are catalysts for promoting traditional Indian food globally.

In this era of convenience-driven consumption, digital platforms are transforming how people access and enjoy food. Food delivery platforms such as Zomato, Swiggy, and Blinkit have transformed the industry by providing consumers with a streamlined experience and easy access to various cuisines. Offering traditional Indian food on these platforms has the potential to attract foreign consumers and boost its awareness in the global market.

Social media platforms are one of the most potent instruments in today's world. Visual sites like Instagram, TikTok, and Pinterest endorse food brands with mouthwatering pictures. Thus, social media can play a significant role in two ways: first, introducing foreign consumers to traditional Indian food, and second, raising knowledge about the nutritious benefits and great flavour of traditional Indian food, which can lead to the broad popularity of Indian food.

8. LIMITATIONS

The study is primarily based on existing literature, articles, and reports, which may limit its ability to provide real-time insights and validate source data.

The study employs a qualitative, conceptual, and exploratory approach, with interpretations and findings that personal perspectives may impact.

The study does not address the financial viability, cost implications, or investment constraints that restaurants and food entrepreneurs confront when implementing such innovations.

The study does not consider how international relations, commercial agreements, and diplomatic ties affect the expansion of Indian food into specific worldwide markets.

The study does not address how climate change and environmental issues may affect the production and supply of critical ingredients, restricting global expansion efforts.

9. CONCLUSION

Several factors, such as Globalisation, women's employment, dietary considerations, food availability, and changing lifestyles, have impacted the contemporary food system, with people increasingly preferring convenience over traditional rich cuisine and nutrition. Despite all of the uniqueness and variety of Indian cuisine, it is surprising that it has yet to gain global recognition & more & more people are shifting from

traditional food to Western cuisine. There are several shortcomings in traditional Indian food that must be addressed, including a lack of a firm brand name, misconceptions about Indian food, and time-consuming preparations. These shortcomings of Indian food can be addressed using technology. With the progress of technology, several technical and inventive solutions are available that can help overcome these limitations of traditional Indian food and enable them to reach popularity in the global market.

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