IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
Research Paper **© 2012 IJFANS. All Rights Reserved**, Journal Volume 11, Iss 08, 2022

Factors Affecting Smart Packing Application & Its Impact on Consumer Choices Towards Food Safety: Under the Shadow of Small-Scale Food Manufacturing Industries

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Abstract

Purpose: The present study aims at developing an integrated model to identify assorted factors and also investigates the influence of identified factors on consumers' choices towards smart packaging for food safety.

Design/Methodology: A conceptual model is proposed and validated. Besides this, 460 questionnaires were distributed and 382 were deemed usable. Structural equation modelling was used to demonstrate the stability of the proposed model and to test research hypotheses.

Findings: Freshness, security, and smart labels packaging, as well as resuable, connected, tracing, and tracking packaging, have a significant impact on consumers' intent to purchase food products, whereas food safety has less of an impact.

Limitations: The present study is limited to only six smart packaging applications, and even those are restricted to a specific age group in a single city.

Implications: This study illuminates customer choice by examining smart packaging technology adoption and food safety decisions in small-scale food production businesses. The findings can help regulators, industry experts, and researchers improve food safety and consumer confidence in small-scale food manufacturing. Overall, this research improves food safety regulations and practises.

Keywords: Consumer choice, Small scale industries, Smart Packaging, Applications

Introduction

The food industry in the modern period, marked by rapid technological breakthroughs, is always adjusting to meet the changing preferences of its customers. Small-scale food businesses must actively adapt to new trends and use novel methods to stay competitive in the face of the ongoing digital transformation. Smart packaging, which incorporates Internet of Things (IoT) technology into traditional packaging practises to increase customer happiness, has attracted a lot of attention.Food quality, freshness, and safety may all be tracked in real time thanks to "smart packaging," which refers to the introduction of sensors, actuators, and communication technology into packaging materials. Because of this technical development, the methods used for packing, storing, and delivering food goods have undergone a radical transition, with many positive outcomes for both consumers and businesses. Intelligent packaging plays a critical role in ensuring the delivery of high-quality food goods and empowering shoppers to make informed decisions. To do this, key details about the product's authenticity, shelf life, and ideal storage conditions are provided to the buyer.

The growing popularity of e-commerce and the demand for convenience have resulted in customers becoming more concerned about the quality and safety of the food they purchase. Consumers are increasingly seeking products that exhibit specific qualities, including transparency, traceability, and personalised experiences. Smart packaging is designed to meet customer preferences by enabling the continuous tracking of a product's entire supply chain, from its manufacturing site to its final delivery to the customer's home. The information provided is detailed and includes specific details about the product's origin, components, nutritional content, and recommended storage instructions. This allows buyers to make informed assessments based on accurate information. There may be substantial benefits for smaller food producers who adopt intelligent packaging technologies. Manufacturers frequently face challenges, such as scarcity of resources, lack of funding, and stringent regulatory requirements. Businesses may improve their operating procedures, product quality, and market standing with the help of smart packaging because it is both cost-effective and efficient. Using IoT-enabled intelligent packaging, small-scale food firms may improve supply chain operations, reduce waste, prevent product recalls, and win back the trust of their customers.The goal of smart packaging in the food industry is to improve food safety, extend product shelf life, reduce waste, and increase customer happiness by incorporating advanced technology and intelligent systems into packaging materials. To monitor multiple food-related characteristics, this cutting-edge technology incorporates sensors, indicators, and tracking devices within the packaging materials. The fundamental goal of this consolidation is to ensure that the product maintains its superior quality and pristine state at all times along the supply chain. The use of smart packaging practises in the food industry is widely acknowledged as an essential method for improving food safety. The incorporation of sensors and indicators into packaging materials allows for the monitoring of critical factors such as temperature, humidity, and oxygen levels. The sensors have the ability to detect deviations from optimal conditions and promptly notify relevant individuals in a timely manner. The use of this early warning system allows for timely intervention measures to be taken, reducing the spread of harmful bacteria and lowering the risk of foodborne illnesses.In addition, the use of intelligent packaging technology has the potential to significantly extend the lifespan of perishable food items. Smart packaging solutions possess the ability to create an optimal microclimate for food by closely monitoring and regulating environmental conditions like temperature and humidity. The methodology described enables the slowing down of the degradation process, which helps to preserve the sensory attributes (such as flavour and texture) and nutritional composition of the meal for a longer period of time. The reduction of food waste has the potential to benefit customers by allowing them to consume food goods that are fresher and safer. The adoption of intelligent packaging technology plays a vital role in ensuring food safety, extending shelf life, and reducing food waste. According to data from the Food and Agriculture Organisation (FAO), it is estimated that around one-third of the global food production is lost or wasted every year. The utilisation of smart packaging has the ability to reduce waste by providing accurate information about the remaining shelf life of a product. The ability to make informed decisions about food consumption and disposal is enhanced by this, which helps to reduce unnecessary waste.

In addition, smart packaging has the potential to improve the shopping experience overall. Intelligent packaging has the potential to provide consumers with a wealth of information about the product, from its origin and nutritional profile to its allergenic properties. Transparency between customers and food businesses builds trust and confidence, allowing customers to make well-informed decisions based on their personal tastes and dietary needs. To further understand the value of intelligent packaging in the food industry, we will examine a case study titled "Smart Packaging for Fresh Produce." To ensure the freshness and quality of the produce evaluated here, researchers used a cutting-edge packing technique. The package was created with temperature sensors, gas sensors, and indicators to properly monitor and maintain

ISSN PRINT 2319 1775 Online 2320 7876
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suitable storage conditions. Intelligent packaging solutions were found to significantly increase the shelf life of perishable foods, resulting in a significant reduction in spoilage and waste. In addition, customers' satisfaction with the quality and freshness of the goods they purchased rose. In conclusion, intelligent packaging technology is dramatically changing the food sector by improving food safety measures, extending product shelf life, reducing waste, and raising customer happiness. Throughout the supply chain, the quality and freshness of food products can be ensured by the incorporation of sensors, indications, and tracking devices into packing materials. Intelligent packaging has the potential to greatly improve the food industry's efficiency and environmental friendliness. Its ability to reduce the risk of food-borne illness, cut down on food waste, and educate buyers has contributed to its popularity. Given the benefits that could result from using smart packaging in micro- and small-scale food production, it is surprising that so little research has been done on the topic. The primary goal of this study is to fill a knowledge gap by investigating the value of Internet of Things (IoT) technology and smart packaging solutions in the context of localised food production. The purpose of this essay is to analyse how the IoT has contributed to the evolution of packaging. In order to provide useful recommendations to industry players, this study will investigate the factors that influence consumers' decisions in this setting.

Objective

The primary goal of this work is to examine recent developments and emerging trends in smart packaging for foods undergoing minimal processing. The second objective of this research is to examine the factors that influence consumers' preferences for smart packaging and their readiness to pay a premium for products that come in such packaging. The primary objective of this research is to analyse the pros and cons of using smart packaging enabled by the Internet of Things (IoT) for smaller-scale food producers. The fourth objective is to advise smaller food companies on how to increase their market competitiveness through the use of smart packaging and Internet of Things technology.

Research Paradigm

The research strategy will include a thorough literature review, in addition to questionnaires and in-person interviews with experts and regular people in the field. This study will add to the existing body of knowledge and provide light on how small-scale food producers may make the most of IoT-enabled smart packaging to cater to consumer preferences and stay competitive. The ability to make educated decisions and drive innovation in the food production industry is facilitated by a thorough understanding of the possibilities of intelligent packaging and its implications for small-scale food manufacturing.

Research Background and hypothesis Development

Recent years have seen a rise in interest in smart packaging technologies due to their potential to revolutionise the food industry. Customers' expectations have increased, necessitating packaging with more functionality than simple confinement and safety. The capacity of smart packaging to provide timely information and open up two-way lines of communication with consumers makes it an intriguing prospect as a means to adapt to consumers' ever-evolving wants and demands. The purpose of this literature review is to examine and synthesise the existing literature and research on smart packaging and its effect on consumer preferences and purchasing decisions. In this analysis, we'll look at the major developments, challenges, and potential solutions in this area of research.

Smart Packing and Consumer Choices

Incorporating smart components and materials into packaging systems gives them the ability to perform additional functions beyond what is possible with conventional packaging. Sensors or

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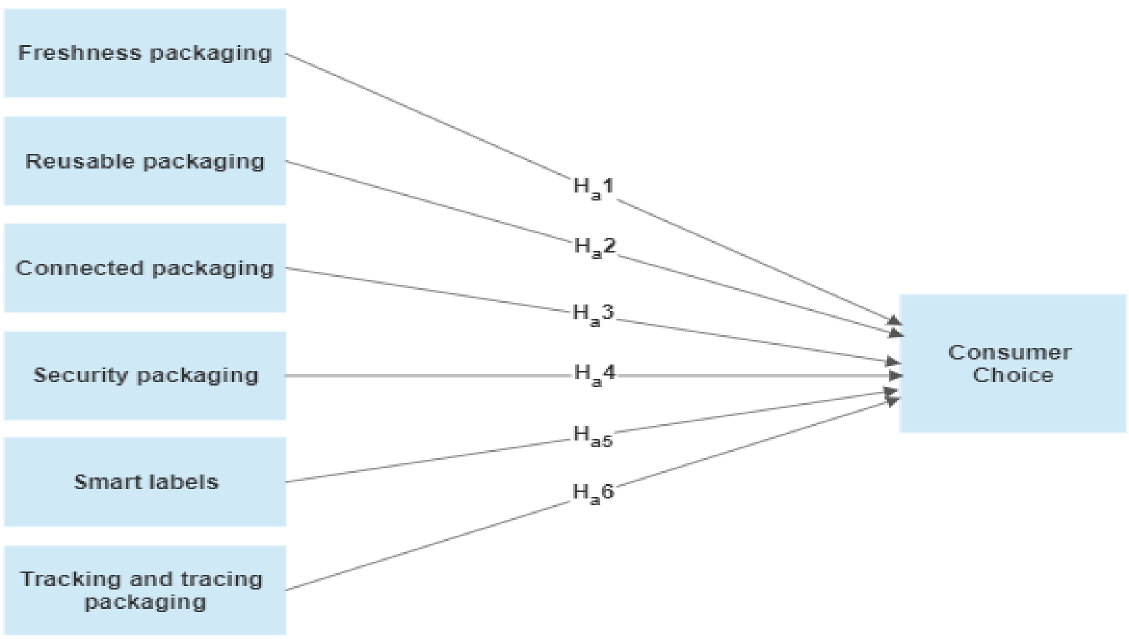
intelligent labels, data carriers, indicators, and actuators are the backbone of intelligent packaging technology in the food industry. These components are used to keep an eye on the state of the food, the storage conditions, and the surrounding environment. Inkjet printing, gravure printing, and silk-screen printing are frequently used to produce the electronic components of intelligent packaging. Sustainability, convenience, and information transparency are just a few of the factors that consumers now take into account when making packaging decisions, in addition to the original focus on utility. Consumers today show a marked preference for packaging that does double duty by protecting the product inside and enhancing their shopping experience as a whole. Customers show a strong preference for packaging options that reflect their values, such as those that make use of recyclable materials and employ low-impact manufacturing techniques. In addition, shoppers increasingly anticipate product packaging that provides comprehensive, up-to-date information on the item, including its origin, ingredients, nutritional make-up, and freshness.

Figure 1

Conceptual Framework



Freshness packaging

Consumers do not purchase packaging; rather, they purchase culinary products that include packaging as part of the offering. When investigating the effect of food packaging on consumer food selection, it is essential to focus on how packaging alters the value equation for the food products themselves. (E.P. Köster, 2009) asserts that packaging is an extrinsic product characteristic that influences food selection, one of six crucial factors. It can be argued, however, that packaging interacts with some, if not all, of the other factors, given that it is a fundamental part of the food product at the point of sale, e.g., intrinsic characteristic through varying levels of protection or psychological factors where novel packaging interacts with a consumer's food neophobia. (Shao et al., 2021) argue that freshness indicator has gained popularity particularly in the research sector due

ISSN PRINT 2319 1775 Online 2320 7876
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to the changing attitude of customers towards food safety nowadays. Additionally, according to the multiple researchers (Abderahman Rejeb et al., 2022), (Blaise et al., 2022), (Ufer & Ortega, 2022) & (Umesh Bamel et al., 2022) this is a cutting-edge kind of food packaging that monitors food freshness in real time while protecting both the food and the packaging. The conventional approach of "best service period" and "valid period" showing food freshness has undergone a significant reform in the form of intelligent packaging of food freshness, which not only accommodates and protects food but also signals food quality. FI is an intelligent gadget that can successfully meet the market's needs for food quality monitoring, notably for the freshness evaluation of various perishable commodities like milk, fresh fish, meat, and other perishables. Smart devices called freshness indicators are used in smart packaging to track and convey the quality and freshness of food goods (Ma et al., 2022). They are essential in supplying the food quality monitoring needs of the market. These indicators offer details on the product's shelf life, spoiling indicators, the maturity of fresh produce, and the concentrations of carbon dioxide and oxygen in food packaging. There aren't many studies precisely highlighting how freshness indicators affect consumer choice (Young et al., 2020). Additional studies in this field may yield insightful information on customer preferences and how they affect the market's acceptance of freshness indicators therefore this research article tries to address the gap that how customer preferences are being affected by these smart changes to packaging.

According to the study findings of (Aday et al., 2013.) some consumers are concerned that innovative packaging may mislead them, so sales should be conducted under reputable brands. The vast majority of consumers were willing to utilise novel food packaging to prevent microbial decomposition. Due to the possibility of error, consumers have indicated that they do not want to see sachets in active food packaging. After seeing the positive effects of innovative packaging, consumers who initially focused on the price of food packaging would be willing to tolerate a price increase of less than 10 percent. Most consumers (74.79 percent) expected innovative packaging to allow them to visually observe the history and freshness of foods contained within. Forty-five and a half percent of respondents indicated that education through commercials would be the most effective method for increasing the overall acceptability of innovative packaging. However, the study was only limited to Turkish consumers, and the results may not be applicable to other nations.

Hypothesis 1: Freshness packaging significantly influences consumer choices .

Reusable packaging

Signifies packaging materials or containers that are intended for repeated use before being discarded or recycled. It reduces waste and environmental impact, making it a sustainable alternative to single-use packaging (twede et al,.2004). The concept of smart packaging can be applied to reusable packaging by incorporating technologies that improve its functionality and provide additional benefits. For instance, intelligent reusable packaging may contain sensors or indicators that monitor the product's condition or trace its location during transport. This data can be used to optimise logistics, guarantee product quality, and enhance overall efficiency (Mahmoudi et al., 2020). By integrating the principles of reusability and intelligent packaging, businesses can create packaging solutions that are more environmentally friendly and technologically advanced. Recycling and reuse practises reduce the demand for raw materials and the quantity of waste sent to landfills, which is common knowledge. However, such strategies have been criticised by decision-makers due to the potential link they have with other types of resource utilisation, environmental issues, and less tangible but nonetheless crucial economic variables. Reusable packaging incurs additional costs in the form of additional vehicles, additional weight, reverse logistics expenses, greenhouse gas emissions, and the energy required to clean packages and containers.

Even though reusable packaging is becoming increasingly popular, it is not safe to presume that all reusable packaging will have positive environmental effects

(Coelho et al., 2020). According to Zink and Geyer (2017), there is a chance that circular rebound effects will occur, leading to unanticipated outcomes that undermine sustainability, the recirculation process may increase energy and material inputs or contribute to increased consumption patterns. This indicates that consumers are more likely to purchase a product if they are aware of the possibility of recirculation. According to Castro et al. (2022), It is possible for instance, that reusable packaging solutions will reduce waste, but they may also increase the amount of energy required for transport, sorting, and cleansing. In other situations, the various dimensions of sustainability might not be in perfect harmony with one another. For instance, the use of certain forms of reusable packaging may result in positive environmental outcomes, but such practises may not be economically viable D'Adamo and Lupi (2021). For example, introduce the concept of the circular premium, which explains the difference between the circular price and the regular price. These authors compare and contrast circular pricing and standard pricing. There is no assurance that consumers will be willing to pay a premium for reusable packaging, which could threaten the long-term viability of circular economies. Consequently, it is abundantly clear that throughout the entire life cycle of reusable packaging, potential negative consequences and sustainability trade-offs must be thoroughly evaluated. The measurement of circular rebound effects has largely shifted to the use of Life Cycle Assessments (LCA) to determine environmental footprints (van Loon et al., 2021). On the other hand, this has a propensity to disregard social and economic factors, which are essential components of a sustainable system. According to research conducted by Coelho et al. in 2020, the current state of the art regarding reusable packaging does not adequately address the problem of circular economy rebound effects, especially when environmental concerns are not taken into account. This is a challenge because the implementation of reusable packaging solutions may have unanticipated negative effects on sustainability, thereby undermining the circular economy. In addition, Consumer acceptance of active and intelligent packaging is not a well-researched topic, so there are numerous areas which require further study which help us to generate research hypothesis (Young et al., 2020):

Hypothesis 2: Reusable packaging significantly influences consumer choices.

Connected packaging

Connected packaging refers to the incorporation of digital technology with conventional packaging to create intelligent and interactive solutions. It enables real-time communication between the product, the packaging, and the consumer, thereby improving consumer engagement and supply chain effectiveness. Connected packaging offers numerous advantages, such as enhanced product traceability, enhanced consumer experience, and waste reduction. Nonetheless, it presents obstacles such as data security and privacy concerns, technological constraints, and the need for standardization. Internet of Things (IoT), RFID sensors, and augmented reality (AR) are poised to revolutionise the packaging industry, which bodes well for the potential of connected packaging in the foreseeable future. These developments will allow for personalised and individualised packaging experiences, seamless product monitoring, and innovative marketing strategies.

The use of security packaging is essential for minimising risks to a product's integrity and maximising protection for the general public (Tucker et al., 2006). Conceptual frameworks have been developed in order to fathom the role that security packaging plays in reducing the likelihood of these threats. These frameworks emphasise the necessity of incorporating security measures into packaging systems to prevent theft, manipulation, and counterfeiting. The use of physical barriers, such as tamper-evident seals, holograms, and unique identifiers, is one method for improving the safety of product packaging (Vanderroost et al., 2014), (Gupta et al., 2015). These characteristics provide consumers with visual indicators that the product has not been compromised with and guarantee its authenticity. Moreover, radio frequency identification tags (RFID) and rapid response (QR) codes can be incorporated into packaging to provide track and trace capabilities,

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thereby enhancing supply chain security. Utilizing intelligent packaging solutions is another method for accomplishing packaging security. These systems utilise technology to monitor the condition of the product throughout its lifecycle and relay their findings (Henchion et al., 2019). For instance, temperature-sensitive packaging can be used to ensure that perishable goods are stored and transported at the correct temperature, thereby preventing product deterioration and maintaining product quality. This can be attained by maintaining the ideal temperature at all times. Similarly, time-temperature indicators can alert consumers if a product has been exposed to unfavorable conditions for an extended period.

Hypothesis 3: connected packaging significantly influences consumer choices.

Security packaging

Implementation of digital technologies has also had a substantial impact on the evolution of secure packaging. For example, blockchain technology can be used to create a secure and transparent record of a product's journey from manufacturer to end user Katare et al., (2016). This record is then accessible to anyone who requires it. This not only enhances the ability to trace items, but also helps identify and halt the production of counterfeit products. In addition to preserving the integrity of products and the safety of consumers, the use of security packaging provides businesses with a number of other advantages. Brands are able to protect their reputations and continue to earn consumers' trust when they implement a variety of security measures (Shiksha Kushwah et al., 2019). Consumers are more willing than ever to pay a premium for authentic products as they become more aware of the prevalence of counterfeit products. Consequently, security packaging can be viewed as a useful strategic tool for safeguarding brands and differentiating products. However, there are challenges associated with the use of security packaging. Compatibility with preexisting packaging systems, compatibility with implementation costs, and technological complexity are among the most significant obstacles faced by businesses (Ulf Lindqvist et al., 2011). In addition, because counterfeiting techniques are constantly evolving, there is an ongoing need for research and development in the field of secure packaging. Future scope of security packaging lies in the combination of digital technologies and personalised packaging experiences. Recent advancements in technologies such as the Internet of Things (IoT), artificial intelligence (AI), and augmented reality (AR) have created opportunities for the development of interactive and immersive packaging (Icek Ajzen, 1991). Not only can these packaging experiences enhance consumers' interaction with a brand, but they can also add additional layers of protection. In addition, innovative marketing strategies can be utilised to obtain a competitive advantage by using secure packaging as a selling point. Through marketing campaigns that highlight the safety features of their product packaging, businesses can demonstrate their commitment to the authenticity of their products and the protection of their consumers (Icek Ajzen, 1991). This has the potential to cultivate customer trust and loyalty. In a nutshell we can say that the use of security packaging is crucial for the protection of consumers and the reduction of risks associated with the integrity of products. Physical barriers, intelligent packaging systems, and digital solutions are just a few of the strategies, technologies, and techniques that have been developed to enhance the security of packaging (S.M Alfadul & A.A Elneshwy, 2010). Not only does the use of security packaging benefit brands by protecting their reputations, but it also reassures and calms consumers when making purchasing decisions. However, there are obstacles, and continuous research and innovation are necessary to overcome these obstacles and capitalise on future opportunities in the security packaging industry.

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Hypothesis 4: Security packaging significantly influences consumer choices.

Smart labels

Intelligent packaging systems, of which smart labels are an essential component, are crucial for preserving the integrity of products, assuring consumer safety, and safeguarding brands. The conceptual framework underlying smart labelling is based on the combination of cutting-edge technologies and data-driven problem-solving techniques (A.M & Kerry, 2016). Smart labels incorporate sensor technology to monitor and collect data in real time about the product. These sensors can detect a wide range of characteristics, including temperature, humidity, light exposure, and gas concentrations. The data collected by these sensors not only provides valuable insights into the product's condition, but also aids in preserving its quality. Information Technology A variety of communication technologies, including RFID (Radio Frequency Identification) and NFC (Near Field Communication), are incorporated into smart labels. These technologies allow the label to communicate with other devices, such as smartphones or readers, and provide users with access to the product's origin, constituents, expiration date, and storage recommendations (Kyösti Pennanen et al., 2014), (Sousa et al., 2019).

The information obtained from smart labels can be analyzed using more sophisticated data analysis techniques. The implementation of machine learning algorithms and data modelling enables manufacturers to gain significant insights regarding the product's shelf life, the rate at which its quality degrades, and the associated risks (Robertson, 2016). The distribution of products, the management of inventories, and the quality control all benefit from the availability of this information, which facilitates the making of informed decisions. Smart identifiers make it possible to authenticate products and provide supply chain-wide traceability. Integrating blockchain technology into their operations enables manufacturers to create a transparent and immutable record of the product's journey from production to consumption (Zhou & Hu, 2018), (Satter, 2007). This increases the legitimacy of the product, discourages the production of counterfeit goods, and inspires greater consumer confidence in the product's origin and quality. The Internet of Things (IoT) is an essential component of smart labels' conceptual foundations. When manufacturers connect intelligent labels to a network of interconnected devices, they can capture data from a variety of sources in real time (Wilson et al., 2018). This allows manufacturers to make proactive decisions and swift interventions, both of which are required to ensure product quality and safety (Schnettler et al., 2014). Measures of Security and Anti-Tampering: Anti-tampering and security features such as tamper-evident seals, holograms, and invisible dyes can be incorporated into smart labels. These safeguards make it simpler to detect and eliminate instances of unauthorised access, product modification, and counterfeiting. Customers will be able to verify the authenticity of a product before making a purchase if the manufacturer incorporates digital solutions such as QR codes or other unique identifiers (Vandermoere, 2016) (Sheth et al., 1991).

Hypothesis 5: smart labels packaging significantly influences consumer choices.

Tracking and tracing packaging

(Regattieri et al., 2013) Tracking and tracing packaging relies on concepts such as radio frequency identification (RFID), rapid response (QR) codes, near field communication (NFC), and blockchain technology. These foundations aim to increase supply chain visibility, ensure product authenticity, prevent counterfeiting, enable real-time tracking, and provide product traceability throughout its entire voyage (stampfli et al., 2010), (Siegrist et al., 2007). Through the integration of these technologies, tracking and tracing package systems are able to capture and store information regarding the product's origin, manufacturing processes, transit, and storage. Then, stakeholders will be able to gain access to these data and verify its accuracy to ensure the product's integrity, reduce

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associated risks, promote efficiency, and earn consumers' trust (Spence et al., 2018), (Lynn Van Wezemael et al., 2011).

Hypothesis 6: Tracking and tracing packaging significantly influences consumer choices.

Methodology

This research is applied as it is all about finding a solution to the problem. The researcher used the explorative cum descriptive method. From the perspective of the time element (contact), this study falls under the category of a cross-sectional (one-shot) study. The sample was collected through a systematic procedure of online questionnaire survey method via Google form; researchers test the hypotheses and gained further insights into Application of smart packaging and consumer choice. Modified standardized scales were used in this research. 460 respondents were approached through the snowball sampling technique who were determined based on Krejcie and Morgan (1970) criteria for the identification of a reasonable sample size Questionnaires were distributed in select small cities of Mid India as these cities were selected for study areas. Primary as well as secondary data were used in the study and Collected data has been analysed through SPSS version 22 and AMOS version 24. Study variables normality were verified through skewness and kurtosis as the range was within +2 and -2 which shows normality in data (Ryu, 2011).

Results

Respondents' Profile

In the present study total of 460 respondents were targeted to participate. Out of 460 respondents, a total of 382 final and complete response was received which was used in the data analysis, and the remaining 18 responses were excluded because of an incomplete questionnaire. Of the total of 382 respondents, 66.3% were male and the rest were female. Most of the respondents were from 2 to 38 years (69.1%), High literacy has been revealed among respondents (88.9%). Respondents earning an annual household income between Rs. 15,000-80,000 was 70.2% of total sample size.

Preliminary Analysis through Exploratory Factor Analysis (EFA)

EFA was applied to all four predictors. The KMO score was 0.844, and the Bartlett test score was 0.00. All items with a score greater than 0.6 were retained (Hair et al., 2010). Sixty-nine.220 percent of the variances were explained by four Eigen value-based factors. On the premise of research, factors have been identified. Freshness packaging as a factor 1 has a total of seven predictors, five of which are accepted based on their relative loadings, which are.820,.789,.799,.829, and.787, and their eigen value is 7.383.As a second factor, reusable packaging has a total of six predictors, four of which are accepted based on relative loadings of.825,.834,.846, and.923, with an eigen value of 2.748.Cocnceted packaging as the third factor has a total of five predictors, and after their relative loading, four predictors are accepted based on loadings of.879,.784,.856, and.662; the eigen value is 2.110. Secure packaging as the fourth factor has a total of six predictors, and after their relative loading, four predictors are accepted based on loadings of.751,.749,.746 and.778; the eigen value is 1.86. Smart Lables as the fifth factor has a total of five predictors, three of which are accepted after relative loading:.905,.772, and.901, and the eigen value is 1.647%. Tracking and Tracing packaging as a sixth factor has a total of five predictors, and after their relative loading, three predictors are accepted: 8.11, 8.64, and 8.46, with an eigen value of 1.37.

Through convergent and discriminant validity, construct validity has been determined. Researchers observed convergent validity based on factor loadings, composite reliability, and extracted average variance (Fornell, C., & Larcker, D. F., 1981) (refer to tables 2 and 3). With average variance extracted (AVE), discriminant validity has been established

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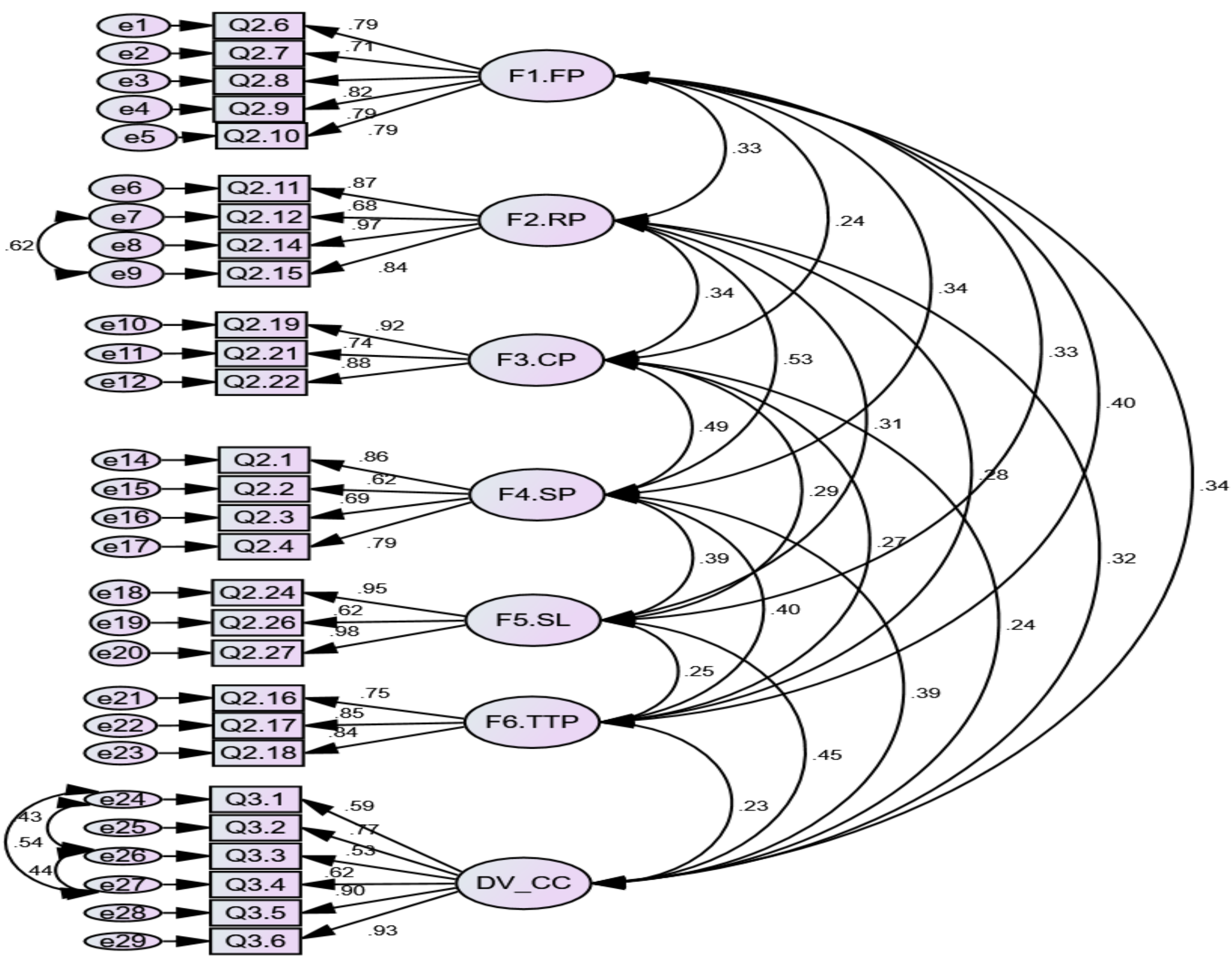
because the values are greater than 0.5. Table 3 displays the diagonal values (Bagozzi & Yi, 1988). All factors had a correlation of less than or equal to 0.70 (Hair et al., 2010), so the multicollinearity issue was examined.

Confirmatory Factor Analysis

Model fit is indicated by the CFA scores of the revised measurement model (Chi-square/df=1.630, p= 0.00, GFI=.916, AGFI=.995, CFI=.973, NFI=.933, RMSEA=0.39, RMR=0.28). After a closer examination, items with low Standardized regression weights (SRWs) were eliminated to ensure a decent model fit (refer to figure 2). The measurement model guarantees that Cronbach's alpha scores are greater than 0.7 (refer to table 2). The validity and reliability standards are determined by the outcomes of the measurement model; therefore, the identified factors and their items are suitable for structure models and hypothesis testing.

Figure 2

Measurement Model



Source Amos

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ISSN PRINT 2319 1775 Online 2320 7876
, Journal Volume 11, Iss 08, 2022

Table 1

Estimation of Cronbach's alpha (α), VIF and AV (Discriminant Validity Test)

	F1.FP	F2.RP	F3.CP	F4.SP	F5.SL	F6.TTP	DV_CC	AVE	α	VIF
F1.FP	***0.893***							0.797	0.892	3.7
F2.RP	0.534	***0.908***						0.825	0.901	3.9
F3.CP	0.501	0.544	***0.911***					0.830	0.876	4.1
F4.SP	0.533	0.561	0.556	**0.912**				0.832	0.912	4.0
F5.SL	0.511	0.517	0.533	0.493	***0.917***			0.841	0.896	4.4
F6.TTP	0.504	0.511	0.499	0.506	0.537	***0.924***		0.854	0.910	4.4
DV_CC	0.590	0.562	0.501	0.561	0.5460	0.504	***0.909***	0.826	0.887	4.9

Source: Excel

Hypothesis Testing

Table 2

Items			**Estimate**	**S.E.**	**C.R.**	**P**	**Label**
DV_CC	<---	**F1.FP**	.208	.062	3.377	***	**Accepted**
DV_CC	<---	**F2.RP**	.103	.047	2.175	.030	**Rejected**
DV_CC	<---	**F3.CP**	.016	.046	.350	.726	**Rejected**
DV_CC	<---	**F4.SP**	.183	.055	3.340	***	**Accepted**
DV_CC	<---	**F5.SL**	.288	.042	6.797	***	**Accepted**
DV_CC	<---	**F6.TTP**	.007	.059	.124	.901	**Rejected**

Hypothesis Testing

After measuring the validity and reliability of the measurement model, the structural model revealed a satisfactory fit ($\chi 2$ = 1.630, p= 0.00, GFI = 0.91, AGFI = 0.99, CFI = 0.973, NFI = 933, RMSEA = 0.39). All standardized regression weights (SRWs) fall within the acceptable range (figure 3). Additional research is required to evaluate the generated hypotheses (see Figure 3 and Table 4). Three of the six hypotheses (H1), (H4), and (H5) are supported, while (H2), (H3), and (H6) are not. Smart Labels Choice (0.288) has a considerable impact on Consumer Choice.

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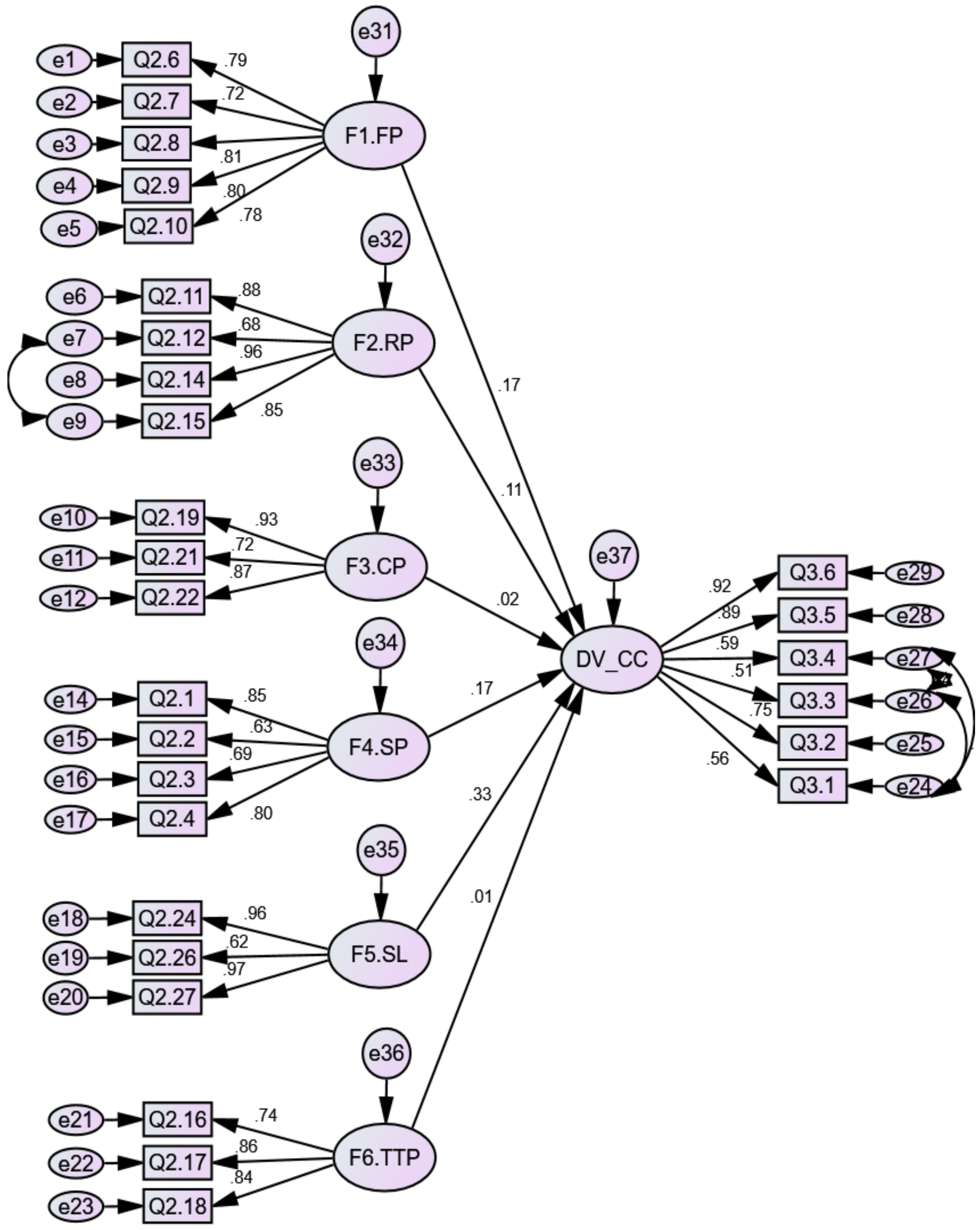
Figure 3
Measurement Model



Source: Amos

Conclusion

This study provides valuable insights into the decision-making process of consumers when selecting culinary products from small-scale businesses. It was discovered that freshness packaging, security packaging, and smart labels play a significant role in consumer decisions, particularly in regards to product safety. Small-scale food companies should therefore priorities these packaging elements in their efforts to meet customer expectations and safety standards. In this context, however, reusable packaging, connected packaging, and tracking and tracing packaging have not demonstrated a significant impact on consumer choices s. While these factors may have other advantages or applications, they appear to be of less importance to consumers when selecting food products from small-scale enterprises in terms of food safety.

In light of these findings, it is recommended that small-scale food companies implement and improve freshness packaging, security packaging, and smart labels in their products. These factors are likely to have a substantial impact on consumer choices s and can provide a competitive edge in the culinary industry. Despite the significant insights offered by this study, additional research is required in this field. The selection of culinary products from small-scale enterprises may be influenced by additional variables in the future, such as price, brand reputation, and other product attributes. In addition, future research could investigate the influence of packaging types not addressed in this study on consumer choices s and food safety concerns.

Research Recommendations for the Future

Future research should investigate the possibility of examining a broader range of products in order to diversify its focus. By examining intelligent packaging in a broader array of industrial products, scholars can gain a more comprehensive understanding of its benefits and limitations. Increasing Sample Size: In order to improve the precision of the results, future studies may benefit from a larger sample size. Such an investigation would yield a more accurate representation of the population and pave the way for more exhaustive research. Future research endeavors could investigate the various possibilities and potential applications of this technology, including product safety, consumer engagement, and environmental sustainability. Researchers have the opportunity to make significant contributions to their field of study by recognizing and overcoming the aforementioned limitations in future scholarly investigations. This will result in an increase in knowledge and a deeper comprehension of smart packaging and its inherent potential. Consequently, this could potentially lead to the creation of intelligent and eco-friendly packaging alternatives that offer advantages to both businesses and consumers.

Declaration of interest

The authors declare no conflicts of interest. The sole responsibility for the content and composition of this article is with the authors.

Funding

The authors did not receive any financial assistance for the research, authoring, and/or publication of this paper.

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ISSN PRINT 2319 1775 Online 2320 7876
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