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An Integrated Model for Exploring Determinants of Online Fruits and Vegetable Purchasing Intention in Densely Populated Cities

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Abstract

Amid the rapid growth of e-commerce and increasing reliance on digital platforms, understanding the psychological and technological determinants of online food purchasing has become essential, especially in densely populated cities. This study aims to identify the key factors influencing urban consumers' intention to purchase fruits and vegetables online by developing an integrated model that combines the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM). The model was empirically tested using structural equation modeling on data collected from customers of Tehran's municipal fruit and vegetable markets—the largest in Iran. The results reveal that subjective norms and interpersonal influence are the strongest predictors of online purchasing intention, while attitude exerts a weaker yet significant effect. Perceived enjoyment, compatibility, and facilitating conditions significantly enhance positive attitudes and perceived control, whereas perceived usefulness shows no direct impact. These findings underscore the dominant role of social and experiential factors over purely utilitarian evaluations in shaping consumer behavior. The integrated framework provides a more comprehensive understanding of urban online food purchasing by linking behavioral, social, and technological dimensions. The study offers practical insights for policymakers, platform designers, and urban planners, suggesting that strengthening social marketing, improving digital infrastructure, and designing user-friendly and enjoyable platforms can enhance adoption and contribute to more sustainable and accessible urban food systems.

Keywords
Theory of planned behavior, Technology acceptance model, Tehran, Purchasing intention, Environmental behavior

1. Introduction

The rapid urbanization of the 21st century has significantly reshaped consumption patterns, particularly in densely populated metropolitan areas (Ang, 2023; Garg & Bakshi, 2024). One of the most visible transformations is occurring in the food sector, where the intersection of digital technology, consumer behavior, and urban infrastructure is giving rise to new forms of purchasing practices (Yazdanpanah & Forouzani, 2015). Among these, online food purchasing has emerged as a prominent trend, offering both convenience and adaptability in cities faced with spatial constraints, time scarcity, and changing lifestyle preferences (Luján-salamanca et al., 2025; Weiler & Gilitwala, 2024). The increasing reliance on digital platforms for acquiring food, ranging from groceries to ready-to-eat meals, represents not only a technological innovation but also a sociocultural shift with profound implications for urban food systems (Bagmalek & Moosaei, 2024; Qi et al., 2025). This transition is especially pronounced in high-density urban environments, where logistical efficiency, environmental stress, and population pressure converge to challenge traditional food distribution mechanisms (Janatabadi et al., 2024; Maleknia & Enescu, 2025; Wei et al., 2024). Densely populated cities confront unique structural and environmental pressures that impact food accessibility and consumer choice. Issues such as traffic congestion, limited space for retail outlets, environmental pollution, and the need for efficient supply chain logistics demand innovative approaches to urban food provisioning (Lewicki & Bera, 2024; Raki, 2024). Simultaneously, consumers in such settings are increasingly time-constrained, technologically literate, and attuned to the convenience of on-demand services (Maleknia & Hălălişan, 2025; Zhang & Yu, 2020). In response, e-commerce platforms and mobile applications offering online food purchasing options have proliferated, promising enhanced accessibility, wider food selection, and time-saving alternatives (Garg & Bakshi, 2024; Panopoulos et al.,

2023; Zhang & Yu, 2020). However, the adoption of such technologies is not solely driven by utility or availability; it is deeply rooted in consumer attitudes, perceived behavioral control, normative beliefs, and individual acceptance of technological innovations.

Understanding the dynamics of online food purchasing behavior in urban settings requires a nuanced theoretical approach that integrates both psychological and technological dimensions (Jun et al., 2025). Numerous studies employing various behavioral models have sought to identify and examine the psychological and behavioral factors that influence individuals' intentions and actions related to online purchasing (Juanli et al., 2025). These studies defined several contextual factors that influence online food purchasing behavior in urban settings including cultural values, digital literacy, attitude, perceived behaviors control and social pressure (Gopalakrishna et al., 2022; Monoarfa et al., 2024; Mya et al., 2025; Samanta & Arkoudis, 2024). While several studies have explored consumer preferences and motivations in online food shopping, there remains a research gap in comprehensive frameworks that simultaneously account for behavioral intention and technology acceptance within the urban context. In addition to these variables, factors related to the acceptance of technology and the use of new tools necessary for enacting a particular behavior may also play a significant role in influencing this process (Higueras-castillo et al., 2024; Shanmugavel & Micheal, 2022). Therefore, it is essential to examine the various dimensions of individuals' behavioral intentions—such as personal values, technological readiness, social pressure, and perceived ability to engage in online purchasing—particularly in large urban areas. Such a comprehensive approach can contribute to a deeper understanding of the key factors shaping online purchase intentions.

In particular, the intersection of two influential theoretical models, the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM) can offer a robust analytical lens for examining the multi-dimensional nature of this phenomenon. TPB provides insight into the psychological determinants of behavior, including attitudes, subjective norms, and perceived behavioral control (Ajzen, 2005, 2011), while TAM contributes an understanding of how perceived usefulness and perceived ease of use shape technology adoption (Y. Huang et al., 2024; Savari et al., 2024). When synthesized, these models can offer a more holistic account of the drivers and inhibitors influencing online food purchasing behavior in densely populated urban centers. The integration of the TPB and the TAM is particularly pertinent for capturing the complex interplay between internal motivations and external enabling factors in urban contexts. TPB postulates that individual behavior is driven by behavioral intentions, which are in turn shaped by attitudes toward the behavior, perceived social pressures (subjective norms), and the perceived ease or difficulty of performing the behavior (Ajzen, 1985). Meanwhile, TAM focuses more specifically on users' acceptance of new technologies, positing that perceived usefulness and perceived ease of use are primary determinants of an individual's willingness to adopt a given technological innovation (T. Huang, 2023; Salehi & Rasouliazar, 2025; Savari et al., 2025). By integrating these two models, researchers can explore not only whether individuals are inclined to engage in online food purchasing due to normative or attitudinal influences, but also how their perceptions of digital platforms influence this intention and behavior.

In light of these dynamics, the present study seeks to develop an empirically grounded, theoretically integrated model that explains online food purchasing behavior in densely populated urban centers. Drawing upon both TPB and TAM, this research examines the combined effects of psychological, social, and technological variables on consumer intentions and behaviors. The central research questions guiding this inquiry include: (1) What attitudinal, normative, and control beliefs influence urban residents' intentions to purchase food online? (2) How do perceptions of technological usefulness and ease of use affect these intentions? (3) How do contextual variables—such as infrastructure, digital literacy, and environmental awareness—moderate these relationships? By addressing these questions, the study contributes to a deeper theoretical understanding of consumer behavior in digital food markets, while also offering practical insights for policymakers, urban planners, and e-commerce providers seeking to enhance food access and service delivery in rapidly growing cities. By examining these interconnected variables, this study aims to provide a deeper understanding of the motivations and limitations underlying online food purchasing behavior in urban settings.

Rapid urbanization has transformed food consumption patterns, particularly in densely populated cities where digital technologies increasingly shape how people access food. Despite the rapid growth of online food purchasing, previous studies have often examined behavioral or technological factors separately, overlooking the interconnected psychological, social, and technological determinants that drive consumer behavior in urban contexts. This study addresses this gap by integrating the TPB and the TAM into a unified analytical framework to explain consumers' online purchasing intentions. The model is further extended by incorporating context-specific constructs such as interpersonal and external influence, compatibility, facilitating conditions, and perceived enjoyment. By empirically validating this extended model in Tehran—a dense megacity facing infrastructural, environmental, and policy challenges—this research provides novel insights into how social norms, attitudes, and technology perceptions jointly shape online food purchasing behavior. It also accounts for sustainability initiatives, local food promotion, and regulatory frameworks influencing consumer attitudes and market dynamics. Overall, the study offers theoretical

innovation and practical guidance for policymakers and platform designers seeking to enhance sustainability, accessibility, and efficiency in urban food systems.

2. Theoretical Framework

This study employed a specific theoretical framework by integrating two prominent behavioral models including the TPB and the TAM to explore the various dimensions influencing individuals' online purchase intentions for the fresh food sector. This extended theoretical framework offering a more holistic perspective on the factors influencing behavioral intention. The following sections outline the conceptual foundations of these models and present the research hypotheses based on their key constructs.

2.1. Theory of Planned Behavior

The TPB, originally conceptualized by (Ajzen, 1985), is a prominent framework for predicting and explaining deliberate human actions across a wide range of contexts. As an extension of the theory of reasoned action, TPB incorporates an additional construct, perceived behavioral control to address circumstances where individuals may not have full volitional control over their behavior (Ajzen, 1991). This extension has significantly enhanced the model's applicability, particularly in complex, real-world decision-making environments. At the core of TPB lies the premise that behavioral intention is the most immediate determinant of actual behavior. This intention is influenced by three interrelated components: attitude toward the behavior, referring to an individual's overall evaluation of performing the behavior (Rahman et al., 2025; Sharifi et al., 2025); subjective norms, which capture the perceived expectations and social pressures from significant others; and perceived behavioral control, which reflects the individual's assessment of their ability to perform the behavior, considering both internal resources and external constraints (Armitage & Conner, 2001).

TPB has demonstrated substantial explanatory power across diverse domains, including consumer decision-making (Jin et al., 2020; Yazdanpanah & Forouzani, 2015), health-related behaviors (Alshagrawi, 2024; Hagger et al., 2022), environmental practices (Maleknia & ChamCham, 2024; Maleknia & Namdari, 2025), and technology-mediated actions (Liu & Park, 2024; Mya et al., 2025). In the context of urban food purchasing, particularly within digital platforms, TPB offers a structured lens through which to examine the psychological and contextual factors that guide consumer choices. Urban environments often involve a complex interplay of socio-economic, technological, and infrastructural factors that influence purchasing decisions, making TPB particularly relevant for capturing both individual agency and contextual limitations. Recent empirical studies affirm the model's relevance in food-related behaviors, especially in technology-enhanced contexts. For example, research employed TPB to explore sustainable food consumption intentions (Singh et al., 2024; Thi Tuyet et al., 2025). In urban settings, where food purchasing is increasingly mediated by online platforms, TPB allows for the integration of personal attitudes (e.g., convenience, health, or price sensitivity), social influences (e.g., digital communities or peer recommendations), and perceived constraints (e.g., internet access, digital literacy, or delivery availability). In light of these strengths, TPB serves as a robust theoretical foundation for the present study. It facilitates a comprehensive analysis of the psychological determinants of online food purchasing behavior among urban residents, particularly within the socio-technological complexities of densely populated cities. By employing TPB, this research seeks to uncover how attitudes, social norms, and perceived control interact to shape consumer intentions in urban digital food systems. Moreover, TPB's adaptability allows for its integration with complementary models—such as the TAM thereby enhancing its explanatory capacity for behaviors situated at the intersection of technology use and urban consumption.

2.2. Technology Acceptance Model

The TAM, first introduced by (Davis, 1989), is a foundational framework in information systems research that explains how users come to accept and use new technologies. TAM posits that an individual's intention to use a particular technology is primarily influenced by two key perceptions: perceived usefulness and perceived ease of use (Y. Huang et al., 2024; Jun et al., 2025). These constructs represent users' beliefs about whether technology will enhance their performance and the degree to which it will be free of effort, respectively. These perceptions shape the individual's attitude toward the technology, which in turn influences behavioral intention and actual usage (Hadi et al., 2025; Mastour et al., 2025). TAM has been widely applied across various technological domains, including e-commerce, digital health, mobile applications, and online service platforms (Ibrahim et al., 2025; Kemp et al., 2024; Rejali et al., 2023; Yang et al., 2025). Its simplicity, empirical robustness, and adaptability have made it one of the most influential models for understanding user acceptance of digital tools. In the context of online food purchasing, especially within densely populated urban settings, TAM offers a valuable perspective for examining how consumers evaluate and engage with digital food retail platforms.

Urban consumers often rely on online channels for food access due to factors such as time constraints, traffic congestion, and the availability of delivery services (Kong et al., 2024; Li et al., 2023). In such contexts, users' perceptions of technological effectiveness and usability become critical predictors of their adoption behaviors. Perceived usefulness may reflect beliefs that digital platforms provide convenience, access to a wider variety of food, or improved food security in urban environments. Perceived ease of use, on the other hand, may capture users'

evaluations of interface design, payment flexibility, navigation, and overall digital literacy required to complete an online food purchase. In this study, TAM is employed to account for the technological dimension of online food purchasing behavior in urban areas. It complements the psychological and social determinants explored through the Theory of Planned Behavior by focusing on how individuals evaluate and adopt technology-based solutions in their everyday food acquisition practices. The integration of TAM with TPB enables a more holistic understanding of behavioral intention by bridging attitudes toward behavior with perceptions of technology. This combined framework is especially suitable for densely populated urban contexts, where the success of online food systems is contingent not only upon behavioral motivations but also on the perceived functionality and accessibility of digital tools.

2.3. Additional Constructs for an Enhanced Model

While TPB and TAM provide a strong foundation, research indicates that additional factors play a crucial role in shaping online purchasing behavior, particularly for fresh food products. This study extends the traditional TPB-TAM framework by incorporating perceived risk, trust, and facilitating conditions, which have been widely discussed in recent e-commerce literature. Perceived Risk is a critical factor , it influence on intention was confirmed in research (Gopalakrishna et al., 2022; Maleknia et al., 2024) and might influencing online purchasing decisions, especially for perishable goods such as fruits and vegetables. Several types of risk are relevant in this context: product risk which concerns the freshness, quality, and accuracy of product, unreliable payment systems, or hidden fees. Delivery risk: uncertainty regarding delivery delays, damaged goods, or inefficient logistics. Prior studies suggest that higher perceived risk discourages online food purchases. Therefore, online platforms must implement transparent return policies, quality guarantees, and real-time tracking features to mitigate these risks.

Trust has been identified as a fundamental determinant of consumer behavior in online shopping (Amangeldi et al., 2024; Juanli et al., 2025; Tan et al., 2023). In agricultural e-commerce, trust is shaped by platform trust which is confidence in the e-commerce platform's reliability, security, and credibility. Vendor trust which is perceptions of honesty, ethical practices, and customer service of sellers. Studies indicate that consumers are more likely to purchase perishable products online if they trust the accuracy of product descriptions, vendor transparency, and the platform's customer protection policies (Arturo & Valenzuela, 2006; Meira et al., 2024; Zhuang et al., 2021). Facilitating conditions refer to external factors that support online shopping adoption (Venkatesh et al., 2022). This includes digital infrastructure, availability of high-speed internet, user-friendly platforms, and secure payment systems. Logistics and delivery services, reliable delivery networks, cold storage solutions, and flexible scheduling options (Hong et al., 2023; Kong et al., 2024; Li et al., 2023). Customer support and policies which include effective complaint resolution, return/exchange policies, and real-time assistance. Research suggests that when facilitating conditions are strong, perceived barriers to online shopping decrease, leading to higher adoption rates.

2.4. Hypotheses Development

Based on this extended framework, the study proposes a conceptual model that integrates TPB, TAM, and additional constructs (perceived risk, trust, and facilitating conditions) to provide a holistic view of consumer behavior in online fruit and vegetable markets. The following hypotheses guide the study:

H1: Perceived ease of use significantly positive influence on perceived usefulness.
H2: Perceived ease of use significantly positive influence on perceived enjoyment.
H3: Perceived ease of use significantly positive influence on attitude toward online fruit and vegetable shopping.
H4: Perceived enjoyment significantly positive influence on attitude toward online fruit and vegetable shopping.
H5: Perceived usefulness has a positive impact on attitude toward online fruit and vegetable shopping.
H6: Combability influences attitude toward online fruit and vegetable shopping, positively.
H7: Interpersonal influence positively influences subjective norms.
H8: External influence positively influences subjective norms.
H9: Self-efficacy positively influences perceived behavioral control.
H10: Facilitating conditions positively influences perceived behavioral control.
H11: Attitude positively influences intention to purchase fruits and vegetables online.
H12: Subjective norms positively influence intention to purchase fruits and vegetables online.
H13: Perceived behavioral control positively influences the intention to purchase fruits and vegetables online.

3. Materials and Methods

3.1. Location of Study

This study was conducted in Tehran (Fig. 1), the capital and most populous city of Iran, located in the northern part of the country at the foot of the Alborz mountain range. As a densely populated megacity with over 8 million residents in its metropolitan area, Tehran is characterized by a highly urbanized environment, complex transportation networks, and growing socio-economic diversity. The city experiences significant challenges related to traffic congestion, air pollution, time scarcity, and uneven access to fresh food markets, particularly in peripheral districts.

These urban pressures underscore the relevance of exploring digital alternatives for food access. In this context, online purchasing platforms for agricultural products offer a promising solution to improve food accessibility, reduce logistical burdens, and support time-efficient shopping behavior. Digital food systems can enhance consumer convenience, decrease dependency on car-based shopping, and potentially mitigate urban environmental impacts. Tehran's infrastructure, demographic density, and rapid digital transformation make it an ideal case study for examining how psychological and technological factors influence the adoption of online food purchasing in high-density urban settings.

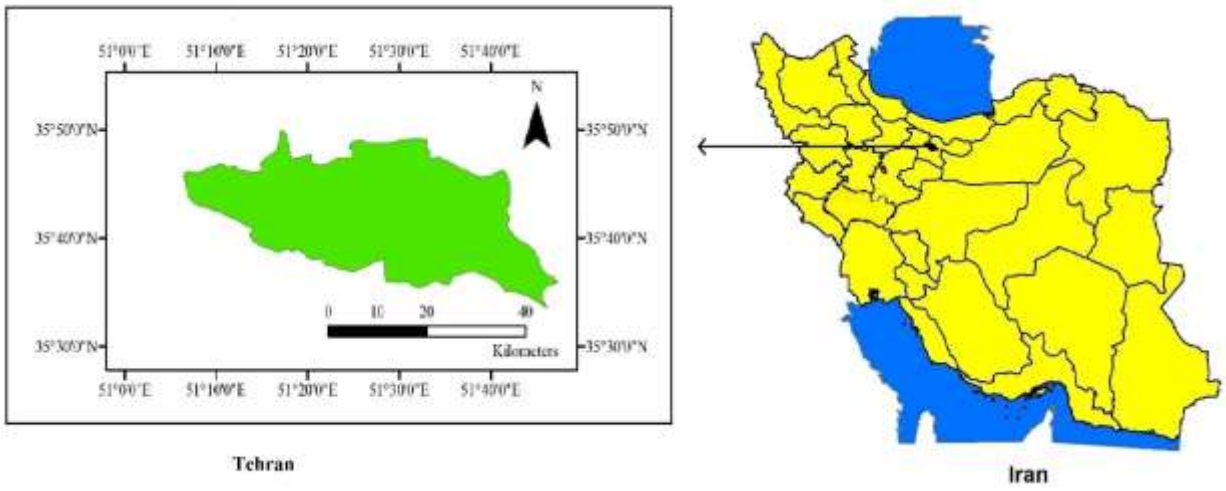

Figure 1. Location of study

3.2. Statistical Population

The target population of the present study comprises customers of fruit and vegetable markets located throughout the city of Tehran. As the capital and most populous city of Iran, Tehran is administratively divided into 22 distinct municipal districts. Each of these districts includes several fruit and vegetable markets, the number and size of which are proportionate to the district's population density and geographical area. These markets are considered essential components of the city's food supply system, offering a wide variety of fresh produce at relatively affordable prices. A significant proportion of Tehran's residents regularly visit these markets to meet their daily or weekly food needs. Due to their accessibility, affordability, and widespread presence across all districts, fruit and vegetable markets serve a broad cross-section of the urban population, encompassing diverse demographic and socioeconomic groups. As such, this population offers both spatial and social representativeness, making it an appropriate and inclusive sampling frame for investigating consumer behavior in the context of urban food purchasing.

In light of the widespread use and strategic distribution of these markets, customers of these venues are well-positioned to provide valuable insights into the dynamics of urban food purchasing behavior. To determine the appropriate sample size for the study, the Krejcie and Morgan (1970) sample size determination table was employed, resulting in a required sample of 384 respondents. This sample size is statistically sufficient to ensure generalizability of the findings across the broader target population, while also maintaining a manageable scale for data collection and analysis.

A multi-stage cluster sampling method was employed for the selection of the study sample. In the first stage, six out of the 22 municipal districts of Tehran were selected, ensuring a balanced geographic distribution across the city to achieve representativeness of the overall urban population. In the second stage, two fruit and vegetable markets were chosen from each of the selected districts, resulting in a total of twelve markets. Finally, in the third stage, respondents were randomly and proportionally selected from each of these markets, with an equal number of participants drawn from each site to maintain balance across the clusters. This sampling approach ensured both geographic coverage and randomization, thereby enhancing the generalizability of the study findings.

3.3. Data Collection

To address the research problem and effectively fulfill the research objectives, a structured, researcher-developed questionnaire was employed as the primary instrument for data collection. The use of a customized questionnaire was deemed appropriate due to the specific contextual and behavioral dimensions under investigation, particularly those related to online purchasing behavior within the setting of urban fruit and vegetable markets. The questionnaire was designed in two main sections to ensure comprehensive coverage of both demographic characteristics and behavioral constructs. The first section gathered essential information on the personal and socio-demographic attributes of the respondents, including variables such as age, gender, educational attainment, and occupational status. These variables were considered critical for understanding the background context of the participants and for enabling the analysis of potential relationships between individual characteristics and behavioral tendencies related to online food purchasing.

The second section of the questionnaire focused on the core constructs of the study, specifically the intention to purchase agricultural and food products online from municipal fruit and vegetable markets, as well as the factors influencing this behavioral intention. Items in this section were developed based on relevant theoretical frameworks and literature—most notably the TPB and the TAM to capture attitudes, perceived behavioral control, subjective norms, perceived ease of use, perceived usefulness, and trust related to online purchasing platforms. Each item in the second section was measured using a five-point Likert scale, offering respondents the options of strongly agree, agree, neutral, disagree, and strongly disagree. This scale allowed for the quantification of attitudes and perceptions, facilitating statistical analysis of the data. Respondents were asked to indicate the extent of their agreement or disagreement with each statement based on their personal experiences, perceptions, and intentions.

To ensure the validity and clarity of the researcher-developed questionnaire, a two-step process involving expert review and pre-testing was conducted prior to the full-scale data collection. In the first step, the content validity of the questionnaire was assessed through consultation with a panel of academic and professional experts in the fields of consumer behavior, agricultural marketing, and e-commerce. This panel consisted of 8 experts. These experts were selected based on their relevant experience and scholarly contributions, and they were asked to evaluate the questionnaire items in terms of their relevance, clarity, comprehensiveness, and alignment with the study's objectives and theoretical framework. Based on the feedback received, several items were revised to improve wording precision, eliminate ambiguity, and ensure conceptual consistency with constructs drawn from the TPB and the TAM. This expert evaluation helped to strengthen the construct validity of the instrument by confirming that each item appropriately reflected the underlying theoretical dimensions it was intended to measure. In the second step, a pre-test of the revised questionnaire was conducted with a small sample (n = 30) drawn from the target population. The purpose of the pre-test was to examine the practical aspects of the questionnaire, including item clarity, logical flow, time required for completion, and respondent comprehension. Participants were encouraged to provide feedback on any confusing or difficult items, and their responses were analyzed to detect any patterns of nonresponse or inconsistencies that might indicate underlying problems in item construction. The insights gained from the pre-test led to minor refinements in the questionnaire layout and wording, further enhancing its usability and reliability for the main survey. Overall, the combination of expert validation and pilot testing provided a solid foundation for ensuring the face and content validity of the instrument, thereby increasing confidence in the accuracy and reliability of the data collected for this study.

Following the completion of the two-step validation process, the final phase of data collection commenced. Data were gathered through face-to-face interviews with customers at municipal fruit and vegetable markets. For this purpose, participants were selected randomly, and each was invited to complete the questionnaire. Prior to the start of the interview process, participants were assured that their responses would remain strictly confidential and would be used solely for academic purposes. In accordance with ethical research standards, all participants were asked to provide written informed consent before taking part in the study. The average time required to complete each questionnaire was approximately 15 minutes. Data collection was carried out over a three-month period, from August to November 2024.

3.4. Data Analysis

3.4.1. Validity and Reliability Assessment

Establishing the validity and reliability of measurement instruments is a critical prerequisite in behavioral and social science research, particularly when employing latent constructs within structural equation modeling (SEM). In the present study, a rigorous multi-criteria evaluation was conducted to ensure that the constructs used in the proposed model possess satisfactory psychometric properties. This evaluation was carried out in accordance with the guidelines

outlined by Hair et al (2019), Fornell and Larcker (1981), and other foundational methodological sources, ensuring both the internal consistency of measurement items and the conceptual distinctiveness of latent variables. Internal consistency refers to the degree to which multiple items purported to measure the same construct yield consistent results. To assess the reliability of the latent variables, three complementary indices were employed: Cronbach's alpha (α), composite reliability (CR), and rho_A.

Cronbach's alpha is a widely used indicator of internal consistency, representing the average correlation among items within a construct. Although some scholars regard alpha values above 0.60 as minimally acceptable, a more conservative threshold of 0.70 was adopted in this study to ensure stringent psychometric quality (Cronbach, 1951). However, it is important to acknowledge that Cronbach's alpha assumes tau-equivalence (equal loadings), which is often violated in SEM contexts. To address this limitation, CR was also computed. Unlike alpha, CR accounts for the actual factor loadings of each item and provides a more accurate reflection of construct reliability, especially in models with varying item contributions. A CR value equal to or greater than 0.70 was used as the criterion for acceptable reliability, as recommended in SEM literature (J. F. Hair et al., 2019). In addition, the study utilized rho_A, a relatively more robust measure of reliability under partial least squares (PLS-SEM) estimation. Rho_A is particularly advantageous when evaluating reflective measurement models, as it provides a less biased estimate compared to Cronbach's alpha. A rho_A value above the threshold of 0.70 is considered indicative of satisfactory internal consistency (J. Hair et al., 2017).

Convergent validity assesses the extent to which indicators of a specific construct share a high proportion of variance. This is a fundamental requirement for reflective measurement models, ensuring that observed variables truly represent the underlying latent factor. In this study, Average Variance Extracted (AVE) was used as the primary indicator of convergent validity. AVE represents the mean of the squared loadings of each item on its corresponding construct and is interpreted as the amount of variance that a construct captures from its indicators, relative to the variance due to measurement error. According to the established benchmark proposed by Fornell and Larcker (1981), an AVE value of 0.50 or higher is considered adequate. This threshold implies that the construct explains more than half of the variance in its observed indicators. Constructs failing to meet this criterion may indicate a need for model respecification or item refinement. The AVE values were carefully scrutinized to ensure the conceptual coherence and empirical adequacy of each construct within the proposed model. While convergent validity ensures that items within a construct are highly correlated, discriminant validity confirms that constructs are empirically distinct from one another. In this study, discriminant validity was assessed using the Fornell-Larcker criterion, a widely accepted technique in structural equation modeling. This method stipulates that the square root of the AVE for a given construct should be greater than its highest bivariate correlation with any other construct in the model. If this condition is satisfied, it can be inferred that the construct shares more variance with its own indicators than with those of other constructs, thereby confirming its uniqueness and theoretical independence.

Ensuring discriminant validity is particularly important in integrated models, such as the present study's TPB-TAM framework, which contains conceptually related constructs such as perceived usefulness, perceived ease of use, and attitude. Overlapping constructs without sufficient discriminant validity can result in multicollinearity, model misspecification, and biased parameter estimates. Therefore, rigorous assessment using the Fornell-Larcker criterion was essential to demonstrate the integrity of the measurement model.

3.4.2. Structural Model Evaluation

Following the validation of the measurement model, the structural model was analyzed to test the hypothesized relationships. The evaluation of the structural model involved the following key metrics: Path Coefficients: The statistical significance of the relationships between constructs was assessed using a bootstrapping procedure with 5,000 resamples. A p-value of less than 0.05 was used to determine significance. Coefficient of Determination (R^2): The R^2 values of the endogenous constructs were examined to assess the explanatory power of the model. Values of 0.26, 0.13, and 0.02 were interpreted as substantial, moderate, and weak, respectively, following Cohen's (1988) guidelines. The structural model was used to test the proposed hypotheses. Path coefficients, along with their associated t-values and p-values, were examined to determine the significance of the hypothesized relationships.

4. Results and Discussion

4.1. Results of Validity and Reliability

The internal consistency of the constructs was assessed using Cronbach's alpha and CR. As shown in Table 1, Cronbach's alpha values ranged from 0.711 to 0.926, exceeding the minimum threshold of 0.70 for all constructs. This indicates acceptable internal consistency across all constructs. CR values for all constructs were also above the

recommended threshold of 0.70, ranging from 0.748 to 0.947, providing further evidence of reliability. Additionally, rho-A values were examined, with most constructs meeting the acceptable threshold of 0.70, except for "External Influence" (rho-A = 1.587), which indicates a potential issue with this construct. Convergent validity was evaluated using the AVE. The AVE values for all constructs exceeded the recommended threshold of 0.50, ranging from 0.516 to 0.818. This demonstrates that the constructs capture a sufficient proportion of variance from their respective indicators, confirming convergent validity. Discriminant validity was assessed using the Fornell-Larcker criterion, which requires the square root of the AVE for each construct to be greater than its correlations with any other construct. The results, presented in Table 2, confirm that this criterion was met for all constructs. For instance, the square root of the AVE for Attitude (0.788) was higher than its correlations with other constructs, such as Compatibility (0.512) and Facilitating Conditions (0.463). Similarly, Compatibility demonstrated strong discriminant validity, with its square root of AVE (0.859) exceeding its correlations with constructs such as Facilitating Conditions (0.781) and Intention (0.742). While some constructs exhibited moderate correlations, such as Perceived Ease of Use and Perceived Usefulness (0.713), the square roots of their AVEs (0.843 and 0.885, respectively) were sufficiently higher, indicating conceptual distinctiveness. Additionally, External Influence had relatively lower correlations with other constructs, such as Attitude (0.06) and Compatibility (0.311), while maintaining a square root of AVE of 0.719. Overall, the results demonstrate that all constructs meet the Fornell-Larcker criterion, providing evidence that the constructs are both conceptually and empirically distinct.

To assess discriminant validity among the latent constructs, the Heterotrait-Monotrait Ratio of Correlations (HTMT) was employed, which is considered a robust method in variance-based structural equation modeling. As shown in the HTMT matrix (Table 3), all values fall below the conservative threshold of 0.85 recommended by Henseler et al. (2015), indicating that each construct is empirically distinct from the others. Specifically, the HTMT values between intention and other key constructs such as attitude, perceived behavioral control, perceived enjoyment, and compatibility remain within acceptable bounds, further supporting discriminant validity. Even closely related constructs, such as perceived enjoyment and compatibility or subjective norms and interpersonal influence, do not exceed the critical limit, confirming the absence of multicollinearity or conceptual overlap. This confirms the measurement model's adequacy in capturing unique conceptual dimensions, ensuring the validity of subsequent structural path estimations.

Table 1. Reliability and validity of model

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
Attitude	0.711	0.729	0.829	0.621
Compatibility	0.882	0.926	0.918	0.737
External influence	0.722	1.587	0.748	0.516
Facilitating conditions	0.926	0.954	0.947	0.818
Intention	0.831	0.851	0.887	0.663
Interpersonal influence	0.713	0.913	0.807	0.603
Perceived behavioral control	0.781	0.784	0.859	0.603
Perceived ease of use	0.803	0.928	0.877	0.711
Perceived enjoyment	0.727	0.794	0.841	0.642
Perceived usefulness	0.907	0.908	0.935	0.783
Self-Efficacy	0.739	0.743	0.844	0.643
Subjective norms	0.774	0.816	0.855	0.602

4.2. Structural model and hypotheses test

The explanatory power of the model was evaluated by examining the coefficient of determination (R^2) for each endogenous variable. The analysis (Fig. 2) indicated that the model accounted for 56.7% of the variance in behavioral intention, 41.7% in subjective norms, 35.5% in perceived behavioral control, 30.0% in attitude, 50.8% in perceived usefulness, and 22.0% in perceived enjoyment. These values reflect a moderate to substantial level of predictive accuracy, suggesting the model is well-suited to explain the targeted behavioral constructs. The path coefficient analysis revealed that ten out of thirteen hypothesized relationships were statistically significant at the 0.05 level (Table 4). perceived ease of use exhibited a strong and significant positive effect on perceived usefulness ($\beta = 0.713$, $t = 26.291$, $p < 0.001$), supporting Hypothesis 1 (H1). Additionally, perceived ease of use significantly influenced perceived enjoyment ($\beta = 0.469$, $t = 9.813$, $p < 0.001$), thereby confirming H2. However, the hypothesized direct effect of perceived ease of use on attitude was not statistically significant ($\beta = 0.056$, $t = 1.063$, $p = 0.288$), resulting in the rejection of H3.

Table 2. Fornell & Larcker criterion of study

	Attitude	Intention	Perceived ease of use	Subjective norms	Perceived behavioral control	Perceived usefulness	Perceived enjoinment	Combability	Interpersonal influence	External influence	Facilitating conditions	Self-Efficacy
Attitude	0.788											
Intention	0.461	0.814										
Perceived ease of use	0.347	0.533	0.843									
Subjective norms	0.428	0.709	0.451	0.776								
Perceived behavioral control	0.511	0.571	0.445	0.522	0.776							
Perceived usefulness	0.397	0.608	0.713	0.567	0.529	0.885						
Perceived enjoinment	0.497	0.662	0.469	0.646	0.589	0.601	0.801					
Combability	0.512	0.742	0.553	0.707	0.681	0.646	0.718	0.859				
Interpersonal influence	0.458	0.711	0.439	0.628	0.503	0.548	0.566	0.704	0.777			
External influence	0.06	0.351	0.274	0.341	0.145	0.194	0.171	0.311	0.317	0.719		
Facilitating conditions	0.463	0.733	0.499	0.658	0.595	0.589	0.694	0.781	0.633	0.369	0.904	
Self-Efficacy	0.289	0.332	0.33	0.238	0.303	0.341	0.368	0.515	0.192	0.405	0.47	0.802

Table 3. HTMT criterion of study

	Attitude	Intention	Perceived ease of use	Subjective norms	Perceived behavioral control	Perceived usefulness	Perceived enjoinment	Combability	Interpersonal influence	External influence	Facilitating conditions
Intention	0.585										
Perceived ease of use	0.392	0.575									
Subjective norms	0.556	0.857	0.522								
Perceived behavioral control	0.686	0.695	0.498	0.653							
Perceived usefulness	0.49	0.695	0.792	0.666	0.63						
Perceived enjoinment	0.636	0.813	0.504	0.816	0.747	0.721					
Combability	0.631	0.848	0.574	0.828	0.8	0.697	0.838				
Interpersonal influence	0.552	0.81	0.533	0.647	0.564	0.591	0.59	0.744			
External influence	0.099	0.353	0.365	0.349	0.207	0.211	0.237	0.328	0.578		
Facilitating conditions	0.561	0.82	0.526	0.768	0.681	0.638	0.806	0.845	0.666	0.38	
Self-Efficacy	0.372	0.37	0.384	0.334	0.369	0.369	0.439	0.623	0.203	0.473	0.552

Regarding perceived usefulness, the results indicated no significant effect on attitude (β = 0.021, t = 0.350, p = 0.726), and thus H4 was not supported. In contrast, perceived enjoyment was found to have a significant and positive effect on attitude (β = 0.253, t = 4.239, p < 0.001), confirming H5. Compatibility also demonstrated a statistically significant influence on attitude (β = 0.285, t = 4.142, p < 0.001), thereby supporting H6. These findings suggest that hedonic and experiential perceptions, along with system compatibility, play important roles in shaping user attitudes. In the context of normative influences, both interpersonal and external influence were found to be significant predictors of subjective norms. Interpersonal influence showed a strong and positive relationship (β = 0.578, t = 15.755, p < 0.001), confirming H7. External influence also had a statistically significant effect on subjective norms (β = 0.157, t = 3.019, p = 0.003), supporting H8. These results highlight the relevance of both personal networks and broader social contexts in the formation of normative beliefs regarding online behavior.

With respect to control beliefs, facilitating conditions were found to significantly influence perceived behavioral control (β = 0.581, t = 10.896, p < 0.001), thus supporting H9. However, the effect of self-efficacy on perceived behavioral control was not statistically significant (β = 0.030, t = 0.692, p = 0.489), leading to the rejection of H10. This suggests that structural support may play a more prominent role than individual self-confidence in determining perceived control within this behavioral context. Finally, the analysis of predictors of behavioral intention revealed significant effects for all three primary antecedents. Attitude had a positive and statistically significant impact on intention (β = 0.111, t = 2.313, p = 0.021), confirming H11. Subjective norms also emerged as a strong predictor (β = 0.540, t = 11.096, p < 0.001), validating H12. Similarly, perceived behavioral control had a significant positive effect on intention (β = 0.233, t = 4.741, p < 0.001), confirming H13. These results underscore the theoretical relevance of constructs drawn from the TPB and TAM perspectives in explaining consumers' online behavioral intentions. The findings emphasize the multidimensional nature of intention formation, involving attitudinal evaluations, normative pressures, and perceived behavioral control, shaped by both technological perceptions and social influence factors.

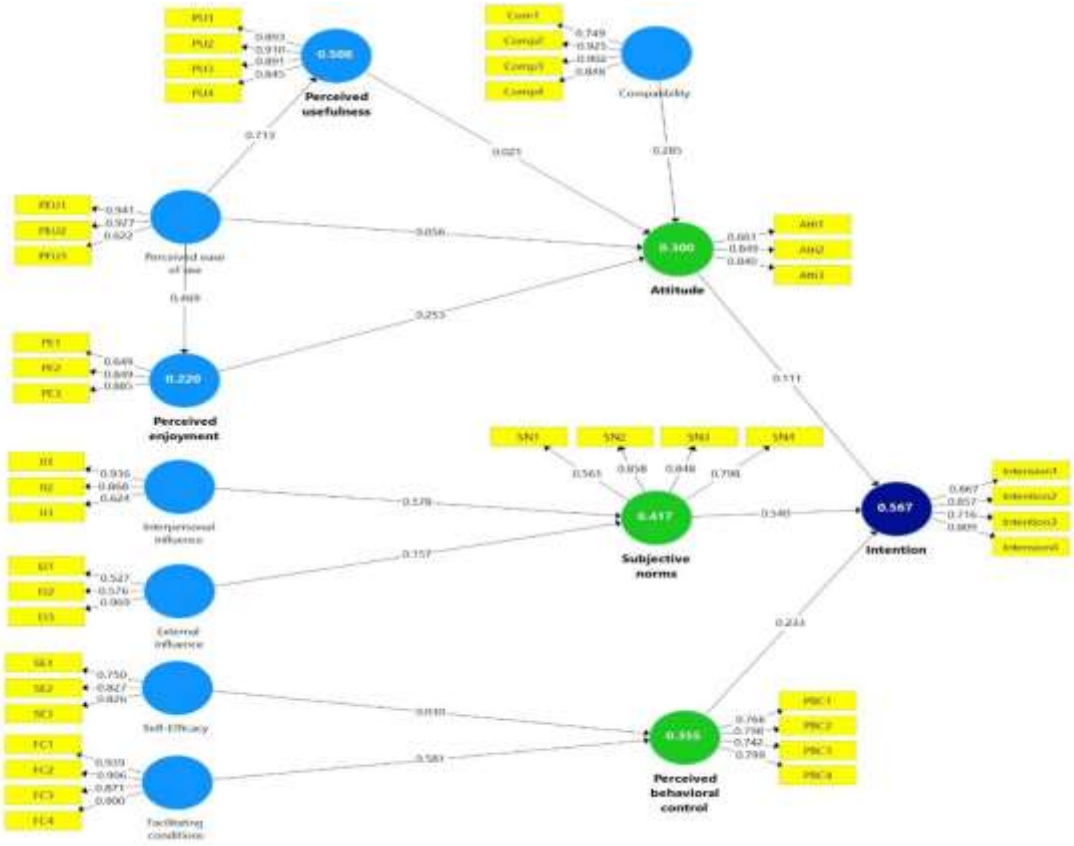

Figure 2. Structural model of study

Table 4. Hypotheses test results

	Hypotheses	Standard Deviation	T Statistics	P Values	Result
H1	Perceived ease of use -> Perceived usefulness	0.027	26.291	0.00	Confirmed
H2	Perceived ease of use -> Perceived enjoyment	0.048	9.813	0.00	Confirmed
H3	Perceived ease of use -> Attitude	0.053	1.063	0.288	Rejected
H4	Perceived usefulness -> Attitude	0.059	0.35	0.726	Rejected
H5	Perceived enjoyment -> Attitude	0.06	4.239	0.00	Confirmed
H6	Compatibility -> Attitude	0.069	4.142	0.00	Confirmed
H7	Interpersonal influence -> Subjective norms	0.037	15.755	0.00	Confirmed
H8	External influence -> Subjective norms	0.052	3.019	0.003	Confirmed
H9	Facilitating conditions -> Perceived behavioral control	0.053	10.896	0.00	Confirmed
H10	Self-Efficacy -> Perceived behavioral control	0.043	0.692	0.489	Rejected
H11	Attitude -> Intention	0.048	2.313	0.021	Confirmed
H12	Subjective norms -> Intention	0.049	11.096	0.00	Confirmed
H13	Perceived behavioral control -> Intention	0.049	4.741	0.00	Confirmed

5. Discussion

This study aimed to investigate the determinants of behavioral intention to purchase agricultural products online in Tehran's urban fruit and vegetable markets by integrating two widely established behavioral models the TPB and the TAM, while also extending them with constructs such as compatibility, facilitating conditions, interpersonal and external influence, self-efficacy, and enjoyment. The results provide both expected and novel insights, contributing to the growing body of literature on technology adoption in digital food ecosystems.

The TAM component of the model demonstrated partial support in explaining intention through indirect pathways. First, Hypothesis 1 (H1), which posited that perceived ease of use would positively affect perceived usefulness, was strongly supported. This finding is consistent with previous studies (Joyram et al., 2024; Liu & Park, 2024; Tang et al., 2023), confirming that user-friendly systems enhance perceived functionality in digital environments. In the context of online fruit and vegetable markets, where consumers interact with unfamiliar interfaces for perishable goods, ease of use may alleviate concerns related to product selection, transaction steps, and delivery logistics, thus enhancing perceptions of utility. Similarly, Hypothesis 2 (H2), which posited that perceived would positively influence perceived enjoyment, was also supported. This supports the notion that user interface simplicity not only enhances usability but also the affective experience, as suggested in the extended TAM literature (Juanli et al., 2025). Online agricultural purchases differ from routine digital services due to product perishability, sensory variability, and delivery risks; thus, an interface that is intuitive and minimally demanding may foster enjoyment, particularly for users with lower digital literacy.

Contrary to classical TAM expectations, Hypothesis 3 (H3), which anticipated a direct positive effect of PEOU on attitude, was not supported. This finding aligns with recent critiques of TAM's universal applicability in complex or emotionally charged decision contexts (e.g., food safety, freshness, or environmental concerns). The influence of perceived ease of use on attitude may be mediated through hedonic or experiential constructs like enjoyment or trust, rather than operating directly (Juanli et al., 2025). In this study, ease of use did not shape attitudes unless filtered through enjoyment or system compatibility, underscoring the multidimensional nature of user attitudes in online food purchasing. Moreover, Hypothesis 4 (H4), which proposed that perceived usefulness directly affects attitude, was rejected. This result diverges from much of the TAM literature (Sallam et al., 2024; Toros & Asiksoy, 2024) which typically identifies perceived usefulness as a key predictor of attitude toward using technology. The insignificant role of usefulness in forming positive attitudes in this context may be attributed to the unique characteristics of agricultural goods limiting the perceived utility of the online channel regardless of platform efficiency. In certain domains, affective and contextual variables may supersede perceived usefulness in shaping consumer preferences.

In contrast, Hypothesis 5 (H5), which posited that perceived enjoyment positively influences attitude, was supported. This confirms the growing recognition of hedonic motivations in online consumption. In online food retail, enjoyment may stem from the novelty of the platform, interactive product displays, personalized suggestions, or the convenience of ordering from home. Previous studies (Maleknia & Salehi, 2024) suggest that affective engagement enhances trust and satisfaction, which may translate into more favorable attitudes toward the act of purchasing perishable goods online. This finding underlines the need for platform designers to consider emotional design principles that enhance shopping pleasure and user satisfaction. Hypothesis 6 (H6), which predicted that compatibility with users' values and needs would positively influence attitude, was also confirmed. This result underscores the

importance of value alignment and contextual appropriateness in shaping consumer preferences (Ruiz & Sebastian, 2025). Compatibility reflects the degree to which digital shopping fits a user's lifestyle, routines, and expectations particularly important in urban settings where time constraints, traffic, and household responsibilities limit offline shopping. This is consistent with research which found that perceived congruence between technology use and users' lifestyles enhances user satisfaction and system uptake (Ally & Oh, 2025; Wonneberger et al., 2025). While the original TAM constructs showed mixed predictive power confirming H1, H2, H5, and H6 but rejecting H3 and H4 the extended constructs (enjoyment and compatibility) were pivotal in explaining attitude formation. This suggests that functional perceptions alone are insufficient; rather, positive attitudes in agricultural e-commerce are largely driven by affective engagement and contextual fit.

TPB formed the conceptual backbone for understanding psychological determinants of intention in this study. All three of TPB's primary predictors attitude (H11), subjective norms (H12), and perceived behavioral control (H13) were found to have significant positive effects on behavioral intention to purchase agricultural products online, thereby offering strong support for the theory's validity in the context of urban digital food shopping. Beginning with Hypothesis 11 (H11), the analysis confirmed that attitude significantly influenced behavioral intention, although its effect size was smaller than expected. This finding partially aligns with traditional TPB models, where attitude typically plays a central role in determining intention (Ajzen, 1991). However, in contrast to some prior studies in online retail (Bazhan et al., 2024; Kherazi et al., 2024; Satinover et al., 2023), the relatively modest coefficient in this study suggests that while consumers' favorable evaluations of online food purchasing matter, they may be overshadowed by social and logistical pressures in densely populated urban environments (Maleknia, 2025). In such contexts, decisions may be driven more by external constraints and peer expectations than by personal preference alone. By far the strongest predictor of intention in the model was subjective norms, supporting Hypothesis 12 (H12). This substantial influence demonstrates that social acceptability and peer pressure are dominant motivators for adopting online purchasing channels in Tehran's fruit and vegetable markets. In collectivist and semi-collectivist cultures like Iran's where social approval and group identity are especially salient, normative influence plays a disproportionately powerful role in guiding behavior. These findings are consistent with prior studies that emphasize the weight of subjective norms in behavioral domains involving social risk, novelty, or uncertainty, such as organic food consumption and climate-smart shopping (Maleknia et al., 2024; Thi Tuyet et al., 2025). The results suggest that behavior change interventions should strategically leverage peer endorsements, influencer marketing, and word-of-mouth strategies to amplify normative pressures in favor of online food purchasing.

Perceived behavioral control also emerged as a significant predictor of intention, confirming Hypothesis 13 (H13). This finding aligns with core TPB assumptions and supports the notion that consumers are more likely to engage in online food shopping when they feel capable of doing so (Maleknia et al., 2025; Savari et al., 2023). However, a closer inspection of the antecedents of facilitating conditions (H9) and self-efficacy (H10) revealed an asymmetrical contribution. Facilitating conditions (e.g., infrastructure availability, logistics support, digital tools) significantly influenced perceived behavioral control supporting H9, whereas self-efficacy (e.g., internal confidence or technical skill) did not, leading to the rejection of H10. This divergence is theoretically important. It suggests that in highly infrastructured urban contexts, external resources and systems carry more weight than internal self-assurance in shaping behavioral control perceptions. Similar conclusions have been drawn by who found that the success of digital transformation in urban environments depends not on individual digital competence but on the availability of supportive ecosystems (e.g., fast internet, efficient delivery, digital payment systems) (Erfanian et al., 2024; Sembada & Yeik, 2021). In short, even if individuals feel confident, the absence of reliable delivery mechanisms or user-friendly platforms can negate their intention to adopt.

In addition to traditional TPB constructs, this study extended the normative component by introducing interpersonal influence and external influence as antecedents to subjective norms, yielding insights into how social messaging is constructed and internalized. Hypothesis 7 (H7) was strongly supported, as interpersonal influence showed the highest direct effect on subjective norms. This result reaffirms the enduring role of close social referents—family, friends, colleagues—in shaping norms, particularly in behaviors involving trust and risk, such as the purchase of perishable food items online. Interpersonal endorsement may mitigate skepticism around quality, delivery, and safety, and prior evidence (An et al., 2024; Fleary et al., 2020; Meira et al., 2024)confirms that peer influence is a persuasive cue in digital adoption, especially in regions with emerging or maturing e-commerce infrastructure. Furthermore, Hypothesis 8 (H8), which tested the impact of external influence on subjective norms, was also supported. Though the effect size was smaller than for interpersonal channels, its significance highlights the growing impact of mass media, social platforms, and advertising in shaping behavioral expectations. As observed in the research (Caputo et al., 2025; Maleknia & Enescu, 2025; Mehrabizadeh et al., 2024) institutional and media sources can legitimize behaviors, normalize emerging practices, and expand perceived consensus around digital consumption. In this context, promotional campaigns, endorsements by food delivery influencers, or public health messaging may play a subtle but pivotal role in establishing online food purchasing as a mainstream practice. These findings suggest

that both micro-level social relationships and macro-level discursive environments interact to shape the perceived social legitimacy of online food shopping. Future studies could explore the interplay of these normative sources across different demographic groups, especially in terms of trust in digital media versus trust in interpersonal networks.

6. Implications

6.1. Theoretical Implications

This study contributes to the theoretical understanding of consumer behavior in the context of online purchasing in fruit and vegetable markets by integrating the TPB and the TAM. The findings highlight the significant role of subjective norms and interpersonal influence in shaping consumers' behavioral intentions, reinforcing the importance of social factors in online purchasing decisions. This suggests that, beyond individual attitudes and perceived control, the opinions and behaviors of peers, colleagues, and media sources are crucial determinants of online shopping behavior for agricultural products. Additionally, the study challenges the conventional assumption that perceived usefulness is a primary driver of attitude formation in technology adoption. The results indicate that compatibility and perceived enjoyment exert a more substantial impact on consumer attitudes, emphasizing the need to refine existing models by considering experiential and contextual factors specific to agricultural e-commerce. These findings suggest that future research should further investigate the psychological and social dimensions of online food purchasing, particularly in emerging economies where digital transformation is still evolving. Moreover, the study underscores the importance of facilitating conditions in enhancing perceived behavioral control, highlighting the necessity of infrastructure, support systems, and ease of access in promoting technology adoption. The rejection of the relationship between self-efficacy and perceived behavioral control further suggests that external resources and systemic support may outweigh individual confidence in determining consumers' ability to engage with online shopping platforms. By integrating TPB and TAM in the context of fruit and vegetable markets, this study expands the application of these theories in the field of e-commerce, providing a more comprehensive framework for understanding consumer behavior in digital agricultural markets.

6.2. Policy Implications

The findings offer several actionable insights for policymakers, particularly those involved in digital transformation strategies for urban food markets. Given that subjective norms and interpersonal influence are the strongest determinants of online purchasing intention, policymakers and market administrators should leverage social marketing strategies, influence endorsements, and word-of-mouth campaigns to encourage adoption. Public awareness initiatives emphasizing the convenience, cost-effectiveness, and environmental benefits of online shopping could foster greater acceptance among consumers. Furthermore, since perceived enjoyment significantly influences attitude toward online purchasing, digital platforms should prioritize user-friendly interfaces, gamification elements, and interactive shopping experiences to enhance consumer engagement. Policymakers can support initiatives that encourage market operators to improve their platforms' ease of use and ensure seamless navigation and transaction processes. The critical role of facilitating conditions in perceived behavioral control suggests the need for improved digital infrastructure and logistics support. Governments and municipal authorities should invest in reliable delivery networks, digital payment solutions, and regulatory frameworks that streamline online transactions for agricultural products. Subsidizing digital transformation efforts for small and medium-sized enterprises (SMEs) operating in fruit and vegetable markets could further promote participation in e-commerce. Additionally, the findings indicate that compatibility with consumers' financial and lifestyle constraints is a significant driver of positive attitudes toward online purchasing. Policymakers should advocate dynamic pricing strategies, flexible payment options, and digital literacy programs to ensure that online shopping remains accessible to diverse consumer segments. Finally, in light of the growing emphasis on food security and waste reduction, online fruit and vegetable markets should be integrated into broader urban sustainability initiatives. Encouraging digital procurement methods can reduce food waste, optimize distribution channels, and minimize traffic congestion in densely populated areas. Public-private partnerships could facilitate investment in technology-driven solutions that enhance the efficiency and accessibility of online agricultural markets.

7. Limitations and Future Research

Despite the theoretical and practical contributions of this study, several limitations should be acknowledged, which also offer promising avenues for future research. First, the study's findings are based on data collected exclusively from consumers in Tehran's municipal fruit and vegetable markets, limiting the generalizability of the results to other urban contexts. While Tehran is a densely populated megacity with significant digital infrastructure, socio-cultural norms, institutional structures, and market dynamics may differ substantially in other cities or countries. Future research should replicate this model in diverse geographic and cultural settings, particularly in smaller cities, rural areas, or different national contexts, to validate and extend the applicability of the integrated TPB-TAM framework. Second, the study employed a cross-sectional design, capturing behavioral intentions at a single point in time. Although structural equation modeling allowed for the testing of theoretical relationships, the design restricts any inference of causality. Given that consumer behavior especially in online contexts is subject to rapid shifts due to

technological innovation, socio-political factors, or global events, longitudinal or experimental studies could offer deeper insight into the evolution of attitudes, perceived control, and normative influences over time. Third, while the model integrated several critical variables it did not directly include perceived risk, trust, or product-related factors as predictors, despite their recognized relevance in online food commerce. Future research should expand the model by incorporating affective and cognitive risk appraisals, trust mechanisms, and food quality perceptions to better reflect the decision-making complexities associated with perishable goods. Fourth, the non-significance of perceived usefulness and self-efficacy warrants closer examination. While these findings challenge traditional assumptions of TAM and TPB, it is possible that these constructs are mediated or moderated by latent variables such as digital literacy, prior experience, or platform trust. Future studies might use multi-group analysis to explore whether such relationships vary across demographic groups, including age, education level, or income. Lastly, although the survey instrument was rigorously developed and validated, self-reported data remains vulnerable to biases such as social desirability and recall inaccuracy. The incorporation of behavioral trace data, app usage logs, or observational techniques could complement self-reports and yield a richer understanding of actual purchasing behaviors. By addressing these limitations, future research can deepen our understanding of how psychological, social, and technological factors interact in shaping consumer behavior in digital agricultural markets ultimately contributing to more effective policy design and technological innovation in urban food systems.

8. Conclusion and Recommendations

This study investigated the factors influencing consumers' behavioral intention to purchase agricultural products from fruit and vegetable markets using an integrated model of the TPB and the TAM. The findings highlight the critical role of subjective norms, interpersonal influence, and facilitating conditions in shaping consumers' adoption of online purchasing systems. While subjective norms and interpersonal influence emerged as the most significant predictors of behavioral intention, perceived usefulness showed no significant effect on attitude, challenging conventional assumptions in technology adoption research. Instead, factors such as compatibility and perceived enjoyment played a more prominent role in shaping consumer attitudes toward online purchasing. The study also underscores the importance of infrastructure and systemic support in enhancing perceived behavioral control, suggesting that policymakers and market operators should prioritize improving digital accessibility, delivery logistics, and user-friendly online platforms. The results contribute to the theoretical discourse by integrating TPB and TAM into a novel context, offering a more comprehensive framework for understanding consumer behavior in digital agricultural markets. From a policy perspective, the findings suggest that targeted interventions, such as social marketing campaigns, digital infrastructure investments, and tailored pricing strategies, could significantly enhance consumer participation in online fruit and vegetable markets. Given the potential of digitalization to reduce food waste, improve market efficiency, and minimize urban congestion, future efforts should focus on scaling up e-commerce solutions in agricultural markets. Overall, this study provides valuable insights for academics, policymakers, and practitioners aiming to promote the adoption of online purchasing platforms in the agricultural sector. Future research could explore additional psychological and contextual factors influencing consumer behavior, particularly in emerging economies where digital transformation is still evolving.

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